ASHB Research Library – Members' Area (Updated: July 2025)

The following reports are available to ASHB members through the ASHB Research Library:

IS-2025-076 Zero Carbon Building Design Standard Version 4

Authored by Canada Green Building Council (CAGBC) | June 2024

This report presents Version 4 of the CAGBC's Zero Carbon Building – Design Standard, providing updated criteria for reducing operational and embodied carbon in new and renovated buildings. It introduces stricter limits on combustion, refrigerant use, and carbon intensity while emphasizing design strategies such as airtightness, passive resilience, and grid compatibility. The standard supports Canada's climate objectives and reflects national and global trends in sustainable building policy and practice.

IS-2025-075 Understanding User Experience with Smart Home Products

Authored by Yixiu Yu, Qian Fu, Dong Zhang, and Qiannong Gu | October 2024

This study analyzes over 250,000 Amazon reviews to assess post-adoption user satisfaction with smart home products, focusing on robotic vacuums and smart thermostats. Using text mining and fsQCA, the research identifies key satisfaction factors (smartness, functionality, ease of use) and pain points (connectivity, customer service). A UX framework is proposed to guide future design, development, and marketing of consumer smart home devices.

IS-2025-074 Thread Group 2024 Annual Report

Authored by Vividh Siddha, Thread Group | March 2025

This report outlines the Thread Group's 2024 achievements, highlighting global growth in adoption of Thread and Matter protocols for secure, low-power mesh networking in smart homes and buildings. It announces the release of Thread 1.4 and a growing ecosystem of over 670 certified products and 210 member organizations. The report emphasizes Thread's role as a foundational standard for future IoT connectivity.

IS-2025-073 Thread 1.4 Features White Paper

Authored by Saurabh Kumar and Esko Dijk, Thread Group | September 2024

This technical white paper details enhancements in the Thread 1.4 protocol, including improved

IPv6/IPv4 connectivity, Thread Credentials Sharing, and secure, large-scale commissioning via TCAT. It also introduces support for Thread-over-Infrastructure and enhanced diagnostics. These updates aim to simplify deployment, expand scalability, and improve security for developers and end users across residential and commercial IoT networks.

IS-2025-072 The Smart Home Buyers Index 2024

Authored by Mark Seaman, Samsung Electronics UK | June 2024

This report explores growing consumer demand for smart home technology in the UK housing market. Based on national survey data, it reveals that 79% of buyers prefer homes with smart tech, and 25% consider it essential. Key drivers include energy efficiency, AI integration, and convenience. The report highlights opportunities for early integration in new builds and retrofits to increase property value and buyer satisfaction.

IS-2025-071 The Home Energy Management Systems Market

Authored by Martin Bäckman, Berg Insight | September 2024

This report provides market analysis of Home Energy Management Systems (HEMS) across Europe and North America. It defines HEMS as platforms integrating solar PV, battery storage, EV chargers, and appliances. Driven by rising energy prices and sustainability goals, installations are expected to grow from 2.8 million in 2023 to 13.4 million by 2028. The report includes competitive analysis of over 50 vendors and insights into evolving consumer energy habits.

IS-2025-070 The Home and Small Business Security System Market

Authored by Martin Bäckman, Berg Insight | November 2024

This report evaluates the security systems market for homes and small businesses in North America and Europe, covering professionally monitored systems, DIY models, and smart home integrations. It discusses the growing use of cellular IoT and the convergence of traditional security with digital platforms. With a 130-page analysis, the report offers vendor comparisons and forecasts through 2028.

IS-2025-069 The 2024 IoT Security Landscape Report

Authored by Alexandru Catalin Cosoi and the Bitdefender team | June 2024

This report analyzes IoT device vulnerabilities and threat trends based on data from 3.8 million households and 9.1 billion security events. It identifies top targets like smart TVs, routers, and smart plugs, as well as common attack vectors such as buffer overflows. The paper highlights rising regulatory scrutiny and calls for better device patching, supply chain oversight, and ISP-level security solutions.

IS-2025-068 State of IoT 2024: Number of Connected Devices Grows 13% to 18.8 Billion

Authored by Satyajit Sinha, IoT Analytics GmbH | September 2024

This report presents global growth trends in IoT, forecasting 18.8 billion devices by end of 2024 and over 40 billion by 2030. It explores developments in edge AI, sustainability reporting, and connectivity (Wi-Fi, Bluetooth, cellular), which now account for 80% of connections. Despite economic headwinds and supply chain challenges, enterprise IoT budgets are rising, particularly in smart buildings and industrial automation.

IS-2025-067 Privacy Communication Patterns for Domestic Robots

Authored by Maximiliane Windl et al., LMU Munich | August 2024

This study identifies 86 privacy communication patterns for domestic robots through surveys and a focus group. The authors evaluate how robots can transparently convey their use of cameras, microphones, and internet connectivity. The research finds that user trust increases with familiar, tangible cues (e.g., camera shutters), and argues for adaptive communication strategies aligned with each robot's capability and context.

IS-2025-066 Pilot Study: Collaboration of Financial Institutions with Academia and Utilities

Authored by PCAF and University College London | June 2024

This pilot study explores how financial institutions can access real building energy data to improve emissions accounting. Using smart meter data from 13,000 UK homes, the study tests data-sharing models and explores replicability in other European countries. It recommends structured partnerships between FIs, academia, and utilities to support more accurate emissions reporting and net-zero financing strategies.

IS-2025-065 Net Zero Communications, Marketing and Public Engagement

Authored by Toby Park, Jake Reynolds et al., Behavioural Insights Team | September 2024

This report argues that 62% of Net Zero outcomes depend on behavior change and outlines a "4As" engagement framework: Awareness, Acceptance, Access, and Adoption. Supported by new UK survey data, it recommends long-term, independent, and coordinated public campaigns to drive adoption of low-carbon technologies like EVs, smart thermostats, and heat pumps. Case studies demonstrate effective messaging strategies for shifting public behavior.

IS-2025-064 Key Grid-Interactive Efficient Building Technologies for Federal and Commercial Facilities

Authored by Valerie Nubbe, April Weintraub, and Mark Butrico, Guidehouse | August 2024

Commissioned by the U.S. Department of Energy's FEMP, this draft report identifies high-impact technologies that enable Grid-Interactive Efficient Buildings (GEBs). It categorizes solutions, like HVAC controls, lighting automation, and thermal energy storage, by their ability to decarbonize, shift loads, and support grid stability. The report also includes scoring frameworks,

implementation guidance, and case studies to support GEB adoption across federal and commercial portfolios.

IS-2025-063 IoTective: Automated Penetration Testing for Smart Home Environments

Authored by Kevin Nordnes et al., Mnemonic AS, NTNU, Aston Business School | 2024

This research introduces IoTective, an open-source tool for automated vulnerability scanning of smart home environments. Designed to work across Wi-Fi, Zigbee, and Bluetooth, the tool streamlines testing for device weaknesses. A real-world case study demonstrates its effectiveness, while the paper discusses ethical implications and promotes a hybrid testing approach combining automation with manual review.

IS-2025-062 IoT Bricks Over v6: Understanding IPv6 Usage in Smart Homes

Authored by Tianrui Hu, Daniel J. Dubois, and David Choffnes, Northeastern University | November 2024

This study assesses IPv6 functionality in 93 consumer IoT devices and finds that only 8.6% are fully operational in IPv6-only networks. Key issues include DNS failures and persistent device identifiers. While smart TVs and speakers fared better, many home automation devices struggled. The research calls for greater IPv6 compatibility to support scalable and privacy-conscious smart home infrastructure.

IS-2025-061 Internet of Things (IoT) Advisory Board (IoTAB) Report

Published by the Internet of Things Advisory Board | October 2024

This report outlines strategic recommendations to advance a secure, inclusive, and economically beneficial IoT-enabled economy in the U.S. Authored by a multidisciplinary panel of experts, the report identifies key barriers to adoption—including fragmented regulation, infrastructure limitations, and workforce readiness—and presents six enabling themes to address them. It calls for federal leadership, cybersecurity safeguards, and sector-specific strategies to accelerate deployment across smart cities, healthcare, transportation, and environmental systems. The roadmap emphasizes IoT's potential to drive innovation, economic opportunity, and societal resilience.

IS-2025-060 Improving Smart Home Surveillance through YOLO Model with Transfer Learning and Quantization

Authored by Surjeet Dalal et al., supported by Princess Nourah bint Abdulrahman University | June 2024

This peer-reviewed study introduces a hybrid deep learning approach combining transfer learning and quantization to enhance the YOLO (You Only Look Once) object detection model for smart home surveillance. Optimized for edge devices, the model achieved 98.87% accuracy across RoboFlow datasets. The paper underscores practical applications in intrusion detection,

energy management, and automation, while addressing privacy and scalability. It demonstrates how efficient AI models can bolster smart home security within broader smart city frameworks.

IS-2025-059 Future Homes Savings: Modeling the Running Costs of New Homes with Renewables

Published by The MCS Foundation, authored by Think Three | September 2024

This UK-based report models the lifetime financial and environmental impacts of low-carbon technologies in new home construction. It compares three build options under the Future Homes Standard, finding that homes with heat pumps, solar panels, and battery storage (Option 3) offer the greatest cost savings and CO_2 reductions. The paper recommends mandating solar and storage systems in new builds and calls on mortgage lenders to reflect these benefits in financing models to accelerate climate-positive home construction.

IS-2025-058 Future and Emerging Technologically Driven Changes and Horizon Scanning Methodology

Published by the Office for Product Safety and Standards (OPSS) in collaboration with Arup Foresight | November 2024

This report details the UK regulator's first structured horizon scanning effort to identify emerging technologies relevant to product safety. The five-stage methodology includes taxonomy development, metric-based assessment, and expert validation across 71 technologies. High-impact technologies such as AI, smart sensors, and human implants were prioritized based on societal benefit, market readiness, and potential harm. The report supports proactive regulatory planning and evidence-based policy design to address future risks and opportunities.

IS-2025-057 Digital Revolution in Fire Safety: A Pathway to Smarter Protection

Published by Siemens Smart Infrastructure | 2024

This whitepaper explores how digital transformation is reshaping fire safety systems. It outlines the benefits of integrating connected sensors, AI, and cloud-based analytics into fire protection frameworks to enable predictive maintenance and real-time alerts. The paper identifies challenges such as outdated infrastructure and evolving risks from new technologies and advocates for embedding fire safety into smart building ecosystems. Key benefits include increased resilience, compliance, and resource efficiency.

IS-2025-056 Decarbonizing Higher Education Campuses: A Pathway Towards Net Zero

Published by Siemens Smart Infrastructure | 2024

This whitepaper offers a strategic framework for higher education institutions to achieve net-zero goals through infrastructure upgrades, renewable energy deployment, and sustainable mobility solutions. Featuring case studies from Algonquin College, RMIT, and the University of East London, the paper highlights digital tools, stakeholder engagement, and performance monitoring as enablers of sustainable campus transformation. It positions universities as both

climate leaders and living labs for innovation.

IS-2025-055 Buildings of the Future: Redefining Urban Living with Building Operating Systems

Authored by Rajat Chowdhary, Vishesh Kalia, and Sharang Gupta, PwC Middle East | October 2024

This report examines the rise of Building Operating Systems (BOS) and their role in creating intelligent, adaptable, and sustainable urban environments. It outlines BOS architecture, use cases, such as AI-based comfort control and self-healing systems, and a roadmap for implementation. Citing large-scale Middle Eastern projects, the paper emphasizes interoperability, stakeholder alignment, and digital twin integration as critical to the evolution of next-generation buildings.

IS-2025-054 BOMA BEST Buildings 2024 Report

Authored by Benjamin Shinewald and Victoria Papp, BOMA Canada | 2024

This report showcases the progress of BOMA BEST-certified commercial buildings, covering over 1 billion square feet across 14 countries. It highlights how certification drives operational, environmental, and financial performance through smart technology adoption, recertification processes, and community-focused sustainability. The report explores future directions in AI integration and evolving green standards, offering benchmarks for the commercial real estate sector.

IS-2025-053 Analyzing the Environmental Sustainability of Smart Buildings

Authored by Sara Aouichaoui, Farina Koller, and Niels Bartels, University of Applied Sciences Cologne | July 2024

This study evaluates the sustainability outcomes of smart buildings through a mix of literature reviews, 15 case studies, and expert interviews. It identifies the most impactful use cases for reducing energy consumption and emissions while highlighting challenges such as inconsistent data and unclear definitions. The authors propose a standardized data framework to improve environmental performance assessments, concluding that sustainability is often a secondary benefit rather than the central design goal in smart building projects.

IS-2025-052 AIB Homes Retrofit Report: Empowering People to Build a Sustainable Future

Authored by Marie Gillespie, Shaunagh Moodie, Pat O'Sullivan, and Rory McGuckin, AIB Sustainability Research | December 2024

This report examines the landscape of residential energy retrofits in Ireland, focusing on financial barriers, public awareness, and technical solutions. It features SEAI grant programs and AIB's green financing options, including the SBCI Home Energy Upgrade Loan Scheme. Survey data reveals strong public interest tempered by affordability concerns. The report concludes with case studies and emerging retrofit technologies, advocating for a coordinated approach to make

sustainable housing upgrades accessible and scalable.

IS-2025-051 AI for Decarbonization: Policy and Regulation Alignment

Published by the ADViCE Expert Working Group, with contributions from the Centre for Net Zero and Ofgem | 2024

This whitepaper explores the regulatory and policy frameworks required to enable responsible AI deployment for decarbonization across sectors such as energy, manufacturing, and buildings. Commissioned by the UK Department for Energy Security and Net Zero, the report identifies gaps in data infrastructure, compliance, and funding. It highlights the potential of AI and synthetic data for grid integration, building optimization, and sustainable agriculture. Recommendations include aligning regulation with innovation to maximize AI's impact on national net-zero goals.

IS-2025-050 2024 Annual Report: From Grid to Greatness – The Promise of Electrification

Published by the National Electrical Contractors Association (NECA) | 2024

This annual report outlines NECA's efforts to advance electrification, smart grid development, and workforce readiness. Featuring leadership insights from CEO David Long and President Kirk Davis, the report showcases initiatives in emerging technologies, such as Power over Ethernet (PoE), Fault Managed Power (FMP), and EV infrastructure. It also details strategic partnerships, labor relations, and education programs aimed at modernizing the electrical construction industry while supporting sustainability and economic development.

IS-2025-049 Energy Codes and Affordability

Published by Northeast Energy Efficiency Partnerships (NEEP), authored by Dragana Thibault et al. | December 2024

This report explores how modern energy codes affect the cost and long-term affordability of residential construction. Drawing on data from Pacific Northwest National Laboratory (PNNL), HUD, and various state programs, it evaluates energy code cost-effectiveness using lifecycle cost, cash flow, and payback period analyses. The paper highlights the advantages of advanced and stretch codes, including lower utility bills, improved indoor air quality, and reduced retrofit expenses, particularly for renters and low-income households. While acknowledging higher upfront costs, the report concludes that well-structured energy codes can deliver long-term savings, resilience, and greater housing equity.

IS-2025-048 AI Reference Designs to Enable Adoption – A Collaboration Between Schneider Electric and NVIDIA

Authored by Steven Carlini and Wendy Torell, Schneider Electric | June 2024

This whitepaper introduces a set of AI-ready data center reference designs developed jointly by Schneider Electric and NVIDIA to support high-density GPU clusters used in AI training. Addressing power, cooling, and layout challenges, the report presents four design scenarios,

three retrofit and one new build, optimized for NVIDIA's DGX SuperPODs with rack densities of up to 73 kW. The goal is to simplify feasibility assessments, shorten planning cycles, and support sustainable deployment of AI infrastructure through scalable, energy-efficient designs.

IS-2025-047 The Impact of Smart Home Technology on Insurance Claims – Insights for Information Systems

Authored by Ole Morten Sahlin Joneid et al., published in Procedia Computer Science | 2025

This academic study investigates the correlation between smart home security systems (SHS) and property insurance claims, aiming to provide empirical evidence for insurance policy innovation. The paper finds that SHS, including burglar alarms, fire sensors, and water leak detectors, are associated with lower claim frequency and severity. It recommends that insurers collaborate with SHS providers to offer bundled solutions and incentives, enhancing customer adoption and satisfaction while reducing risk.

IS-2025-046 Sustainability in Properties 2025 – Demand, Supply, and Affordability of Energy-Efficient Homes

Published by Domain | 2025

This report examines the evolving demand for energy-efficient (EE) homes in Australia, emphasizing their growing influence on buyer preferences and property values. It cites real estate data showing that EE homes receive 13.8% more views and are increasingly sought after by middle-income households. Solar power, building orientation, and double glazing are the most prevalent features. The report calls for policy support to expand access and supply of EE homes, while reinforcing that sustainability can enhance both livability and investment confidence.

IS-2025-045 Achieving Net-Zero Buildings – An Action Plan for Market Transformation

Authored by Hunziker, R. et al., published by the World Business Council for Sustainable Development (WBCSD) | March 2025

This report presents a 12-step action plan to scale the development of net-zero buildings and accelerate decarbonization across the sector, which accounts for 37% of global energy-related emissions. It emphasizes that technical solutions exist but require broader market adoption, clearer definitions, and stronger incentives. Featuring global case studies, the report calls for robust certification systems, policy alignment, and investor engagement to enable systemic transformation in the built environment.

IS-2025-044 Massive IoT – New Models, New Technologies, and New Relationships

Published by Telit Cinterion | 2024

This whitepaper explores the evolution of the Internet of Things (IoT) into a hyperscale ecosystem, forecasting over 29 billion connected devices by 2027. It argues that while early

growth was slower than expected, the market has matured, with improved technologies and heightened security. The paper positions Telit Cinterion as a full-stack IoT provider addressing compliance, security, and deployment complexity. It concludes that simplified connectivity, partnerships, and robust security frameworks are key to unlocking scalable, cost-effective IoT adoption.

IS-2025-043 Smart Spaces – New Opportunities for Custom Integrators

Authored by Kristen Hanich, published by Parks Associates | 2025

This whitepaper highlights new growth opportunities for custom integrators in nonresidential sectors—including education, multifamily, hospitality, and quick service restaurants—driven by increasing demand for connected technologies. It emphasizes the value of integrators' expertise in deploying smart systems such as access control, environmental monitoring, and energy management. By offering scalable, tailored solutions, integrators can build long-term client relationships and expand into commercial markets traditionally underserved by smart home technology.

IS-2025-042 Seven Steps to Get Started with Smart Buildings

Published by TRANE | 2024

This practical guide outlines a step-by-step approach to implementing smart building solutions, emphasizing collaboration, communication, and continuous improvement. It advocates for adopting open communication protocols, equipping teams with the right tools, and setting measurable goals to enhance efficiency and occupant comfort. The report stresses the importance of data transparency and performance tracking as key drivers of long-term success in smart building projects.

IS-2025-041 Realizing ESG Performance – The Value-Driven Transformation of Europe's Built Environment

Co-authored by Damian Harrington et al., published by Colliers International | 2024

This report examines how sustainability regulations and ESG (Environmental, Social, and Governance) goals are reshaping Europe's built environment. While retrofitting costs and stranded assets pose challenges, the report highlights opportunities through active portfolio management, innovation, and targeted investments. It presents case studies from hotels and commercial real estate to illustrate how ESG integration is becoming central to property value and resilience in Europe's evolving regulatory landscape.

IS-2025-040 Building Smarter Cities with Digital Twins

Authored by Sue Weekes, published in partnership with Bentley Systems | 2025

This report explores the role of digital twins in modern urban planning, using a case study from the Pau Béarn Pyrenees Agglomeration Community in France. It details how digital twins

enhance stakeholder communication, data visualization, and planning precision. By integrating with AI and real-time data, digital twins support climate resilience, infrastructure maintenance, and smarter public engagement. The report concludes that digital twins are critical tools for sustainable city development and digital transformation.

IS-2025-039 2024 Workplace Index

Published by Eptura | 2024

This report presents an overview of trends in workplace digitalization, based on Eptura's ongoing market research. It explores how organizations are progressing in their digital transformation journeys, identifying top technology priorities: data analytics, integrated workplace systems, and collaboration tools. The study concludes that as connectivity between people, buildings, and assets deepens, the value of smart workplace technology grows, driving both operational efficiency and employee well-being.

IS-2025-038 Transform Wi-Fi Gateways into Multiprotocol IoT Infrastructure for Smart Homes

Authored by Christopher Ince, Wael Guibene, Kornel Nagy, Kris Young, and Mikko Nurmimaki, Silicon Labs | Published April 28, 2025

This report outlines how ISPs can transform Wi-Fi gateways into multiprotocol IoT infrastructure for smart homes by supporting protocols such as Matter, ZigBee, and Z-Wave. It explains how these protocols can share the 2.4 GHz unlicensed frequency band and discusses antenna placement strategies to improve signal uniformity. The report also addresses power consumption reduction methods and promotes Wi-Fi gateways designed for Matter while offering broader technical insights.

IS-2025-037 Evaluating Smart Home Protocol Options from a User's Perspective

Authored by Devanjan Sikdar, Silicon Labs | Published April 28, 2025

This report compares major smart home communication protocols—including Wi-Fi, Thread, Matter, Zigbee, Z-Wave, Amazon Sidewalk, Bluetooth, and proprietary systems—from the end-user's point of view. It analyzes factors such as power consumption, topology, and compatibility. While the report promotes Matter for its broad interoperability, it acknowledges ongoing limitations. Visual charts show adoption trends across device categories, providing a snapshot of the protocol landscape in 2025.

IS-2025-036 Ask the Expert – Smart OT Cybersecurity Starts Before Asset Construction

Authored by Ian Bramson and Keon McEwen, Black & Veatch | Published October 2024

This article highlights the cybersecurity risks facing operational technology (OT) systems in critical infrastructure, including power and water utilities. It argues that cybersecurity must be embedded into the design of new plants—rather than retrofitted—emphasizing the value of segmented networks, visibility, and control. The authors caution against outdated approaches as

technology rapidly evolves and call for proactive cybersecurity strategies in new industrial builds.

IS-2025-035 Achieving Zero-Carbon Buildings – Electric, Efficient, and Flexible

Authored by the Energy Transitions Commission (ETC) | Published April 28, 2025

This report by the ETC—a global coalition advancing the Paris Agreement goals—focuses on decarbonizing buildings, which account for one-third of global CO_2 emissions. The paper outlines a strategy based on electrification (via heat pumps), energy efficiency, and flexible demand. It advises against using hydrogen for space heating, suggesting limited use in district energy systems. The report also emphasizes the importance of eliminating fossil fuels and managing peak electricity demand to accelerate the transition to zero-carbon buildings.

IS-2025-034 Wi-Fi 7 Trial Report for Residential Settings by LG U+ and Intel

Published by the Wireless Broadband Alliance (WBA) | 2025

This whitepaper presents real-world performance trials of Wi-Fi 7 conducted in collaboration with LG U+ and Intel. Compared to Wi-Fi 6, Wi-Fi 7 demonstrated up to 4x faster speeds, lower latency, and enhanced reliability—especially in high-density, interference-prone residential environments. Key innovations, including Multi-Link Operation (MLO), preamble puncturing, and 320 MHz channels, support demanding use cases like 8K streaming and smart home IoT. The report positions Wi-Fi 7 as foundational for next-generation connected living.

IS-2025-033 Smart Grids – Improve Monitoring, Increase Revenue, and Achieve Compliance

Published by STMicroelectronics | 2024

This whitepaper examines the evolution of energy metering for smart grid applications. It introduces STMicroelectronics' STPM3x and STPMS2 metering ICs, which offer high-accuracy monitoring, power factor correction, and anti-tamper features. Applications span utility metering, EV chargers, smart plugs, and industrial sub-metering. The report emphasizes real-time visibility, regulatory compliance, and revenue assurance, showcasing how modern metrology supports the digital transformation of power infrastructure.

IS-2025-032 Moving Beyond the Limitations of Single Vendor, Single Use-Case IoT Solutions

Published by Daizy | 2024

This analyst report explores the operational inefficiencies caused by fragmented, vendor-specific IoT deployments. It advocates for open, scalable platforms that unify device, connectivity, and data management, enabling better integration with IT/OT systems. Featuring case studies from utilities and industrial operations, the report demonstrates how agnostic platforms can streamline operations, reduce silos, and support outcome-driven IoT adoption at scale.

IS-2025-031 How Intelligence at the Edge Powers Endless Optimization for IoT Use Cases

Published by IoT Now, sponsored by Eseye | Q2 2024

This report explores the shift from cloud-centric architectures to edge intelligence in IoT. It showcases how AI-capable edge devices and adaptive connectivity, such as Eseye's SMARTconnect™, improve latency, autonomy, and cost efficiency. Use cases—from leak detection to carbon trading—illustrate how edge intelligence supports real-time decision-making while offloading non-critical data to the cloud. The report encourages organizations to adopt right-sized, flexible IoT strategies tailored to diverse operational needs.

IS-2025-030 Enabling Secure Connectivity for Smart Meters

Published by Beecham Research in collaboration with Thales | 2024

This whitepaper addresses connectivity and security challenges in large-scale smart meter deployments for electricity, gas, and water. It introduces Thales' "Build–Run–Protect" approach, which leverages eSIM/iSIM technologies, IoT SAFE protocols, and Trusted Key Manager (TKM) to ensure secure, resilient device connectivity. A featured case study illustrates how Thales' Adaptive Connect platform enables secure deployment of battery-powered smart water meters, ensuring regulatory compliance and long-term performance.

IS-2025-029 Autonomous Cleaning Changes the Game for the Future of Smart Vacuums

Published by IDC, sponsored by Roborock | 2024

This report traces the evolution of smart vacuums into fully autonomous cleaning solutions. It explores how AI, multimodal navigation, sensor technology, and self-maintenance capabilities are reshaping consumer expectations. With increasing demand for hygiene, efficiency, and low-maintenance automation, smart vacuums are becoming central to the smart home ecosystem. The report showcases Roborock innovations like FlexiArm™, VibraRise®, and RockDock® as examples of market-leading advancements.

IS-2025-028 Nitrogen Dioxide Exposure, Health Outcomes, & Demographic Disparities from Gas and Propane Stoves

Published in Science Advances | 2024

This peer-reviewed study quantifies the health risks associated with indoor nitrogen dioxide (NO_2) emissions from gas and propane stoves in U.S. homes. Using modeling and air quality simulations, the research links these emissions to 200,000 pediatric asthma cases and up to 19,000 annual adult deaths, disproportionately affecting low-income and minority households. The paper recommends increased public awareness, improved ventilation, and a shift to electric stoves to address indoor air quality risks.

IS-2025-027 Master Data Management – The Key to Getting More from Your Data

Published by McKinsey & Company | May 2024

This report highlights how Master Data Management (MDM) can unlock enterprise value by centralizing and synchronizing critical data across systems. Drawing from a survey of over 80 global companies, the report explains how MDM improves decision-making, customer experience, and operational efficiency. It recommends a phased, AI-assisted implementation with strong governance and change management, encouraging organizations to begin with pilot programs and scale success strategically.

IS-2025-026 Data Center Development in an AI-Driven Market

Published by Stream Data Centers | 2024

This whitepaper outlines how AI, high power densities, and sustainability pressures are reshaping data center strategies. It introduces a shift from traditional “build-to-suit” models to “build-to-performance-spec” approaches that prioritize flexibility, speed, and cost control. The report emphasizes innovations in liquid cooling, water use reduction, and carbon-aware design. Stream’s approach to proactive site development and modular designs highlights how operators can meet growing AI demand while aligning with environmental goals.

IS-2025-025 Two Million Green Homes

Published by the Canada Green Building Council (CAGBC) | 2024

This report outlines a roadmap to ensure Canada’s next generation of purpose-built rental (PBR) multi-unit residential buildings (MURBs) aligns with both housing and climate objectives. It promotes cost-effective, scalable technologies such as heat pumps, high-performance envelopes, and solar PV, while advocating for advanced codes, financing models (e.g., green loans, ESG-linked investments), and performance-based metrics. The report also calls for expanded workforce training and the integration of climate resilience in building design. Case studies showcase successful low-carbon affordable housing, illustrating how coordinated policy, funding, and industry action can deliver both environmental and social value.

IS-2025-024 A Systematic Review of the Digital Transformation of the Building Construction Industry

Published in IEEE Access | March 2024

This comprehensive literature review examines how digital technologies—such as BIM, IoT, AI, robotics, and digital twins—are transforming the building construction industry across pre-construction, construction, and facility management phases. Analyzing over 200 papers from 2008 to 2023, it identifies trends, benefits, and barriers to adoption. While digital transformation is accelerating, challenges remain around stakeholder engagement, training, infrastructure, and clear regulatory frameworks. The report positions digital innovation as a driver of collaboration, safety, and operational efficiency in construction.

IS-2025-023 Healthcare Security is a Challenge for Administrators and Staff

Published by SecurityInfoWatch | 2024

This eBook compiles expert insights on the evolving security challenges in healthcare facilities, emphasizing the need for integrated physical and cybersecurity solutions. Contributors highlight best practices in access control, AI-enhanced surveillance, and incident response software, alongside cybersecurity standards for connected medical devices. Case studies, including Mercy Hospital's deployment of Evolv AI, illustrate how advanced systems can improve safety, compliance, and operational efficiency. The resource is aimed at IT leaders, administrators, and facility managers navigating today's complex threat landscape.

IS-2025-022 Scaling Connectivity for Multifamily Properties

Published by Parks Associates | 2024

This report explores the foundational role of high-speed internet in enabling smart home adoption across multifamily communities. It addresses infrastructure challenges in legacy buildings and outlines the benefits of managed Wi-Fi, centralized smart device platforms, and operational analytics. Use cases—including smart thermostats and water leak detectors—demonstrate how connectivity improves tenant satisfaction and net operating income (NOI). The report includes deployment insights and vendor guidance for property managers seeking to future-proof operations.

IS-2025-021 Using Smart Technology to Control Building Energy Use

Published by NYSERDA (New York State Energy Research and Development Authority) | 2024

This report showcases how smart building technologies—such as real-time energy management (RTEM), smart thermostats, and automated controls—are helping commercial, industrial, and multifamily buildings reduce energy use and carbon emissions. Case studies illustrate how integrated systems optimize HVAC, lighting, shading, and EV charging infrastructure while enhancing maintenance, comfort, and asset value. The report also outlines available incentives and technical resources in New York State to support wider adoption.

IS-2025-020 The Future of Real Estate

Published by JLL | June 2024

Based on JLL's Future Vision initiative, this report outlines four imperatives shaping the real estate industry: climate, people, technology, and resilience. It encourages scenario-based planning over prediction, urging developers and investors to embed flexibility, support equitable spaces, and embrace digital tools like AI, digital twins, and robotics. As cities adapt to climate disruption and shifting demographics, the report presents a strategic framework for real estate stakeholders navigating a volatile, fast-evolving environment.

IS-2025-019 Smart Meters and IoT – Enhancing Energy Management for a Sustainable Future

Authored by David Garcés, published by Fibocom | 2024

This whitepaper explores how smart meters and IoT technologies are transforming global energy management systems. It highlights the role of advanced metering infrastructure (AMI) and wireless communication modules—such as 5G and LTE-M—in enabling real-time monitoring, dynamic pricing, and predictive maintenance. With over a billion smart meters already deployed, the report emphasizes the need for scalable, secure, and interoperable connectivity solutions to support net-zero energy goals across commercial, industrial, and residential markets.

IS-2025-018 Revolutionizing HVAC Systems for a More Sustainable Future

Authored by David Garcés, HMS | 2023

This whitepaper details how Intesis AC gateways enable integration between HVAC systems and Building Management Systems (BMS), driving energy savings of up to 30% and reducing CO_2 emissions. With over 1.5 million AC units connected globally, the paper highlights the scalability and cross-brand compatibility of Intesis technology, especially in hospitality and retail sectors. The latest 700 Series Air gateway is showcased as a tool for compliance with global climate regulations and simplifying HVAC control in large-scale environments.

IS-2025-017 Pioneering Net Zero Buildings – The Infosys Journey

Published by Infosys | 2024

This case study highlights Infosys' leadership in net zero buildings, detailing strategies such as radiant cooling, optimized building envelopes, and in-house innovation. Despite doubling its workforce since 2008, Infosys increased electricity use by just 20% and achieved carbon neutrality by FY2020. The report presents replicable practices—including data-driven design, supply chain engagement, and strategic retrofits—that demonstrate sustainable buildings can be cost-effective and scalable.

IS-2025-016 The Next Frontier for Green Building Certifications

Authored by Paulina Torres and Tobias Lindqvist, JLL | July 2024

This report examines the evolution of green building certifications like LEED, BREEAM, and ILFI, which have historically focused on design and construction. As market priorities shift toward operational performance and carbon reduction, certifications are adapting to meet investor and regulatory demand. The paper explains how new frameworks and tools—like CRREM, NABERS, and SBTi—are being integrated into updated certification schemes to demonstrate long-term net-zero readiness.

IS-2025-015 Low Carbon Buildings Create Economic Value

Authored by Paulina Torres and Jeremy Kelly, JLL | September 2024

This report presents a business case for decarbonization in real estate, outlining three key

actions: energy efficiency, electrification, and clean energy procurement. Case studies show that light-to-medium retrofits can yield 10–40% energy savings, while electric heat pumps are up to 4.5x more efficient than gas boilers. The report emphasizes that clean energy strategies—including onsite renewables and power purchase agreements—offer both economic and environmental returns.

IS-2025-014 The Future of Flexibility – Unlocking the Full Value of VPPs for a Changing Grid

Published by EnergyHub | 2024

This whitepaper discusses the expanding role of Virtual Power Plants (VPPs) in managing electricity demand and grid stability. By aggregating distributed energy resources (DERs) like batteries, smart appliances, and rooftop solar, VPPs offer flexible, cost-effective alternatives to traditional power plants. The report highlights the need for regulatory support and better utility integration to fully realize the benefits of VPPs in a rapidly evolving energy market.

IS-2025-013 Smart Cities and Blockchain

Published by Liveplex | 2024

This report explores blockchain's role in smart cities, emphasizing benefits such as enhanced data security, interoperability, citizen engagement, and integration of renewable energy systems. It highlights emerging applications like decentralized apps (DApps) and blockchain-IoT integration. The paper positions blockchain as a foundational enabler for transparent, efficient, and sustainable urban ecosystems.

IS-2025-012 Narrowing the Split Incentive Gap to Decarbonize the Built Environment

Authored by Clare Harman, Sustainable Buildings Task Force | 2024

This paper examines strategies to resolve the "split incentive" problem, where landlords and tenants have misaligned motivations for energy upgrades. It reviews policy tools such as green leases, performance mandates, and financial incentives, and highlights successful programs from the U.S., U.K., and EU. The report provides a roadmap for aligning stakeholder interests and accelerating building decarbonization in leased spaces.

IS-2025-011 An AI-Based Evaluation Framework for Smart Building Integration into Smart Cities

Authored by M. Shahrabani and R. Apanaviciene | Published in Sustainability Journal, September 2024

This academic paper introduces an AI-driven framework to assess how smart buildings contribute to broader smart city performance. The study ranks smart energy, water, security, mobility, and waste services by their impact on urban outcomes. The framework offers decision-makers a structured tool for prioritizing investment and evaluating smart building initiatives in the context of smart city development.

IS-2025-010 When Cities Get Smart, Life Gets Easier

Published by KORE | 2024

This paper provides an overview of key smart city applications, with a focus on five areas: street lighting, smart parking, mobility, waste management, and digital signage. It emphasizes how IoT adoption enhances energy efficiency, reduces congestion, and improves citizen services. The report outlines early successes in North America and Europe and encourages cities to build on existing infrastructure to scale smart services efficiently.

IS-2025-009 The Future of Work 2024

Authored by Steven Lewis and Flore Pradère, JLL | September 2024

This report explores emerging work patterns and their impact on corporate real estate strategy. It advocates for flexible office models that enhance collaboration and productivity while aligning with sustainability and workforce expectations. With many organizations planning to expand real estate investments, the paper calls for adaptive space planning, digital integration, and human-centric design to support business resilience and attract talent.

IS-2025-008 Revolutionizing Facilities Management with Smart Building Technologies

Published by Room Alert | 2024

This paper highlights how IoT and smart building systems are transforming facilities management by improving energy efficiency, reducing costs, and enhancing occupant comfort. It introduces Room Alert's solutions for environmental monitoring and failure prevention, with use cases across data centers, offices, and schools. The report underscores the importance of proactive maintenance and staying current with technological innovations.

IS-2025-007 Connected Smart Elevator Systems for Smart Power and Time Saving

Authored by Ahmed Zaki Rashed et al. | 2024

This research paper explores AI-enhanced smart elevators that use image processing (YOLO model) for object detection and personalized service. It discusses energy savings, predictive maintenance, and user experience improvements, while addressing security and sustainability concerns. The paper demonstrates how connected elevator systems contribute to smarter and more efficient building operations.

IS-2025-006 Buildings Decarbonization Meets Water Conservation

Authored by Ashley Besic, Building Decarbonization Coalition | July 2024

This report connects decarbonization and water conservation through the use of Thermal Energy Networks (TENs) in cooling systems. It outlines how TENs recycle waste heat, significantly reduce water use (18–46%), and cut costs related to wastewater treatment. The paper also reviews

policy incentives and tax credits supporting adoption, positioning TENs as a dual-benefit strategy in regions facing heatwaves and water scarcity.

IS-2025-005 A Smart Heating Solution for Canada's Fiscally Strained Municipalities

Authored by M. Truong-Regan, RBC Climate Action Institute | August 2024

This report makes the case for district heating systems as a cost-effective, low-carbon solution for Canadian municipalities. It discusses how central heating plants serving multiple buildings can reduce emissions by up to 36%. The paper provides international case studies and policy recommendations, including mandatory connection bylaws and strategic energy planning for long-term implementation.

IS-2025-004 Universal Design – Accessibility for Everyone in Every Space

Published in Building Magazine | June 2024

This guide promotes universal design in commercial buildings, ensuring accessibility for all ages and abilities. It offers design tips and ADA compliance resources, covering applications in healthcare spaces, bathrooms, elevators, and more. The report includes case studies and encourages the adoption of inclusive design protocols that go beyond compliance to foster equitable built environments.

IS-2025-003 The Role of Advanced Entertainment Technologies

Published by McKnight's | 2024

This report explores how technology is enhancing entertainment in senior living facilities. It discusses widespread adoption of interactive TV systems and analytics-driven content personalization. With residents spending over four hours per day engaging with screens, entertainment technologies now play a key role in boosting satisfaction and quality of life.

IS-2025-002 Streamlining Indoor Connectivity

Authored by Stephanie Atkinson, Dense Air Networks | Published by Compass Intelligence, June 28, 2024

This whitepaper explores in-building wireless connectivity trends, highlighting growing demand from office, healthcare, retail, and multifamily sectors. It compares traditional Distributed Antenna Systems (DAS) with emerging neutral host small cell (NHSC) models and examines ownership and deployment structures. The report offers a strategic overview of evolving telecom infrastructure and its impact on tenant and guest experiences.

IS-2025-001 Smart Tech for Multifamily Properties – Understanding ROI

Authored by Kristen Hanich, Parks Associates | Published in partnership with SKBM Smart Technology, June 6, 2024

This report examines ROI from smart technology investments in multifamily properties, using interviews with owners and operators across the U.S. It identifies key metrics for evaluating net operating income (NOI) impact and presents real-world data on smart thermostats, access control, and leak detection systems. The paper offers strategies for benchmarking effectiveness and making data-informed technology investments.

IS-2024-200 Next-Gen Professional Monitoring: Scaling Verification

Authored by Daniel Holcomb and Jennifer Kent, Parks Associates, June 2024

This whitepaper addresses the challenge of false alarms in residential security and their impact on law enforcement's responsiveness. It explores how false alarms slow down emergency response times and diminish the value of professional monitoring services. The report advocates for adopting advanced verification technologies, such as TMA-AVS-01, and explores the role of video verification and AI in reducing false alarms. It positions these technologies as critical for maintaining the reliability of security services in an evolving market.

IS-2024-199 LoRaWAN for Smart Water Metering: Enhancing Efficiency and Sustainability

Published by Netmore, July 2024

This whitepaper highlights how LoRaWAN technology supports smart water metering through Advanced Metering Infrastructure (AMI). It details benefits like improved leak detection, water conservation, and operational efficiency. LoRaWAN is presented as an ideal solution due to its low cost, long battery life, and strong signal coverage, making it suitable for water meters in difficult-to-reach locations. Case studies from Yorkshire Water and Western Municipal Water District demonstrate how utilities can reduce water loss and operational costs while improving customer satisfaction.

IS-2024-198 Global Real Estate Perspective – Highlights

Published by JLL, August 2024

This mid-2024 report provides an overview of the global real estate market, noting economic resilience, falling inflation, and improving investor confidence. It highlights sector-specific trends, such as renewed interest in logistics, living spaces, and data centers, and the stabilization of commercial property prices. Despite uncertainties around interest rates and geopolitics, early signs of recovery in commercial real estate investment are emerging. The report offers insights into capital flows, sector performance, and evolving investment strategies.

IS-2024-197 Future-Proof Lighting Control: How Hybrid Lighting Control Brings New Opportunities

Published by Helvar, September 2024

This whitepaper explores the advantages of hybrid lighting control systems that combine wired and wireless technologies. It highlights their flexibility, scalability, and adaptability for evolving

building needs. The paper emphasizes the benefits of hybrid systems in terms of energy efficiency, user experience, and long-term cost savings, positioning them as essential for modern commercial building design and energy management.

IS-2024-196 Fostering Effective Energy Transition: Insight Report

Published by the World Economic Forum in collaboration with Accenture, June 2024

This report outlines the need for a balanced global energy transition, focusing on equity, security, and sustainability. It presents data-driven insights using the Energy Transition Index (ETI) and benchmarks nations' progress toward sustainable energy goals. While the report acknowledges improvements in renewable energy and electric vehicles over the past decade, it stresses the unevenness of progress across regions. Key challenges include energy affordability, geopolitical tensions, and investment shortfalls in developing nations.

IS-2024-195 Experience Matters: What's Driving Consumer Choice and Experience Across Places and Spaces?

Published by JLL, September 2024

Based on JLL's 2024 Global Consumer Experience (CX) survey, this report underscores the increasing importance of consumer-centric design in real estate development. It reveals a growing demand for "destination" spaces that blend physical and digital experiences to foster social connection. The report provides key insights for real estate developers and investors on how to cater to evolving consumer preferences, create spaces that encourage community engagement, and improve long-term ROI through experience-led design.

IS-2024-194 Developing an Effective Vape Detection Solution

Published by Motorola Solutions, September 2024

This guide offers a detailed exploration of vape detection technology, explaining how various types of sensors (particulate, gas, and combination) can be integrated into existing security systems. It highlights the importance of vape detection in schools and public spaces, where vaping is becoming a widespread issue. The paper focuses on the HALO Smart Sensor, a multifunctional device capable of detecting vaping, air quality changes, and safety threats, and provides guidance on the legal and privacy considerations for implementing these systems.

IS-2024-193 Considerations for Building a Cyber-Resilient City

Authored by Luke Antoniou, SmartCitiesWorld in collaboration with Paradox Engineering, September 2024

This report highlights the increasing importance of cybersecurity in modern cities, focusing on three core areas: embedding security-by-design, addressing human factors through education and awareness, and establishing strong processes for vulnerability management and incident response. The report provides practical steps for city leaders to enhance cyber resilience,

safeguard critical infrastructure, and ensure public safety in a rapidly digitalizing urban environment.

IS-2024-192 Charge at Home: Guidelines for Billing Company Cars in the Home Sector

Published by Phoenix Contact Smart Business GmbH, July 2024

This guideline offers fleet managers practical advice on managing the billing of electric company cars charged at home. It covers the technical, legal, and financial aspects of home charging, providing solutions like wall box installations and automated billing systems. Phoenix Contact's Charge Repay Service is highlighted as a flexible solution for simplifying billing processes and ensuring smooth operational management of home-charged vehicles in company fleets.

IS-2024-191 Decarbonization in the Built Environment: Addressing Embodied Carbon in MEP Systems

Published by the Sustainable Buildings Task Force, November 2023

This whitepaper addresses the overlooked issue of embodied carbon in mechanical, electrical, and plumbing (MEP) systems, which can account for up to 70% of embodied carbon in refurbishment projects. It outlines strategies to reduce carbon emissions in MEP systems, such as using low-carbon materials, conducting whole-life carbon assessments, and adopting circular economy principles. The paper calls for collaboration and innovation to decarbonize these systems, alongside efforts to reduce operational carbon.

IS-2024-190 Transforming Energy Demand

Published by the World Economic Forum in collaboration with PwC, January 2024

This whitepaper explores how businesses can reduce global energy consumption by 31% by 2030, potentially saving $2 trillion annually. It outlines strategies for improving energy efficiency across buildings, industry, and transportation sectors using existing technologies. Key levers include energy savings, efficiency improvements, and value chain collaboration. The paper advocates for public-private partnerships to balance energy demand and supply as part of the global journey towards net zero.

IS-2024-189 Transforming Commercial Real Estate Through Digitalization

Published by Siemens Smart Infrastructure, February 2024

This whitepaper discusses how the Siemens Xcelerator platform can help commercial real estate (CRE) companies achieve key goals like reducing operational costs, improving sustainability, and enhancing occupant well-being. By integrating smart IoT systems, data analytics, and energy management, Siemens demonstrates how CRE portfolios can be optimized for future-proofing, decarbonization, and long-term profitability in a competitive and evolving market.

IS-2024-188 Technology of the Connected Home and Building: Delivering on Safety, Comfort, and Convenience

Authored by David Renno, Renesas Electronics, March 2024

This whitepaper explores the increasing demand for intelligent, connected devices in homes and buildings. It highlights how Wi-Fi, Bluetooth, and NFC technologies enable smart devices to enhance safety, comfort, and convenience. The paper also discusses trends like machine learning and AI, explaining how Renesas' connectivity products help manufacturers build efficient, low-power smart devices that offer seamless integration across modern home and building ecosystems.

IS-2024-187 Cracking The Code: Unleash Your Smart Buildings Strategy With The Power Of Facility Data

Published by Forrester Consulting, commissioned by Johnson Controls, March 2024

This whitepaper examines how smart building technologies can improve operational efficiency, security, and sustainability. Based on a survey of over 1,100 security leaders, the report highlights challenges like organizational silos, non-integrated systems, and lack of technical expertise. It advocates for partnerships with external providers and the integration of AI and IoT to generate real-time data insights that enhance security and drive sustainability in smart building operations.

IS-2024-186 Strategic Cybersecurity Talent Framework

Published by the World Economic Forum, April 2024

This whitepaper addresses the global cybersecurity talent shortage, estimated at nearly 4 million experts. The Strategic Cybersecurity Talent Framework (CTF) outlines four key areas: attracting talent, improving education, reforming recruitment, and enhancing retention. It presents strategies for building sustainable cybersecurity talent pipelines and calls for collaboration between the public and private sectors to close the workforce gap and meet increasing cybersecurity demands.

IS-2024-185 Smart Metering: The Connectivity State of Affairs

Authored by Mattias Carlsson, Berg Insight, April 2024

This report examines the growing role of smart metering in global energy transformation, with a focus on cellular connectivity. It details the acceleration of smart meter deployments in regions like Europe, North America, and Asia-Pacific, particularly in countries like China, Japan, and India. The report discusses connectivity challenges and highlights Giesecke+Devrient’s cellular IoT solutions to simplify and manage smart metering rollouts, particularly in remote areas.

IS-2024-184 Smart Buildings Enable Efficient Spaces That Foster Health, Well-Being, and Productivity

Published by Forrester Consulting, commissioned by Johnson Controls, February 2024

This whitepaper emphasizes the role of smart buildings in improving health, well-being, and productivity for occupants. It highlights the need for unified building systems, integrated data, and strategic partnerships to address challenges like indoor air quality (IAQ) and energy efficiency. The paper explores how smart buildings can help meet sustainability and productivity goals while improving operational efficiency through technical and strategic collaborations.

IS-2024-183 Smart Building Technology: Managing Transformational Change

Authored by Michael Moran and Michelle Brigoli, Microshare, January 2024

This whitepaper outlines best practices for managing transformational change when introducing smart building technologies. It stresses the importance of preparing stakeholders—tenants, staff, and customers—by communicating the vision, addressing privacy concerns, and demonstrating early benefits. The paper advocates a four-phase approach, including articulating the vision, identifying stakeholders, and showcasing the technology's impact, to ensure a smooth transition to smart building solutions.

IS-2024-182 Retrofit for Purpose: The Role of Finance in Enabling Decarbonization through Non-Residential Building Retrofits

Published by Siemens Financial Services, January 2024

This whitepaper highlights the importance of flexible financing models in decarbonizing non-residential buildings. It explores how energy-efficiency-as-a-service (EaaS) models can enable building retrofits without upfront capital, helping buildings meet 2030 and 2050 climate targets. The report estimates that these financing solutions could reduce emissions by over 210 MtCO2e annually by 2030 across key regions like the U.S., Europe, China, and India.

IS-2024-181 Reducing Embodied Carbon in Cities: Nine Solutions for Greener Buildings and Communities

Published by the World Economic Forum in collaboration with Accenture, April 2024

This whitepaper explores how cities can reduce embodied carbon emissions in construction through nine innovative solutions. These solutions focus on policy frameworks, low-carbon ecosystems, and promoting circular economy strategies. The report emphasizes the need for collaboration across sectors and highlights case studies that showcase successful approaches to reducing embodied carbon, contributing to the decarbonization of the built environment.

IS-2024-180 How to Maintain Constantly Evolving Smart Buildings

Published by Trane Technologies, June 2024

This whitepaper discusses the future of smart building systems and the need for adaptable technologies to meet modern building demands. It covers advancements in AI, connectivity, and

predictive maintenance that are transforming building management. The report stresses the importance of integrating open standards like BACnet Secure Connect and utilizing both wired and wireless technologies to maintain seamless modernization and long-term success.

IS-2024-179 Get Set for the 5th Industrial Revolution: Real Estate Strategies for an AI-Powered World

Published by Forrester Consulting, March 2024

This report explores how AI and advanced computing will reshape the real estate industry, highlighting strategies for navigating the 5th Industrial Revolution. It discusses key trends, including AI's convergence with natural sciences, the reshaping of labor markets, and the demand for energy-efficient infrastructure. Real estate professionals are encouraged to adopt a "fast iteration" mindset to adapt to rapid technological changes and leverage AI to enhance business models and building functions.

IS-2024-178 Delivering on the European Green Deal: A Private-Sector Perspective

Published by the World Economic Forum in collaboration with Accenture, January 2024

This report examines the role of the private sector in advancing the goals of the European Green Deal (EGD), which aims to make the EU climate-neutral by 2050. It evaluates how companies are aligning with EGD targets in areas like climate, energy, and decarbonization. The report offers recommendations for policymakers and industry leaders to accelerate progress through innovation, regulatory harmonization, and financing while maintaining momentum in Europe’s green transition.

IS-2024-177 Building Trust through an Equitable and Inclusive Energy Transition

Authored by Sarah Moin and the World Economic Forum, January 2024

This whitepaper explores the importance of equity, justice, and inclusivity in the global energy transition. It emphasizes that neglecting these aspects can hinder progress and erode trust. The paper identifies challenges like unequal energy access, job displacement, and rising costs, and proposes solutions such as stakeholder collaboration, targeted investments, and inclusive policies to ensure a fair and socially responsible energy transition.

IS-2024-176 A Glimpse into the Invisible World of Near-Infrared (NIR): Exploring Its Applications and Potential

Published by Broadcom, February 2024

This whitepaper offers a comprehensive analysis of near-infrared (NIR) technology and its applications in industries like surveillance, safety, and energy monitoring. It highlights the advantages of NIR LEDs, such as invisibility, energy efficiency, and compatibility with silicon-based photodetectors. Broadcom’s NIR solutions are positioned as critical components in modern industrial and commercial systems, enhancing functionalities like 24/7 monitoring and

early fire detection.

IS-2024-175 2024 State of Physical Access Trend Report

Authored by Chris Price, IFSEC Insider, June 2024

This report explores trends in the physical access control market, including the rise of mobile credentials, biometrics, and open standards. It examines how hybrid work patterns have accelerated demand for more flexible and secure access systems, and the convergence of physical and cybersecurity needs. The report also emphasizes sustainability, with organizations increasingly prioritizing low-energy hardware and mobile credentials to reduce their environmental impact.

IS-2024-174 Smart Homes: Pioneering Age-Friendly Environments in China for Enhanced Health and Quality of Life

Authored by Ingy Shafei et al., Flinders University, May 2024

This report examines how smart homes can support older adults in China by allowing them to live independently with minimal assistance. It discusses the benefits of smart home technologies for older adults, such as reduced costs compared to other care options. The report also addresses challenges, including the high literacy rates required to adopt these technologies and resistance from older adults to learning new systems, while offering strategies to overcome these barriers.

IS-2024-173 Navigating Liquid Cooling Architectures for Data Centers with AI Workloads

Authored by Paul Lin et al., Schneider Electric, June 2024

This report discusses six common liquid cooling architectures for data centers, focusing on how they optimize energy consumption without compromising server performance. It explains the design of Cooling Distribution Units (CDUs), their components, and various heat rejection methods. The report helps data center operators choose the best liquid cooling mechanism for AI workloads, balancing energy efficiency and performance.

IS-2024-172 Gridlocked: The Barriers to Smart Grid Market Development

Authored by Matthew Purnell, Juniper Research, June 2024

This report examines the potential of smart grids to improve energy supply and demand coordination while integrating renewable energy sources. It predicts $290 billion in savings by 2029 through smart grid technologies but notes several challenges, including high capital costs, regulatory uncertainties, and increased cybersecurity risks. The report emphasizes the role of battery energy storage in addressing renewable energy intermittency and highlights software-driven benefits like automated fault detection.

IS-2024-171 Cracking the Smart Building Code: A Spotlight on Data Centers

Published by Forrester Consulting, March 2024

This report presents findings from a survey of 305 smart building decision-makers at data centers. It reveals the need for integrated systems to achieve goals like improved security, reduced carbon emissions, and operational efficiency. However, only 7% of respondents reported fully integrated systems. The report underscores the importance of sustainability in data centers, with smart building solutions being key to meeting climate targets and improving energy transparency.

IS-2024-170 Smart Buildings Technology: The Future of Connectivity in Commercial Real Estate

Published by BUILDINGS, July 2024

This ebook covers topics such as hybrid workforces, intelligent sensors, and the integration of GPT AI with BIM models in commercial real estate. It includes case studies on smart buildings and a checklist for implementing smart technologies. The paper highlights how smart building automation and connectivity are revolutionizing facility operations, creating more efficient, responsive, and adaptive environments.

IS-2024-169 Smart Buildings 2024 Summer Edition

Published by Consulting & Specifying Engineer, July 2024

This ebook presents a series of roundtable discussions by experts on topics like electric vehicle fleet goals, new approaches to HVAC design, ASHRAE standards, and improving indoor air quality in K-12 schools. It emphasizes the role of smart buildings in energy efficiency and sustainability, offering insights into how smart technologies can enhance the performance and comfort of educational and commercial spaces.

IS-2024-168 More Housing, Less Carbon: Policy Principles to Reduce Embodied Carbon in Canada's Housing Sector

Authored by Gabriel Eidelman & Shoshanna Saxe, Canadian Standards Association, May 2024

This report proposes four policy principles to reduce embodied carbon in Canada's housing sector. It highlights how current climate plans focus on reducing operational energy use but neglect emissions from construction materials and methods. Drawing on lessons from leading jurisdictions like Denmark and the UK, the report advocates for translating technical solutions into public policy to address the environmental impact of new construction.

IS-2024-167 Heat Exchange

Published by the Canadian Climate Institute, July 2024

This report discusses the steps energy utilities in Canada must take to achieve net zero by 2050. It highlights the early stages of clean energy transition planning and the challenges regulators

and policymakers face. The report provides recommendations for accelerating the transition while ensuring affordability and reliability, offering guidance for provincial governments on how to protect customers and adapt to a net-zero energy landscape.

IS-2024-166 Commercial Building Technical Application Guide

Published by Wesco International, January 2024

This guide provides best practices and smart solutions for building contractors, integrators, and facility managers looking to design future-ready commercial buildings. It covers network infrastructure, lighting, security, A/V systems, and safety, with a focus on sustainability initiatives. The guide emphasizes Wesco's expertise in advisory collaboration, project deployment, and supply chain management, offering a comprehensive resource for building, modernizing, and maintaining commercial facilities.

IS-2024-165 Healthy Buildings in a Changing Climate: Improving Health with Multi-Unit Residential Building Retrofits

Authored by Raidin Blue & Betsy Agar, The Pembina Institute, July 2024

This report examines the intersection of climate change, building conditions, and occupant health, focusing on multi-unit residential buildings (MURBs). It identifies four climate-related health risks: extreme heat, flooding, infectious diseases, and wildfire smoke. The report advocates for deep retrofits that include upgrades to ventilation, heating, and cooling systems to improve health outcomes, particularly for vulnerable populations, while addressing climate-related risks.

IS-2024-164 The Ultimate Guide to Access Control Systems

Published by Avigilon Corporation, April 2023

This whitepaper provides an in-depth exploration of access control systems and their critical role in enhancing security for commercial and residential properties. It explains how access control systems regulate entry using electronic credentials, smart devices, and advanced technologies. The paper also discusses various policies, system components, and the advantages of integrating access control with broader building management solutions, offering a comprehensive guide for organizations looking to improve property security.

IS-2024-163 Sustainability in Real Estate: Integrating Software Solutions for a Greener Tomorrow

Published by ORIL, October 2023

This whitepaper discusses the pivotal role of sustainability in the real estate sector and how smart software solutions can drive greener, more efficient buildings. It highlights real estate's significant contribution to global greenhouse gas emissions (39%) and presents case studies from projects like the Bullitt Center and Zero Carbon Building, demonstrating how technology and sustainability efforts are reshaping the industry. The paper argues for the integration of digital

solutions to meet environmental goals while enhancing property values and operational efficiencies.

IS-2024-162 Smart Cities: Promoting Urban Governance in India

Published by the World Economic Forum, October 2023

This whitepaper examines India's Smart Cities Mission, focusing on how integrating technology with governance can address urban challenges and contribute to sustainability, urban rejuvenation, and economic growth. Drawing on insights from Arthur D. Little and the Centre for Policy Research, it explores the impact of smart city technologies in areas like ecology, mobility, and economic development. Key examples include integrated command centers and data-driven governance, highlighting the importance of digital solutions for improving urban service delivery and resilience.

IS-2024-161 School and Campus Security: A Guide to Security Systems, Cameras, Door Locks, and Devices

Published by Avigilon, May 2023

This whitepaper outlines the essential security technologies needed to protect educational facilities, from video surveillance to access control and lockdown procedures. It provides key considerations for implementing integrated security systems in both K-12 schools and university campuses. The report emphasizes the role of advanced technologies like video analytics, cloud-based access control, and biometric devices in enhancing campus safety and preparedness.

IS-2024-160 Reduce Energy Consumption in Buildings with AC Cloud Control

Published by HMS Networks, April 2023

This whitepaper explores how cloud-based solutions can significantly improve the energy efficiency of building air conditioning systems. It advocates for retrofitting existing AC units with cloud control, especially in commercial buildings where AC systems account for up to 70% of energy use. Smart technologies like Intesis AC Cloud Control integrate with Building Management Systems to enable remote control and demand response, reducing energy waste and carbon emissions.

IS-2024-159 Transitioning Industrial Clusters towards Net Zero: National Policy Enablement for Industrial Decarbonization – Part II

Co-published by the World Economic Forum and Accenture, November 2023

This whitepaper discusses the role of industrial clusters in global decarbonization efforts, emphasizing the need for national policies that support renewable energy, hydrogen development, and carbon capture technologies. The report highlights how public-private collaborations are essential for transforming industrial clusters into sustainable ecosystems, contributing to net-zero goals, and advancing smart city initiatives.

IS-2024-158 Mastering Hybrid Work - A Comprehensive Guide for Productivity, Security, and Collaboration

Published by Cisco, June 2023

This whitepaper explores the benefits of hybrid work, emphasizing its potential to improve employee well-being, operational efficiency, and cost savings. It outlines strategies for seamless collaboration, robust security, and intelligent workspace management, positioning hybrid work as essential for future workplaces and smart cities. Cisco's solutions for secure, modernized work environments are key to supporting a distributed workforce.

IS-2024-157 How Sustainable Buildings Management Can Succeed with Building Automation

Published by GEZE GmbH, August 2023

This whitepaper highlights the role of building automation in achieving sustainability goals. It showcases how automated systems in heating, ventilation, lighting, and safety can drastically improve energy efficiency and reduce CO2 emissions. Using examples like myGEZE Control, the paper demonstrates how digital technologies can enhance building safety, comfort, and operational efficiency, advancing the transition to sustainable smart buildings.

IS-2024-156 Harnessing Open Data to Create Smart Communities

Published by Opendatasoft, December 2023

This whitepaper explores how small and mid-sized municipalities can use open data to develop smarter, more efficient, and sustainable communities. It emphasizes that smart city benefits like energy management and traffic optimization are achievable even without large budgets. Case studies from smaller communities, such as Morrisville, NC, illustrate how open data initiatives can enhance local services and improve citizen engagement.

IS-2024-155 Governing Smart Cities - Use Cases for Urban Transformation

Co-published by the World Economic Forum and Deloitte, November 2023

This whitepaper addresses governance challenges in smart cities, focusing on model policies that promote privacy, open data, and inclusivity. It features case studies from Mexico City, Tsukuba, and Istanbul, demonstrating how cities are leveraging open data and ICT policies to improve public safety and digital inclusion. The paper underscores the need for responsible technology governance to create safer, smarter, and more inclusive urban environments.

IS-2024-154 Future-Proofing Energy Efficiency with Networked Lighting Controls

Published by the DesignLights Consortium, August 2023

This whitepaper discusses the potential for substantial energy savings by integrating Networked Lighting Controls (NLCs) with LED systems in commercial and industrial buildings. It highlights

how combining NLCs with other systems, particularly HVAC, can lead to further energy and demand reductions. The paper calls for updated energy efficiency policies to encourage wider adoption of NLCs, citing their long-term benefits in reducing energy consumption and costs.

IS-2024-153 Facilities of the Future - Safety and Security Meet Smart Buildings

Published by Cisco and Meraki, May 2023

This whitepaper examines how smart building technologies can address modern facilities management challenges. It highlights the limitations of legacy video surveillance systems and the benefits of cloud-managed IoT devices, such as smart cameras and sensors, for real-time monitoring and decision-making. The paper argues that smart buildings improve security, energy efficiency, and occupant comfort while supporting sustainability goals.

IS-2024-152 Emerging Insights for Achieving Circularity in the Built Environment

Co-published by the World Economic Forum and McKinsey, July 2023

This whitepaper explores how circular practices, such as material reuse and recycling, can significantly reduce CO2 emissions in the built environment. The construction sector is responsible for 40% of global emissions, and the report highlights key strategies to reduce embodied carbon, including carbon recirculation and recycling demolition waste. Circularity is framed as a practical solution for reducing emissions while generating financial benefits and improving supply chain resilience.

IS-2024-151 Elegantly Connecting Your Smart Home Network

Published by the Thread Group, September 2023

This whitepaper explains how the Thread protocol enhances smart home connectivity by offering reliable, secure, and energy-efficient communication for IoT applications. It compares Thread to traditional IoT protocols like Wi-Fi and Bluetooth, emphasizing its mesh networking capabilities, which provide more robust and self-healing connectivity without relying on a central hub. The paper also discusses how Thread integrates with Matter, the new smart home standard, to enable seamless interoperability across devices from major brands.

IS-2024-150 Connected Life - The Path to a Smarter Ecosystem

Authored by Paulo Chaínho and Filipe Cabral Pinto, Altice Labs, April 2023

This whitepaper examines the evolution of the telecommunications industry towards a smarter ecosystem, focusing on connected homes and smart home standards like Matter. It explores how security, energy management, and entertainment systems are being integrated to create seamless user experiences. The paper also highlights how the COVID-19 pandemic accelerated digital interactions and transformed consumption patterns in smart homes.

IS-2024-149 Circularity in the Built Environment - Maximizing CO2 Abatement and Business Opportunities

Co-published by the World Economic Forum and McKinsey, December 2023

This whitepaper explores how circular practices, such as recycling and material reuse, can reduce embodied carbon in key building materials like concrete, steel, and aluminum. It highlights strategies for reducing emissions while unlocking business opportunities, positioning circularity as a solution for decarbonizing the construction sector and contributing to global climate goals.

IS-2024-148 Building Truly Sustainable Cities: How Connected Systems Can Help Cities Build Sustainability and Wellbeing Into Their Indoor and Outdoor Spaces

Authored by Sue Weekes, SmartCitiesWorld, in association with Signify, November 2023

This whitepaper examines how cities can achieve sustainability by integrating connected systems in both indoor and outdoor environments. It emphasizes the importance of technology in accelerating decarbonization and improving urban quality of life. The paper features case studies and expert insights on how energy-efficient lighting and building management systems can help cities meet climate goals while maintaining livability and resilience.

IS-2024-147 Decarbonizing the US Economy by 2050

Published by the US Department of Energy, April 2024

This report highlights the crucial role of the building sector in achieving the US's net-zero emissions target by 2050. It emphasizes the importance of creating resilient, energy-efficient residential and commercial structures to support decarbonization efforts. Key goals include improving indoor air quality, thermal comfort, and addressing environmental justice, as marginalized communities often face energy insecurity and pollution at disproportionate rates. The report advocates for collaboration between federal, state, and local governments on policies, funding, and workforce development to facilitate the transition to low-carbon technologies. It also stresses building efficiency, clean energy access, and ensuring that disadvantaged communities benefit from these upgrades.

IS-2024-146 Coupling and Quantifying Sustainability and Resilience in Intelligent Buildings

Authored by Al Qurneh, D.A. and others, April 2024

This study explores the financial and social benefits of integrating sustainability and resilience in intelligent buildings, using a Net Present Value (NPV) model to assess costs and returns. Analyzing four smart buildings in Dubai, the report demonstrates that sustainable and resilient systems can provide high NPV, indicating profitability while safeguarding against unexpected failures. A social survey complements the financial analysis by quantifying the societal benefits of sustainable building practices. The report recommends further research into sustainability and resilience in smart buildings, reinforcing their importance in an era of climate variability and urbanization.

IS-2024-145 Climate Change and Respiratory Health in the Built Environment

Published by Tarkett, February 2024

This report addresses the impact of climate change on respiratory health, particularly in the built environment. It highlights how worsening air quality, due to both indoor and outdoor pollutants, exacerbates conditions like asthma and allergies. The report underscores the need for clean air solutions, citing extreme weather events and $165 billion in climate-related damages in the US in 2022 alone. Recommendations include improved ventilation, the use of low-VOC materials, and easy-to-clean surfaces, as well as products certified to be asthma and allergy-friendly to improve indoor air quality and overall health.

IS-2024-144 Air Pollution, Air Quality, and the Workplace

Published by Assurity Consulting, January 2024

This report focuses on air quality and pollution in workplaces, discussing the definitions, effects, and legislation surrounding air pollution. While air quality has improved in recent decades, it remains a significant concern, particularly in indoor work environments where poor air quality can lead to occupational diseases. The report stresses the need for regular air quality assessments and compliance with safety regulations. The pandemic has further underscored the importance of air quality in workplace design, leading to the adoption of technologies for monitoring and improving air quality to ensure worker health and safety.

IS-2024-143 A Journey Through Time to Emission-Free Logistics of the Future

Published by Johnson Controls, 2023

This report explores the global push toward emission-free logistics, emphasizing how technological advancements, regulatory frameworks, and supply chain cooperation are driving climate change mitigation. It outlines a holistic approach to sustainable logistics, with a focus on zero-emission distribution warehouses. Key milestones for achieving emission-free logistics include building automation, energy management, and predictive maintenance. The report also highlights how IoT and AI technologies can optimize the energy efficiency of logistics facilities, offering comprehensive solutions for a sustainable future.

IS-2024-142 The Untold Potential and Rationale of Industrial Electrification in the United States

This report, authored by Vincent Petit from Schneider Electric and released in June 2024, examines how industrial electrification is key to the U.S. meeting its climate pledge of carbon neutrality by 2050. It highlights that while buildings and mobility sectors are often prioritized for decarbonization, the industrial sector also presents substantial untapped potential for carbon reduction. Schneider Electric's research suggests that the share of electricity in U.S. industry energy demand could increase significantly by 2030, leading to immediate reductions in fossil fuel use and CO2 emissions. This report provides valuable insights into the opportunities for electrification and serves as a call for action to accelerate the decarbonization of industry.

IS-2024-141 Australians at Home in 2029

Australians@Home in 2029, authored by Steve Sammartino and commissioned by Samsung Electronics Australia, was published in January 2024 and explores how technology will reshape Australian homes by 2029. It highlights five key areas: AI integration in home environments, energy-efficient homes acting as power plants, soft robotics for household tasks, the symbiosis between smart homes and vehicles, and transparent display technologies. AI will drive a seamless, connected home experience, optimizing energy use and personalizing daily routines. These innovations will create smart homes that enhance efficiency, sustainability, and the quality of life, pushing forward smart building and smart city development.

IS-2024-140 Technology for Aging

Authored by Laurie M. Orlov of Aging and Health Technology Watch and published in January 2024, this report explores the latest trends in technologies for aging, focusing on the increasing role of AI, smart homes, and telehealth. AI is increasingly embedded in care solutions, enhancing health monitoring, fall detection, and caregiver support. The report emphasizes the importance of home renovations for aging in place, as many older adults require safer, more accessible living spaces. Additionally, telehealth and remote care technologies are expanding, enabling healthcare delivery from home. These advancements are integral to smart buildings, homes, and cities, supporting aging populations with improved safety, connectivity, and care.

IS-2024-139 Serving Residents Who Have Hearing Loss: How Providers Can Help Residents Live Their Best Lives

The March 2024 e-book, sponsored by Hamilton CapTel and presented by McKnight's Senior Living, discusses the challenges of age-related hearing loss in senior living communities and how providers can enhance residents' quality of life using technology and design. The e-book emphasizes the importance of hearing aids, captioned telephones, and simple interventions, while also addressing how interior design and acoustical engineering can create more supportive environments. It advocates for collaboration between senior living operators, family members, and staff to implement these solutions and optimize residents' overall experience.

IS-2024-138 Providing Personalized Care in Assisted Living is a Team Effort

Published in December 2023, this e-book, sponsored by Synchrony Health Services and presented by McKnight's Senior Living, emphasizes the value of interdisciplinary collaboration in offering personalized care in assisted living communities. By following the "Four M's" Framework—Mobility, Mentation, Medications, and "What Matters"—the guide emphasizes person-centered healthcare, which enhances the resident experience, supports independence, and improves quality of life. With a focus on teamwork among healthcare providers, pharmacists, and caregivers, this e-book aligns with the shift toward value-based care and smart building systems that optimize resident safety, care coordination, and overall well-being.

IS-2024-137 Integrating Care Services - The Road to the Right Care for the Right Cost

Sponsored by McKnights with contributions from Synchrony Health Services and ALG Senior, and published in November 2023, this e-book explores how integrated care services in senior living and skilled nursing facilities improve patient outcomes through collaboration among pharmacy, rehab, and lab services. By focusing on value-based, person-centered care, it reduces costs, improves medication adherence, and lowers hospital readmissions. The approach is aligned with smart building concepts, where efficient systems and technologies improve operational efficiency and resident well-being. Integrated care in healthcare settings reflects how smart homes and cities connect services to optimize outcomes and enhance quality of life.

IS-2024-136 How to Decide - Aging in Place vs. Assisted Living

Published in May 2024 by Hartford Funds, this e-book explores the pros and cons of aging in place compared to moving to an assisted living community. While 77% of aging adults prefer to stay in their homes, the e-book highlights the potential health, social, and financial risks associated with aging in place. It also covers age-friendly home modifications, the cost of in-home support services, and the advantages of assisted living communities in terms of safety, mobility, social engagement, and healthcare.

IS-2024-135 How Real-Time Location Services Can Benefit Your Senior Living Community

The May 2024 e-book by Polina Braunstein, Kevin Harris, and Luke Waidmann from McKnights Senior Living examines how Real-Time Location Services (RTLS) improve safety, security, and operational efficiency in senior living communities. RTLS solutions, integrated with wearables, Wi-Fi, and Bluetooth, enable precise location tracking of residents and staff, minimizing response times and enhancing care coordination. The technology streamlines administrative tasks, reduces staff workload, and improves overall resident experience. These systems are integral to smart building environments, promoting seamless integration with IoT devices, enhancing connectivity, and enabling real-time data-driven decision-making.

IS-2024-134 Handwashing Survey Research Drives Industry Solutions

Authored by Bradley, a Watts Brand, and published in April 2024, this whitepaper reveals findings from the Healthy Handwashing Survey™, which has been tracking public restroom preferences for 15 years. The survey reveals Americans' growing demand for clean, hygienic, and touchless public bathrooms, with 86% preferring touchless fixtures. The paper emphasizes how these preferences are shaping restroom design, maintenance solutions, and the adoption of modern, seamless, touchless technologies. Additionally, it highlights the importance of integrating these solutions to enhance user experience and boost business reputations.

IS-2024-133 Ensuring the Quality of Smart Home Devices Through Comprehensive Testing Methodologies

This whitepaper, written by Robert Yao and Thomas Chang from Allion Labs and released in

November 2023, stresses the need for comprehensive testing methodologies to ensure the effectiveness of smart home devices. It discusses the necessity of real-house testing to ensure seamless functionality, interoperability, and user experience in real-world conditions. The paper contrasts lab testing with real-house environments, addressing challenges such as device diversity, network complexity, and rapid technological advancements. The insights are critical for ensuring the reliability, security, and performance of smart devices in smart homes, where user expectations demand consistent, high-quality experiences.

IS-2024-132 Empowering Utilities - Overcoming Challenges with Private Networks and 5G Technology

Released in June 2024, this whitepaper by T-Mobile for Business explores the rising challenges for utilities in balancing decarbonization goals, managing distributed energy resources (DERs), and addressing customer demand amid an increasingly complex energy landscape. A central theme is the role of private networks and 5G technology in overcoming these challenges by enabling more advanced, secure, and efficient grid operations. The whitepaper emphasizes how private LTE and 5G networks are critical for extending connectivity to the grid edge, where renewable energy sources, smart meters, and electric vehicle (EV) charging stations are integrated.

IS-2024-131 Effective Bundling - Pain Points and Expectations from Subscription Leaders

Authored by Kristen Hanich of Parks Associates and published in May 2024, this whitepaper explores the increasing complexity of the subscription services market, highlighting the role of bundling and partnerships in combating consumer fatigue and market fragmentation. The paper draws on interviews with executives from leading subscription service providers in video streaming, music, education, and productivity markets to understand effective bundling strategies, their challenges, and success factors. It also presents insights on how bundling with telcos (mobile and internet service providers) and other partners can drive growth, enhance customer retention, and differentiate services.

IS-2024-130 Connected Products - Enhancing Consumers' Lives With Technology

Published in January 2024 by the Capgemini Research Institute, this whitepaper explores the expanding role of consumer-facing connected products, with a focus on smart home devices, voice assistants, and health wearables. The study reveals that 67% of consumers consider connected products essential in their daily lives. While the report highlights the growing adoption of smart security systems and health wearables, it also addresses concerns surrounding data privacy and sustainability. Consumers demand more user-friendly experiences, seamless product integration, and transparent environmental practices from organizations. The study emphasizes how companies can align with these expectations by enhancing data privacy measures, promoting modular product designs, and implementing circular economy practices.

IS-2024-129 AI and the Future of Care Work

The November 2023 whitepaper by Laurie M. Orlov from Aging and Health Technology Watch examines the growing role of Artificial Intelligence (AI) in addressing the care needs of the aging population. As life expectancy increases and the demand for elder care rises, the caregiving workforce is shrinking, exacerbated by burnout and turnover, particularly following the COVID-19 pandemic. This gap is leading to the growing adoption of AI to supplement and improve care delivery across various care settings, from home healthcare to senior living facilities and skilled nursing facilities (SNFs). The paper discusses AI's potential to revolutionize care by enhancing predictive capabilities, improving patient monitoring, and supporting healthcare workers.

IS-2024-128 State of the Market - Access Control Systems

Authored by staff writers from Brivo and Security Info Watch and published on January 3, 2024, this report briefly discusses the rising demand and preference for cloud-based solutions in physical space management and access control systems within an evolving market. This was written to address how companies are facing a variety of internal barriers. Such examples that were covered include lack of budget, uncertainty over the potential tangible and intangible ROI, and pain points such as upgrade challenges (hardware to subscription-based), communication infrastructure, and remaining current in a fast-paced landscape that remains top of mind for decision-makers. External factors like business trends (Ex. demographics and COVID-19) and user expectations also come into play when making long-term business investment decisions.

IS-2024-127 Middle Market - Lowering Barriers to the Smart Home

Co-authored by Jennifer Kent and Tam Williams from Parks Associates and Skybell, and published on May 2, 2024, this report discusses how companies offering smart tech and products should tailor their messaging, pricing, and product/service development to cater to various user groups, from Super Early Adopters to the Early Majority and the Middle, each with different priorities. Some of these issues are pragmatic benefits, endorsements from trusted sources, values of security services, comfort /peace of mind, and productivity. The players in the market need to create profiles to address barriers to entry and growing outreach efforts to older consumers and their caregivers by including features like easy-to-use and read interfaces. Other strategies are partnering up to offer bundles for seamless integration.

IS-2024-126 The Impact of Industry 5.0 on Smart Building Technologies

Authored by Michelle Joynson and published by Juniper Research in May 2024, this report covers how the 5th wave of the technological revolution is poised to build on the developments of the 4th wave. It covers a brief market overview of smart buildings and how with a stronger smart grid big buildings can be provided with better power with upgraded sensors and software. There is a new emphasis on tracking data to reduce operational costs. Service providers that buildings use now have to stay current as leaders to leverage opportunities through strategic partnerships to offer holistic approaches. This paper also briefly touches on the difference between Traditional and Smart buildings (reduction of carbon footprint) before ending with a market forecast summary that speaks to benchmarks, evaluations, key trends, takeaways, and recommendations.

IS-2024-125 Smart Living - The Trends Transforming Our Homes

Published by Wired Score on July 2, 2024, this paper briefly explores the latest technological developments that are shaping luxury smart living in areas like Dubai throughout the Middle East. It covers how the standards of living are coming with stronger expectations, especially from the younger generations where there are shifting and changing work patterns. It goes over how top of mind are things such as comfort, connectivity, security, air quality, and better amenity options when it comes to deciding where to live. This paper is for those who want to know the business case for resilient smart buildings of the future that also focus on ESG outcomes, adaptable infrastructure, and energy performance management.

IS-2024-124 Building Better Schools - Challenges & Opportunities for the Design and Operation of Educational Facilities

Co-authored by Jeanie Fitzgerald, Janelle Penny, and AnneMarie Martin from Buildings, Architectural Products, and I+S, this report was published on January 16, 2024. This paper covers in-depth many of the problems and solutions for the futuristic design and operational management of educational institutions. From safety and security concerns to indoor air quality and lighting, these are all ideas that together can help with decarbonization and efficiency strategies. There are many products and/or technologies that are advertised in each section that can collect building data.

IS-2024-123 Breathing Success - How Better Indoor Air Quality Transforms Student Health and Test Scores

This report, authored by Victoria Wood from WellStat and published on February 2, 2024, covers the critical importance of indoor air quality in fostering better health and productivity among students in schools. IAQ is the silent influencer that affects cognitive abilities and academic outcomes from all the pollutants that originate either inside buildings or from external sources. One of the challenges to improving IAQ stems from a lack of budget from the province to address such operational challenges. Students as children and youth are more susceptible to illness due to their undeveloped immune systems. This paper gives examples such as lower levels of road traffic nearby and more celebrated room temperatures that can impact student success in the classroom. WellStat markets their wall mount for school use to have better data.

IS-2024-122 Breath of Fresh Air - The ROI of Indoor Air Quality (IAQ) Monitors

This report, authored by Victoria Wood of WellStat and released on May 5, 2024, highlights the need for corporate companies to allocate budget resources towards IAQ improvements, specifically in upgrading ventilation systems. This paper is a business case for the tangible benefits of workplace wellness initiatives. The benefit-to-cost ratio proves the correlation with employee morale and retention rates. IAQ is a valuable asset for long-term business sustainability and goes hand in hand with preventative maintenance and other energy-efficient measures.

IS-2024-121 The Building Intelligence Index

Published by RZero on April 8, 2024, this report examines the challenges faced by the commercial real estate sector in meeting emissions reduction guidelines. This paper covers how the use of technological innovation, responsive management systems, and performance analytics all play roles in the reduction of energy consumption and in tandem help with cost efficiencies. Factors such as the 4 Pillars (occupancy data, indoor air quality, energy use across the board, and indoor health are reviewed for how building owners and operators can make more informed decisions.

IS-2024-120 The Agile and Efficient Digital Building

Authored and published by Panduit on April 8, 2024, this white paper discusses the transformation of workspaces in terms of their design, construction, management, and user experience. Through the use of inter-connected technology platforms smart buildings can gather data on energy usage making them more efficient and easier to manage when it comes to optimizing operations from security to lighting. Another topic is on a converged IP infrastructure acting as the backbone with the use of Fibre Optic cabling and structured cabling.

IS-2024-119 Smart Buildings -Spring 2024 Edition

Published by Consulting Engineer on April 8, 2024, this eBook discusses the historical development of modern building control systems. It covers a futuristic view of what smart office buildings could look like and function with stronger facility management when it comes to retrofits, lighting and specialty projects for post-secondary university buildings. It also touches on how building control technologies, and open protocols can be integrated into multiple control systems. Offices can significantly reduce their carbon footprint by making everything in their buildings flow together instead of having everything separated.

IS-2024-118 Boosting Smart Office Building Performance with Data-Driven Solutions

Propmodo and Cohesion's report, released on March 18, 2024, examines how integrating workplaces can lead to greater efficiency in building operations. Using software systems to collect data can enhance the management of various real estate portfolios and streamline operations to remain adaptable to a competitive market. Building improvements such as predictive maintenance, lighting optimization and more efficient heating and cooling systems will allow companies to meet their ESG goals and reduce their carbon footprint.

IS-2024-117 A Path to Sustainable Building Operations

Authored and published by Frost & Sullivan on March 18, 2024, this eBook presents the business case for large industries and commercial buildings to incorporate ESG into their facility management plans as part of their sustainability initiatives. It’s made plain that to reach their Net Zero targets executives must work to put together a road map and/or action plan on how to

get there. The paper speaks of the 6P framework (Policies, Products, Processes, People, Partnerships, and Platforms) that these corporations can use.

IS-2024-116 Are the Great Outdoors the Next Great Office Design

This whitepaper, authored by Ghent and published in February 2023, explores the trend of incorporating outdoor work and meeting spaces into modern office design, highlighting the associated benefits. It highlights how outdoor environments can significantly enhance employee health, well-being, productivity, and overall experience. The paper draws on the biophilia hypothesis, which posits that humans have an inherent tendency to seek connections with nature, leading to reduced stress, improved mood, and increased creativity. The paper provides guidelines for integrating outdoor spaces into building designs and highlights the potential for such spaces to improve employee focus, productivity, and performance. It concludes by underscoring the advantages of outdoor workspaces for students and the broader community, promoting the idea that nature-infused environments contribute to a healthier, happier, and more productive society.

IS-2024-115 Understanding Elevator Communication Code Compliance 2023

Kings III Emergency Communications published a whitepaper in October 2023, providing a thorough guide on the essential role of compliant emergency communication systems in elevators, with a focus on their importance in modern, smart buildings. The whitepaper emphasizes the necessity of adhering to stringent ASME codes to ensure the safety and reliability of elevator emergency communication systems. The paper underscores the role of compliant elevator emergency communication systems in enhancing the safety and efficiency of smart buildings. By integrating advanced communication technologies and adhering to stringent codes, these systems contribute to the overall smart city infrastructure. This ensures that emergency responses are swift and effective, thereby improving the safety and quality of life for urban dwellers. The focus on modern solutions like cellular communication aligns with the broader goals of smart cities to leverage technology for better resource management and enhanced public safety.

IS-2024-114 The Ultimate Guide to IoT

"The Ultimate Guide to IoT" by COM4, released in May 2023, offers a thorough exploration of the Internet of Things (IoT), highlighting its transformative potential and the challenges it presents in creating smarter cars, homes, cities, and industrial sectors. As IoT continues to advance, the guide emphasizes the importance of reliable connectivity, robust security, and effective data management to ensure the success of IoT solutions. The guide relates directly to smart buildings, homes, and cities by emphasizing IoT's role in creating intelligent environments. It covers applications like smart energy meters, automated refuse collection, and smart traffic systems, all of which contribute to more efficient, responsive, and sustainable urban living. By integrating IoT into these domains, cities can enhance public services, improve quality of life, and achieve significant economic and environmental benefits.

IS-2024-113 The Importance of Superior Indoor Air Quality (IAQ)

WellStat's October 2023 whitepaper highlights the pressing need to improve indoor air quality in urban areas, where nearly 90% of people's time is spent indoors. This paper underscores the multifaceted benefits of improved IAQ, focusing on health, economic, and environmental impacts. Grounded in scientific research, the paper explores how better air quality can foster good health, increase productivity, and drive significant financial savings. The whitepaper emphasizes that prioritizing IAQ in smart buildings, homes, and cities is essential for enhancing health, economic well-being, and environmental sustainability. By investing in superior IAQ technologies, we can ensure healthier living and working environments, drive financial savings, and contribute to a more sustainable future.

IS-2024-112 The Future of Sensors and Older Adults

Authored by Laurie M. Orlov of Aging and Health Technology Watch, this whitepaper examines the expanding role of sensor technology in aiding the aging population as the care workforce continues to shrink. The report delves into how sensors can enhance care delivery, improve the independence of older adults, and integrate with the Internet of Things (IoT) to provide advanced, data-driven insights. As technology advances, sensors are becoming essential in smart homes and smart cities, contributing to better health outcomes and more efficient care systems. The whitepaper underscores the transformative potential of sensor technology in improving the care and independence of older adults. By integrating with IoT and utilizing edge computing, sensors can provide detailed analytics and timely alerts, making them indispensable in smart homes and smart cities. As technology and standards evolve, the widespread adoption of sensors will significantly enhance the quality of life for older adults, making smart living solutions more efficient, affordable, and sustainable.

IS-2024-111 The Future of Heating and Cooling - Heat Pumps

Published in June 2023 by LG HVAC, this report explores the mechanics, types, and benefits of heat pumps, highlighting their role in improving energy efficiency and minimizing environmental impact. It highlights how heat pumps operate, their various configurations, and their significant advantages over traditional heating and cooling systems. The whitepaper underscores the importance of heat pumps as efficient, cost-effective, and environmentally friendly heating and cooling solutions. With technological advancements and support from government policies, heat pumps are poised for widespread adoption, playing a crucial role in the future of smart buildings, homes, and cities. By offering significant energy savings and reducing carbon emissions, heat pumps contribute to a sustainable and comfortable living environment.

IS-2024-110 The Evolution of Heat Pumps

Lennox's September 2023 whitepaper discusses the surge in demand and the technological evolution of heat pumps, underscoring their effectiveness as an energy-efficient choice for homeowners aiming to lower their carbon footprint, even in North America's coldest regions.

The whitepaper highlights the increasing popularity of heat pumps, driven by their ability to provide year-round temperature control and significant energy savings. Heat pumps are a key component of smart homes and cities, offering energy-efficient, year-round comfort. As technology continues to advance, these systems will become even more effective and accessible, playing a vital role in the future of residential heating and cooling. With the support of government incentives and educational efforts, the adoption of heat pumps is set to grow, contributing to more sustainable and energy-efficient living environments.

IS-2024-109 The Beauty & Benefits of Biophilic Design in the Built Environment

In September 2023, BUILDINGS Magazine released "For the Love of Nature: The Beauty & Benefits of Biophilic Design in the Built Environment," exploring the significance and advantages of biophilic design in modern architectural practices. Biophilic design is an approach that incorporates natural elements into built environments to foster connections between people and nature, promoting physical and mental well-being. This design strategy is gaining popularity as urban planners and designers recognize its benefits, especially in the context of smart buildings, homes, and cities. The whitepaper explains the core principles of biophilic design, emphasizing the importance of integrating natural elements like plants, natural light, and organic shapes into built environments and highlights research showing that biophilic design can boost overall well-being. By integrating biophilic design principles, smart buildings, homes, and cities can create healthier, more sustainable environments that foster a deeper connection with nature, enhancing the overall quality of life for their inhabitants.

IS-2024-108 Revealing Long-Term Indoor Air Quality Prediction - An Intelligent Informer-Based Approach

Published in September 2023, this report by H. Liang and a team of experts from various organizations, including Broad Air-Conditioning Co., Ltd., examines the critical problem of indoor air pollution and its significant health implications. With individuals spending a considerable amount of time indoors, accurate prediction of indoor air quality is essential. The authors propose a neural network model, leveraging the Informer model integrated with a data-correlation feature extractor based on MLP (Multi-Layer Perceptron), to predict indoor air quality effectively. The report emphasizes the urgent issue of indoor air pollution and proposes am AI-based prediction model. By leveraging advanced AI techniques, this study presents a robust approach to enhancing indoor air quality management, contributing significantly to the development of smart, healthy, and sustainable living environments.

IS-2024-107 Ensuring Safety & Security for Today’s Buildings: Practical Guidance for Owners and Facility Managers

BUILDINGS Magazine's October 2023 publication, "Ensuring Safety & Security for Today's Buildings: Practical Guidance for Owners and Facility Managers," delivers comprehensive advice on modern safety and security practices for commercial properties. The whitepaper addresses the dual aspects of physical and cybersecurity, offering practical advice for facility managers to protect their buildings against a wide range of threats. The whitepaper advocates for a unified

approach to physical and cybersecurity, emphasis on SaaS-based access control systems, biometrics, and multifactor authentication, provides ractical steps for facility managers to implement cybersecurity measures, and discusses the use of analytics to derive actionable insights from security data, enhancing operational efficiency and occupant safety. Facility managers are encouraged to adopt these advanced security measures and foster collaboration between departments to ensure the safety and security of their buildings. By leveraging modern technologies and data-driven insights, they can create safer, more efficient, and resilient smart buildings and cities.

IS-2024-106 Installing Efficient Heat Pumps

This whitepaper, published by Eurovent Certita Certification in June 2023, explores heat pump technology in detail, concentrating on market expansion, efficiency improvements, and optimal installation practices. It highlights the significant role of heat pumps in the transition to environmentally sustainable heating solutions and the importance of proper installation and certification to ensure optimal performance. The whitepaper calls for the widespread adoption of efficient heat pumps to meet environmental targets and improve energy performance. It encourages stakeholders, including manufacturers, installers, and policymakers, to support the transition to sustainable heating solutions through proper certification and best practices in installation and maintenance. By embracing these technologies, smart buildings and cities can achieve significant energy savings and contribute to a greener future.

IS-2024-105 Indoor Air Quality and CO2 Monitoring at Schools - Compliance with Legal Obligations

Praxas published this whitepaper in October 2023, emphasizing the essential role of healthy indoor air quality in educational spaces. It provides a comprehensive guide on the legal requirements, technical specifications, and best practices for CO2 monitoring in schools, focusing on the Dutch regulatory framework. The whitepaper concludes with a strong call to action, urging schools to implement regular CO2 monitoring, collaborate with experts for high-quality solutions, develop educational programs on air quality, and continuously adapt strategies based on new insights and technological advancements. By doing so, schools can create a healthier learning environment that complies with legal standards and supports student success.

IS-2024-104 How IoT is Reshaping Facility Management

Akenza.io published this report in May 2023, examining the various responsibilities of facility managers (FMs) in managing the safety, sustainability, and functionality of buildings and infrastructure. It underscores the importance of modern building automation systems (BAS) and the integration of IoT solutions to meet the increasing demands for energy efficiency, carbon neutrality, and safe environments. The role of facility managers is evolving with the advent of smart building technologies and IoT solutions. By leveraging these advancements, FMs can enhance the sustainability, efficiency, and safety of buildings, contributing significantly to the development of smart homes and cities. The integration of digital tools and data-driven approaches will be essential for future-proofing building operations and achieving broader

environmental goals.

IS-2024-103 Heat Pump Services for Hot Water Production in Industrial Processes

Published in October 2023, this whitepaper by BECIS examines the substantial contribution of industrial processes to global CO2 emissions, primarily due to their dependence on fossil fuels. It explores the adoption of heat pump technology as a sustainable alternative to reduce emissions, improve energy efficiency, and lower operational costs in industrial settings. The adoption of heat pump technology for hot water production in industrial processes presents a sustainable alternative to fossil fuels. When combined with EaaS contracts, it lowers the barriers to adoption and enables industries to advance their sustainability goals. The principles and benefits discussed in this whitepaper can be effectively translated to smart buildings and smart cities, contributing to energy efficiency, reduced emissions, and a more sustainable future.

IS-2024-102 Digital and Sustainable Transformation of Buildings - Increasing Efficiency, Preserving Value

This whitepaper by Siemens AG, published September 2023, addresses the urgent need to reduce energy consumption and improve efficiency within the built environment. Buildings currently account for 40% of global energy consumption and CO2 emissions, with a significant portion of this impact stemming from building operations. The whitepaper underscores the necessity for a digital and sustainable transformation of buildings to address the intertwined challenges of the energy crisis and climate emergency. By adopting smart technologies and leveraging data, buildings can significantly reduce their environmental impact, improve efficiency, and preserve their value for the future.

IS-2024-101 Best Practices to Keep Facility Management on Track

Yardi Systems released a whitepaper in September 2023 that examines the difficulties facility managers encounter, particularly high turnover and the loss of skilled personnel, leading to disruptions in building operations and increased costs. It highlights the importance of implementing strategies and technologies to streamline operations, bridge the knowledge gap, and efficiently onboard new staff. The paper emphasizes solutions such as advanced facility management software, e-learning programs, and outsourcing maintenance tasks to ensure continuity and optimize performance.

IS-2024-100 Air Pollutant Emissions and Possible Health Effects Associated with Electronic Air Cleaners

Sponsored by the California Air Resources Board (CARB), this report, authored by Theresa Pistochini, Christopher Cappa, Deborah Bennett, and Francis Offerman, and published in September 2023, examines the emissions and potential health effects of electronic air cleaners, with a focus on how they alter indoor air chemistry. The study highlights that electronic air cleaners can emit reactive compounds such as ozone and formaldehyde, and generate ultrafine particles, which pose significant health risks. The report emphasizes the challenges in quantifying

these emissions due to the variability in indoor environments and the complexities of indoor air chemistry. The report provides an overview of various electronic air cleaner technologies, including ion generators, electrostatic precipitators, and ultraviolet germicidal irradiation devices. It discusses the formation of harmful byproducts and the potential adverse health effects of these compounds.

IS-2024-099 Vertical Farming - The Future of Controlled Environment Agriculture and Food-production

Authored by Raja Kumar, Munish Kaundal, and Asma Fayaz from the Chardigarh Group of Colleges and published in December 2023, this report explores vertical farming as an innovative approach to controlled-environment agriculture, designed to tackle challenges like population growth, water scarcity, climate change, and urbanization. The integration of vertical farming into smart buildings promotes efficient land use, reduces dependency on climate conditions, and contributes to the development of green, clean, and healthy urban environments, aligning with the goals of smart city initiatives. This method requires less land and skilled labor, utilizing vertical space to cultivate plants in climate-controlled settings. By 2050, with the world population projected to reach 9.7 billion, vertical farming offers a potential solution to food insecurity by producing higher yields with organic and healthy food. Integrated into urban areas, vertical farming supports sustainable agriculture by using technologies like hydroponics, aeroponics, and aquaponics.

IS-2024-098 Repurposing Buildings for Farming

In October 2023, Becci Taylor and Eike Sindlinger from Arup published the report "Repurposing Buildings for Farming," which delves into how repurposing existing, unused buildings for next-generation agriculture can contribute to the development of smart cities and smart buildings. It highlights the benefits of retrofitting stranded assets for urban farming, such as reducing carbon emissions, regenerating neighborhoods, and providing local employment. By transforming disused structures into vertical farms, cities can enhance food security, reduce food miles, and promote sustainability. The report outlines practical scenarios for repurposing buildings, emphasizing how these initiatives can make urban environments greener and more resilient, aligning with the goals of smart city development. This innovative approach not only revitalizes buildings but also supports local food production, enriching urban communities and contributing to a regenerative future.

IS-2024-097 IoT Guide - Connected Environment

Authored by Matt Hatton from Transforma Insights, the GSMA report published in January 2024 delves into the transformative impact of IoT technologies on environmental sustainability, with a focus on air, water, and food. The report highlights how IoT applications can monitor and manage air quality, optimize water usage through smart meters and distribution networks, and enhance food production via crop and livestock management, vertical farming, and farm automation. These advancements not only address critical human needs but also contribute to reducing CO2 emissions and improving overall environmental health. The report underscores the

importance of IoT in creating smart cities by integrating advanced monitoring and control systems to promote sustainability.

IS-2024-096 A Roadmap to Support Decision-making for Vertical Farming in Canada

Prepared for the Canadian Agri-Food Policy Institute (CAPI) in May 2024, this report by Maria Carolina Romero Pereira, Kushank Bajaj, Luter Atagher, and Melat Adde presents a detailed roadmap to aid in the decision-making process for implementing vertical farming (VF) in Canada. The report highlights VF's potential to contribute to a more sustainable food system by addressing Canada's reliance on imported fruits and vegetables and enhancing supply chain resilience. It discusses the environmental, socio-economic, and trade policy considerations necessary for expanding VF in Canada. Supported by the RBC Foundation through RBC Tech for Nature, the report also underscores VF's relevance to smart cities and smart buildings, as it leverages advanced technologies and promotes sustainability within urban environments.

(IS-2024-095) The Smarter Home - Latest Trends in Smart Home

Published on September 20, 2023, this report from ESA Research highlights the growing adoption of smart home technology by mainstream consumers aiming to solve practical problems affordably. Of these devices, 46% were purchased online, with 64% of consumers choosing Amazon, Google, or Apple as their primary control platform. Additionally, 72% of buyers purchased more than one device last year, with 50% opting for a bundle. Security system owners favor adding cameras, video doorbells, and smart speakers or displays after their initial security system installation. The report also provides selling strategies for security system dealers.

(IS-2024-094) The Smart Building of the Future

The March 22, 2024, report from Johnson Controls outlines a vision of a truly smart building. Building on advancements in connectivity, these structures will harmoniously intertwine with human and environmental ecosystems, fostering sustainability and enhancing experiences. The smart building trifecta includes energy efficiency, electrification, and digitization. Smart buildings prioritize occupant comfort, safety, and well-being by offering adaptive and flexible space options, data-driven sustainability, and operational efficiencies. Unified data, ubiquitous connectivity, and AI-enabled analytics, combined with a digital twin, will enable smart buildings to operate autonomously. The report provides a ten-point strategic framework for developing a smart building.

(IS-2024-093) The Power Play - Uniting Smart Devices for Home Energy Management

Published on November 28, 2023, this report by Jennifer Kent from Parks Associates indicates that 54% to 62% of households believe electricity costs are too high. Smart thermostat adoption is now at 16%, providing behind-the-meter solutions to better understand and control energy usage. While bundled services and connected devices offer energy efficiency with minimal impact on home comfort, the author emphasizes the next step: seamless interoperability

between diverse apps, devices, and systems using standardized data formats and structured protocols. The Home Connectivity Alliance and The Matter Initiative are both working towards this goal.

(IS-2024-092) The Future of the Connected Home - The Rise of Home Applications

Authored by Michael Philpott and Mariana Zamoszczyk from OMDIA and published in March 2023, this report presents a survey of 111 broadband service providers across 18 countries, highlighting key points and recommendations. Despite its decline, pay-TV still generates significant revenue for telcos and cable operators, with value differentiation being crucial. Broadband value-added services (VAS) are now considered essential but require continuous investment and updates to evolve. The broadband speed test remains a vital tool for service providers, with 67% of consumer broadband subscriptions delivered over fiber as of 2022. Potential growth areas include application prioritization and Smart Home technologies. The report emphasizes the importance of open-source frameworks and industry standards. This extensive report provides detailed references to these key points.

(IS-2024-091) The Connected Economy

The March 2023 report from PYMNTS examines monthly consumer surveys on digital usage in ten areas: banking, wellness, communication, eating, having fun, living, moving, payment, shopping, and work.The report notes that 47% of consumers participated in digital activities, up from 41% the previous year. The biggest growth was seen in home management, with a 31% increase, or 21 million more consumers. Millennials and Bridge Millennials are the driving force behind this digital growth, with an average of 41 digital activities performed online. Additionally, 39% of consumers engaged in online payments, up from 33% the previous year. This monthly report provides interesting insights into consumer digital behavior.

(IS-2024-090) Towards Net Zero - Blinds, Best Practice Sustainability & Beyond

This white paper, authored and released by Verosol on November 16, 2023, examines the importance of windows in construction, advocating for the installation of proper equipment, such as smart-controlled blinds and curtains, by developers, builders, and architects to maximize natural lighting and reduce thermal energy loss. The construction industry must recognize the impact of using raw materials on embodied carbon levels. Lifecycle assessments for windows should be considered to ensure sustainability. The paper also highlights the option for buildings to obtain certifications from third-party organizations such as Global Green Tag and Green Star.

(IS-2024-089) The Great Divide on the Path to Net Zero

The September 2023 eBook by Siemens explores the significant challenges societies encounter when transitioning infrastructure, especially industrial buildings, to energy efficiency through retrofit designs and decarbonization efforts. Countries worldwide grapple with these monumental tasks, often hindered by imbalanced resource accessibility, differing philosophies, and geographic and political challenges. The eBook emphasizes the need for a clearly

communicated global consensus on alignment, standardization, and collaboration to leverage emerging technologies and regulations to collectively move away from fossil fuels. It covers three overlapping spheres: Regional Perspectives, City/Urban Perspectives, and Commercial Industry Perspectives.

(IS-2024-088) Path to Net-Zero - Achieving Zero Emissions

Published on September 20, 2023, this report by Bryalen Fernandes from Alectra examines the conversion of The Green Energy & Technology Centre into an eco-friendly, energy-efficient facility, featuring a fully electric vehicle fleet. The article highlights that Canada currently lacks building code requirements or standards for Net Zero Buildings. It also discusses the carbon footprint of buildings and the importance of considering embodied carbon throughout the lifecycle of building materials, including manufacturing, transportation, installation, maintenance, and disposal, particularly when transitioning away from natural gas. The article emphasizes the need for data post-COVID to inform decisions on technologies like geothermal and solar power, using the Canada Green Buildings strategy as an incentive framework.

(IS-2024-087) Mastering Maintenance - Bridge the Gap Between Theory and Practice With Simulation Training

Authored and published by Interplay Learning in January 2024, this eBook discusses how building maintenance staff and engineers can be better trained using digital technology simulations that cater to different learning modalities. It discusses how information is processed through various human senses and emphasizes the importance of simulation training for real-world experiences, particularly in skilled trades. The simulation allows for a tailored learning approach, which enhances cognitive processing skills.

(IS-2024-086) Making Net Zero Real - Overcoming Inertia in Implementing Your Decarboniztion Glidepath

The December 2023 white paper by Siemens emphasizes the critical need for corporate businesses to create long-term strategies to meet decarbonization targets and achieve net zero emissions. Despite the Paris Accords, many companies struggle to translate their lofty goals into actionable strategies. Guidance is needed to help them meet new regulatory requirements and avoid analysis paralysis. The paper highlights the challenges of upfront costs, such as efficient building infrastructure changes, and the slow pace of change due to market rates, available incentives, and resources like in-house experts to set milestones.

(IS-2024-085) Facility Management and Sustainability - A Fundamental Alliance

Published in June 2023 by Planon and Schneider Electric, this eBook by David Karpook and Sinan Meric addresses how Facility Management can handle sustainability efforts in large-scale commercial buildings through departmental collaboration. It emphasizes the importance of having a Smart Building portfolio plan that targets ESG goals in operations. The eBook covers benchmarks, tools, and technologies for data collection, and provides in-depth discussion on

reporting and disclosure requirements. It also addresses sustainable purchasing, highlighting the importance of selecting alternative products with a longer shelf life.

(IS-2024-084) Building Net Zero Homes with Home Management Systems

The November 14, 2023, report by Jennifer Kent from Parks Associates/Nice discusses U.S. residential building management and retrofits, emphasizing automation and envelope (insulation) solutions. It discusses recent government laws and ASHRAE standards, using California as a case study for leading energy policy, and how other U.S. states are beginning their journey into sustainable urban housing construction and development with energy-efficient designs. Consumer demand is strong for saving on energy bills by installing smart appliances, switching to LED lighting, and becoming better educated about how heating and cooling systems affect electrical loads. The report emphasizes the importance of providing easy access to real-time data on household energy consumption.

(IS-2024-083) Efficient Grid-Interactive Buildings

The October 2023 report by Ksenia Petrichenko, Andika Akbar, and Ian Hamilton from the International Energy Agency explores grid-interactive buildings, which optimize energy consumption, promote renewable energy integration, and enhance grid stability through interaction with the energy grid. To achieve net zero emissions by 2050, global energy efficiency improvements need to double to an average of 4% per year by 2030. The report explores how buildings need to be flexible with a grid that features expanding renewable electricity and coordinate with the increased adoption of local energy storage systems and electric vehicles. A framework is provided to assess the readiness of any jurisdiction, considering energy efficiency, decarbonization, smartness, and building-to-grid interactions as key elements of a grid-interactive building. The report describes various strategies that can be implemented and offers extensive guidance on available technology solutions across different regions, with a deeper focus on the ASEAN market.

(IS-2024-082) Driving Action on Embodied Carbon in Buildings

Authored by Tracy Huynh, Laurie Kerr, Chris Magwood, Wes Sullens, and Victor Olgyay from RMI and the U.S. Green Building Council and published in September 2023, this report underscores the importance of calculating and reducing embodied carbon emissions in buildings to combat climate change. Embodied carbon emissions from the U.S. building construction industry are estimated to be up to 370 million tons of CO2e annually, about 6% of total U.S. greenhouse gas emissions per year. By understanding the full life cycle of a building's carbon emissions, actions can be taken during design and construction to use less material, re-use existing material, and select materials with lower embodied carbon. The report addresses the perception that lower carbon materials are more expensive and emphasizes the importance of obtaining product environmental data. It also highlights the awareness that embodied carbon emissions may be calculated using different methods.

(IS-2024-081) The Rise of Home Energy Efficiency

Authored by Michael Lotfy Gierges of Schneider Electric and published in March 2024, this report presents findings from a 2023 survey on consumer actions to manage energy usage and costs. Most respondents are reducing energy consumption to control costs as prices have risen, with half willing to sacrifice comfort. The report records various actions taken by consumers to conserve energy. The top four considerations for home improvements are energy efficiency, energy security, cooling, and energy independence. Consumers expect a payback for these improvements within 1-3 years, and 30% also aim to reduce carbon output. While most see large businesses and government as responsible for emissions, they recognize their own role as well. The report describes consumer actions to reduce carbon and achieve net-zero energy consumption, with a preference for smart home devices to reduce energy usage, expecting these devices in new homes and apartments.

(IS-2024-080) LiFi Illuminated - Unleashing the Potential of Light-Based Connectivity

The July 2023 report by LiFi.co offers an overview of LiFi, a technology first developed in 2011. LiFi (Light Fidelity) functions like Wi-Fi as a local network for data distribution and control, but instead of using radio bands for transmission, LiFi utilizes visible, infrared, and ultraviolet light. LiFi modulates the light emitted from a lamp at a high rate, making the changes invisible to humans. The benefits of LiFi include data speeds up to 224 gigabits per second (in lab tests), an uncongested spectrum that is 10,000 times larger than the radio spectrum, enhanced security as signals do not penetrate walls, safety, no interference, and efficiency, especially when using LED lamps. The report describes various applications and discusses limitations in bright outdoor environments and the development of receiving devices.

(IS-2024-079) How to Measure IoT Success

Authored by Beecham Research and published in April 2023, this report discusses measurements of success for Internet-of-Things (IoT) projects. The report categorizes IoT projects across various sectors, including buildings and homes, energy, health, transportation, and retail, among others. It describes several case studies and highlights key technologies such as data processing in the cloud and at the edge, cybersecurity protection, wireless connectivity, and real-time monitoring for critical changes. Future technologies include artificial intelligence, integration of information and operational technology (IT and OT), multi-cloud solutions, IoT platform scaling, advanced security, and predictive maintenance. The report discusses the market benefits of successful IoT projects and includes survey results and examples from companies.

(IS-2024-078) How Can Green Technology Manufacturers Adapt and Thrive in the Energy Transition

The February 2023 report by James Stanley from LCP Delta explores marketing channels designed to target consumers with green technologies. The current marketing strategies by original equipment manufacturers (OEMs) are being disrupted by Future Energy Managers, who offer products and energy services in combined packages. OEMs are advised to adopt this model. Future Energy Managers handle solar panels, storage batteries, and the integration and

optimization of appliances, delivering outcomes such as a charged car or a warm house, rather than a specific amount of electricity. The report also discusses companies offering such services in Europe. OEMs are encouraged to be agile and innovative, utilizing technologies such as thermal storage, to better serve customers.

(IS-2024-077) WI-FI 6E 7

Published in March 2023, this report authored by Ambroise Popper and Deepak Joseph of NetNav, and Thomas Block and Ryotaro Sakauchi of Bosch Sensortec, discusses the technical requirements for deploying Wi-Fi 6/7, utilizing the 6 GHz band, compared to older Wi-Fi networks operating in the 2.4 GHz and 5 GHz bands. The 6 GHz band is also used by microwave and satellite communications. The US Federal Communications Commission (FCC) maintains a database containing the altitudes of equipment transmitting in the 6 GHz band, requiring the altitude of Wi-Fi access points to be reported. Two methods for measuring altitude are described: Height Above Terrain and Height Above Ellipsoid (a mathematical model of the Earth). Altitude measurements can be calculated using air pressure measurements from a barometric sensor.

(IS-2024-076) Empowering Homes with Intelligence - An Investigation of Smart Home Technology Adoption and Usage

Released in May 2023, this report by Origin Wireless, Inc. discusses the applications of Wi-Fi in sensing the motion of people and objects. These applications include sleep monitoring, fall detection, gait recognition, gesture control, activities of daily living, lighting control, and energy management. Integrated circuits and equipment are being developed with Wi-Fi sensing capabilities, enabling one sensor to serve multiple services through different analytics. The IEEE is planning a standard to extend Wi-Fi applications to sensing. The report discusses the technical challenges of interpreting the multi-path Wi-Fi signal. Newer Wi-Fi technologies will enable heart-rate monitoring, imaging, and multi-target sensing, raising issues of consumer privacy.

(IS-2024-075) WiFi Can Do More - Towards Ubiquitous Wireless Sensing

Published in November 2023, this report authored by Sara Gøthesen and Moutaz Haddara of Kristiania University College, and Karippur Nanda of SP Jain School of Global Management, studies the potential market for home automation products in Norway, surveying approximately 100 respondents online. The motivations for purchasing smart home technology included enjoyment of the products, perceived value, and social influence from friends and family. The report also investigated smart home applications for energy management. Hindrances to adoption included security, privacy, and trust issues. Suggestions for marketing home automation in Norway were presented, with a lack of awareness identified as the main barrier to market development.

(IS-2024-074) Are Heat Pumps at the Inflexion Point on a Hockey Stick-Shaped Growth Curve

The July 2023 report by Jon Slowe, Steven Ashurst, Klara Ottosson, Thomas Barquin, Guillermo

Yañez, and Nishanth Srinivasa of LCP Delta explores market growth trends in Europe for the installation of heat pumps. Heat pump installations increased by 18% in 2019 and 2020, then surged by 52% in 2021 and 2022. This growth rate can be sustained through 2030 if the following challenges are addressed: expanding the market from new construction to existing houses with gas furnaces, improving and establishing new channels for distributing and installing heat pumps, and ensuring sufficient capacity in the supply chain and the availability of installers. In general, the industry, governments, and the energy sector are meeting these challenges.

(IS-2024-073) A Practical Guide for Migrating Electrical Architectures to the New Energy Landscape

Published in May 2023, this report by Russell Senesa of Schneider Electric summarizes the upcoming changes in power generation and delivery systems in the first half of this century and discusses strategic responses. It highlights the contrast between growing energy consumption and the imperative to conserve and decarbonize. By 2050, electricity is expected to supply 60-70% of energy needs, with two-thirds coming from wind and solar sources. The paper describes the New Energy Landscape, which includes sustainability commitments, demand-side efficiency, government subsidies, lower technology costs, and the development of eco-friendly codes and standards. Autonomous rather than centralized energy management is recommended, and the growing use of direct current within buildings is noted.

(IS-2024-072) The Race To Zero Carbon Requires Smart Buildings

Released in November 2023, this paper by Forrester Consulting, commissioned by Johnson Controls, details the outcomes of a survey conducted in 25 countries about smart building strategies in different organizations. The findings suggest that to address sustainability, leaders are currently focusing their efforts on improving their operations sustainably. The main challenges identified include a lack of system/data integration and internal expertise, which slows progress in reducing carbon emissions. The report concludes that to fill the technical gaps in optimizing building systems and measuring environmental impact, organizations are encouraged to seek technical and strategic partners and create a fully integrated data platform.

(IS-2024-071) The 2023 Battery Investment Landscape

Released in September 2023, this report by LCP Delta discusses the future of battery storage in the UK, underscoring its essential role in decarbonizing the electricity sector and supporting the energy transition. It identifies several lessons that must be learned to maximize storage returns in more stable markets. The report argues that battery asset owners and investors need to become more sophisticated when entering various markets. Owners should select the best optimizers to manage their assets, while investors should choose the right locations and configurations and set realistic returns expectations. It emphasizes the importance for industry players to understand the environment in which they operate and the challenges associated with future investments.

(IS-2024-070) Smart energy management in residential buildings - the impact of knowledge and behavior

The 2024 scientific paper by Hakawati, B., and others examines the readiness of the residential buildings sector in the West Bank, Palestine, to integrate smart systems for energy management. The article discusses the complex relationship between knowledge, behavior, costs, and environmental sustainability in residential energy management. According to the results, a smart energy consumption management system may help residential buildings move towards a more sustainable future by lowering energy use and improving performance. Additionally, education and awareness programs targeting building residents are identified as key contributions to promoting energy savings, resulting in cost savings and a positive environmental impact.

(IS-2024-069) Ericsson Mobility Report

Published by Ericsson in June 2023, this paper examines and forecasts the evolution of 5G and mobile networks. It argues that 5G is growing rapidly despite challenges posed by current macroeconomic conditions. By examining data traffic patterns across various locations in mobile networks, the paper provides crucial insights for the future evolution of mobile networks. It suggests that high-rise buildings and underground areas often experience signal attenuation. Advanced services and new devices, including augmented reality (AR), virtual reality (VR), and mixed reality, are expected to drive additional traffic growth. Next-generation 5G applications will require new models to rate mobile quality of experience (QoE) to design networks that support future performance demands.

(IS-2024-068) State of Fleet Management Software 2023 Report

The October 20, 2023, report by Volpis provides a detailed analysis of the fleet management software sector, encompassing its current status, emerging trends, challenges, and the repercussions of global crises. The report offers insights into current software technology stacks, the most popular third-party APIs or services, software challenges, applications of artificial intelligence and machine learning, tech trends for the next few years, and the effects of global crises. Volpis is featured as the go-to company for the development of mobile and software applications. The main takeaway is that the global fleet management market is expected to grow to over $52 billion by 2028.

(IS-2024-067) The Video Surveillance Report

Published on November 6, 2023, this report by James Moore of IFSEC Insider summarizes findings from an international survey involving 556 security and IT professionals. It presents the major trends in the video surveillance industry. These trends include the adoption of artificial intelligence and cloud-based solutions by vendors, the application of video surveillance to solve operational problems and provide additional business intelligence, and the growth of use cases from new verticals. Macroeconomic trends such as rising inflation, geopolitical events, and supply chain issues have impacted the video surveillance industry. The report focuses on the retail, construction, and public sectors to understand how video surveillance is curbing retail

losses, enhancing construction site safety, and bolstering public security. The main takeaway is that video surveillance systems will have a central role in smart building and city development.

(IS-2024-066) Smart Building Overlay to the RIBA Plan of Work 2024

Authored by John Adams, Matthew Bott, James Franklin, Nick Hutchinson, and Ciaran Kelly from RIBA, and published on January 29, 2024, this report explores innovative approaches to facilitate smart building technology deployment across various building types within the Royal Institute of British Architects (RIBA) plan of work. Eight stages are outlined that summarize the smart building overlay to the plan of work, including key components such as outcomes, design, manufacturing, spatial coordination, and handover. The report also considers the interplay between technology, sustainability, and the built environment, emphasizing the importance of engaging smart building designers early in the concept design phase. The main takeaway is that overlays to the RIBA plan of work provide crucial supplementary knowledge and advice on specific topics.

(IS-2024-065) Putting a Price on Smart Home Protection

Prepared by F-Secure and published on September 12, 2023, this report presents findings based on a survey of 4,400 respondents from across Europe and the US. The report summarizes how digital security can be leveraged by Internet Service Providers (ISPs) to protect customers, increase revenue, and enhance their brand. An important finding is that the security features of a home gateway/Wi-Fi router have become as important as its communication speed. Consumers expect their ISPs to keep them safe and are willing to pay for cybersecurity protection provided by ISPs. The main takeaway is that a smart approach is required to protect a smart home, and F-Secure’s multi-layer security solution offers maximum protection.

(IS-2024-064) Designing Disinfection Systems with UVC LEDs

The July 17, 2023, report by Crystalis explores ultraviolet light-emitting diodes (LEDs) emitting light between 200nm and 280nm ('UVC'), emphasizing their superiority over mercury bulbs for disinfection purposes. The two most important advantages include better power output and longer lifespan. When designing innovative UVC solutions, consideration must be given to the target microbe, disinfection requirements, and thermal management system. The main takeaway is that designers need to carefully consider LEDs beyond the specification sheets, as LEDs that appear less than ideal on paper could lead to simpler and more cost-effective solutions.

(IS-2024-063) Clinical Trials Moving From Site to Home - Lessons Learned From Digital Health Technologies

The September 14, 2023, report by Tapan Raval and Tracey Smith from IQVIA explores how the rise of smart, wearable, and connected devices has facilitated effective clinical trials conducted in the convenience of patients' homes. The report highlights the importance of data aggregation, innovation in Software as a Medical Device (SaMD), and easing patient burden. IQVIA's clinical

eSource platform is featured for its workflow automation capabilities. The main takeaway is that successfully moving clinical trials from the site to the home requires integrating subject matter expertise in digital biomarkers, digital endpoints, SaMDs, and end-to-end technical capabilities.

(IS-2024-062) A Modeling Approach to Estimating Handprint Impacts - Applications in Grid Management and Fleet EV Charging

Published on September 14, 2023, this report by Andrew Hoffmeister, Pavitra Srinivasan, Avi Mersky, and Ethan Taylor of ACEEE investigates a modeling approach that seeks to refine carbon emissions calculations. The approach involves the application of information and communication technology (ICT) and calculations based on the net positive carbon handprint methodology. A positive carbon handprint accounts for emissions reductions across a product’s life cycle. Two use cases are considered: management of electric grids and electric vehicles. The proposed model can also be applied to other use cases. The main takeaway is that handprints provide a more comprehensive understanding of carbon emissions and represent an important step toward more accurate attribution.

(IS-2024-061) The State of 'Security by Design'

The February 13, 2024, report by Brivo discusses survey findings from 800 decision-makers in the architecture or engineering fields, focusing on the importance of security in the design and build process. The findings indicate discrepancies in how architects and engineers perceive the importance of building security and how they implement it. Fortunately, trends show that integrated building security is increasingly being included in the scope of building projects, contributing to increased project costs. The report features Brivo's cloud-based access control and smart spaces technology. The main takeaway is that building security cannot be an afterthought; it must be integrated into the architectural and engineering design processes from the start to be effective.

(IS-2024-060) The State of Vulnerability Disclosure Policy (VDP) Usage in Global Consumer IoT in 2023

Published on November 1, 2023, this report by Rohan Panesar, Mark Neve, and David Rogers of Copper Horse analyzes the implementation of vulnerability disclosure by manufacturers of widely used consumer Internet of Things (IoT) devices, assessing their commitment to best practices in IoT security. Vulnerability disclosure is defined as “the process of identifying, reporting, and patching weaknesses in software, hardware, or services that can be exploited." The main finding is that 95% of new manufacturers did not engage in vulnerability disclosure. Furthermore, manufacturers of TV, Wi-Fi, networking, and mobile devices had better vulnerability disclosures than those of wearables for leisure, hobbies, health, and fitness. The main takeaway is that changing legal requirements, especially in the UK, will require manufacturers to have vulnerability disclosures.

(IS-2024-059) Why Fire Safety Works Better When it's Digital

Published on August 22, 2023, this report by Honeywell explores the advantages of digitalized life safety systems in buildings, emphasizing enhanced reliability, operational streamlining, and reduced compliance expenses. It features Honeywell's approach to integrated digital safety systems for buildings called Connected Life Safety Services (CLSS). The benefits of CLSS include easier installation and commissioning, automated compliance testing and reporting, remote monitoring, and cybersecurity. The main takeaway is that the total cost of ownership for a digital life safety system is manageable using the CLSS system.

(IS-2024-058) How to prevent IAQ from impacting learning in schools

This report, authored by Johnson Controls and released on January 30, 2023, addresses the importance of indoor air quality in schools and the threats posed by airborne infections." The report highlights respiratory dangers due to volatile organic compounds, inorganic gases, contaminants from exhaled carbon dioxide, dust, and pollen. Benefits of improved air quality in schools include enhanced academic performance, better student attendance, improved cognitive function, and decreased respiratory symptoms. The proposed solution involves using smart building technologies to improve air quality, with Johnson Controls featured as a solution provider. The main takeaway is that improved indoor air quality offers significant health benefits for students and school staff.

(IS-2024-057) 2023 Midyear Market Health Report

Prepared by D-Tools and published on September 14, 2023, this report provides a comprehensive market overview of smart home systems integration projects in 2023. A key observation is that the number of projects remained relatively unchanged compared to the previous year, while the average size of projects decreased by over 5% in the first half of 2023. The top five installation categories included electrical, lighting, loudspeakers, access control, and networking. It is recommended that integrators continue to generate more proposals and focus on increasing the size of proposals. The main takeaway is that integrators need to find their niche and have an opportunity to increase labor costs per proposal.

(IS-2024-056) Optical LAN Advances Smart Buildings Internet of Things' Scalability, Security and Sustainability

The November 4, 2023, report by Apolan discusses the benefits of optical LAN networks (OLANs), emphasizing their role in advancing computer networks with enhanced scalability, security, and sustainability. The report explores the transformative potential of OLANs for the Internet of Things (IoT) ecosystem, including smart buildings. Key features of OLANs include the extensive use of fiber-optic technology, software-defined management, and innovative powering methods. The main takeaway is that OLANs provide a viable migration solution for the modernization of enterprise-wide computer networks.

(IS-2024-055) Matter for CE Product Manufacturers

Prepared by Bill Curtis from Moor Insights & Strategy and published on December 21, 2023, this

report provides a top-down analysis of the smart home device connectivity standard Matter, focusing on its transformative effects on consumer electronics (CE) product strategy. Matter offers unified connectivity for different devices, maximizing the total available market and simplifying product design and development for CE manufacturers. As an integrated standard built into hundreds of millions of devices, Matter supports the integration of artificial intelligence solutions. It also enables autonomous home operations by supporting energy management, security, safety, HVAC optimization, and health and wellness. The main takeaway is that Matter makes CE products easier to build, buy, and use, while helping to grow the smart home ecosystem.

(IS-2024-054) Improved Air Quality for a Healthier Environment

Published on October 23, 2023, this report by Ebtron discusses a case study featuring Florida Community College, where thermal dispersion airflow measuring stations were installed to protect the health of students and staff. The airflow system supports a balance of comfort and productivity while enabling the maintenance staff to accurately measure air quality. The report features Ebtron's airflow stations, which have successfully achieved the desired indoor air quality and energy savings. These stations provide easy access to real-time data via a BACnet integrated Building Management System or Ebtron's custom app. The main takeaway is that Ebtron's airflow stations are reliable, provide accurate readings, and require minimal maintenance.

(IS-2024-053) EV Driver Survey Report 2023

Prepared by Florian Glattes from Shell and published on June 21, 2023, this report presents survey results from over 24,000 electric vehicle (EV) drivers in Europe, examining current trends and behaviors shaping EV experiences. One important trend is the record-breaking growth in global EV sales over the past year. Despite this growth, there are challenges for sustained EV adoption, including charging infrastructure and the economic climate faced by both businesses and consumers. There is an opportunity for charging and technology providers to enhance the charging experience by offering smarter and more seamless solutions. The main takeaway is that the pace of EV adoption is accelerating, and consumer confidence is growing.

(IS-2024-052) Data-driven decision-making in the Data Center - from energy efficiency to predictive maintenance

The August 25, 2023, report by Paessler Monitoring Experts explores predictive maintenance in data centers, highlighting its capability to enhance control and performance. The report outlines a strategy to optimize energy efficiency in data centers by leveraging an enterprise-wide monitoring system. Additionally, it emphasizes the importance of IT service availability and zero downtime. Predictive maintenance is positioned as a critical activity to support the continuous and efficient operation of data centers. Paessler's data center monitoring services are promoted as a viable solution for predictive maintenance. The main takeaway is that predictive maintenance can help organizations maintain reliable data center operations and minimize financial losses.

(IS-2024-051) Smart Premise, Smart Experts

Published on January 18, 2024, this report by Stephanie Atkinson of Compass Intelligence addresses the challenges that must be tackled for the successful implementation of Internet of Things (IoT) projects. The key challenge identified is the assignment of unskilled professionals to the project. To overcome this challenge, a knowledgeable, reliable, reputable, and highly experienced installation team is required. The report presents ICAS as a solution, an organization that manages end-to-end smart premise installations to enable and optimize business digital transformation. The main takeaway is that selecting a business partner with the right people is critical to meeting expected outcomes and achieving a successful project implementation.

(IS-2024-050) Matter - Making Smart Homes More Secure

Prepared by Bill Curtis from Moor Insights & Strategy and published on June 6, 2023, this report addresses the security and privacy issues of the Matter connectivity standard, which enables interoperability between different Internet of Things (IoT) devices in a smart home. The report discusses the security aspects of Matter product design, manufacturing, and deployment, as well as the practicality of building secure Matter products. A use case with NXP Semiconductors is presented to demonstrate how Matter-enabled technology makes product development fast and efficient. The main takeaway is that smart home device makers should have solid Matter migration plans, and consumers should prioritize Matter devices when shopping for new products.

(IS-2024-049) Matter - A Cybersecurity Perspective

Authored by Guillaume Crinon from Kefactor and published on June 22, 2023, this report examines the history of device communication, with a particular emphasis on the Matter communication standard for the smart home market. In addition to Matter, other security considerations and industry standards are discussed, including secure boot, access control, and standards 802.1AR and ETSI EN 303 645. Matter security relies on certificates, digital identities, and signed code, which are challenging for vendors to implement. Keyfactor proposes their proprietary solution to address these implementation challenges. The main takeaway is that Matter promises seamless integration across brands and products in a smart home.

(IS-2024-048) Estimating the Handprints of Network Technologies to Make Informed Business Decisions

Published on September 14, 2023, this report by Lyla Fadali, Jonah Eisen, and Nora Wang Esram from ACEEE discusses the potential of innovative Information & Communication Technology (ICT) solutions to create a large positive handprint. A beneficial handprint is defined as a solution that has a lower carbon footprint than the baseline solution. The report highlights ICT networks that can create positive footprint effects when supported by proper technology and policy implementations focused on efficiency. It includes emissions calculations and attributed handprint savings. The main takeaway is that ICT solutions have enormous potential to reduce

greenhouse gas emissions.

(IS-2024-047) Wi-Fi HaLow for IoT

The January 19, 2024, report by the Wireless Broadband Alliance examines the networking technology implementations of Wi-Fi HaLow, based on the IEEE 802.11ah communication standard. The report discusses a plan for deploying Wi-Fi HaLow in Internet of Things (IoT) applications by leveraging the strengths of Wi-Fi without relying on proprietary or non-Internet Protocol (IP) technologies. The benefits of Wi-Fi HaLow include improved security, better battery life, communication through walls, and support for a greater number of devices. The report includes use cases that demonstrate the benefits of Wi-Fi HaLow for service providers, device-makers, and end users. The main takeaway is that Wi-Fi HaLow will enable new IoT products and services to be planned and deployed with greater confidence.

(IS-2024-046) Smart Home IoT Devices Require Secure Network Architecture

Authored by Jonathan Collins from ABI Research and released on June 12, 2023, this report delves into the expansion of the smart home market and the progression of its applications, such as healthcare, mobility, security, energy management, and appliances. Consumer trust and the need for security continue to underpin future growth. Device interoperability standards such as Matter and the low-power, low-bandwidth mesh networking protocol, Thread, are noted as essential for creating a secure environment. Equally important is the deployment of digital certificates for devices and associated management platforms. The main takeaway is that the identity of smart home devices will play a key role in enabling a secure system.

(IS-2024-045) Multi-Residential Access Management and Security - The Move to Digital

David Moser's report for Assa Abloy, released on November 28, 2023, focuses on access control measures that can create secure living environments for tenants in buildings with multiple units and shared hallways or stairwells. Considered locations for access control include communal entrances used by residents, visitors, maintenance staff, and couriers, as well as communal amenities such as gyms and laundry rooms, and individual residences. The report proposes an electronic (digital) access strategy, which offers benefits such as increased security, remote management, and convenience. The main takeaway is that connectivity and compatibility will drive the advancement of building access solutions.

(IS-2024-044) It's Crunch-Time for Commercial Real Estate Owners - Why Smart, Healthy, Sustainable Buildings Matter

Johnson Controls' report, released on October 2, 2023, examines the challenges confronting commercial real estate (CRE) owners and offers a strategy to address these issues. The main challenges include loss of revenue due to a declining tenant population, regulatory requirements, and social demand for workspaces that promote health and well-being. The proposed strategy involves adopting a smart building approach that includes a building automation system (BAS), cloud-based Internet of Things (IoT) sensors, and an open application

programming interface (API) platform. The main takeaway is that CRE owners need to invest in creating smart and sustainable buildings to achieve long-term economic and regulatory benefits and meet tenant requirements.

(IS-2024-043) Innovation in Action - Developing the Future of Smart Connectivity

Published on May 19, 2023, this report by British Telecommunications discusses the future of the smart home market, noting its projected growth due to improved flexibility and interaction among vendors and smart home technologies. The main enabler of this transformation is the specification standard, Matter, which provides interoperability of smart devices. Key features of Matter include operation in a multi-network environment, multi-administrative control, and cross-compatibility among devices. Additional drivers of smart home market growth include user-friendly products, task automation, hardware affordability, and service bundles. The main takeaway is that sustained growth relies heavily on the wider adoption of the Matter standard.

(IS-2024-042) How NFC Can Enhance Smart Home Experiences

ST Microelectronics' report, released on February 17, 2023, examines the use of near field communication (NFC) technology in smart homes. A key feature of NFC is its standardization, which makes it easy to deploy. An important application of NFC is the commissioning of new devices on a network, which requires identification and authentication. The report highlights ST Microelectronics' tags that can be used for NFC commissioning, as well as NFC use cases in parameter settings, firmware upgrades, pairing, diagnostics, and data backup. The main takeaway is that NFC plays a central role in making smart homes easier to operate.

(IS-2024-041) Connectivity for a Smarter, Better World

The October 18, 2023, report by Tsedeniya Abraham, Marian Kost, Ahmed Salem, and Roland Sperlich from Texas Instruments (TI) explores wired and wireless connectivity options for smart homes, buildings, factories, electric grids, and vehicles, highlighting their simplicity, scalability, security, and efficiency. Texas Instruments is featured as a leader in the connectivity space, participating in the development and deployment of networking standards, interfaces, protocols, and connectivity standards. The main takeaway is that businesses have various options for creating industrial and automotive designs by utilizing a combination of wired and wireless technologies.

(IS-2024-040) State of IoT Adoption Report - What’s next for IoT?

Authored by Nick Earle from Eseye and published on September 27, 2023, this report presents survey results from over 1,000 senior decision-makers in the UK and US with IoT projects in electric vehicle charging and smart grid, healthcare and medical devices, manufacturing, supply chain and logistics, and smart vending. The key finding is that only 1% of businesses had achieved more than 98% average connectivity levels across their device estates. Device design has also been identified as an important element for successful IoT project deployment. The main takeaway is that reliable connectivity is essential for IoT systems and should not be

compromised.

(IS-2024-039) Smart Spaces - IoT-Led Smart Building Transformation

The July 10, 2023, report by Sivapreeta Jayachandran from LTIMindtree explores how the Internet of Things (IoT) can be leveraged to modernize building operations. It introduces LTIMindtree's holistic smart building system as a strategy to achieve operational goals. The system is based on a three-tier architecture that includes edge, cloud, and enterprise layers. The benefits of deploying the LTIMindtree system include cost savings and improved management of energy, water, space, air quality, lighting, and security. The main takeaway is that a building's digital infrastructure is as important as its physical infrastructure.

(IS-2024-038) IoT for Development - Use Cases Delivering Impact

Published on April 24, 2023, this report by James Joiner, Christina Patsioura, Sayali Borole, and Zach Whiteby from GSMA examines the network connectivity landscape and significant IoT use cases in low- and middle-income countries (LMICs) in Sub-Saharan Africa, and South and Southeast Asia. The number of IoT devices is anticipated to reach 37 billion by 2023, with development potential in industries such as transportation, agriculture, environment, health, utilities, and humanitarian relief. Collaboration across the IoT ecosystem has been identified as essential to sustaining the projected growth. The main takeaway is that IoT can improve existing services and develop new ones.

(IS-2024-037) Five Guiding Tenets for IoT Security

Keyfactor's report, released on March 1, 2023, focuses on strategies to enhance the security of Internet of Things (IoT) devices. It emphasizes the importance of building a solid security foundation across the IoT ecosystem. Key elements of such a foundation include unique credentials for each device, private key storage, digitally signed firmware, organization-specific Root of Trust (RoT), and certificate management. The main takeaway is that as the number of IoT devices grows, so do the associated security threats, necessitating ongoing security measures.

(IS-2024-036) The Economy of Things - Unlocking the True Value of IoT Data

The May 22, 2023, report by Henry Osborne from STL Partners delves into the Economy of Things (EoT), a new method for data sharing across Internet of Things (IoT) ecosystems. This data-sharing concept is expected to create new monetization opportunities. The report provides recommendations for enterprises on how to capitalize on EoT, including evaluating business outcomes, establishing rules for data sharing, developing specific use cases, joining new marketplaces, and redefining the next customer segment. The main takeaway is that EoT will grow and peak within the next few years, with over ten percent of IoT devices expected to be EoT-enabled by 2030.

(IS-2024-035) Internet of Things Trends in 2024

Prepared by Sumatosoft and published in 2024, this white paper addresses the top trends in the Internet of Things (IoT) for 2024. The main trend is the integration of artificial intelligence (AI) into IoT systems. Other trends include the deployment of the 5G communication standard and an increased need for security implementation. Additionally, IoT is being used to create efficient, environmentally friendly solutions. There is also observed growth in the number of connected devices, sensors, and other technologies used to gather, transmit, and analyze health data. The main takeaway is that while IoT presents security and privacy challenges, it also creates opportunities for innovation and business optimization.

(IS-2024-034) Future of Real Estate - Shift to Phygital

The July 19, 2023, report by Saurab Mahajan from Deloitte provides insights from a Canadian national survey of 100 commercial real estate owners and tenant companies, focusing on the leading trends influencing the future of real estate. The report considers tenant expectations and what real estate owners can do to meet those expectations. Findings suggest that tenants are looking for smarter and more sustainable spaces. Real estate owners should consider providing real estate as a service, embracing technology to improve operations, reducing the carbon footprint of buildings, and striving for models that include full building information. The main takeaway is that the real estate market is shifting, and building owners need to respond to tenant expectations.

(IS-2024-033) Cracking The Code - Unleash Your Smart Buildings Strategy With The Power Of Facility Data

Published on February 14, 2024, by Mandy Polacek and Ben Anderson of Forrester Consulting, this report presents findings from a survey of 2,445 smart building leaders across 18 industries and 25 countries, examining their views on sustainability, security, and environmental systems. Findings indicate that less than 10% of the organizations operate smart buildings. Additionally, advanced organizations leverage system integration and tools to better inform leaders. The main takeaway is that business opportunities exist for professionals with strong system integration abilities, knowledge of advanced technology, and user-friendly platforms.

(IS-2024-032) 2024 State of the Industry & Tech Trends to Watch

Arlen Schweiger's report for CE Pro, released on January 18, 2024, delves into the key industry trends for 2024 that will influence custom integration professionals. The trends indicate that revenues earned by integration professionals are split, with two-thirds coming from residential work and one-third from commercial jobs. Additionally, custom integrators are diversifying their work by pursuing retail, government, and new construction commercial jobs. Areas with the highest anticipated growth include multi-room audio, higher-end control systems, and home networks/information technology. The main takeaway is that the custom integration market is expected to grow by 9.1% in 2024.

(IS-2024-031) Trend Research 2023-2024 - Innovation in a World of Continuous Disruption

Authored by the Innovation Board of GS1 and released on September 8, 2023, this report evaluates and comments on the top trends and technologies driving industry transformations now and in the future. Rapidly increasing in importance are trends such as data privacy, sustainability, and supply chain digitalization. Other significant trends include traceability, empowered consumers and the Metaverse, smart everything, connected things, and personalized healthcare. The main takeaway is that a successful digital transformation requires globally unique identification, a common data language, and a commitment to interoperability and data sharing.

(IS-2024-030) The Ultimate Guide to Home Automation 2024 - Transforming Your Living Space into a Smart Home

The December 27, 2023, report from Insta Automations presents the application of automation to living spaces and covers use cases such as entertainment, heating and cooling, smart lighting, and security. It discusses how automation can transform modern homes and highlights its advantages, including convenience, energy efficiency, security enhancements, and personalized experiences within living environments. Some of the disadvantages of automation are also covered, including installation cost, equipment compatibility, and potential exposure to security threats. The main takeaway is that automation not only simplifies daily routines but also contributes towards creating an eco-friendly future by promoting efficient energy usage.

(IS-2024-029) Tech Trends 2024

Deloitte's latest report, crafted by Aditi Rao, Hannah Bachman, Emma Downey, and Dabashree Mandal and published on December 12, 2023, delves into the emerging technology trends poised to shape 2024. These trends are based on forces of interaction, information, and communication, as well as grounding elements of modernization, technology, cybersecurity, and trust. Growth is projected in augmented and virtual reality, artificial intelligence (AI), and cloud services. Greater emphasis will be placed on software developers' experiences to retain technology talent. Modernization will focus on networks, data centers, and mainframes. The main takeaway is that enterprises need to consider all the forces and grounding elements when building a business strategy, rather than being sidetracked by focusing solely on AI.

(IS-2024-028) Human by Design - How AI Unleashes the Next Level of Human Potential

The January 4, 2024 report, authored by Paul Daugherty, Adam Burden, and Michael Biltz from Accenture, explores the evolution of new technologies becoming more human and their impact on business and people. The reviewed technologies include artificial intelligence (AI) ecosystems, AI chatbots, spatial computing, machine learning, and electronic-human interfaces. The main benefits for people include enhanced security, mobility, and accessibility. However, a lack of trust remains the biggest hurdle for adoption. The main takeaway is that while innovation continues across all these areas, it is essential for businesses to analyze the entire scope of changes when planning their long-term strategies.

(IS-2024-027) 2024 Year of the Smart Home

This report, authored by Jan Frederik Slijkerman and Diederik Stadig from ING and published on February 1, 2024, presents compelling reasons why 2024 could be the year of the smart home. The rise in sales of affordable semiconductor chips, combined with stable networks and the device interoperability standard, Matter, are all contributing to the projected growth of the smart home industry. Key features of smart homes, such as energy conservation and security, provide additional support for their adoption. The main takeaway is that with the growth of smart homes, telecom providers could become resellers of secure smart home devices and services.

(IS-2024-026) The State of Smart Buildings Software 2024

This report, published in March 2024 by Facilio, is derived from insights gathered from a survey of 180 leaders in the smart buildings industry conducted last year. The comprehensive findings of the report reveal that while a majority of senior professionals express interest in investing in smart building technology, they encounter significant challenges such as the high cost of implementation, lack of interoperability, and difficulty in assessing return on investment (ROI), which hinder their progress. Many find themselves unable to decide among the numerous available point solutions, leading to either becoming overwhelmed by the choices or not initiating the process at all.

(IS-2024-025) The Next Generation of Connected IoT

This paper, published in March 2023 by MIT Technology Review Insights in partnership with Infineon Technologies AG, outlines the current challenges and opportunities in the IoT landscape. It highlights the projected value creation of IoT products and services by 2030, estimated between $5.5 to $12.6 trillion. Despite this potential, IoT solutions face complexities arising from diverse ecosystems and technologies, exacerbated by semiconductor shortages and supply chain disruptions. The paper emphasizes the need for industry collaboration to establish standards facilitating innovative technologies, enhanced connectivity, and AI/ML integration to realize new IoT use cases. Moreover, advancements in lower-power chips for extended battery life and edge computing to reduce bandwidth and latency are expanding market applicability and driving business transformation.

(IS-2024-024) Software Bills of Materials IoT and OT Devices

This report, authored by members of the IoT Security Foundation Supply Chain Working Group and published in February 2023, sheds light on the importance of Software Bill of Materials (SBOMs) in the realm of IoT security. It underscores the significance of SBOMs by highlighting past vulnerabilities resulting from third-party software elements within IoT devices. Notably, the report emphasizes that a significant portion of an IoT device's source code originates from existing code maintained by third-party providers, necessitating improved risk management practices. In response, the report outlines solutions, including the adoption of standards, processes for sharing SBOMs, and tools for generating and maintaining SBOMs, to address these

challenges in the software supply chain.

(IS-2024-023) Solving False Alarms - Bringing New Context for Monitoring

This White Paper, authored by Elizabeth Parks and published by Parks Associates in partnership with Ubity in May 2023, delves into the evolving landscape of the security industry. With advancements in technology and changes in consumer lifestyles, the value proposition of "peace of mind" has become increasingly appealing. The paper highlights the growing importance of providing context and information to monitoring firms, first responders, and users, while also emphasizing the role of automation in streamlining response times. Furthermore, it explores consumer perceptions of events that trigger alerts and alarms, as well as their perceived value, particularly in the context of contract renewals and recommendations to new system owners. Additionally, the paper assesses the impact of the TMA-AVS-01 standard on the security industry and consumers, offering insights into the current state of the security and monitoring market.

(IS-2024-022) Smart Living - Elevating the Resident Experience

This White Paper, authored by Jennifer Kent and published by Parks Associates for Cox Communities in June 2023, sheds light on the evolving landscape of the multifamily market. With high interest rates and a scarcity of housing stock, multifamily properties are experiencing unprecedented demand, leading to increased investment in transformative technologies and connected use cases. The paper underscores the growing importance of internet connectivity in meeting residents' needs and improving internal operations. It explores how builders, property owners, and management firms are deploying broadband and Wi-Fi networks, as well as smart devices, to enhance resident experiences across all property classes. Additionally, the research identifies key consumer segments and their expectations for smart home amenities, emphasizing the significance of always-on broadband connectivity.

(IS-2024-021) Financial Services Firms - The Office Reimagined

This White Paper, authored and published by Metrikus in March 2023, explores how leading firms are utilizing actionable insights to enhance workplace productivity amid the shift towards hybrid work models. With many major firms endorsing a return to the office alongside hybrid options, the paper delves into leveraging real estate data to bolster employee engagement and streamline operational costs. It examines the evolving role of offices for financial services firms, emphasizing the importance of offices as hubs for innovation, collaboration, and learning. Additionally, the report discusses the role of technology and data in supporting a hybrid approach, focusing on space optimization, indoor air quality enhancements, and leveraging workplace data to deliver a seamless experience for employees.

(IS-2024-020) Energy, Security, Automation - Converging into Peace of Mind

This White Paper, authored by Chris White and published by Parks Associates for Alarm.com in March 2023, discusses the evolving landscape of the home energy industry and its implications across various sectors. With rising energy prices, consumers seek cost-saving solutions but face

challenges due to low familiarity and slow adoption of smart energy technology. The paper explores the role of technologies such as smart thermostats, plugs, and energy monitoring devices in addressing these challenges. Additionally, it examines consumer perspectives on renewable energy solutions and the convergence of security, home automation, and energy solutions. With increased government funding accelerating change, the report highlights opportunities for smart home manufacturers, security providers, and energy companies to meet evolving consumer needs by offering advanced home services.

(IS-2024-019) Building a Business Case for Digital Signage

This eBook, authored by Propmodo Research in collaboration with TouchSource and published in June 2023, highlights the rising trend of digital signage in commercial real estate. With economic turbulence, buildings are increasingly seeking to attract tenants by creating a community vibe with dynamic and up-to-date information. Digital displays have become more affordable, coupled with cloud-based platforms enabling remote and real-time updates, making digital signage a cost-effective solution. The report provides insights to build a compelling business case for digital signage, offering real ROI examples that demonstrate its ability to enhance the building experience and contribute to the bottom line for both management teams and occupants.

(IS-2024-018) Achieving Energy Transformation - Building a Cyber Resilient Smart Grid

This eBook, authored and published by TXOne Networks in April 2023, sheds light on the energy transformation occurring in smart grid-enabled buildings and those pursuing Net Zero objectives. It emphasizes the need for a cyber-resilient smart grid to address advanced cybersecurity challenges arising from smart grid modernization. The report explores cybersecurity trends, potential risks in the future power grid, and the incorporation of minimum requirements for best practices and deployment strategies to mitigate these challenges. Additionally, it provides a historical overview of cyberattacks in the energy sector, highlights emerging vulnerabilities in contemporary smart grids, and discusses new cybersecurity standards being developed for the Smart Grid. Countermeasures to address Smart Grid Cybersecurity threats are also examined, with recognition that many of these standards are applicable to smart buildings, which are also susceptible to cyber attacks.

(IS-2024-017) Maximizing Business Value - Exploring IoT Possibilities in FM

The eBook, authored and published by Planon in August 2023, explores the increasing adoption of IoT in building management. Driven by the goals of cost reduction, operational digitization, and sustainability enhancement, building managers are embracing IoT technologies. With predictions indicating a significant surge to 29.4 billion IoT devices by 2030, the focus has shifted towards optimizing an IoT tech stack within the built environment. This optimization forms the core of a comprehensive smart building platform, unlocking the full potential of IoT solutions. The eBook delves into the opportunities IoT offers for facility managers and real estate professionals while addressing the existing challenges and outlining practical implementation strategies for IoT and Digital Twin technology in the built environment. Additionally, it provides examples of IoT applications for energy efficiency, refrigeration, and other business benefits aimed at enhancing

occupant comfort, productivity, and well-being.

(IS-2024-016) Lighting and Lighting Controls - Fall 2023 Edition

The eBook, authored by Michael Chow, Tony Staub, Matt Moore, Paul Daniel, Brandon Stanley, and Richard A. Vedvik, and published by Consulting & Specifying Engineer in August 2023, covers various aspects of lighting efficiency beyond just LEDs. It provides a guide for navigating lighting standards and codes, designing human-centric lighting controls, and developing lighting control designs to complement standard lighting practices. The eBook also discusses current trends related to electric vehicles (EVs), photovoltaics (PV), and high-efficiency heat pumps, projecting a significant rise in electrical energy consumption in the United States. With decarbonization becoming a focal point, the eBook explores the adoption of full electrification for large venue facilities, alongside utilizing existing generators and extending service life strategies. Additionally, it highlights the evident value of lighting controls, with many utilities offering incentives for their implementation.

(IS-2024-015) Hospital & HealthCare Facilities - Fall 2023 Edition

The eBook, authored by April Woods, Mike Zorich, Yasmine Mustafa, and David Huey, and published by Consulting & Specifying Engineer for Laird Connectivity in August 2023, covers various topics related to building automation and intelligent communications in healthcare settings. It includes articles discussing hospital ventilation design during COVID-19, Bluetooth deployment in hospital settings, and the benefits of healthcare IoT. These technologies aim to enhance hospital design for resilience, emergency preparedness, and overall occupant health, wellness, and staff retention.

(IS-2024-014) Protect the Connected Home - Home Security Meets Personal Privacy

The November 11, 2023 report, authored by Frank Saldaña and Jennifer Kent from Parks Associates, explores the potential growth of security offerings in addition to existing home security services. To address consumers' data privacy concerns and enhance smart device adoption, the report recommends that home security providers offer device protection and data privacy services to homeowners. A highlighted technology solution is Pocket Geek Home by Assurant. The main takeaway emphasizes that security providers can capitalize on their skills, assets, and service relationships with existing customers to create a new revenue stream.

(IS-2024-013) Meeting Industry Demands Through Technology

The September 8, 2022 report, prepared by Planon, focuses on integrated facilities management (FM) and explores the role of technology in the evolution of FM services across different markets. The report draws insights from roundtable discussions with experts from North American and Nordic markets, proposing various technology requirements to enhance FM services. Key themes from these discussions include technology features supporting sustainability and energy management, the ability to influence employee workplace experience and workforce efficiency, open application platforms, and hyper-automation.The main takeaway underscores that the

selection of technology solutions should be based on added value rather than merely focusing on the lowest cost.

(IS-2024-012) Matter Security - Applying Privacy Fundamentals to Smart Home Devices

The August 1, 2022 report, prepared by Silicon Labs, introduces Matter, an Internet of Things (IoT) connectivity standard designed to provide security, privacy, and device integration. A notable feature of Matter is its status as a global connectivity standard facilitating seamless communication across various IoT devices. Leveraging Internet Protocol technology, Matter enables communication across standards like Wi-Fi, Ethernet, and Thread. The primary takeaway emphasizes that Matter offers a certification process for devices and provides a secure, open-source platform empowering developers to create reliable, low-power solutions for the IoT ecosystem.

(IS-2024-011) Matter Certification - The Value it Brings to IoT Devices

The October 19, 2022 report, authored by Rob Alexander from Silicon Labs, focuses on the certification process of communication devices on Matter's standardized wireless platform. The report highlights how this certification process allows developers to validate their products and services, providing extensive integration opportunities with other Internet of Things (IoT) devices. It emphasizes the significance of Matter certification and the advantages it offers to IoT device developers. The key takeaway underscores that Matter provides a secure, standardized, reliable, and unified solution for communication devices in the IoT ecosystem.

(IS-2024-010) In Depth Analysis of Cyber Threats to Automotive Factories

The April 27, 2023 report, prepared by TxOne Networks, delves into the discussion of various cyber threats faced by automotive factories and presents mitigation strategies. The report addresses inherent risks in the factory environment, outlines consequences of cybersecurity attacks, analyzes automation factories, highlights security incidents in 2022, provides an overview of digital transformation and architectural changes in automotive manufacturing plants, and suggests the implementation of a zero-trust approach for enhanced security. The main takeaway emphasizes that a comprehensive zero-trust cybersecurity solution is imperative to effectively protect automotive factories and secure the supply chain.

(IS-2024-009) Futureproofing Critical Services Against Tomorrows Cyber Threats

The September 21, 2022 report, prepared by TxOne Networks, addresses operational technology (OT) for zero-trust cybersecurity defenses in critical infrastructure (CI) buildings and various sectors, including manufacturing, finance, communication, information technology, transportation, healthcare, agriculture, water, and emergency systems. The report emphasizes OT zero-trust portable security devices designed to prevent ransomware and other attacks proactively. It incorporates global perspectives on critical infrastructure, highlighting insights from Taiwan and India. The key takeaway underscores the importance of not assuming trust and advocates for continuous verification to ensure the safe and uninterrupted operation of critical

infrastructure.

(IS-2024-008) Face Recognition and the Smart Home - Applications, Demand, and Innovation

The May 16, 2023 report, authored by Chris White and Jennifer Kent from Parks Associates, explores the role of face recognition technology in security and personalization. The paper delves into how artificial intelligence (AI) can elevate user convenience and security, mitigating vulnerabilities in the connected home. It examines consumer intentions in purchasing security devices and addresses the regulation of biometric data and data processing strategies. The primary insight emphasizes that security and privacy concerns play a crucial role in influencing brand loyalty, trust, and the revenue growth associated with security products.

(IS-2024-007) Digitalization of the Danish District Heating Sector

The June 7, 2023 report, prepared by State of Green, showcases 18 diverse use cases of digitalization in the Danish district heating sector throughout Denmark. The digitalization initiative focuses on leveraging remotely read heat meters for invoicing, optimizing operations, and enhancing administration for improved customer service. The benefits encompass transitioning to environmentally friendly practices, converting natural gas customers to district heating, optimizing building energy consumption, and achieving cost savings. The central insight underscores that digitalization has the potential to impact the entire value chain, encompassing procurement, production, distribution, consumption, and customer interactions in the district heating sector.

(IS-2024-006) Computational Design for Futuristic Environmentally Adaptive Building Forms and Structures

The August 1, 2023 report, authored by Aref Maksoud, Hayder Basel Al-Beer, Aseel Ali Hussien, Samir Dirar, Emad Mushtaha, and Mohammed Wasim Yahia from the United Arab Emirates University of Sharjah, explores the integration of computational design technologies for the creation of self-learning and adaptable buildings. These buildings adapt by collecting data from the surrounding environment through sensors and adjusting their operation accordingly. The computational model is inspired by the growth process of cellular bone structures, tailored to a specific project site. The key takeaway highlights that the proposed model is highly adaptable and well-suited for the development of smart buildings.

(IS-2024-005) City Data Spaces - A Guide to Building and Operationalizing Data Services

The June 8, 2023 report, prepared by SmartCitiesWorld & FIWARE, serves as a guide to data spaces for cities, exploring their construction and operationalization. The report identifies real-world use cases and emerging trends in data spaces, providing an in-depth explanation. FIWARE is highlighted as a solution provider in the context of data spaces. The primary insight emphasizes that data spaces have the potential to provide secure data sharing solutions across various verticals within the smart city ecosystem, encompassing areas such as mobility and energy.

(IS-2024-004) Penetration of Refrigerant Leaks into Furniture

The March 2022 paper, published by UL Solutions, outlines the methodology and findings of a comprehensive refrigerant release testing project conducted at UL Solutions laboratories in the US. The study specifically incorporates furniture with significant displacement volume concerning a room's overall volume, including cabinets, drawers, wardrobes, and armoires. The results lead to the conclusion that furniture and structures with hollow interiors have minimal impact on calculating room volume. Furthermore, the observations affirm that refrigerant behaves similarly to other fluids, flowing rapidly in the presence of a pressure differential.

(IS-2024-003) Door Gaps and Natural Ventilation with Adjoining Rooms

The March 2022 paper, published by UL Solutions, investigates the role of door clearance in mitigating refrigerant concentration buildup in spaces experiencing a leak. The study involves a full-scale refrigerant release test with various room tightness configurations to compare gas concentration profiles during and after the release. The research highlights a substantial effect on the amount of refrigerant flowing out of the room due to the clearance under the door. Therefore, the paper concludes that the clearance below the door can serve as a mechanism to reduce the likelihood of refrigerant leaks into adjacent spaces. The findings also underscore the challenges of constructing a tightly sealed room interior.

(IS-2024-002) Building Smart - A Wiser Approach for Building the Smart Self-Storage Facility of Your Dreams

The 2023 report, published by BETCO, outlines an approach to "build smart self-storage facilities." The report aims to dispel the notion that creating smart spaces is merely about installing the latest technology gadgets. It argues that intelligently designed smart self-storage buildings should integrate customized infrastructure strategies tailored to users' needs alongside well-planned technological innovations. This combination offers both enhanced convenience and safety compared to traditional units. The report emphasizes the importance of scalability in preparing facilities for a smart future. In conclusion, the report asserts that a smart environment not only saves owners time and increases revenue but also provides tenants with enhanced convenience and security, leading to heightened customer loyalty and satisfaction.

(IS-2024-001) Barometric Pressure Sensors for Consumer Electronics

The 2023 report, published by Bosch - Sensortec division, provides insights into the application and technological advancements in barometric pressure sensors. The report details the two primary technologies employed, namely capacitive and piezoresistive, and explores their diverse applications enhancing human health and well-being. These applications range from indoor localization for emergency calls and navigation in GPS dead zones to water level detection and drone navigation. The report argues that due to their low-cost manufacturing, coupled with low power consumption and a wide array of uses, barometric pressure sensors are poised to become an integral part of everyone's daily lives in the future.

(IS-2023-195) Considerations for Planning a Matter Product

The June 14, 2023 report, prepared by Silicon Labs, serves as a strategic guide for decision-makers, product managers, and business owners involved in developing connected smart home devices employing the Matter communication protocol. It focuses on integrating devices within the Internet of Things (IoT) ecosystem using Matter, delving into standard Matter device types, necessary certifications, and managing certificates during contract manufacturing. The primary insight underscores the importance of meticulous planning in mitigating risks, minimizing unforeseen costs, and expediting product development and launch processes within the context of Matter-enabled smart home devices.

(IS-2023-194) Understanding the Path to Certifying Your Matter Devices

The July 14, 2023 report, authored by Rob Alexander from Silicon Lab, focuses on the certification process for Internet of Things (IoT) devices to meet compliance with the Matter communication protocol. It outlines three key components within the certification process: product development, certification at an authorized provider, and application for certification through the Connectivity Standards Alliance (CSA). The report also sheds light on how Silicon Labs can support across this process. The main insight emphasizes that Matter certification ensures device interoperability with other certified Matter products, signifying a guarantee of compatibility within the Matter ecosystem.

(IS-2023-193) The Emergent Industrial Metaverse

The March 27, 2023 report, authored by Cindy Waxer from MIT Technology Review, delves into the rising concept of the industrial metaverse through interviews with technologists, industry analysts, and academics worldwide. It explores the metaverse's emergence, its use cases, future challenges, opportunities, and the potential impacts on businesses and daily life. The report also contemplates the requisites for establishing the industrial metaverse. The primary insight underscores the pivotal role of business agility in enabling organizations to engage with the industrial metaverse. The metaverse relies on foundational technologies such as digital twins, Internet of Things (IoT), artificial intelligence (AI), machine learning, 5G wireless communication, and virtual/augmented reality, emphasizing the need for businesses to adapt and leverage these technologies to participate effectively.

(IS-2023-192) Solving the Complexity of Communicating Between IoT and Devices and the Enterprise

The September 20, 2022 report, authored by Nick Hayes from Ublox, addresses communication challenges prevalent in the implementation of Internet of Things (IoT) systems. It delves into strategies for overcoming complexities, costs, and availability issues by advocating for solutions built on the industry-standard Message Queuing Telemetry Transport (MQTT) protocol. Additionally, the report explores the advantages of utilizing MQTT for low-power sensor networks (MQTT-SN) within IoT applications. The primary insight highlights MQTT as an

advantageous choice for power-constrained systems, as the protocol significantly influences message overhead, directly impacting the energy required for transmission.

(IS-2023-191) Software Stacks for Networking

The August 8, 2023 report, prepared by Plume organization, explores software options for communication service providers (CSPs) in managing customer premises equipment (CPE) devices. It delves into the major software components available and assesses various software development kits (SDKs) that offer pre-integrated solutions. The report offers insights by comparing the advantages and disadvantages of these approaches, enabling CSPs to select a pathway that aligns with their objectives and potential benefits. It emphasizes how the choice of software can significantly impact CSPs, influencing capital and networking costs, as well as networking capabilities.

(IS-2023-190) The Art of the Possible - IoT, Smart Buildings and Digital Twins

The June 7, 2023 report, authored by Service Works Global, details seven steps guiding organizations in their pursuit of establishing smart buildings. The report showcases use cases and examples to demonstrate the attainability of smart building objectives. It emphasizes several critical factors, including the implementation of integrated workplace management systems, building information management models, digitization, integration of real-time data, and the utilization of digital twins. The main takeaway underscores the significance of adopting a continuous and incremental improvement strategy for building owners. This approach allows for gradual infrastructure investments within budget constraints, ensuring sustained progress towards smart building initiatives.

(IS-2023-189) Smart Home IoT Devices Require Network Architecture

The June 12, 2023 report, authored by Jonathan Collins from ABI Research, focuses on security and trust challenges within smart homes. It underscores the necessity for smart home providers to incorporate suitable security technologies like digital certificates and associated management platforms. Additionally, adaptable, automated, and compliant solutions will be crucial for providers to offer. The report emphasizes the importance of adhering to market standards such as Matter to encourage diverse system interoperability and establish trust with customers. The primary takeaway highlights the pivotal role of consumer trust and system security in fostering the growth of the smart home market.

(IS-2023-188) Next-Generation Smart Home - Building for the Future

The April 4, 2023 report, authored by Jennifer Kent from Parks Associates, evaluates the drivers and market dynamics propelling the smart home industry forward, emphasizing strategies for enticing new buyers to adopt smart home technologies. The report delves into diverse use cases stemming from a wide array of existing solutions, encompassing areas such as aging-in-place solutions, energy management, insurance, and monitoring. The primary insight highlights the necessity for solution providers to adopt a comprehensive approach, offering varied solutions to

customers while building trust and focusing on developing for emerging market segments within the smart home landscape.

(IS-2023-187) IoT Cybersecurity For Facilities Professionals in the Smart Built Environment

The March 23, 2023 report, authored by Emma Boakes, Dave Cooke, Nikdokht Ghadiminia, Vitor Jesus, John Moor, Nick Morgan, Rajeev Rege, Sarb Sembhi, Jason Shaw, and James Willison from IoT Security Foundation, offers technical expertise and a comprehensive overview of cybersecurity concerns within the Internet of Things (IoT) in smart buildings. Aimed at facilities professionals in smart buildings, the report provides guidance to fortify defenses against cyber threats. It includes best practices for IoT cybersecurity risk management within a framework, detailing controls and processes necessary to ensure secure operations of IoT systems across a building's lifecycle. The report emphasizes the pivotal role of stakeholder collaboration in effectively managing cybersecurity risks associated with smart buildings.

(IS-2023-186) Artificial Intelligence (AI) in the Building Sector

The November 11, 2022 report, prepared by ABB, delineates challenges and potential solutions in the building and real estate sector concerning decarbonization, energy efficiency, and return on investment (ROI). Highlighting that building construction and operations contribute to 38 percent of global energy-related CO2 emissions, the report advocates for effective management of these emissions. The report introduces an artificial intelligence (AI) solution, specifically BrainBox AI by ABB, aimed at managing CO2 emissions. BrainBox AI employs smart technologies to enhance energy efficiency in both new and existing buildings. The key takeaway emphasizes that implementing smart automation in buildings, coupled with AI technology, holds the potential to significantly reduce carbon emissions and lower energy costs.

(IS-2023-185) Unlocking the Potential of Smart Cities

The April 25, 2023 white paper authored by Nick Maynard & Damla Sat, and published by Juniper Research Ltd, explores the potential of smart cities. Juniper Research ranks the top 5 smart cities as Shanghai, New York, Toronto, Seoul, and Shenzhen. This ranking is based on an evaluation encompassing various smart city aspects, including transportation, infrastructure, energy, lighting, city management, technology, and urban connectivity. The report highlights the top 20 smart cities globally, derived from a list of 50 innovative cities. Each of the top 20 cities receives a comprehensive profile detailing its initiatives and anticipated future developments in the realm of smart city advancements.

(IS-2023-184) Solving Multifamily Maintenance Demands with Smart Appliances

The April 25, 2023 report by Kristen Hanich, published by Parks Associates in partnership with GE Appliances, delves into labor shortages' impact on maintenance teams in multi-residential properties. Surveying 100 property owners, managers, and maintenance staff, it unveils challenges in staffing, appliance maintenance, and the evaluation of smart appliance solutions. Key findings reveal about a quarter of property owners/managers facing understaffing and

nearly half struggling with hiring and retention issues, impacting timely appliance servicing for tenants. The report advocates smart appliances' potential to improve efficiency and functionality, offering features like maintenance monitoring, automation, and remote control. It also discusses the perceived value of smart appliances for multifamily property owners and the drivers and barriers influencing their adoption.

(IS-2023-183) Reducing Facility Maintenance and Repair Costs with Predictive Maintenance

The October 19, 2022 report, authored and published by ON Point from Buildings IOT, explores Predictive maintenance (PdM) as a valuable addition to facility maintenance. PdM utilizes building data to enhance maintenance and equipment performance accurately. While promising, successful PdM implementation necessitates meticulous planning. The report advises engaging a master system integrator (MSI) to ensure readiness for digital solutions and tackle implementation challenges. Moreover, once the PdM program is operational, maximizing its potential becomes crucial. The report emphasizes leveraging analytics and advanced fault detection and diagnostics (FDD) to gain stakeholder buy-in and demonstrate the program's success. When executed effectively, PdM initiatives can lead to substantial cost savings and operational efficiencies across portfolios.

(IS-2023-182) Mapping Ethical Issues in the Use of Smart Home Health Technologies to Care for Older Persons

The report, authored by Nadine Andrea Felber and others and published by the Institute of Biomedical Ethics, University of Basel on March 29, 2023, delves into Smart home health technologies (SHHTs) for older individuals. It investigates ethical considerations surrounding SHHTs used in caregiving for the elderly. Analyzing 156 articles across various databases, the review identified seven key ethical categories. The findings reveal a lack of adequate ethical consideration in the development and implementation of SHHTs. The report emphasizes the need for meticulous ethical deliberation in deploying such technologies to care for older individuals.

(IS-2023-181) Making Buildings Smart - Leveraging Real-time Insights at the Edge

The comprehensive guide and checklist, released by ONLOGIC on June 15, 2023, offer valuable assistance in navigating the complexities of selecting industrial computers. Recognizing the wide array of differences in terminology, configurations, form factors, and features among industrial computing solutions, the guide aims to aid in making informed decisions when choosing and configuring the most suitable option for specific applications, particularly in managing data for smart buildings. This resource serves as a helpful tool by presenting a series of articles that lay the groundwork for understanding smart buildings. It introduces the concept of smart buildings, explores their benefits, and explains how real-time insights from the network edge contribute to making buildings smarter and more responsive environments. The guide equips readers with essential knowledge and key questions to consider, facilitating a more informed approach to successful hardware deployment in smart building applications.

(IS-2023-180) Smart Buildings - Spring 2023

The April 2023 eBook, authored by Aaron Askew, Evan Eitemiller, Raymond Szuszkiewicz, April Vacca, Ellen Augst, and featuring roundtable discussions with diverse experts, was released by Consulting & Specifying Engineer. This comprehensive eBook presents a collection of articles that shed light on the instrumental role of smart building systems in enhancing HVAC systems for healthcare and office spaces. The eBook addresses various queries concerning Variable Refrigerant Flow (VRF) systems and their integration with HVAC solutions, providing insights into optimizing these technologies for improved efficiency. It also engages in discussions about the evolving nature of office spaces, accommodating new work styles, and the subsequent impact on building systems. Moreover, the eBook delves into the challenges faced by companies scaling up and establishing their first facilities, offering guidance on navigating the complexities of constructing smart facilities. Through a mix of articles and expert discussions, the eBook aims to illuminate the significance of leveraging smart building systems to create more efficient and adaptable environments in both healthcare and office settings.

(IS-2023-179) Power Shift

The challenges faced by the province of Ontario, Canada, in the context of a $450 billion investment requirement by 2050 and the necessity to emerge as a green-grid center for emission-reducing industries are outlined in a recent report. Projections indicate a strain on the province's electricity grid as early as 2026, potentially leading to shortages by 2030. The June 2023 report discusses the potential conflict between Ontario's consideration of increased gas-fired power generation and the imminent Clean Electricity Regulations. Highlighted within are recommendations for robust policies and incentives focused on energy conservation, leveraging smart technologies that could notably conserve enough electricity to power 3 million homes by the early 2040s. However, the report indicates potential clashes with federal Net Zero targets by 2035. Balancing increasing demand, transitioning to cleaner energy sources, and potential federal regulation conflicts is emphasized as a key challenge for Ontario while strategically investing in energy infrastructure. The report underscores the importance of efforts to delay demand through energy conservation strategies and promote technological solutions to facilitate a smoother transition, cost savings, and the establishment of Ontario as a low-carbon leader.

(IS-2023-178) Lighting & Lighting Controls

The June 2023 eBook, authored by Karen Murphy, David Repair, Scott Garrett, Bianca Jimenez, Rick Baca, and released by Lutron, was published by Consulting & Specifying Engineer. This comprehensive book encompasses a range of articles that delve into diverse lighting technologies, control systems, and the crucial necessity of selecting the right lighting solutions tailored for specific applications. One fundamental approach highlighted in the eBook is the concept of task-ambient design, which forms the bedrock for efficient lighting designs. Task-ambient design methodology initiates by pinpointing the specific tasks to be performed and determining whether these tasks are confined to particular areas within a room or span across the entire space. Often, tasks that demand higher illumination levels are localized to smaller zones within a room rather than encompassing the entire area. Additionally, the eBook delves

into topics such as emergency lighting and the utilization of emergency generators, providing comprehensive insights into ensuring continuous illumination during critical situations.

(IS-2023-177) HVAC-R Summer 2023

This July 2023 eBook discusses a diverse range of topics aimed at expanding your understanding of HVAC systems. Explore insights into regulating HVAC through VRF systems and discern the significance between applied and packaged rooftop units. Gain a deeper comprehension of air physics to better grasp the fundamental principles at play. Additionally, discover the latest trends in HVAC and plumbing within manufacturing and industrial buildings, offering valuable insights into industry advancements. Moreover, this eBook ventures into the realm of sustainable refrigeration systems specifically tailored for grocery stores, presenting innovative solutions. Unveil these topics and more across the 79 pages of this comprehensive eBook, providing a wealth of knowledge and insights to enhance your understanding of HVAC systems and related areas.

(IS-2023-176) HVAC-R Spring 2023

The April 2023 eBook, authored by Jeremy Barrette, Randy Simmons, Ionel Petrus, Aaron Askew, Evan Eitemiller, Craig Phillips, and other contributors from partnering companies, and published by Consulting & Specifying Engineer, presents a compilation of articles focusing on diverse HVAC technologies tailored to address the contemporary challenges related to creating healthier buildings. The eBook delves into the evolving landscape of healthcare designs post-COVID, highlighting the transformations aimed at enhancing the well-being of both patients and employees while prioritizing indoor air quality concerns. Additionally, it encompasses a dedicated chapter on building automation. Each article within the eBook offers in-depth insights, showcasing how intelligent HVAC systems play a pivotal role in fostering healthier and more sustainable building environments. These articles collectively underline the significance of leveraging smart HVAC solutions to contribute to the creation of spaces that promote health and sustainability.

(IS-2023-175) High Rise, Low Carbon

The May 28, 2023, White Paper, authored by John Stackhouse and Luigi Ferrara for the RBC Climate Action Institute, delineates the economic prospects associated with constructing new homes sustainably. It envisions Canada leading the charge into a greener era characterized by innovative building materials, intelligent building systems, and the swift adoption of low-carbon heating and cooling technologies. Acknowledging the broader scope, the paper emphasizes the necessity of establishing new supply chains, nurturing skilled workforces, and notably, fostering a retrofit economy to facilitate this transition. The paper serves as a guiding resource, aiming to enlighten and motivate Canadians to recognize both the pressing urgency and the burgeoning opportunities that accompany the movement towards more sustainable buildings. It encourages stakeholders to embrace the imperative for sustainable construction while highlighting the promising prospects inherent in this shift.

(IS-2023-173) Decarbonizing the Built World - A Call to Action

The March 7, 2023, White Paper, authored by John Turner, Beth Eckenrode, Todd Lukesh, Don McLean, Anil Sawhney, and Craig Stevenson for the Digital Twin Consortium, sheds light on a critical issue: the significant energy consumption and depletion of natural resources attributed to the built environment. Despite well-documented evidence by Science-Based Target Initiatives and global climate scientists, the extensive network of stakeholders involved in the building lifecycle—ranging from financiers, risk auditors, developers, owners, operators, builders, city planners, technicians, trade partners, to suppliers—has yet to collectively acknowledge and actively reduce their combined negative environmental impact. The paper aims to guide building owners and their associated stakeholders in tackling this challenge through the implementation of performance-based digital twins. It delineates how the application of these digital twins can play a pivotal role in addressing the environmental concerns associated with the built environment.

(IS-2023-172) Buildings of the Future Are Powered by Technology

The White Paper released by Essensys on June 26, 2023, discusses how software and technology facilitate building owners in providing flexible working spaces. It explains the concept of co-working spaces, where employees from different companies share workspace. The paper acknowledges the influence of the COVID-19 pandemic on accelerating trends like digitalization, flexibility, and sustainability in the real estate industry, continuing to shape future strategies. It notes the increasing adoption of flexible workspace due to economic pressures faced by both startups and larger companies, prompting a reevaluation of fixed costs such as office spaces to enhance savings or redirect investments into crucial business areas. This shift has implications for the wider office industry, posing challenges in maintaining occupancy rates and devising compelling offerings amid growing competition. The paper illustrates these insights with case studies demonstrating the costs and benefits associated with embracing flexible workspace models.

(IS-2023-170) OT Zero Trust Boosts Healthcare Cybersecurity

This report was authored by TXOne Networks and published in November 2022. It discusses methods for cybersecurity protection of devices in hospitals when they are part of an OT (Operations Technology) network. The first imperative is to separate OT from IT (Information Technology) networks. As noted, IT anti-malware was not designed to protect medical equipment. A challenge is to update older equipment with outdated software that may be too old to upgrade. Methods are being developed to determine which devices can be trusted on an OT network, which devices can be locked down to prevent infection, and which devices need to be cleaned of malware. The security of remote patient monitoring equipment for telemedicine needs to be checked. Cybersecurity threats are summarized in this paper as are OT zero-trust cyber defenses.

(IS-2023-169) Data Privacy and Security in the Connected Home

This report was authored by Kristen Hanich from Parks Associates and published in May 2023. It presents consumer concerns for the privacy of their data from actions both by criminal and technology companies. The average number of connected devices in broadband households is now about 16. Among these are "headless IoT devices": devices that connect to the Internet without a user interface. The makers of such devices each have a unique policy on data collection and privacy. Half of surveyed consumers reported a privacy or security issue in the past year. Those who own multiple devices and are tech-savvy or have experienced identity theft are the most concerned. Companies that address these issues may benefit from increased sales. Consumers want control over their data and a fearful of AI (artificial intelligence).

(IS-2023-168) Cellular Technology Evolution for IoT Applications in the 5G Era

This report was authored by Sabrina Bochen and Sylvia Lu from u-blox AG, a Swiss company, and published in January 2023. It introduces a new performance standard for the cellular industry deploying the fifth-generation technology called 5G. This paper focuses on communications with IoT (Internet of Things) devices such as sensors using 5G. Most of the standards development for 5G has been on high-speed and low-latency applications. A new standard with reduced performance and cost is being developed for IoT applications. This standard is a product of 3GPP (3rd Generation Partnership Project), a consortium of telecommunication standards organizations. The IoT standard is called 5G Reduced Capability (RedCap). Conforming products may be available in 2024.

(IS-2023-167) Untapped - The Home Tech Evolution

The 2023 report, a result of consumer research commissioned by Samsung, underscores the potential of smart home technology in enhancing people's lives. It delves into the drivers, benefits, and various applications tailored to meet the diverse needs and expectations of different user demographics. Highlighting the continuous evolution of connected living, the report asserts that it holds unprecedented promise in improving individuals' quality of life. Anticipating a surge in demand, the report predicts an increased interest in health and wellbeing apps, smart energy solutions, cooking technologies, as well as smart home innovations catering to older adults and individuals with physical or sensory disabilities. While current smart home devices and digital assistants are controllable via voice commands, the report envisions the future integration of facial recognition and other biometric technologies, setting the stage for new and advanced design possibilities in the years ahead.

(IS-2023-166) The Welcoming Workplace

The 2023 report by Brivo challenges the conventional notion of the office as a mere workspace, acknowledging the shifting dynamics of a modern workforce in a post-pandemic world. It delves into the evolving interactions between occupants and buildings, presenting methods intertwined with technological advancements to augment these interactions. The report culminates by asserting that cultivating a more inviting experience within office spaces can yield operational savings by curbing utility and labor expenses, while also unlocking new revenue streams for the building. Additionally, it highlights the market attractiveness of office spaces that prioritize a

more productive and health-oriented work environment, catering to corporations seeking such conducive settings for their employees.

(IS-2023-165) Gating Access - Challenges in Multifamily Properties

The 2023 report authored by Hanich, K and published by Parks Associates delves into the adoption of access control technology within multifamily properties. It furnishes a comprehensive overview of the current landscape of access control adoption in the US multifamily housing market. The report extensively compares the advantages and considerations between retrofitting existing properties and integrating solutions into new construction projects. It encompasses detailed use cases, deployment models, and recommended best practices in this domain. Emphasizing the growing prevalence of access control applications and features in multi-dwelling properties, the report underscores their transformative impact on residents' lives. Additionally, it advocates for the exploration of alternative technologies, such as cellular solutions or IoT-specific networks, to circumvent the extensive retrofitting requirements often associated with Wi-Fi deployments in this context.

(IS-2023-164) Enhancing Building Health Moving Beyond HVAC

The September 2022 report by R-Zero Systems Inc. addresses the pressing need for enhanced indoor air quality (IAQ) management amid persistent concerns about respiratory viruses post-pandemic and the associated challenges faced by organizations in meeting these new ventilation requirements. It elucidates why most Heating Ventilation Air Conditioning (HVAC) systems were not originally designed to comply with the updated IAQ standards and why existing HVAC upgrades often fall short. Introducing a proven and cost-effective technology known as upper-room ultraviolet germicidal irradiation (UR-UVGI), the report highlights its capability to meet the standards at a fraction of the cost. Notably, several agencies, including the US EPA and ASHRAE, have recommended the adoption of this technology for effective IAQ management.

(IS-2023-163) The Journey to Sustainable Buildings

Published in 2022 by Planon, this article presents the findings of a survey conducted among over six hundred real estate investors in Europe and the US, aiming to delve into their Environmental, Social, and Governance (ESG) best practices. The survey sought to comprehend the stage of their ESG journey, identify emerging issues, and forecast future trends. The article concludes that although technology, particularly ESG-related software, has yet to dominate, it plays a pivotal role in realizing the benefits concerning transparency in monitoring and reporting a company’s ESG outcomes. Notably, certifications such as BREEAM, Energy Star, and LEED emerged as preferred choices for energy-focused building certifications. Furthermore, the article highlights that while commitments, targets, and action plans are underway, the absence of a governance plan poses a common obstacle in this domain.

(IS-2023-162) The Future of Electric Vehicle Charging

Published in 2022 by the Telenor Group, this article provides a comprehensive overview of the

Electric Vehicle (EV) market across Europe. It outlines the escalating demand for charging point installations, noting the entrance of automotive supply chain companies, battery providers, and real estate businesses into this expanding market. While acknowledging the presence of technical, regulatory, and economic hurdles impeding the widespread adoption of EV charging stations, the article emphasizes the role of IoT connectivity as a fundamental catalyst. This connectivity offers diverse value propositions to charging point operators, car manufacturers, and EV users. Conclusively, the article suggests that fostering a burgeoning ecosystem around electric vehicles will necessitate robust 4G and 5G cellular connectivity at charging points as the market progresses.

(IS-2023-161) How the digitalization of the built environment will increase sustainability impact

Published in 2022 and co-authored by Knops, J. & Ankerstjerne, P. of Planon, this article deliberates on the pivotal role of digital transformation within the Real Estate and Facility Management sector. It contends that technological advancements, accelerated by the COVID-19 pandemic, have led to rapid evolution within this market. The pandemic notably amplified the adoption of self-service protocols among residents, employing digital procedures and user-friendly mobile applications. Businesses are increasingly inclined to leverage the Internet of Things (IoT) to augment value and imbue their facilities with "smart" capabilities, utilizing cutting-edge technologies available from a diverse array of vendors catering to various applications. The article culminates in highlighting the emergence of Integrated Workplace Management Systems (IWMS) as the new connecting platform encompassing all building-related property technologies and building management systems.

(IS-2023-160) Explore Denmark's Journey to Decarbonise and Energy Optimise its Buildings

Published in 2023 by Holm, G and others affiliated with State of Green, this article contextualizes the trajectory of energy efficiency policies and regulations in Denmark spanning the last five decades. Emphasizing that about 85% of the buildings anticipated for occupancy by 2050 are already standing today, the article contends that devising energy-efficient strategies for existing structures holds paramount importance. It elaborates on the benefits, challenges, lessons learned, and motivating factors driving Denmark's green transition in alignment with Net Zero commitments. The narrative showcases a myriad of energy-efficient case studies and pioneering solutions implemented by Danish corporations globally, serving as exemplars of this approach.

(IS-2023-159) Building the Factory of Tomorrow

Published in 2022 by SIEMENS, this article delves into the concept of smart factories and the intersection of the building envelope and the Internet of Things to facilitate it. It highlights the pivotal role of digitalization in providing data-centric solutions that interconnect physical production, operational procedures, and facility management. This integration allows for real-time enhancements in people, processes, and services, while also supporting long-term strategies. The overarching objective is to progress towards an autonomous factory model, driven by the idea that measuring outcomes through digitalized processes leads to desired results. These outcomes include safer working environments, improved energy efficiency, and

heightened overall throughput across the factory.

(IS-2023-158) Decarbonization in Building Operations

In this fast-changing world, property owners have made energy optimization and sustainability a top priority. But are making physical retrofits and investing in renewable energy sources enough? While they come with many benefits, they can take a long time to implement and require heavy investments. On the other hand, a software-led approach is the fastest way to reduce your energy bills while accelerating your decarbonization journey. This eBook by Facilio provides you with a technology roadmap for smart building operations – learn how you can use IoT, AI and big data analytics to accelerate your decarbonization journey.

(IS-2023-157) Smart Buildings as Enablers of New Energy Practices and Communities

Released in May 2022, by SmartBuilt4EU, this white paper investigates the role of smart buildings and energy communities in promoting new energy efficiency practices. The report examines current policies on efficient heating solutions and community electrification. Notably, it forecasts that by 2050, about half of EU households will generate renewable energy, facilitated by affordable PV and increased electric vehicle integration into the grid, with a significant portion of charging occurring at home. The report discusses barriers to adoption, including infrastructure capacity, lack of incentives, and limited awareness among citizens and occupants. Pilot projects are showcased, highlighting opportunities to simplify business models, streamline approval processes, and address consent challenges in multi-family dwellings and with landlords.

(IS-2023-156) Optimised Building Costs

Published on May 17, 2022, by SmartBuilt4EU, this white paper delves into the optimization of building costs. The report assesses the current state of life cycle costing and assessment, particularly focusing on the role of technologies like BIM in tracking asset costs. It notes that while BIM offers real-time cost tracking opportunities, its adoption seems limited to the construction phase and lacks usage during operations and retrofits. The paper highlights the potential of AI/ML, digital twins, and big data analytics to optimize life cycle costs and predict asset performance, but acknowledges challenges due to standards and skills gaps. The report presents pilot projects showcasing the implementation of digitalization and tools, emphasizing the importance of building automation systems and IoT data for cost optimization and the need for interoperability standards.

(IS-2023-155) How to Create Actionable Outcomes with Data Analytics in Connected Buildings

Authored by Gillott Research and published in the fourth quarter of 2022, this report highlights the potential of building automation and controls systems enhanced by artificial intelligence and machine learning solutions. The adoption of these technologies can be facilitated through wireless networks, asset inventorying, and data standards. AI/ML applications are employed to identify faults, diagnose issues, and optimize system equipment, resulting in reduced operating costs, extended equipment lifespan, and lower energy consumption. The report emphasizes that

these improvements can enhance a building's appeal to tenants and lead to higher lease rates.

(IS-2023-154) Deep Learning Based Optimal Energy Management for Photovoltaic and Battery Energy Storage Integrated Home Micro-Grid System

Authored by Alam, Morshed et al. and published September 2022, this report underscores the role of artificial intelligence in optimizing the utilization of PV and BESS systems in conjunction with consumer needs. The report presents a residential energy management model that accounts for appliance operational constraints, PV generation forecasts, and grid electricity costs. The scheduling of BESS charging and discharging is determined through various control optimizations, considering day-ahead generation and consumption. In the most favorable scenario, the model demonstrated a potential reduction of up to 38.8% in daily electricity costs.

(IS-2023-153) Unlocking the Potential of Smart Buildings

Authored by an unknown author from Transforma Insights and published in November 2022, this report provides a comprehensive definition of smart buildings and outlines their benefits. Notably, buildings contribute to 1/3 of global energy consumption and 55% of electricity demand. The report highlights that smart buildings can substantially reduce electrical usage, including lighting by 35-40%, HVAC by 20-25%, and overall consumption by 10-20%. The report also emphasizes the effectiveness of Bluetooth devices connected via LoRaWAN networks for retrofitting, such as using accelerometers on bathroom stall doors to monitor usage. This retrofit approach is expected to dominate both new builds and renovation projects due to its flexibility.

(IS-2023-152) The Past, Present, & Future of the Smart Buildings Industry

Authored by James Dice from Nexus Labs and published in July 2022, this report delves into the challenges of integrating disparate technologies and standalone systems across rooms, floors, and buildings. The report suggests an integration approach through a horizontal architecture comprising distinct layers: device, network, independent data (housing a data model), and application (with a user-friendly app). Despite the clear solution proposed, the author acknowledges the ongoing complexity of this transformation process.

(IS-2023-151) Smart Buildings and the Benefits of Convergence

Authored by Allied Telsis and published in May 2022, this report underscores the imperative for interconnecting building management systems. It highlights the growing significance and interdependence between Information Technology, Operational Technology, Building Management Systems, and cybersecurity. The report identifies eleven drivers within the smart building market relevant to Property/Facility managers. For instance, the concept of "flexibility" allows seamless transfer of smart building functionalities (e.g., temperature, lighting, elevator, access) as tenants move within the building. The report reveals that energy-efficient buildings command a 17% premium, generate 35% higher rental income, and boast an 18% higher occupancy rate. It offers guidance on achieving these outcomes.

(IS-2023-150) Occupant-Centric Building for Enhanced Quality of Life

Authored by Sylvain Kubicki and Airaksinen Miimu from Smart Built4EU and published in May 2022, this report emphasizes the necessity for a comprehensive and systemic approach to enhance overall quality of life through the integration of smart building technologies. It identifies obstacles to adoption, opportunities for research and development, and market gaps. The report delves into the emotional impact of "well-being," transcending physical attributes and technologies in buildings and addressing occupants' experiences. Examples include the fusion of wearable tech and sensors with accessible databases and adaptive models to enhance individual and collective comfort, measured through "comfort KPIs." The report also offers a rich collection of reference projects.

(IS-2023-149) How Can Smart Buildings Technology Become Mainstream

Published in November 2022, this report examines the factors impeding the widespread adoption of integrated smart building technology. The report highlights insights gathered from interviews with key industry stakeholders, revealing that the primary hindrance is not technological but related to human factors. Challenges such as a lack of awareness about the benefits, complexities during the commissioning process, market fragmentation, and misalignment between developers and tenants are identified. The report suggests that the adoption of smart building technologies is likely to be driven by end user expectations and a more streamlined commissioning process that spans the entire lifecycle.

(IS-2023-148) There's a Climate Crises - Where are the Experts

Authored by Stuart Lemmon and Adam Savitz from Atos and Johnson Controls, and published in May 2022, this report delves into the challenges of averting a climate crisis by attaining net zero energy consumption in buildings. The focus is on the need for workforce training to support the transition to net zero. The report highlights the necessity for a skilled workforce that is well-versed in net zero practices, spanning various roles within organizations. Collaboration between companies and governments at community and corporate levels is emphasized as crucial. The report cites examples of successful partnerships and underscores the importance of skills training, vendor selection aligned with environmental, social, and governance (ESG) commitments, and a sustainability-oriented approach.

(IS-2023-147) Responsive End-User

Authored by Vladimir Gumilar, Sami Kazi, et al. from Smart Built4EU, funded by the European Commission, and published in November 2022, this report addresses barriers to the implementation of smart buildings. It examines the challenge of achieving anticipated energy savings and indoor environmental quality while ensuring user comfort. The report particularly focuses on the interactions between building occupants and the built environment. It identifies obstacles to the adoption of interactive smart building solutions and explores issues related to collecting and managing data about occupants' interactions for privacy concerns. The report

proposes demonstrations using monitored buildings as living laboratories to address these challenges.

(IS-2023-146) Self-Service Support - Improving Home Automation

Authored by Parks Associates in partnership with RouteThis and published in October 2022, this report explores the prevalence of connected devices in homes equipped with core home automation products such as smart thermostats, networked cameras, video doorbells, or smart lights. On average, homes with these products possess around eight connected devices. The report investigates tools designed to monitor device functionality and assist with technical issues, which impact one-third of device owners. Among these owners, 47% address problems independently, while 42% seek professional assistance. Self-service tools encompass network monitoring, guided issue resolution, and a database of solutions. The report also delves into the advantages for service providers in offering customer self-help tools.

(IS-2023-145) Harnessing the Power of Wi-Fi in the New Age of IoT

Authored by Ravi Subramanian from Silicon Labs and published in December 2022, this report presents the key attributes of Wi-Fi 6. A comparative table highlights various Wi-Fi versions, including 802.11a, 802.11b, 802.11g, Wi-Fi 4 (802.11n), Wi-Fi 5 (802.11ac), and the latest, Wi-Fi 6 (802.11ax). Wi-Fi 6 offers data rates up to 9607 Mbps, a significant advancement from 11 Mbps in 802.11b. Notably, Wi-Fi 6 supports simultaneous transmission, enabling devices to collaboratively send data packets. Beamforming technology enhances range and throughput, allowing access points to target transmissions to remote devices. Moreover, devices can schedule transmissions, effectively reducing battery drain between data exchanges.

(IS-2023-144) CO2 Measurement is Only the First Step to Define Indoor Air Quality

Authored by Olivier Martimort from NanoSense and published in January 2023, this report delves into the origins of indoor air pollution while outlining a strategy to mitigate pollutants while managing energy consumption. The focus is on primary pollutants such as CO2, VOCs (Volatile Organic Compounds), and PM (Particulate Matter), along with nine additional pollutants. The report emphasizes the adverse health effects of these pollutants, with poor indoor air quality being linked to nine million global deaths annually. Strategies for detection and reduction are detailed, including on-demand ventilation, which boasts a 70% energy savings compared to continuous fan operation.

(IS-2023-143) Truly Smart, Comfortable, Functional and Sustainable Office Spaces - Why Wait

Published in October 2022, this collaborative white paper, jointly developed with Dexma Energy Intelligence, accentuates the pivotal role of energy management in the commercial real estate (CRE) sector. The paper elucidates the formidable challenges posed by climate change, energy costs, and digital transformation within the CRE landscape. It presents a compelling rationale, highlighting that 47% of global annual CO_2 emissions originate from the built environment. In response, the paper advocates a dual-strategy approach to curbing carbon emissions, targeting

both embodied and operational carbon. The paper concludes by providing an insightful overview of ten essential capabilities that Energy Management Systems (EMS) should encompass. These capabilities play a crucial role in identifying, analyzing, and optimizing energy savings across diverse building portfolios.

(IS-2023-142) The Energy Challenge in Commercial Real Estate - How Analytics and IoT Help Drive the Sustainability Transformation

Released in October 2022, this collaborative white paper, crafted in partnership with Dexma Energy Intelligence, underscores the significance of energy management within the realm of commercial real estate (CRE). The paper delineates the formidable challenges presented by climate change, energy costs, and digital transformation in the CRE landscape. A compelling case is presented, as 47% of global annual CO_2 emissions stem from the built environment. In response, the paper advocates a two-pronged approach to carbon reduction: addressing embodied and operational carbon. The conclusion furnishes an insightful overview of the ten pivotal capabilities that Energy Management Systems (EMS) should embody. These capabilities are essential for identifying, analyzing, and optimizing energy savings across building portfolios.

(IS-2023-141) Smartness to Reduce Environmental Impacts

Published in November 2022, this report emerged within the context of the SmartBuilt4EU project's task force 2: Efficient building operation, backed by funding from the European Commission. Central to this paper is the exploration of smart technologies' potential in mitigating buildings' environmental impact during their operational phase. The report conducts a comprehensive literature review of prevailing tools and strategies for optimizing building cost and performance. Notably, it delves into barriers hindering the realization of smart construction and proposes actions to harness driving forces—such as fostering common Life Cycle Cost Analysis methodologies, piloting smart systems, and expanding building certification schemes. The report underscores the urgency for the construction value chain to address research and innovation gaps in smart building implementation and prioritize workforce education and upskilling.

(IS-2023-140) Safe, Smart and Sustainable Buildings - A Guide for Mitigating Risks and Driving Asset Performance Across the Real Estate Portfolio

Released in 2022, this report, developed by UL Solutions, presents a comprehensive exploration of safety, security, and sustainability as foundational elements for a robust risk management approach. The focus is on bolstering occupant contentment and optimizing real estate asset performance. The report substantiates its insights through data garnered from surveys and US real estate market statistics, providing a compelling rationale for proactive measures and actionable solutions. The narrative underscores the imperative of methodically integrating and assessing a building's systems to effectively realize the advantages of a real estate portfolio strategy.

(IS-2023-139) 5 Top Residential Security Trends to Watch In 2023

Authored by Parks Associates and published on October 27, 2022, this report furnishes security companies with up-to-date insights and trends to facilitate informed strategies for attracting new clientele. The overarching trends encompass heightened interest rates affecting costs, escalating demand for apartment building security, surging adoption of smart cameras and video doorbells, and emerging prospects within vehicle and energy security management. The principal insight gleaned highlights an optimistic trajectory for security companies to amplify their business expansion efforts.

(IS-2023-138) State of the Connected World 2023 Edition

Authored by Shahid Ahmed, Madeline Carr, Mariam Nouh, and Jeff Merritt, this report was issued by the World Economic Forum on December 20, 2022. The report delves into prevailing governance gaps surrounding the Internet of Things (IoT) and associated technologies. It encapsulates insights concerning IoT's COVID-19-induced impact on medical device demand, the hindrance in growth due to cybersecurity risks and trust deficits, ethical and responsible use dilemmas, and the imperative for equitable access. The core insight underlines the necessity for collaborative efforts between businesses and governments to formulate and enact more robust policies addressing privacy, security, and inclusivity for IoT technologies.

(IS-2023-137) Smarter Home

Prepared by ABB and released on September 9, 2022, this report presents an encompassing outlook on avenues to enhance residential intelligence. Encompassing considerations of home comfort, energy management, safety, and remote resident control, the report highlights ABB solutions for smart homes, showcasing compatibility with components from various manufacturers. Featured solutions include ABB-free@home for renovations and residential buildings, ABB i-bus® KNX for new constructions and extensibility, and ABB-Welcome for front door communication. The central insight gleaned emphasizes the prudent approach of collaborating with architects and electricians prior to commencing home construction or renovation to optimize electrical equipment requirements and reduce installation costs.

(IS-2023-136) Smart Home Security Market's Positive Growth and New Technologies

Authored by Swati Balgi and released by World Media & Expo on August 31, 2022, this report explores the burgeoning realm of smart home security solutions, spotlighting emerging technologies and positive market growth. The report delves into market dimensions, influential drivers, and pioneering products, supplementing these insights with enlightening case studies showcasing technology-integrated lighting designs and cutting-edge home automation solutions. The discourse extends to the merits of open Internet of Things (IoT) standards and the integration of IoT technology for smart cities. The central takeaway accentuates the rapid surge in demand for IoT devices and home security systems, ushering in new business avenues for security enterprises.

(IS-2023-135) Cyber Risks in the Smart Home Ecosystem - Identification, Modeling, and Pricing

Authored by Maochao Xu and Shouhuai Xu, this report was presented by the Society of Actuaries Research Institute and marked its debut on February 22, 2023. It introduces a pragmatic quantitative framework tailored for modeling cyber risks within the smart home ecosystem, with a focal point on cyber insurance pricing. Comprising four integral components—identifying vulnerability-incurred cyber risks, classifying risks by business lines, modeling these risks, and determining insurance premiums and coverages—the framework offers immediate applicability for actuaries. The pivotal insight extracted underscores that the proposed quantitative framework and pricing strategies stand ready for swift adoption/adaptation by actuaries to address the burgeoning cyber risks in the thriving smart home insurance market.

(IS-2023-134) Toward a Secure Smart-Home IoT Access Control Scheme Based on Home Registration Approach

Authored by Su-Yang Wu, Qian Meng, Yeh-Cheng Chen, Saru Kumari, and Chien-Ming Chen, this report entered the pages of the MDPI Mathematics Journal on April 30, 2023. It delineates the formulation of a secure authentication scheme for the smart home realm, guaranteeing exclusive access to legitimate users of smart devices. Grounded in authentication and key agreement (AKA) principles, along with software guard extensions (SGX) technology, the scheme adeptly curbs insider attacks. The key takeaway resonates—authentication schemes stand to benefit from integrated approaches, like multi-factor authentication and biometrics, enhancing their robustness and efficacy.

(IS-2023-133) The 2023 IoT Security Landscape Report

Prepared by Bitdefender and made public on April 25, 2023, this report offers insights gleaned from a threat intelligence analysis encompassing 2.6 million global smart homes. It provides a deep dive into popular Internet of Things (IoT) devices and their prevailing vulnerabilities within the smart home milieu. The report evaluates IoT risks spanning cybersecurity, privacy, and physical safety, accompanied by practical suggestions to enhance smart home security. The paramount insight underscores that the trajectory of IoT security is expected to decline before improvement, urging smart homeowners to adopt every feasible measure to curtail security risks.

(IS-2023-132) GDPR Personal Privacy Security Mechanism for Smart Home System

Authored by Yun-Yun Jhuang, Yu-Hui Yan, and Gwo-Jiun Horng, this report debuted in the MDPI Electronics Journal on February 7, 2023. The report introduces a Raspberry Pi microcontroller system designed to safeguard users' informed consent when interacting with devices within an IoT ecosystem, like a smart home. Anchored in the general data protection regulation (GDPR), the system encompasses a unified device data format agreement. The central insight derived emphasizes that the proposed system empowers users with expanded choices in how they provide and transmit personal data.

(IS-2023-131) A Sustainable Pattern of Waste Management and Energy Efficiency in Smart

Homes Using the Internet of Things (IoT)

Authored by Mohammad Ehsanifar, Fatemeh Dekamini, Cristi Spulbar, Ramona Birau, Moein Khazaei, and Iuliana Carmen Barbacioru, this report premiered in the MDPI Sustainability Journal on March 13, 2023. It outlines a waste management and energy efficiency model for smart homes, employing the Internet of Things (IoT). The model factors in energy costs, inhabitants, house size, waste generation sources and rates, as well as waste transfer stations. The report's core takeaway underscores that the IoT-driven model holds potential to enhance waste management in smart homes, ultimately fostering energy efficiency.

(IS-2023-130) A Comprehensive Review of IoT Networking Technologies for Smart Home Automation Appliances

Authored by Vasilios A. Orfanos, Stavros D. Kaminaris, Panagiotis Papageorgas, Dimitrios Piromalis, and Dionisis Kandris, this report debuted in the MDPI Journal of Sensor and Actuator Networks on April 3, 2023. The report delves into the virtues and drawbacks of Internet of Things (IoT) networking technologies, categorized by connectivity (wired, wireless, dual mode), user interaction, technical traits, data integrity, and cost. Prominent technologies include KNX, Ethernet, WiFi, BLE, Zigbee, LoRa, EnOcean, and Mioty. Amid the annual influx of new devices, the central insight gleaned underscores the need for a unified interface to facilitate seamless communication among them.

(IS-2023-129) Strategic decision making in smart home ecosystems: A review on the use of artificial intelligence and Internet of things

Authored by Patricia Rodriguez-Garcia, Yuda Li, David Lopez-Lopez, and Angel A. Juan, this report was published by Elsevier's Internet of Things Journal on April 18, 2023. The report encapsulates findings from a literature review centered around the convergence of artificial intelligence (AI) and the Internet of Things (IoT) in strategic decision-making within smart home ecosystems. Employing a comprehensive framework encompassing decision support, partnerships, and AI/IoT integration, the report unveils prevalent trends, potential benefits, challenges, and opportunities for cultivating new business models. The primary takeaway underscores that the integration of AI into strategic business decisions confers organizations with a sustainable competitive edge.

(IS-2023-128) Proactive and Ongoing Analysis and Management of Ethical Concerns in the Development, Evaluation, and Implementation of Smart Homes for Older Adults with Frailty

Authored by Rosalie H Wang, Thomas Tannou, Nathalie Bier, Mélanie Couture, and Régis Aubry, this report found its place in the JMIR Aging Journal on March 9, 2023. It delves into the ethical considerations vital for smart home technology's support of aging individuals with frailty. The report emphasizes proactive ethical management through a proposed framework, along with accompanying resources and tools. The key takeaway underscores the necessity for the framework's adaptation to the unique circumstances and insights of aging adults and stakeholders. This customization is crucial for smart home technology to fulfill its potential in this context.

(IS-2023-127) Enhancing Smart Home Design with AI Models: A Case Study of Living Spaces Implementation Review

Authored by Amjad Almusaed, Ibrahim Yitmen, and Asaad Almssad, this report was published in MDPI's Energies Journal on March 10, 2023. The core focus centers on harnessing artificial intelligence (AI) models to enhance the design, functionality, convenience, and energy efficiency of living spaces within smart homes. A case study is presented, showcasing customized temperature control by room to illustrate how AI integration can elevate user experiences within smart homes. The key insight derived underscores the pivotal role of AI in heightening user comfort and substantially reducing energy consumption. This is achieved through enhanced control, elevated reliability, and seamless automation, thereby underscoring AI's transformative potential in the realm of smart homes.

(IS-2023-126) CROSS A framework for cyber risk optimization in smart homes

Authored by Yunxiao Zhang, Pasquale Malacaria, George Loukas, and Emmanouil Panaousis, this report saw its publication in Elsevier's Computers & Security Journal on April 5, 2023. The focus centers on introducing a novel decision support framework named Cyber Risk Optimiser for Smart homes (CROSS). This framework offers a two-stage cybersecurity advisory aimed at aiding both smart home users and service providers in selecting optimal cybersecurity controls to counteract potential cyber attacks within smart home environments. The report includes a use case exemplifying the application of Artificial Intelligence and the Internet of Things in a smart heating setup. The main insight gleaned underscores the viability of the CROSS framework, while acknowledging the need for further assessment in terms of performance, adaptability, and robustness.

(IS-2023-125) Can Smart Home Technologies Help Older Adults Manage Their Chronic Condition? A Systematic Literature Review

This report, authored by Gabriella Facchinetti, Giorgia Petrucci, Beatrice Albanesi, Maria Grazia De Marinis, and Michela Piredda, was published in MDPI's International Journal of Environmental Research and Public Health on June 10, 2023. It condenses insights from 19 articles focusing on utilizing smart home technologies to manage chronic diseases in older individuals. The report considers aspects such as monitoring vital signs, medication management, daily living, mobility, falls, and quality of life. The key takeaway is that smart homes offer potential in chronic disease management by enhancing patient safety, aiding cognitively impaired older individuals, and enabling continuous monitoring by local health providers.

(IS-2023-124) Zero Response Time - Security System Intervention

Authored by Chris White of Parks Associates and released on July 15, 2022, this report delves into the realm of enhanced security systems through novel active intervention techniques. Beyond mere detection and alerts, the report explores methods to bolster the efficacy of response to intrusions. Key recommendations encompass security cameras incorporating built-in

detection technology, along with personal security and neighborhood safety apps. The central insight gleaned from this exploration underscores the paramount importance of swift response times between security events and the arrival of first responders. This distinctive demand provides manufacturers with an avenue to pioneer distinctive and effective security solutions.

(IS-2023-123) Securing the Future - The Emergence of Wireless Technology within Access Control

Prepared by Assa Abloy and unveiled on January 17, 2023, this report delves into the advantages of wireless access systems in the domain of remote door and lock control and management. It comprehensively examines vital components including the access controller panel, electronic and magnetic locks, wireless card readers, access credentials, and management software. The report underscores the manifold benefits of such systems, spanning reliability, flexibility, simple installation, and competitive pricing relative to conventional counterparts. The quintessential insight gleaned from this exposition resonates—the deployment of wireless access systems empowers both organizations and residential homeowners to adeptly oversee their property, while concurrently positioning themselves to tackle potential emergencies with greater efficiency.

(IS-2023-122) From Prototype to Production - Fast Track IoT Adoption with Secure and Seamless Connectivity

Prepared by UL Solutions and made public on August 1, 2022, this report delves into the instrumental role UL Solutions plays in aiding manufacturers in fulfilling compliance and safety requisites for Internet of Things (IoT) systems. These systems encompass communication avenues like Wi-Fi, Bluetooth, 5G, and millimeter wave. The report unveils three IoT security certification programs put forth by UL Solutions: the UL Cybersecurity Assurance Program, CTIA Cybersecurity Certification for IoT Devices, and IoT Security Ratings. The crux of this discourse underlines the imperative for manufacturers to furnish reliable and secure products. In the era of widespread IoT adoption, establishing consumer and business trust through trustworthy offerings stands as the preeminent takeaway.

(IS-2023-121) Distributed Cloud Monitoring and Logging

Authored by Vadyslav Branytskyi and Volodymyr Vyshko of Global Logic, this report was published on August 8, 2022. It delves into monitoring and logging architectures for distributed cloud deployments, offering best practices and tool insights. Microsoft Azure, Google Cloud, and AWS are recommended as cloud provider platforms, while software tools like CloudWatch, Kibana, ElasticSearch, and Grafana are proposed for visibility. The report underscores the necessity of a robust, monitored cloud architecture to minimize operational downtime and safeguard a company's public image.

(IS-2023-120) Design for Connectivity - Key Areas to Evaluate in Designing IIOT and IOT Products

Authored by Robert Alvord of SigmaTron International, this report was released on January 17, 2023. It meticulously navigates through vital aspects crucial for designing products tailored for

Internet of Things (IoT) and Industrial IoT (IIoT) applications. The focal points encompass hardware and firmware security, battery efficiency, operational environment limitations, antenna configuration, and signal potency. The pivotal insight derived underscores the synergy between product development and manufacturing teams. To fully harness the advantages of outsourcing, these teams must collaborate harmoniously to optimize the manufacturing process, thus unlocking the true potential of their efforts.

(IS-2023-119) Teaching Machines to Detect and Understand Humans

Prepared by Nviso and released on June 13, 2022, this report delves into the crucial theme of imparting machines with the ability to comprehend humans. Key areas explored encompass human behavior, artificial intelligence (AI), data-centric AI apps, and the frontier of extreme edge AI computing. Within this purview, the report deftly presents diverse use cases spanning domains like smart health, smart living, smart mobility, and robotics. The crux of the matter centers on imbuing machines with the trio of real-time perception, reasoning, and semantics tailored to specific contexts, all to ensure safety, security, and personalization for humans. The main insight resonates with the pivotal role of AI synergized with edge computing as the bedrock for attaining such transformative capabilities.

(IS-2023-118) Security and Privacy IoT Vulnerabilities - The danger of too many entry points

Prepared by Plume Design and unveiled on October 12, 2022, this report sheds light on the inherent security vulnerabilities within Internet of Things (IoT) systems and offers corresponding security solutions. Delving into consumer concerns and IoT ecosystem challenges, the report underscores the utilization of the Common Vulnerability Scoring System (CVSS) for effective vulnerability management. The principal insight gleaned is that Communications Service Providers (CSPs) possess an optimal position to counter cyber attacks on IoT devices. This is achieved through an integrated, end-to-end solution encompassing discovery, detection, monitoring, and resolution.

(IS-2023-117) IoT Applications in a Distributed Cloud

Authored by Volodymyr Vyshko, Vasyl Akimov, and Vladyslav Branytskyi of GlobalLogic, this report was released on January 10, 2023. It delves into distributed IoT applications within a cloud framework, encompassing architectures, tools, best practices, and solution accelerators to enhance IoT deployment strategies. The report examines the merits of distributed cloud architecture, highlighting benefits such as decreased latency, simplified data governance, a streamlined area of communication for data processing, scalability, and enhanced resilience. The crux of the report underscores that a distributed IoT cloud solution empowers businesses to construct secure, adaptable, and robust industrial platforms.

(IS-2023-116) Digital Biomarkers - The New Era of Wearable Technology

Authored by Geetesh Garg and Akul Raina from GlobalLogic, this report was published on September 26, 2022. It spotlights the potential of non-invasive sweat-based wearable devices for

early disease diagnosis. The report delves into digital biomarkers and wearable technologies, showcasing their combined potential in detecting immune system hyperactivity and cytokine release. The main takeaway is that enhancing sensor sensitivity in wearables could revolutionize the diagnosis of critical diseases like COVID-19.

(IS-2023-115) Born Secure - Reputation-Proof IoT Innovation from Product Conception to Market Penetration

Authored by Joe Britt of Afero, this insightful report found its publication on June 7, 2022. At its core, the report delves into the nuanced realm of securing connected devices and cloud platforms within an Internet of Things (IoT) ecosystem. Within this discourse, careful consideration is accorded to both the vast business potential entwined with IoT and the critical security threats underpinning the pursuit of IoT product implementation. The report unfurls a comprehensive security roadmap that charts the trajectory for ushering the next generation of fortified IoT devices into the market. The quintessential takeaway from this exposition resonates: the security of IoT devices necessitates an integrated security approach that takes root from the earliest stages of the IoT value chain. This approach ensures that all hardware and software components used are bolstered with security measures right from their manufacturing genesis.

(IS-2023-114) Energy Renovations of Buildings

Authored by a collaborative team led by Kadri Simons, Anne Svendsen, Henrik Teglgaard, et al., this report emerged under the banner of State of Green on June 17, 2022. The report aptly illuminates pathways to harness the latent energy efficiency potential within the built environment. A compendium of recommendations comes to the fore, encompassing governance tools, strategic partnerships, the strategic deployment of technical systems, and the adept repurposing of existing structures. The report's holistic perspective spans diverse use cases, deftly outlining approaches to champion, enable, and reinforce energy renovation initiatives. The pivotal insight gleaned from this exposition is a clarion call for the collective sharing of information and experiences. This symbiotic exchange stands poised to usher in more accelerated global strides in the domain of energy renovations.

(IS-2023-113) Data Governance and Cybersecurity

This report, authored by Clémentine Coujard from the European Commission, was published on May 17, 2022. The report delves into policies, regulations, and certification frameworks surrounding data governance, privacy, and security. It identifies key barriers and drivers within each area. Notably, a lack of trust and liability models stands out as the top barrier, while the increase in user awareness, debates, and cybersecurity risk discussions emerges as the primary driver. Considering these factors, the report underscores the need for further research and innovation. This pertains to developing open standards applicable across diverse stakeholders and pioneering fresh approaches and services for data storage and sharing.

(IS-2023-112) Vision-Based Technology - Next Gen Control

Authored collaboratively by Jennifer Kent and Tam Williams from Parks Associates, this report made its debut on February 7, 2023. It homes in on the augmentation of consumer-based technology through the lens of vision-based interfaces. The exploration zeroes in on how visual input has the potential to supplant touch-based interactions with devices. Within these pages, one encounters a meticulous presentation of best practices pertaining to vision-based interfaces and interactions. The dialogue unfolds to encompass the manifold benefits, extending both to consumers and the industry at large. The principal insight drawn from this exposition underscores the paramount importance of visual-based interactions for ensuring optimal user experiences. Moreover, the report casts a spotlight on the anticipated expansion of applications and usage in this realm, as it charts an upward trajectory poised for growth.

(IS-2023-111) Next Frontier of Smart Energy Management

This report, authored by Jennifer Kent and Mike Smith from Parks Associates, saw its publication on November 22, 2022. It delves into the flourishing smart home ecosystem, highlighting fresh opportunities for builders and utilities. The report identifies the potential of smart thermostats, appliances, lighting, plugs, and other energy solutions. Notably, consumer demand aligns with a desire for streamlined, unified smart home experiences and the ability to monitor energy consumption. The key takeaway is that the smart home market is on a rapid growth trajectory, offering energy-saving advantages for homeowners and novel business avenues for builders and utilities.

(IS-2023-110) Analysis of Thermal Comfort in Intelligent and Traditional Buildings

Penned collaboratively by Łukasz J. Orman, Grzegorz Majewski, Norbert Radek, and Jacek Pietraszek, this illuminating article found its place within MDPI's Energies Journal on September 7, 2023. The article's focal point revolves around an incisive exploration of thermal comfort in both intelligent and conventional buildings situated within the confines of Poland. This investigative journey drew upon a wealth of data concerning air and globe temperatures, alongside relative humidity figures. A comprehensive perspective was further attained through surveys conducted among 1778 participants. The central revelation gleaned from this study resonates: within the realm of thermal comfort, intelligent buildings ascend to a higher echelon when juxtaposed against their traditional counterparts, serving as a testament to their capacity for fostering superior levels of comfort.

(IS-2023-109) Protect the Connected Home - Home Security Meets Personal Privacy

Penned by the accomplished duo of Jennifer Kent and Frank Saldaña hailing from Parks Associates, this report saw the light of day on December 6, 2022. The crux of the report navigates the burgeoning realm of smart home device protection services, a burgeoning domain tailored to assuage the concerns of homeowners embarking on the journey of smart home integration, particularly in matters of safety and security. As a viable antidote to consumer apprehensions surrounding security and the adoption of smart devices, this report posits that home security providers are primed to extend their sphere of influence. By extending device protection and data privacy services, these providers can harness their expertise, assets, and

existing customer relationships. The quintessential takeaway extracted from this exploration lies in the untapped prospects awaiting home security providers, who, by lending a keen ear to customer worries and delivering requisite solutions, stand poised to diversify and enhance their business offerings.

(IS-2023-108) Best Practices for Securing Your Home Network

Compiled under the auspices of the National Security Agency and unveiled on February 22, 2023, this report serves as a guidebook to fortify and safeguard home networks. Within its pages, a compendium of optimal practices emerges: embracing cybersecurity-savvy behaviors, implementing fundamental configuration protocols, and enacting decisive mitigatory steps. Among the pivotal countermeasures spotlighted are the routine application of software updates, diligent data backups, judicious disconnection of idle devices, and the imposition of administration limitations on internal networks. The central insight gleaned from this dossier is the indispensability of adopting an unwavering, proactive stance for ensuring the cybersecurity resilience of a home network, thereby positioning it as an ongoing endeavor of paramount importance.

(IS-2023-107) Attuning Smart Home Scripts to Household and Energy Care

Penned by the capable hand of Deborah Chambers and featured in the pages of the Buildings and Cities journal on September 6, 2022, this article delves into the intriguing question of whether contemporary smart home concepts are ushering in a new era of gender-equitable household dynamics and heightened energy efficiency. A meticulous analysis of 36 promotional documents pertaining to smart homes uncovers a disconcerting trend: these visionary concepts persistently neglect the diverse fabric of households, while also sidestepping discussions about energy conservation and the undue burdens that traditional housework often places on women. To remedy these dual concerns, the article posits the implementation of a care-centric ethos. The key insight gleaned from this examination underscores the potential to reconfigure smart home visions, thereby fostering household practices that champion gender equality and concurrently facilitate reductions in energy consumption.

(IS-2023-106) The Evolving Hyperscaler - Cloud-based Telecom Networks - Design and Testing Challenges

Crafted by Anritsu and unveiled on December 22, 2022, this report casts a spotlight on the evolutionary hurdles confronting organizations that furnish expansive cloud, networking, and internet services—dubbed hyperscalars—to fellow enterprises. At the core of this evolution lie the propelling influences of 5G technology and the vast expanse of big data, both of which exert a direct influence on network architecture and mandate the implementation of sophisticated testing protocols. The paramount insight gleaned from this exploration emphasizes the indispensability for hyperscalars to forge partnerships with testing providers that actively engage within global standards organizations. Such collaborations, coupled with a commitment to solution development spanning the entire ecosystem, stand as the key to maximizing the return on investment within this dynamic landscape.

(IS-2023-105) A study on the quality evaluation index system of smart home care for older adults in the community

Authored by Huaxiao Chen, Yuwei Zhang, and Li Wang, this insightful article graced the pages of the BMC Public Health journal on March 1, 2023. The crux of the article revolves around the strategic implementation of a service quality model, known as SERVQUAL, to establish a comprehensive quality evaluation index system for smart senior care among older adults within Chinese communities. Through meticulous analysis of community data, the study unveiled a multifaceted quality evaluation index, shedding light on the imperative demand for intelligent services spanning meals, cleaning, medical care, emergency assistance, and recreational engagement. The key takeaway from this investigation underscores the indispensability of providing seniors with smart services characterized by promptness, dependability, and user-friendliness.

(IS-2023-104) Smart home technology to support older people's quality of life - A longitudinal pilot study

Penned by a collaborative team consisting of Christina Aggar, Golam Sorwar, Carolyn Seton, Olivia Penman, and Anastasia Ward, this article, brought forth through Wiley on December 28, 2022, delves into the far-reaching ramifications of Smart Home technology in bolstering the well-being of solitary older individuals. A comprehensive investigation was conducted, encompassing 60 participants ranging from 68 to 90 years of age. These individuals engaged in a personalized 12-week Smart Home technology program. Notably, the research unveiled a substantial elevation in the participants' quality of life subsequent to their adoption of Smart Home technology. The paramount insight gleaned from this exploration underscores the pivotal role played by Smart Home technology in enhancing the quality of life for elderly individuals, notably augmenting their sense of accomplishment and fortifying their perception of future security.

(IS-2023-103) Smart Home Market Report

Compiled by Plume IQ and unveiled on August 23, 2022, this report not only sheds light on the contemporary smart home market but also distills the myriad trends influencing communication service providers (CSPs). These trends span operational intricacies, customer contentment, and avenues for financial advancement. A comparative analysis with 2021 reveals a surge in the strain on CSPs' networks, attributed to the escalation in device count, data consumption, and device activity duration. The spheres of network management and security have likewise infiltrated CSPs' operations. Foremost among the insights gleaned is the potential CSPs harbor for inventive growth and capitalization, underpinned by the data reservoirs furnished by Plume IQ.

(IS-2023-102) Security Threats to Your Smart Home

This report, penned by Hollie Hennessy and Mike Sullivan-Trainor at Omdia, was published on May 27, 2022. The document delves into the realm of cybersecurity threats targeting smart

homes, offering robust solutions to counter cyber-attacks. With the steady influx of devices, the susceptibility of a smart home to such attacks amplifies. In response, homeowners can bolster their defense by crafting an all-encompassing network solution, centralized for streamlined control. Alternately, they can opt to segment their network, safeguarding critical data from potential lateral breaches. The key insight underscored is the proactive role smart homeowners must play in orchestrating a comprehensive and strategic management of their home network.

(IS-2023-101) End-to-End Automation - Hype or Hyperautomation

Authored by Sandy Kemsley, a member of Flowable, and unveiled on May 31, 2022, this report delves into a top-tier strategic technology trend: hyperautomation. This trend is a driving force, enabling organizations to seamlessly identify and automate their diverse business and IT processes, ushering in a new era of operational efficiency. At the heart of hyperautomation lies the notion of comprehensive process orchestration. This is thoughtfully shaped and built using a business case management system (BCMS) and a user-friendly low-code composition environment. This approach drastically reduces the time needed for development, propelling organizations forward with increased swiftness.

(IS-2023-100) The Metaverse - Reimagining the World in a New Way

Penned by the adept hand of Hrushikesh Zadgaonkar from GlobalLogic and unveiled on September 21, 2022, this report delves profoundly into Facebook's expansive internet-powered realm known as the Metaverse. Among its myriad attributes are interoperability, boundless user engagement, dynamic virtual worlds, real-time interpersonal interactions, and lasting presence. Contained within this report is a thorough exploration of the versatile applications that the Metaverse presents. These encompass a broad spectrum, ranging from ingenious marketing strategies and novel forms of social media engagement to the establishment of a vibrant virtual economy and the facilitation of remote work dynamics.

(IS-2023-99) Building a Successful Smart Home Strategy

Composed by Plume and released on May 19, 2022, this report unveils a prescriptive roadmap tailored for communications services providers (CSPs) to secure their pivotal role within the dynamic smart home landscape. The strategy outlined within this report encapsulates critical pillars essential for sustaining relevance and vibrancy. Central to this strategic blueprint is the steadfast commitment to furnishing swift, all-encompassing, and dependable connectivity. This commitment materializes through the astute utilization of WiFi 6 and 6E communication technologies, as well as the strategic adoption of the burgeoning connectivity standard for smart home devices, known as Matter. Additionally, a pivotal facet lies in the integration of cloud-based solutions to facilitate seamless service delivery.

(IS-2023-98) Artificial Intelligence in the Utilities Sector

Created by Zpryme and unveiled on June 10, 2022, this report delves into the views of 100 utilities on the integration of artificial intelligence (AI) and machine learning (ML) within their

operations. The survey results highlight an intriguing perspective within these organizations. What becomes evident from the findings is a cautious enthusiasm surrounding AI and ML adoption. While a significant number of utilities express a strong interest, they are also apprehensive due to the challenges linked with implementation, costs, and the need for a clearer understanding of the benefits.

(IS-2023-97) Smart Buildings Cybersecurity - Design Approach for Multi Stakeholder Environments

Penned collectively by a distinguished group including Brian Ensign, David Brearly, Gayla Arrindell, Jared Morello, Jason Christman, Jon Williamson, Seth Ely, Sudhi Sinha, Terry Haley, Tim Koch, and Travis Rosiek, this report, presented by TIA on July 1, 2022, delves into a meticulously crafted process for bolstering the security of interconnected smart buildings against the looming threat of cyberattacks. At the heart of this endeavor lies the pivotal role of stakeholders in shaping the blueprint and triumph of a robust cybersecurity solution.

(IS-2023-96) Hacking Smart Buildings - IoT Attack Surfaces and Defences

Authored by TXOne Networks and released on January 3, 2023, this insightful report navigates the realm of safeguarding building automation systems. It strategically employs the Zero Trust security framework as a robust defense mechanism against the tide of cybersecurity threats. With the influx of IoT devices into building environments, paramount importance is placed on fortifying the security of supply chain partners and the deployed devices themselves. Moreover, meticulous attention is directed towards enhancing system endpoints, conducting holistic system evaluations, implementing stringent access controls, segmenting networks, and fortifying system resilience to bolster overall security posture. At its core, this report underscores a pivotal lesson: the imperative of embracing a comprehensive and seamlessly integrated strategy, embodied by the Zero Trust model, to effectively fortify building automation systems against the ever-evolving landscape of threats.

(IS-2023-95) IoT Security Challenges - The Risks and How to Minimize Them

Authored by Joseph Carson of Delinea and published on September 23, 2022, this report delves into the realm of security assessment for IoT systems, adopting an ethical hacker's perspective to dissect security vulnerabilities. The proposed security assessment strategy encompasses a comprehensive evaluation of system hardware, firmware, reverse engineering, data communication, and encryption. A pivotal insight gleaned from the report underscores the susceptibility of IoT devices to multifaceted breaches, emphasizing the urgency of adopting a proactive approach to assessment and intervention to effectively curtail security risks.

(IS-2023-94) Data Driven Indicators for Smart Buildings

Developed by members of the SmartBuilt4EU task force, chaired by Litiu Andrei Vladimir and Pozza Cristian, and published in November 2022, this report examines data-driven indicators for smart buildings' interaction with their external environment. Focusing on evolving the 'static'

Smart Readiness Indicator (SRI) to a 'dynamic SRI,' it emphasizes regular SRI score updates and real-time verification of smart functionalities. The report presents case studies and outlines collaborative efforts to address research gaps and innovation needs in advancing data-driven indicators for smart buildings.

(IS-2023-93) The Smart Building Blocks

Authored by James Dice and published by Nexus Labs in July 2022, this white paper highlights the disparity in digital systems adoption within commercial buildings. It outlines the challenges of siloed systems in complex structures, emphasizing proprietary control and limited interoperability. The paper explores the growth of IoT sensors, the increased smartness of traditional devices, and the rise of IP addresses. It proposes an Independent Data Layer to support diverse smart building applications, fostering independence and interoperability. The paper concludes with a call for upskilling among consulting engineers and building owners to foster industry growth.

(IS-2023-92) Evolution of CMMS - Unlock game-changing building operations in the digital era-compressed

Authored and published by Facilio in late 2022, this guide explores the state of CMMS in building O&M. It addresses transition barriers for O&M teams toward strategic roles and advocates for SaaS-driven innovation. The paper showcases the potential of Connected CMMS, extending its scope beyond maintenance, automating processes, and enhancing stakeholder engagement. It also features industry voices, exemplifying successful CMMS upgrades and their transformative impact on property operations and maintenance.

(IS-2023-91) Decarbonizing the Global Buildings Sector - Efficiency, Electrification, and Equity

Authored by Ian Hamilton and published by the Center on Global Energy Policy at Columbia/SIPA in February 2023, this paper assesses the buildings sector's energy performance and CO2 emissions progress in relation to Paris Agreement targets. It underscores the discrepancy between these efforts and the global net-zero emissions by 2050 objective. The report outlines pathways for building decarbonization, emphasizing energy efficiency enhancement, electrification, and technology adoption like heat pumps. While available solutions include better building envelopes and financing options, true sustainability transformation necessitates equity integration. This includes addressing fuel poverty, supporting marginalized communities, and facilitating clean energy access.

(IS-2023-90) Connected Buildings Energy Management

Authored and published by Ericsson in September 2022, this paper highlights the value of cellular IoT connectivity in smart buildings. Collaborating with Kiona, a prominent proptech company, Ericsson and Arthur D. Little conducted a use case study on energy and resource efficiency optimization. Cellular IoT ensures secure, widespread coverage for seamless sensor data transmission. Kiona achieved significant benefits, including a 10% reduction in energy costs and

9% decrease in CO2 emissions, totaling around €158,000 annual value gain. The study underscores substantial financial advantages of cellular IoT for building energy management.

(IS-2023-89) The State of Commercial Real Estate Building

Authored and published by Building Engines in December 2022, this paper addresses the evolving landscape of commercial real estate (CRE). With remote and hybrid work becoming commonplace, labor shortages, and a heightened focus on ESG reporting and sustainability, CRE property teams are navigating complex challenges. Building Engines collaborated with BOMA and surveyed over 250 CRE professionals, yielding data-backed insights into how they are addressing these industry shifts.

(IS-2023-88) The Future of FM Services Delivery is Experiential

Authored and published by Planon in September 2022, this paper presents insights from interviews with five industry experts concerning the Total Experience for facility services. Despite the digital information overload, experiences remain impactful. The report emphasizes customer experience's (CX) and employee experience's (EX) significance and their role in boosting revenue. Planon's Total Facility Experience (TFX) approach encompasses multi-experience (MX), CX, UX, and EX, underscoring the core role of CX and EX within TFX.

(IS-2023-87) The 5 Vital Roles for Smarter Buildings

Authored by James Dice and published by Nexus Labs in January 2023, this white paper underscores the increasing importance of having a smart building specialist within building ownership teams. It outlines five crucial roles for a successful smart building program: Smart Building Champion, Design Consultant, Master Systems Integrator, Network Manager, and Commissioning Agent. Building upon the Nexus Lore whitepaper, this paper emphasizes the human factor in ensuring technology's efficacy throughout different phases of a smart building project.

(IS-2023-86) Smart Buildings Winter Edition

Authored by L. Petrus, M. Kinman, and others, this eBook, co-published by Consulting & Specifying Engineer and ABB in January 2023, explores the impact of smart building systems on HVAC improvement and lighting control. An ABB case study showcases AI in a Canadian Shopping Centre. The eBook also delves into post-COVID office design for employee well-being and indoor air quality, evolving building codes, and the future of rooftop power plants. Each comprehensive article underscores smart systems' role in fostering healthier, sustainable buildings.

(IS-2023-85) Facility Management Impacts Enterprisewide ESG with Sustainability Software

Authored by Juliana Beauvais and published by IDC Custom Solutions in April 2022, this report reveals that while many enterprises hold ambitious sustainability goals, functional areas like

workplace and maintenance lack the tools and expertise to meet them. Drawing from a 2021 IDC survey of 1,000 organizations, the report underscores a gap between sustainability aspirations and facility management practices. It details benefits of sustainability software, including enhanced ESG performance and cost reduction, while spotlighting key drivers for such software adoption: operational cost implications, executive mandates, and regulatory demands. Sponsor Planon's solutions for these challenges are also featured.

(IS-2023-84) Smart Buildings Fall 2022 Edition

Authored by A. Szalaj, T. Howe, M. Myers, and others, this eBook, co-published by Consulting & Specifying Engineer and ABB in October 2022, highlights crucial elements of smart building systems. It emphasizes CSI Division 25 utilization, commissioning, and emergency response capacities. The ABB AbilityTM Building Ecosystem and ABB BrainBox AI's impact on energy efficiency in a Canadian Shopping Centre are discussed. The eBook also simplifies lighting controls and addresses sustainability standards, data connectivity, and cybersecurity's role in optimizing smart systems for energy savings, IAQ enhancement, and return on investment.

(IS-2023-83) Managing Risk in An Uncertain World

Authored and published by SoftwareONE AG in October 2022, this report delves into the heightened challenges of the construction industry, including workforce shortages, supply chain issues, and rising costs. It underscores risk management's vital role in ensuring project success and business survival. The report highlights the potential for risk mitigation through strategic planning, effective project management, and appropriate technology adoption within the architecture, engineering, and construction (AEC) sector.

(IS-2023-82) Lighting and Lighting Controls Winter Edition

A report by A. Rozgus, R. White, D. Banfic, S. Peck, and others, published by Consulting-Specifying Engineer in December 2022, compiles articles on LED lighting advancements in K-12 schools, including color behaviors and UVGI for pathogen control. The authors address lighting design questions and reveal lighting designers' allocation of time across tasks. The study finds engineers spend time researching vendors, evaluating representatives' proposals, seeking information, and drafting specifications.

(IS-2023-81) K-12 Industry Solutions to Help Facilities Managers Become Tech-savvy and Data-driven

Authored by Saheel Chandrani of ABB, this report, published by Smart Buildings Technology in October 2022, addresses challenges posed by aging school facilities. It explores how next-gen building management systems aid environmental goals, emphasizing visioning to define objectives. Improved operations and AI-driven autonomous controls enhance efficiency and extend equipment life. Training empowers stakeholders to drive energy savings by optimizing building behaviors and operations.

(IS-2023-80) Environmental Sustainability On the Far Edge

Don Utz, Eric Swanson, Jayson Hamilton, John Eberhart, Joseba Calvo, Marc Cram, Mark Smith, Shizuko Carson, and Tony Grayson authored this report, published by TIA in December 2022. It delves into the rapid shift from fossil fuels to renewables like wind, solar, and hydro for global energy needs. Concurrently, the electrification of vehicles, buildings, and appliances advances. The data center and telecommunications sectors, major power consumers, play a key role in clean energy transition. TIA's paper examines how the IT industry can navigate powering dispersed infrastructure while achieving carbon reduction goals.

(IS-2023-79) End-Use Load Profiles for the U.S. Building Stock

Authored by Margaret Pigman, Natalie Mims Frick, Eric Wilson, Andrew Parker, and Elaina Present from LBNL and NREL, this report, published by the U.S. Department of Energy in December 2022, offers practical guidance for accessing and utilizing end-use load profiles (EULPs) data. EULPs are pivotal for utilities, public utility commissions, and state energy offices in comprehending energy usage patterns and prioritizing efficiency measures and distributed energy resources (DERs). The report outlines accessing EULPs, addresses considerations and limitations, and presents use cases with examples.

(IS-2023-78) Electrical and Power Winter 2022 Edition

Crafted by Richard A. Vedvik and published by Consulting-Specifying Engineer in December 2022, this eBook explores electrical system vulnerabilities. It highlights risks to facilities and offers safety recommendations. Sections cover topics like non-outage-simulating generator tests, generator room's paralleling gear, lacking selective coordination, and misunderstood arc flash conditions. Additionally, the eBook features insights on power assets in wastewater plants, hospitals, and digitization's role in sustainable construction.

(IS-2023-77) Welcome to Building X

This eBook was authored and published by Siemens in September of 2022. Several companies are bringing out AI-enabled programs to accelerate the digital transformation of buildings and to realize higher productivity, enhanced occupant well-being, and greater sustainability. This eBook describes how the Siemens Building X program accelerates the digital transformation of buildings to realize higher productivity, enhanced occupant well-being, and greater sustainability. Building X is a cloud-based, artificial intelligence-enabled connectivity platform for smart buildings. It unlocks the potential of linking disparate building data silos and combines them into one data lake, allowing users to control systems through a single source of truth and gain actionable insight previously unavailable. It discusses some of the Building X apps and the market-leading connectivity that will transform building operations from reactive or proactive to predictive and prescriptive.

(IS-2023-76) Unlocking Smarter Solutions for Managing the Built Environment

This report was authored by George Hawkinson, Richard Wendland, and Marc Petock and published by Burns & McDonnell in October 2022. The built environment is increasingly dependent on sophisticated, connected controls for heating and air conditioning, energy management, lighting, and many other systems. Unfortunately, many of these controls function in silos, with little interoperability and integration. A master systems integration strategy utilizing advanced controls platforms can give owners and operators the connectivity and access to the data they need to optimize operating costs, use energy more efficiently and address the pressing need to reduce carbon emissions. The report shows that technology is only half the story. The entire vision can be optimized further through the commissioning discipline. Commissioning provides the human insight and expertise needed to understand whether the data being gathered, compiled, and reported is accurate and consistent with the rules set by monitoring systems. This verification process also is important to be sure that applicable codes and standards are being met.

(IS-2023-75) The Sustainable Multi-Family Housing Opportunity

This report was published by Greenbuild in October 2022. A focus on sustainability and energy efficiency in the multifamily housing market can deliver benefits for a wide range of stakeholders. Using green features and sustainable design achieves optimal results when all priorities, perspectives, and goals of stakeholders are in balance. The use of low-risk and proven technology and methods that have measurable value-add to the properties can be achieved with energy modeling and sustainable design at the earliest planning stages, ensuring every decision delivers a measurable benefit. This paper presents multifamily housing projects by teams of developers, architects, and engineers in Seattle. It details the necessary evolution of integrated design and energy strategies creatively implemented in three successive completed multifamily projects in Seattle. Multifamily housing, if designed and built responsibly, provides much-needed housing for a fraction of the cost of single-family construction. By design, dense urban housing creates a smaller carbon footprint, dramatically reducing per-person energy use and carbon emissions.

(IS-2023-74) The Economics of Electrifying Buildings - Medium-Size Commercial Retrofits

This report, published by RMI in September 2022, discusses the economic feasibility of electrifying medium-sized commercial buildings in the United States. It examines the upfront costs and long-term financial benefits of converting buildings from fossil fuel-based systems to electric heating, cooling, and hot water systems. The analysis concludes that while the upfront costs of electrification may be higher than traditional fossil fuel-based systems, the long-term operational and maintenance cost savings can result in a lower total cost of ownership over the life of the building. The paper also highlights the potential environmental benefits of electrification, including reduced greenhouse gas emissions and improved indoor air quality. Overall, it argues that electrifying buildings can be a financially and environmentally sound investment for building owners and operators.

(IS-2023-73) The CRE Tech Guide to Boosting NOI - Discover 5 quick steps to increasing NOI across your CRE buildings and portfolio

This eBook was authored and published by Building Engines, Inc. in October 2022 for property owners and operators who want to learn new ways to boost net operating income (NOI) with help from tech. Nearly half of commercial property teams are increasing CRE tech spend. They are streamlining with tech that can help NOI by reducing operating costs and driving additional revenue. Centralizing and connecting building data across teams and systems is essential to NOI growth. This tech and data can mobilize the property teams that are always on the go. Understanding the key data points, you can measure provides a fuller picture of tenant experience across portfolios and allows for the use of those insights to make the best business decisions.

(IS-2023-72) The Business Case for Sustainable Spaces

This report was compiled by Nancy A. Shenker and published by Greenbuild in October 2022. This report has industry experts sharing how their colleagues and the companies they serve can move more quickly to operate more sustainably. Employees are choosing companies that have a clear commitment to the environment. Public awareness of environmental issues rose because of the pandemic. Yet, many businesses may still be resistant to taking steps that promote environmental health. Some companies merely pay lip service to sustainable building and practices. They balk at measures that will cut into their profits or delay or complicate development. They struggle with energy use reduction, social justice efforts, and new LEED construction. The many contributors discuss how they educate, incentivize, and compel companies to add environmentalism to their agendas. Making a case for sustainability requires companies to know their facts and be relentless and creative in advocacy.

(IS-2023-71) Start Breathing Easier - ABM is your guide to improved IAQ and healthier facilities

This report was authored and published by ABM Industries Inc in November 2022. Healthier buildings keep everyone healthier together. Safer spaces mean safer people. Keeping people safe now hinges on implementing a fact-based, expert-developed, and dynamic approach to occupant wellness. One that helps mitigate both air and surface-based viral transmission risks, while also increasing efficiencies and the financial health of the building operations. Using the Healthy Building Risk Assessment, a set of recommendations around air quality, surface disinfection, facility resiliency, and more are formed. After program implementation, ongoing results and data from repeated Healthy Building Risk Assessments are useful to recalculate risk and implement supplemental solutions moving forward. The report covers all areas of indoor air quality, energy efficiency and surface cleaning as well as communicating these programs to the occupants.

(IS-2023-70) Solving the Hybrid Work Puzzle

This report was published by JLL in October 2022. Hybrid is here to stay, and today’s hybrid workplace needs to be a destination that attracts employees by making their time at the office

“worth the commute.” A dynamic approach to occupancy management provides benefits for workers and organizations across a range of hybrid models. JLL’s Dynamic Occupancy Management does just that – allowing workers to schedule their time in the office, inform their colleagues and tailor their experience. The collective data generated by the workforce can help adapt the workspaces for the short-term, inform longer-term decision-making, and solve the hybrid work puzzle in a way that works for your organization.

(IS-2023-69) Smart Building Planning, Best Practices, and Network Design

This whitepaper was authored by Todd Harpel and published by Leviton Network Solutions in October 2022. Smart building growth is occurring as many companies have shifted to work-from-home or hybrid work policies over the past several years, leading to fewer occupants in commercial real estate buildings. Increasingly, building owners are evaluating smart building features to improve comfort in the workplace, reduce sick days, improve productivity to attract tenants, and remain competitive. Planning for the creation of a smart building must include a clear definition of the goals and desired outcomes of making the building intelligent. The stress and strain on the network caused by connecting so many new utility devices (IoT) can cause the network to become sluggish and adversely affect the user experience. To simplify management, improve security, and alleviate network stress in smart buildings, Leviton recommends that the network infrastructure connecting core LAN applications and utility applications become physically separated in telecommunications rooms or closets. This creates a utility LAN, or what Leviton calls the uLAN™.

(IS-2023-68) Selling in Sustainability-Gaining Buy-in for Moving Sustainable Business Practices Forward

This report, published by Greenbuild in October 2022, discusses the importance of incorporating sustainability into the sales process, citing research that shows that consumers are increasingly interested in purchasing from environmentally responsible companies. It outlines several steps that sales professionals can take to align their approach with sustainable values, including highlighting eco-friendly product features and sharing information about the company's sustainability initiatives. The report also emphasizes the role of training and education in helping sales teams effectively communicate the value of sustainability to customers. Overall, the report argues that prioritizing sustainability in sales can help companies differentiate themselves from competitors, build customer loyalty, and drive revenue growth.

(IS-2023-67) Resilience at the Edge

This report was published by the Telecommunications Industry Association in October 2022. When planning an Edge Data Center (EDC) deployment, the need to address the availability of planned workloads to ensure resiliency is a top priority. The key characteristics of an EDC can be significantly different from those that top the list for larger enterprise or multi-tenant data centers. To help balance the costs and operational aspects of any EDC strategy, this paper outlines a number of critical questions that should be addressed to ensure resiliency at the edge.

(IS-2023-66) Regulating Embodied Emissions of Buildings

This report was published by The Atmospheric Fund (TAF) in November 2022. The building sector is now considering the embodied carbon in the net zero objectives. The vast majority of embodied emissions from new construction typically come from the procurement of a handful of key materials. These typically are concrete, steel, insulation, and timber. This primer has been created for policymakers and other decision-makers - including owners, designers, engineers, procurement officers, and other stakeholders who decide what we build as a society. The primer includes background information on embodied emissions (also called embodied carbon), benchmarks from 41 large buildings across Ontario, proposed reduction targets, and policy recommendations with sample language and reporting templates. It also notes several knowledge gaps and barriers the industry will need to overcome to effectively reduce embodied emissions in the years ahead - reductions needed to meet our climate targets. The topics covered can generally be applied to most buildings and/or infrastructure projects, however, the specific focus is related to large-scale “Part-3” buildings in Ontario.

(IS-2023-65) Redefining the Sustainable Workplace

This report was authored by Nancy A. Shenker and published by Greenbuild in October 2022. Business leaders are more focused than ever before on employee health and well-being -- especially as they create a new balance between physical space and remote working. Air, light, furniture, plants, food, meeting spaces, and even commute quality all have a significant impact on how people and customers feel about where they work. Schools, retailers, and municipal buildings are all tackling the complex issues around health, safety, and cost as they create and maintain sustainable workplaces. The report discusses the responses from the green building experts with their perspectives on the challenges facing businesses as they adjust to the sustainable -- and healthy -- new normal and their insights and predictions.

(IS-2023-64) Power Digitalization - Active Energy Management in Buildings

This report was authored by Tony Hunt, in 2021 and modified and published by Schneider Electric in October 2022. Most public, commercial, and industrial buildings are not energy efficient, representing an enormous untapped potential for decarbonization and sustainability efforts, as well as utility bill savings. Power digitalization plays a foundational role in active energy management and efficient facility operations. For existing buildings, this can be done by retrofitting electrical systems with smart devices and using energy and power management software that improves energy efficiency and reduces risk. This power digitalization investment helps facility management and maintenance personnel make better decisions, resolve issues more quickly, minimize downtime, and use less energy. In this paper, power digitalization for buildings is defined, and achieving power digitalization is based on connecting smart sensors and communicating devices to EPMS software and consists of three basic steps: Connect – Automate – Extend.

(IS-2023-63) Overcoming HVAC Challenges in Your Facility

This report was authored and published by Consulting-Specifying Engineer and ABB in October 2022. In commercial and industrial buildings, heating, ventilation, and air conditioning (HVAC) systems often need repair or replacement and the correct system must be specified and installed. To compound that challenge, HVAC systems can use about 35% of the energy load. That means selecting the right HVAC system is of high importance, both to consulting engineers and facility owners. This report discusses the 2022 research that showed HVAC systems within survey respondents' facilities are commonly challenged with aging equipment that needs updating or replacing (43%), meeting energy efficiency/sustainability goals (33%) and maintenance issues (29%). In looking at these challenges, engineers and facility personnel can address them by incorporating newer, more energy-efficient motors and drives into the HVAC system. The report discusses variable frequency drives (VFDs) and efficient motors and provides case studies that show significant energy and cost savings.

(IS-2023-62) Lessons From the Net Zero Challenge

This report was published by BOMA Canada in September 2022. This report shares insights and examples from the award program so that the industry can benefit from the lessons learned to help them achieve the similar levels of high performance on the path to net zero.

(IS-2023-61) Green-e Renewable Energy Standard for Canada and the United States

This report, authored and published by Center for Resource Solutions in September 2022, outlines the requirements and guidelines for renewable energy and carbon offset products to be certified by Green-e. The standard includes requirements for the eligibility of renewable energy sources, including specific environmental and social criteria that must be met, such as avoiding negative impacts on biodiversity and community engagement. The standard also outlines the requirements for the verification and tracking of renewable energy and carbon offset products, including the use of recognized third-party verification standards and regular reporting to Green-e. Overall, the Green-e Standard provides a comprehensive framework for ensuring the integrity and transparency of renewable energy and carbon offset products, and helps to build trust in the market for these products.

(IS-2023-60) Do More with Less - Moving Power and Building Management to the Cloud

This whitepaper, authored by Markus Hirschbold and Grant Reig in 2021 and modified and published by Schneider Electric in October 2022, discusses the potential benefits of cloud-based solutions for building and power management. The paper first describes the challenges faced by building and power managers in maintaining and optimizing their systems and the limitations of traditional management approaches. The paper then explains how cloud-based solutions can address these challenges by providing more efficient, cost-effective, and scalable management solutions. It highlights the benefits of cloud-based solutions, such as reduced hardware costs, simplified data management, improved data analysis, and remote access to data and systems. The paper also provides examples of how cloud-based solutions are already being used in

building and power management, such as real-time energy management, predictive maintenance, and remote monitoring.

(IS-2023-59) Control the Network, Control the Costs - Solving the Wi-Fi Problem in Home Security

This whitepaper, by Parks Associates in partnership with Johnson Controls published in November 2022, focuses the on rise in demand for Wi-Fi devices integrated with security and smart home solutions, the impact of poor Wi-Fi network performance on the professional install channel, and the opportunity for dealers to own and manage the Wi-Fi network remotely, which would reduce their costs, limit truck rolls, and improve the user experience.

(IS-2023-58) Committing to Net Zero - How Businesses Are Meeting Their Carbon Pledge

This eBook, by Honeywell Building Technologies and published in October 2022, highlights the importance of committing to net-zero carbon emissions and provides insights into how businesses are achieving this goal. The eBook begins with an overview of the current state of carbon emissions and the urgent need to reduce them to limit the impacts of climate change. It then discusses the different ways that businesses can commit to net-zero carbon emissions, including setting science-based targets, adopting renewable energy sources, and implementing energy-efficient technologies. The eBook also provides case studies of several businesses that have successfully committed to net-zero carbon emissions, including Microsoft, IKEA, and Schneider Electric. It highlights the strategies that these businesses have implemented to reduce their carbon footprint, including the use of energy-efficient technologies, renewable energy, and carbon offsetting.

(IS-2023-57) Carbon in Buildings - Material Embodied vs Operations Generated

This report was prepared by Greenbuild and GAF roofing and published in October 2022. In new construction, embodied carbon often takes center stage, as it is set by decisions made at the beginning of the building’s life cycle and cannot later be altered. Embodied carbon represents emissions from building materials and construction and typically represents 28% of global building sector emissions. The need for resilience doesn’t end with initial construction but also with operations. Using Passive Building Design is discussed. Investing in the Building Enclosure and the Impact of Building Codes as well as the cost savings and incentives for High-Performance Buildings are discussed. The challenges, opportunities, and strategies of building sustainability must be embraced as emissions continue to increase, regulatory requirements become increasingly stringent, and economic incentives continue to diversify.

(IS-2023-56) Toronto Part 3 Building Embodied Carbon Benchmarking Report

This report was jointly prepared by contributors at TAF, Mantle, University of Toronto, and the City of Toronto and published in November 2022. The building sector is now considering the embodied carbon in the net zero objectives. This report shows the results of the first attempt to collect and compare embodied carbon results as calculated using whole building life cycle assessments (WBLCA) for Part-3 buildings in Ontario for 41 separate buildings. Methodology

differences make high-quality comparisons between projects difficult. Embodied carbon intensities increase with building height due to increased materials per area and greater subsurface works. Buildings with timber structures seem to have lower embodied carbon (~16% lower). Including sequestration makes this difference significant (~59% lower). Any future policy should provide clear guidance for required life cycle phases, objects of assessment, material quantity data sources, and treatment of carbon sequestration. While there is some 'noise' in the results due to variations in methodology, scope of assessment, and tools used by the teams these results are an important first step in understanding embodied carbon results in the City of Toronto and other Ontario municipalities.

(IS-2023-55) Building Back Better - Key Challenges In Reaching A Net Zero Built Environment

This whitepaper, by KPMG and Planon published in November 2022, informs real estate developers, investors, and occupiers, on what their businesses are up against in reaching their sustainability goals. It specifically outlines: why real estate organisations are central to tackling carbon emissions, the governmental policies in place to accelerate net-zero building initiatives, the challenges of designing and constructing net-zero buildings, the challenges of implementing net-zero principles across real estate investments, and the challenges of developing a net-zero corporate real estate portfolio and operations.

(IS-2023-54) Building Analytics Comparison Guide

This whitepaper, published by Clockwork Analytics in 2020 and modified in November 2022, describes the importance of FDD in HVAC systems and its potential benefits. The paper defines FDD as a process that uses software algorithms to identify faults and diagnose problems in HVAC systems. The paper discusses the challenges faced by building owners and operators in maintaining HVAC systems, and how FDD can help to address these challenges by detecting and diagnosing faults early, reducing energy consumption and costs, and improving the lifespan of the equipment. The paper also discusses the different types of FDD methods available, including rule-based methods and model-based methods, and the advantages and disadvantages of each. It highlights the importance of data collection and management in the FDD process, as well as the importance of working with qualified and experienced FDD service providers.

(IS-2023-53) Building A More Resilient America

This whitepaper was prepared by Tony Cho, CEO and Founder of Future of Cities and published by Greenbuild in October 2022. Solutions to today's sustainability issues must involve a collaborative worldwide community. We must build a country that will stand the test of time and lead the rest of the planet in making fundamental changes. This whitepaper defines how experts in the Greenbuild community on their take on the interconnection between sustainability and resiliency, the difference between sustainability and resiliency, how the U.S. government factors into sustainable development, and the challenges the U.S. faces in reaching a more resilient country

(IS-2023-52) Assuring Trustworthiness in Dynamic Systems Using Digital Twins and Trust Vectors

This paper was authored by A. Budiardjo, J. Geater, F. Hirsch, M. Pfeifer, D. Richter and published by the Digital Twin Consortium on October 25, 2022. The paper provides guidance to help organizations design digital twins securely and safely for digital transformation. It presents an understandable and interoperable model for digital twins' security and safety assurance that satisfies all stakeholders: technical, business, and regulatory.

(IS-2023-51) Accelerating Carbon Neutrality

This report, published by Enerbrain for AI4Cities on November 3, 2022, presents a comprehensive analysis of the potential of AI-based solutions to accelerate carbon neutrality in urban environments. The report first provides an overview of the AI4Cities project and its objectives. It then discusses the challenges faced by cities in achieving carbon neutrality and the role that AI can play in addressing these challenges. The report highlights several AI-based solutions that can contribute to reducing carbon emissions in cities. These include smart building systems, intelligent mobility solutions, and energy management systems. The report also discusses the potential of AI to optimize renewable energy generation and distribution, improve waste management processes, and enhance air quality monitoring

(IS-2023-50) A Guide to Measurement & Verification of Heat Pump Retrofits in Multi-Unit Res Buildings

This report was prepared by Rushby Energy Solutions and published by The Atmospheric Fund on October 12, 2022. TAF commissioned this guide to support their Retrofit Accelerator program, which aims to increase the pace, scale, and ambition of retrofits that include heat pumps which require a large capital investment. This guide is intended for building owners, condo board members, and property managers to ensure heat pump installations are generating the expected energy savings, thus increasing heat pump adoption and encouraging electrification across the multifamily sector. It outlines M&V procedures and recommendations for heat pump retrofits, focusing on space heating retrofits in electrically heated MURBs. However, many of the principles can also be applied to heat pump retrofits in gas-heated buildings. IPMVP Option C is the recommended option for heat pump retrofits in MURBs. However, there are some scenarios when other IPMVP Options are recommended.

(IS-2023-49) The growing role of PPAs in corporate power purchasing

This report was prepared by the PV Magazine Group. The report deals with the growth of European corporate power purchase agreements (cPPAs) in solar, wind, renewables, and biomass. The growth is attributed to cPPA's renewable capacity online, channel private investment into new projects, and support EU climate and energy targets in a cost-effective manner. A case study from Spain is included. The main takeaway is that strong policy support is essential for long-term growth of cPPAs.

(IS-2023-48) Moving the Needle on Comprehensive Commercial Retrofits

This report was authored by Rohini Srivastava and Jasmine Mah from ACEEE and published on May 2, 2022. The report provides an assessment of programs that support and advance comprehensive retrofit projects. A literature review is presented along with interviews of experts in the field. Recommendations and resources are included to help increase the scale and scope of commercial retrofit programs. The main takeaway is that comprehensive retrofits achieve 15–40% energy savings.

(IS-2023-47) Leveraging AMI for the Low Voltage Landscape

This report was by prepared Itron and published on February 16, 2022. The report presents best practices for leveraging multi-purpose networks that support advanced metering infrastructure (AMI) to manage low-voltage applications. Insight is provided regarding plans for managing grid-edge devices as they are deployed at scale, along with the ways in which utilities are prioritizing grid management use cases. The main takeaway is that many utilities across the globe are planning to implement low-voltage applications and are finding opportunities for real-time data from EV charging programs.

(IS-2023-46) Industrial Heat Pumps - Electrifying Industry's Process Heat Supply

This report was authored by Ed Rightor, Paul Scheihing, Andrew Hoffmeister, Riyaz Papar from ACEEE and published on April 13, 2022. The report examines the industrial heat pump (IHP) market, economics, industrial needs, and electrification potential to reduce energy and greenhouse gases. Also included are the enablers of research, development, and deployment of IHPs. The main takeaway is that IHPs can save up to 32% of the source energy for process heat generation.

(IS-2023-45) EnergySage Solar Marketplace Intel Report

This report was authored by Vikram Aggarwal from EnergySage and published in March 2022. The report provides a review of trends in pricing, equipment preference, and marketplace data for residential solar energy. Furthermore, it covers the new dynamics that have emerged in both the solar and storage industries throughout the second half of 2021, impacting solar pricing and consumer preferences for storage. The main takeaway is that financial savings are the main driver for consumers to pursue solar energy storage options.

(IS-2023-44) Progress & Pitfalls on the road to Net-Zero

This report was authored by Lance, Angel and published in February 2022 by National Public Utilities Council. It presents the results of a survey of 70 utility representatives in the US regarding climate change and net-zero plans. It is reported that global policy efforts to combat climate change are considered ineffective, and the new infrastructure law will predominantly drive investments in energy storage and renewables. Although It is expected that incremental change will be seen in an industry that is notoriously slow to change like electric utilities, the cost is seen as the main barrier to becoming net-zero utilities. It concludes that addressing the climate crisis will require investments in key technologies and stakeholder collaboration to

overcome delays in deploying a cleaner electric grid.

(IS-2023-43) Office of the future revisited

The report "Office of the future revisited" by Cushman & Wakefield is a follow-up to their 2016 report on the future of the workplace. The report examines how trends in technology, sustainability, and wellness are impacting the design and use of office space. It argues that technology has transformed the way people work, with increased flexibility and mobility. Additionally, the report highlights the importance of sustainability, with companies using green buildings and renewable energy to meet their climate targets. Finally, the report emphasizes the importance of creating a workplace culture that prioritizes employee wellness, as it has become a key factor in attracting and retaining talent. Overall, the report provides insights into the evolving nature of workspaces and how companies can adapt to meet the changing needs of their employees.

(IS-2023-42) Building Decarbonization Solutions for the Affordable Housing Sector

This report, authored by York, Dan, et al. from ACEEE on April 2022, focuses on the need to decarbonize buildings in the affordable housing sector, which is a key component of achieving greenhouse gas emissions reduction targets. The report discusses the key barriers to decarbonization in this sector, such as financing and lack of technical capacity, and provides a range of potential solutions, including leveraging incentives and financing programs, engaging with stakeholders, and advancing technology and innovation. The report also highlights successful examples of building decarbonization in the affordable housing sector and identifies opportunities for further action and collaboration to drive progress towards decarbonization goals.

(IS-2023-41) Using Software and Other Technologies to Make Renewable Energy a Cost-Effective Reality

This briefing paper, published by Harvard Business Review Analytics Services in January 2022, discusses how software and other technologies can be used to make renewable energy more cost-effective. The authors highlight the challenges of renewable energy project management and how technologies such as SiteTracker and Salesforce can help address these challenges. They also emphasize the importance of data analytics and machine learning in optimizing renewable energy production and reducing costs. The paper provides case studies and examples of companies that have successfully implemented these technologies to improve their renewable energy operations.

(IS-2023-40) Smart Buildings and the Battle for Sustainability

This whitepaper, published in March 2022, discusses the emergence of smart buildings, which are defined as buildings that use technology to enable efficient and economical use of resources while creating a safe and comfortable environment for occupants. The whitepaper explains how smart buildings offer advantages such as reduced costs, space optimization, and minimized

environmental impact. However, concerns about privacy and security need to be addressed. The smart building ecosystem comprises building infrastructure management, security and access management, and energy management. Finally, the paper describes the key vertical markets of smart buildings, which are commercial and industrial buildings, healthcare buildings, and residential buildings.

(IS-2023-39) Empowering Green Hydrogen: Data's key role in sustainable energy generation

This whitepaper on green hydrogen was published by Aveva in May 2022. As the world transitions to sustainable energy sources, the hydrogen economy represents a significant opportunity for energy producers with the right tools and strategies to evolve alongside it. The green hydrogen value chain will be more complex and involve more stakeholders than those of conventional energy sources, and without solid digital tools, companies will find it difficult to take full advantage of all the hydrogen economy has to offer. This whitepaper details the market trends and pressures driving investment in hydrogen, the predicted scale and scope of future hydrogen applications, the benefits of, and challenges to, participating in the hydrogen economy and the tools and strategies companies will need to enter the hydrogen ecosystem.

(IS-2023-38) Smart Locks and Access Control Supply Chain: Scaling Innovation

This report, authored by Jennifer Kent from Parks Associates and published on May 24, 2022, discusses the results of a survey conducted by Parks Associates on the adoption of smart home technology and specifically focuses on the usage of smart locks. The survey found that only a small percentage of households currently have smart locks installed, with concerns over security and price being the main barriers to adoption. The paper suggests that manufacturers can increase adoption by addressing security concerns, improving ease of use, and offering lower-priced options. Additionally, the paper identifies the potential for smart locks to be integrated with other smart home devices, leading to increased convenience and security.

(IS-2023-37) Smart Cities World Trend Report 2022 - Governance and Citizen Engagement

This trend report, by SmartCitiesWorld and published on June 24, 2022, discusses the role of citizens in shaping smart city governance, including the importance of transparency, accountability, and participation in decision-making processes. The report also highlights several case studies from around the world, showcasing how cities are working to engage citizens in the development and implementation of smart city initiatives. The report concludes with recommendations for cities on how to build trust and foster collaboration with citizens, such as creating accessible channels for citizen engagement, utilizing data and technology to improve citizen services, and prioritizing inclusive and equitable outcomes.

(IS-2023-36) Indoor green wall affects health-associated commensal skin microbiota and enhances immune regulation: a randomized trial among urban office workers

This report was authored by L. Soininen, M. I. Roslund, N. Nurminen, R. Puhakka, O. H. Laitinen, H. Hyöty, and A. Sinkkonen from University of Helsinki, and the ADELE research group and

published on April 20, 2022. Discussed in the report is the impact of air-circulating green walls on bacterial abundance and diversity on human skin, and on immune responses determined by blood cytokine measurements. Based on an experiment involving a control group (no exposure to green air-circulating walls) and experimental group (exposed to air-circulating green walls), the main takeaway is that air-circulating green walls may induce beneficial changes in a human microbiome.

(IS-2023-35) The [Connected] Home is Where the Heart is: User Interface Design for Smart Appliances

This report, prepared by The Qt Company and published on October 21, 2021, explores the design trends and considerations for creating user interfaces (UIs) for smart appliances. The paper discusses the importance of creating intuitive and user-friendly interfaces for smart appliances, which are becoming more prevalent in households. The authors also emphasize the need to provide a consistent and cohesive UI experience across all devices and platforms, including mobile and web applications. The whitepaper also covers various design trends and best practices, such as using natural language processing, gesture recognition, and voice control. Additionally, the paper highlights the significance of user testing and feedback in creating effective UI designs.

(IS-2023-34) Smart Home with Batteryless Wireless Technology

This report, prepared by EnOcean Alliance and published on November 19, 2021, provides a comprehensive summary of what constitutes a "Smart Home", with a focus on batteryless wireless technology. The advantages of EnOcean's wireless technology are presented and include product interoperability, flexibility, reduced installation cost, free maintenance, and no reliance on batteries. The main takeaway is that the smart home market is expected to grow significantly and will rely on the integration of open interfaces, different standards, and technologies to enable homeowners to create flexible solutions.

(IS-2023-33) Measurement of CO2 Concentrations in Temperature Changes

This report was prepared by the AsahiKasei Group and published on November 12, 2021. The report deals with a comparison of temperature characteristics between Senseair's CO2 sensor and the competitor's products, all which play an important role in monitoring buildings' air quality. A new evaluation system was constructed that keeps a stable CO2 concentration and constant CO2 temperature. The main takeaway is that only Sensair's CO2 sensor achieved the required accuracy of 75 parts per million as required by the Green Building Certification Program (LEED).

(IS-2023-32) LoRaWAN in building automation

This report was prepared by DEOS.AG and published on May 1, 2022. The report deals with the Long Range Wide Area Network (LoRaWan) energy-efficient wireless technology and how it can be applied for building automation. Key components of LoRaWan are examined from networking

and device perspectives. A practical application of LoRaWan to smart buildings is presented, along with its comparison to Wi-Fi and Bluetooth technologies. The main takeaway is LoRaWan's wide scope of benefits that include long-distance range and deep building penetration, long battery life, low cost of infrastructure, and widespread use in cities and communities.

(IS-2023-31) How the Next Generation of Community Solar Can Unlock New Value Streams and Help Communities Pursue Holistic Decarbonization

This report was authored by Stephen Abbott, Amanda Farthing, Matthew Popkin, and Madeline Tyson from RMI and published on April 11, 2022. The first generation of community solar allowed for greater access to solar energy for residential customers, but equitable access to renewable energy requires deliberate policy and program design. The concept of Community Solar+ introduces the idea of strategically deploying community solar projects to maximize local value streams and advance community-wide sustainability and equity goals. Four core value streams are identified: accelerating investment in EV charging infrastructure, increasing energy resilience for critical assets and vulnerable communities, aligning evolving grid and customer needs for an electrified future, and creating a more equitable energy system. The report offers a hypothetical financial model and case studies demonstrating Community Solar+ strategies already under development in Denver, San Antonio, and Washington, D.C. The report concludes with recommendations for local governments, states, utilities, and other key stakeholders seeking to embrace this emerging practice.

(IS-2023-30) The Truth About Corporate Real Estate Data and Insights

This report was prepared by JLL Technologies and published on September 6, 2022. When it comes to data and insights for corporate real estate (CRE), not all business intelligence (BI) solutions are created equal. Many CRE organizations face challenges that prevent them from effectively using their data to make more informed decisions. But they see the value in it, and research from Forrester Consulting reveals CRE leaders' plans to use data and insights from BI platforms to optimize their portfolios, operations, and workplaces. This white paper examines the challenges around leveraging portfolio data to optimize real estate investments, the challenges of addressing operational processes with data and insights and plans to invest in technology to improve building operations and efficiency.

(IS-2023-29) Why Wi-Fi 6 goes hand-in-hand with cellular to enable the hyper-connected enterprise future

This whitepaper, prepared by Quectel and published on February 16, 2022, discusses the new Wi-Fi 6 standard, which is designed to offer faster speeds, improved reliability, and increased capacity for wireless networks. It explains the key features of Wi-Fi 6, including improved modulation and coding techniques, MU-MIMO, and OFDMA, and how they improve the performance of Wi-Fi networks. The paper also compares Wi-Fi 6 to previous Wi-Fi standards and highlights its benefits for different industries, including healthcare, education, and transportation. Additionally, it provides information on the various applications and use cases of Wi-Fi 6 and discusses the challenges and solutions in implementing this new standard.

(IS-2023-28) Simplifying the IoT Edge - Smart Spaces Best Practices

This whitepaper, from Parks Associates, published on April 29, 2022, discusses the growing complexity of the Internet of Things (IoT) ecosystem and the challenges associated with deploying IoT devices at the network edge. It highlights the importance of simplifying the deployment and management of IoT devices to enable the full potential of the IoT ecosystem. The paper identifies key factors driving the complexity of IoT deployments, including device heterogeneity, data security, and network connectivity. It also proposes a new approach to simplifying IoT deployments, which involves the use of an IoT edge platform that provides a unified management and security framework for IoT devices. The paper discusses the benefits of this approach, including reduced deployment and management costs, improved security, and increased scalability. Finally, it provides recommendations for organizations looking to implement an IoT edge platform, including evaluating platform providers based on their security capabilities and interoperability with existing infrastructure.

(IS-2023-27) Is the Industry - And The World - Ready For 5G Advanced?

This report, by ABI Research, published on July 12, 2022, discusses the readiness of the industry and the world for 5G advanced, the next generation of 5G technology. It highlights the various features and benefits of 5G advanced, including higher data rates, lower latency, and improved energy efficiency. The report also discusses the challenges associated with deploying 5G advanced, such as the need for new infrastructure and the potential impact on existing networks. It provides insights into the current state of the industry and the key trends driving the adoption of 5G advanced, including the growing demand for high-speed data and the increasing use of IoT devices. The report also includes case studies of companies that are leading the way in deploying 5G advanced, as well as recommendations for organizations looking to implement this new technology. Overall, the report suggests that while there are challenges associated with 5G advanced, the benefits it offers make it a promising technology for the future of wireless communications.

(IS-2023-26) Is subscription-based the future of physical security?

This whitepaper was prepared by Siemens and published on February 8, 2022. In the business world, Software as a Service, or SaaS, is nearly fully mature. Largely replacing the on-premises delivery model, SaaS has delivered enormous value to businesses, large and small, in the form of lower costs, faster commissioning, better quality of product, a smoother user experience and cost-efficient scalability. But what are the barriers to entry for Security as a Service? Why is it experiencing this surge in popularity? And what does the future hold for this relatively new offering? Will the trend continue or fade quickly into the technology memory hole? And how should companies evaluate whether to take advantage of this new business model? This whitepaper addresses the barriers to entry for Security as a Service and provides security decision-makers with insights into the risks and opportunities.

(IS-2023-25) Are utilities prepared to prevent and solve cyberattacks?

This whitepaper, by Ericsson published on April 1, 2022, discusses the growing threat of cyberattacks in the telecommunications industry and the potential impact on 5G networks. It highlights the various types of cyber threats that telecommunications companies face, including DDoS attacks, malware, and data breaches. The paper also discusses the unique security challenges associated with 5G networks, such as the increased number of connected devices and the need for real-time data processing. It provides recommendations for telecommunications companies to improve their cybersecurity posture, including implementing a layered security approach, conducting regular security assessments, and investing in security technologies such as AI and machine learning. The paper also highlights the importance of collaboration between industry stakeholders, such as service providers, vendors, and regulators, to address cybersecurity threats and improve overall network security.

(IS-2023-24) Technology Advances Are Changing the Facilities Management Role

This report was authored by Edward Wagoner from JLL Technologies and published on August 2, 2022. Innovative software technologies are automating, streamlining, and disrupting facilities management (FM). Discover the job skills necessary for keeping up with the technologies changing the FM world. This whitepaper addresses how FM job descriptions have changed over the years in response to technological innovations and the knowledge gaps keeping FMs from higher job performance and greater career flexibility.

(IS-2023-23) Introduction to Smart Systems

This report, prepared by Harbor Research and published in May 2022, The article discusses the evolution of "smart systems," which are integrated and interconnected networks of sensors, devices, and applications that work together to collect and analyze data and provide intelligent insights and actions. The article highlights the growing importance of smart systems in various industries, including manufacturing, healthcare, and smart cities. It provides examples of how smart systems are being used to improve efficiency, reduce costs, and enhance customer experiences. The article also discusses the challenges associated with implementing smart systems, such as data privacy and security concerns and the need for skilled professionals to manage and maintain these systems. The article concludes by emphasizing the importance of a holistic approach to smart systems, including a focus on interoperability, scalability, and sustainability.

(IS-2023-22) Doing IoT Right: Top Practices for Multi-Dwelling Units

This whitepaper, authored by Kristen Hanich from Parks Associates and published on May 2, 2022, discusses the growth and potential of the "MDU IoT" market, which refers to smart home technologies and devices installed in multi-dwelling unit (MDU) buildings such as apartments and condominiums. The paper highlights the unique challenges associated with deploying smart home technologies in MDUs, such as limited space and the need to ensure privacy and security for residents. The paper also discusses the opportunities for companies in the MDU IoT market,

including the potential for new revenue streams and improved resident satisfaction. The paper provides examples of successful MDU IoT deployments, such as energy management systems and connected security devices, and offers recommendations for companies looking to enter the MDU IoT market, such as developing scalable and interoperable solutions and building partnerships with MDU property owners and managers. The paper concludes by emphasizing the importance of a resident-centered approach to MDU IoT, with a focus on convenience, ease of use, and privacy and security for residents.

(IS-2023-21) The ROI of Construction Technology

The Procore ROI report, published on April 11, 2022, presents findings on the return on investment (ROI) of using Procore construction management software. The report includes data from interviews with Procore customers who shared their experiences with using the software and the benefits they have gained from it. The report presents several key findings, including that companies using Procore experience increased efficiency, cost savings, and improved collaboration among team members. The report provides specific examples of these benefits, such as reducing change orders and increasing project completion rates. The report also highlights the positive impact of Procore on employee satisfaction and retention. Finally, the report offers a tool for estimating the potential ROI of using Procore based on a company's size and type of construction projects. Overall, the report provides evidence to support the value of using Procore for construction project management.

(IS-2023-20) A Cybersecurity Threat Profile for a Connected Lighting System

The report prepared by the U.S. Department of Energy's Building Technologies Office, in February '2022, provides a cybersecurity threat profile for networked building systems, which includes building automation systems, lighting systems, HVAC systems, and more. The report outlines the potential vulnerabilities and risks associated with such systems, which can lead to data breaches, property damage, and even physical harm to occupants. It also identifies the potential threat actors, such as nation-state actors, hacktivists, and cybercriminals, and their motivations for targeting building systems. The report offers recommendations for securing building systems, such as implementing strong passwords and user authentication processes, conducting regular security assessments, and training employees on cybersecurity best practices. The report also emphasizes the need for collaboration between building owners, manufacturers, and cybersecurity experts to address the evolving threat landscape and to ensure the security and resilience of building systems.

(IS-2023-19) Powering nodes of wireless sensor networks with energy harvesters for intelligent buildings: A review

This paper, published on February 23, 2022 in the Elsevier Energy Journal, discusses the role of intelligent buildings in efficient energy management but also highlights the challenges in their energy use, particularly in powering wireless sensor networks. The paper proposes energy harvesters (EHs) as a solution to power sensor nodes in buildings, complementing the use of batteries and extending their lifetimes. The study reviews various EH technologies currently

under the experimental or development phase that can extract power from environmental sources such as mechanical motion, thermal, light, radio-frequency, and fluid flow. The potential sites and building systems for extracting power through EHs are presented, along with the challenges and opportunities for each technology. The research findings indicate that EHs can generate enough power to partially or completely supply the power demands of sensor nodes in intelligent buildings.

(IS-2023-18) What Are the Building Blocks for Designing Smart Buildings

This paper, published by CFE Media - Consulting-Specifying Engineer on September 8, 2022, discusses the implementation of artificial intelligence (AI) in smart building systems to enhance their efficiency, security, and sustainability. The paper highlights the benefits of AI, such as predictive maintenance, optimized energy consumption, and improved occupant comfort. The paper presents several use cases where AI is being utilized in smart buildings, including energy management, fault detection, and predictive maintenance. It also discusses the challenges of implementing AI in smart buildings, such as data privacy concerns and the need for advanced algorithms and computing infrastructure. The paper emphasizes the importance of integrating AI with other smart building technologies such as IoT sensors and cloud computing platforms to create an interconnected and intelligent building ecosystem. It also highlights the potential for AI to improve building resilience and support disaster response efforts. The paper concludes by calling for further research and development in AI and smart building technology to create more sustainable, efficient, and secure buildings. It also emphasizes the importance of collaboration between industry stakeholders, policymakers, and researchers to address the challenges and opportunities presented by the adoption of AI in smart buildings.

(IS-2023-17) Smart Building Connectivity Network

This whitepaper, published by TIA on September 16, 2022, discusses the importance of connectivity in smart building design, operation, and maintenance. It highlights the benefits of a robust connectivity network, including increased energy efficiency, enhanced occupant comfort, improved safety and security, and reduced operating costs. The document presents several case studies demonstrating how advanced connectivity technologies such as Wi-Fi, 5G, and cellular networks are being used to create intelligent and connected building systems. The paper also identifies the challenges of implementing a reliable connectivity network, including the need for adequate bandwidth, proper network architecture, and security protocols. It emphasizes the importance of selecting the right connectivity technology for a specific building environment, based on factors such as building size, use case, and location. The paper concludes by emphasizing the need for collaboration between building owners, operators, and technology providers to ensure that smart building connectivity solutions meet the evolving needs of building occupants and the larger community.

(IS-2023-16) How to Improve Indoor Air Quality While Minimizing Energy Consumption

This whitepaper, published by Schneider Electric on August 9, 2021, focuses on how building owners and facility managers can meet the new expectations of building occupants by improving

indoor air quality. It also outlines how to control energy use and costs while implementing these return-to-work solutions.

(IS-2023-15) How Does Thermal Comfort Differ in Smart vs Normal Buildings

This report, published by AZoM.com Limited T/A on September 8, 2022, explores how the adoption of smart building technology affects thermal comfort in comparison to traditional buildings. The study involves analyzing data collected from occupants in both types of buildings using thermal comfort surveys and measuring environmental variables such as air temperature, humidity, and air velocity. The results suggest that smart buildings provide more precise and comfortable indoor conditions due to advanced control systems that adjust the environment to suit the occupant's preferences. Additionally, smart building technology provides more flexibility in individualizing the thermal comfort settings for occupants, leading to improved satisfaction levels. However, the study also identifies challenges such as higher energy consumption and costs associated with implementing and maintaining smart building technology. The report concludes that while smart building technology offers benefits for thermal comfort, a balance between energy efficiency and occupant satisfaction should be achieved to ensure sustainable and comfortable indoor environments.

(IS-2023-14) Help Wanted - Tech-Savvy Talent to Lead Smart Buildings Into the Future

This article by Betsy Conroy, published by Smart Building Technologies on September 7. 2022, discusses the growing demand for skilled professionals in the smart building industry and the need for workforce development programs to train individuals for these positions. The article highlights the various job roles that are emerging in the smart building industry, such as building automation engineers, data analysts, and cybersecurity specialists. It also discusses the importance of developing a diverse and inclusive workforce to ensure that the industry can benefit from a range of perspectives and experiences. The article suggests that industry stakeholders should collaborate to create training programs and apprenticeships that can help individuals acquire the skills and knowledge needed to succeed in the smart building industry. Overall, the article emphasizes the importance of investing in workforce development to support the growth of the smart building industry and address the skills gap that currently exists.

(IS-2023-13) The CMMS Solution to Facilities Management

This report, published by JLL Technologies on June 29, 2022, discusses how Computerized Maintenance Management Systems (CMMS) can benefit facilities management by improving maintenance planning, asset management, and overall operational efficiency. The report highlights several key features of a CMMS, including work order management, asset tracking, and preventive maintenance scheduling. It also provides case studies to demonstrate the benefits of implementing a CMMS in various types of facilities, such as hospitals, universities, and commercial office buildings. Overall, the report suggests that a CMMS can help facilities management teams streamline their operations, reduce costs, and improve the overall performance of their assets.

(IS-2023-12) The Business Case for Intelligent Buildings

This report published by Arcadis on June 29, 2022, provides an overview of the benefits of intelligent buildings and how they can help organizations achieve their business goals. It discusses the various technologies and systems that can be integrated into intelligent buildings, such as building automation systems, energy management systems, and smart lighting systems. The report also highlights several case studies to demonstrate the financial benefits of implementing intelligent building solutions. Overall, the report suggests that investing in intelligent buildings can improve the operational efficiency, sustainability, and occupant experience of buildings while also delivering a strong return on investment for businesses.

(IS-2023-11) Comprehensive Approach for Physical and Digital Spaces

This whitepaper, authored by Siemens and published on February 8, 2022, discusses the integration of artificial intelligence (AI) and machine learning (ML) technologies into building automation systems (BAS) and how they can improve building performance, occupant comfort, and energy efficiency. The report emphasizes the importance of data collection and analytics in AI and ML models, which can lead to actionable insights and proactive maintenance, reducing energy waste, and improving indoor air quality. The document also provides examples of AI and ML applications, including fault detection and diagnostics, predictive maintenance, and occupant behavior analysis. Additionally, the report mentions the challenges associated with AI and ML integration, such as data quality, privacy concerns, and the need for skilled personnel.

(IS-2023-10) Commercial Real Estate and Air Quality Safety

This whitepaper authored by Blueair and published on December 8, 2021, discusses the potential health risks of poor indoor air quality and the importance of monitoring and maintaining good air quality in buildings. It emphasizes that air quality can have a significant impact on the health, productivity, and comfort of building occupants. The document also explores various strategies and technologies for monitoring and improving air quality, such as ventilation systems, air filters, and air quality sensors. Overall, the document highlights the importance of prioritizing air quality safety in building design, construction, and maintenance to ensure the well-being of occupants.

(IS-2023-9) Clean Indoor Air - The Guide

The report discusses the impact of the COVID-19 pandemic on the building automation and control systems (BACS) industry. The pandemic has accelerated the adoption of new technologies and approaches, such as the increased use of remote monitoring and control systems, the integration of indoor air quality sensors, and the implementation of touchless systems. The report also highlights the need for building owners and managers to focus on sustainability, resiliency, and flexibility in their buildings to ensure occupant health and safety. Furthermore, the document stresses the importance of cybersecurity measures for BACS systems, given the increased reliance on digital technologies and the potential for cyberattacks.

(IS-2023-8) Zero Carbon Building - Performance Standard

Canada Green Building Council's Zero Carbon Building Standard (ZCB Standard) Version 2 - Performance was published on June 21, 2022. The ZCB Standard sets out the requirements for new and existing buildings to become zero-carbon by 2030. The Performance version of the standard provides a framework for designing and operating buildings to achieve zero carbon performance over time. The document includes requirements for energy efficiency, on-site renewable energy, and carbon offsets. It also provides guidelines for measuring and verifying building performance, as well as a scoring system to evaluate a building's performance against the standard.

(IS-2023-7) Zero Carbon Building - Design Standard

This is the third version of the Zero Carbon Building (ZCB) Design Standard developed by the Canada Green Building Council and published on June 20, 2022. The standard provides guidance on designing and constructing commercial, institutional, and multi-unit residential buildings to achieve zero carbon emissions, with an emphasis on energy efficiency and the use of renewable energy sources. The standard includes three pathways for achieving zero carbon: energy efficiency, on-site renewable energy, and off-site renewable energy. It also sets performance metrics for various building components, including envelope, lighting, HVAC systems, and renewable energy systems, as well as requirements for monitoring and reporting energy consumption and carbon emissions. The standard also includes a section on carbon offsets and the use of renewable natural gas.

(IS-2023-6) The Canada Green Buildings Strategy

The Canada Green Building Strategy Discussion Paper, published by Natural Resources Canada in July 2022, presents a national framework for improving the environmental performance of buildings. The paper outlines the benefits of green buildings, identifies gaps and challenges in the current building industry, and proposes strategies to improve energy efficiency, reduce carbon emissions, and promote sustainable building practices across Canada. The proposed strategies include enhancing building codes, standards and rating systems, improving access to financing and incentives, and increasing education and training for industry professionals and the public. The paper also highlights the importance of collaboration and stakeholder engagement in achieving these goals.

(IS-2023-5) Fuel-Switching Hydronic Systems to Low-Carbon with Air-to-Water Heat Pumps

Mitsubishi Electric published a report on February 8, 2022, highlighting the benefits of using air-to-water heat pumps for year-round heating and cooling, which are extremely efficient and can minimize the need for natural gas. Intertek evaluated the performance of Mitsubishi Electric's air-to-water heat pumps in 3 typical buildings located in Toronto, Vancouver, and Montreal with different climates, and confirmed that energy savings and carbon emission reduction can be achieved with a heat pump in various cold climates. The report also noted that a natural gas boiler was needed to supplement the building’s heating needs only on extremely cold days, and

that having an electric heat pump with a supplementary natural gas boiler provides energy diversity and redundancy, ensuring a reliable heating source in case any system goes off grid.

(IS-2023-4) 2022 Migration Patterns - The Ripple Effect

This report, authored by Placer Labs, and published in August 2022 focuses on the ripple effect of recent migration trends. Placer Labs used foot traffic data to show how a small influx of residents can influence a city's office occupancy rates, create commercial opportunities, and impact how retailers serve their communities. The whitepaper answers the following questions:

Where is population growth driving a strong workplace recovery?

Why are national chains now looking to expand in smaller markets?

How does domestic migration impact local retail and dining preferences?

(IS-2023-3) 8 Trends That Will Shape Real Estate And Facility Management By 2027

This whitepaper, authored by Planon and published on June 28, 2022, explores 8 disruptive trends that are currently solidifying and explains the extent of their impact on the CRE & FM domain in the next 5 years. What is happening around the topic of sustainable FM? What technology is there to support? What post-pandemic consequences should be considered?

(IS-2023-2) PoE lighting Benefits and Design Considerations

This whitepaper authored by Panduit Corp. and published on June 10, 2022 discusses the concept of a "digital building," which refers to the convergence of smart devices to manage the day-to-day operations of facilities. It notes that traditionally, buildings have separate networks for various systems, but new technologies are creating the possibility of a single converged digital building network. Power over Ethernet (PoE) lighting is identified as a core component of this digital building revolution, as it merges advances in LED lighting with PoE IP networking, creating a Building Internet of Things (BIoT) component.

(IS-2023-1) How to Achieve Sustainable Indoor Air Quality

A Roadmap to Simultaneously Improving Indoor Air Quality & Meeting Building Decarbonization and Climate Resiliency Goals published by EvVerid on August 5, 2022. The whitepaper discusses the importance of indoor air quality in commercial workspaces, particularly in the context of attracting employees back to the office amid concerns over COVID-19 variants. The whitepaper emphasizes the negative impact of poor indoor air quality on employee productivity and health, and the need for building owners and operators to prioritize improving indoor air quality while also meeting energy conservation and climate resiliency goals. It also presents a four-step Clean First framework for achieving sustainable indoor air quality, which includes defining IAQ goals, cleaning indoor air, optimizing ventilation, and monitoring and controlling IAQ.

(IS-2022-161) The Future of Work Survey 2022

This 2022 Future of Work Survey was authored by Dr. Marie Puybaraud and the JLL's Global research team and published on August 16, 2022. This survey reports on the unprecedented experience of the global public health pandemic. It shows the rapid acceleration of the large-scale adoption of dynamic and flexible working, the growth of workplace technologies to support CRE (corporate real estate) functions in managing these new workstyles, and increased investment to bolster environmental sustainability goals. The power has shifted from the employer to employees, forcing organizations to reimagine workplace and portfolio strategies; and the greater application of technology is becoming crucial to boosting performance levels on all fronts. JLL has surveyed 1,100 strategic decision-makers in businesses around the globe. Offering hybrid working options will be critical to attracting and retaining talent. Without sustained investment in technology and data, it will become more challenging to achieve performance and resilience goals.

(IS-2022-160) The 2022 Tenant Engagement Report

This 2022 Tenant Engagement Report was authored by HqO and published on Jan 14, 2022. The year 2021 was a formative, transitionary period for owners and operators of commercial real estate (CRE) properties. Between growth, consolidation, and significant funding in the PropTech market and evolving workforce needs due to the pandemic, CRE leaders faced an array of new challenges to overcome including how to add value to buildings in ways that support every person who spends time in and around the workplace. HqO surveyed over 100 of the world's leading companies and found that 54% of properties have staff dedicated to tenant experience; 86% of property teams use a building app to communicate with the people in their properties; the many kinds of investments leaders are making to differentiate their assets, attract and retain talent, and achieve financial success; and other critical factors shaping the future of the workplace.

(IS-2022-159) Smart Buildings Balance Efficiency and Tenant Experience

This White paper was authored by Julie Petrone, and published by ABB Building Solutions July 5, 2022. Intelligent buildings open up new possibilities in the building space. As network solutions improve and new IoT services are developed, the buildings industry is leveraging technologies to provide better solutions for energy efficiency and occupant wellness. Digitalization is the driving force behind modern building evolution. Data-driven intelligence and automation have transformed commercial buildings into efficient, sustainable, safe, and comfortable environments that intelligently adapt and respond to people's needs. The networking of a technical building system, which drives efficiency gains, in turn, supports the emergence of new services. The report shows that ABB offers a unified enterprise platform that adds intelligence to buildings and provides a holistic solution for building management, resulting in lower costs and improved ROI over a building's life span, optimized performance and functionality, automated monitoring and control, greater occupant comfort, and enhanced safety and security.

(IS-2022-158) Malls that are Rising to the Top

This White paper authored by Placer Labs, Inc. and published on August 30, 2022, shows how malls are reinventing themselves and staying relevant thanks to experiential offerings, omnichannel options, and strategic tenant selection. Many began to predict the demise and downfall of malls, and that narrative intensified as online shopping grew in popularity. The rise of big-box stores, a focus on "services, not things," and COVID-19 only accelerated these trends. And after two years of isolation and a new, pandemic-induced wave of suburban relocation, malls' potential to bring people together is more prized than ever. Some shopping centers are turning to entertainment to draw crowds into their doors. Others are focusing on offering a full visitor experience that extends beyond simply grabbing a new shirt or a burger at the food court. Top-tier malls are turning to innovative solutions to stay ahead of the game.

(IS-2022-157) Ebook HVAC Summer Edition

This eBook was authored by individual contributors for each topic and published by CFE media on June 30, 2022. The discussions cover the various new methods. technologies and specifications like Divsion 25 and Well V.2 to make the HVAC equipment perform better and also reap the benefits of the digitalization of the new equipment by bringing that data back to a decision-making platform. The topics cover chiller optimization, boilers, and their controls, pumping configurations, and the electrification of our building systems. Each topic covers the issues from the technical capabilities and also the costs and benefits achieved. In many cases, the extra costs up front provide significant operating and energy savings that justify the procurement of better equipment.

(IS-2022-156) Driving Resiliency Through Your Organizations Energy Infrastructure

This report was authored by Ameresco and published on July 26, 2022. In recent years, major weather events, such as hurricanes and wildfires, have exposed vulnerabilities in our energy system that have left many without power for days or weeks, exacting a high cost in terms of lost productivity and quality of life. The price of many distributed energy technologies, such as solar photovoltaic (PV) and energy storage, has dropped precipitously over the last decade, placing them in price parity (or better) with grid-supplied energy. This white paper explores ways in which government agencies, companies, and other organizations can leverage their energy infrastructure to minimize the adverse impacts of major events – in other words, to become more resilient. To date, much of the interest in resiliency has been limited to a few key sectors; however, this white paper, shows that a wide range of organizations are using their energy infrastructure to become more resilient in budget-sensitive ways.

(IS-2022-155) Building Meets Artificial Intelligence

This report was authored by Paul Baumann and published by Siemens on June 20, 2022. The report introduces the many benefits of effective artificial intelligence (AI) in many applications and suggests there are challenges, particularly when connecting and mapping technology within buildings. The topic of AI often causes a split in opinion: making human life easier, and concerns about unethical decisions or the replacement of humans. The subsets of AI in machine learning (ML) using substantial amounts of data from the construction phase and building information

modeling (BIM) are explained. Siemens reports on its Building X, a holistic, open platform of data-driven applications and connectivity solutions for buildings during the operations phase. The platform is based on extendable business services and a common data model that provides a single source of truth for a digital building.

(IS-2022-154) Accelerating Coordinated Utility Programs for Grid-Interactive Efficient Buildings

This report was authored by Kate Strickland & Becca Trietch and published by Smart Electric Power Alliance on July 8, 2022. Grid-interactive efficient buildings (GEBs) are energy- efficient buildings that use smart technologies and on-site distributed energy resources (DERs) to provide demand flexibility while co-optimizing for energy cost, grid services, and occupant needs and preferences in a continuous and integrated way. To help accelerate this GEBs future, building energy programs will need to transition to better integrate conservation and active management of electricity in buildings for the direct or indirect provision of grid services. This study examined the barriers and potential solutions to this building energy program transition with a literature review, survey, focus groups, and one-on-one interviews used to document the industry's current challenges and strategies for success. Solution strategy implementation details, where available, are presented in case studies. By documenting the barriers and key strategies for coordinated EE+DF(+DR) programs, this study aims to support all stakeholders looking to unlock a GEBs future.

(IS-2022-153) The Detailed 5-Step Guide to Ideate Building Performance and Sustainable Design Strategies

This report was authored by COVE.TOOL and published on July 22, 2021. Since each site is different, each project is different, and each client is different, the eBook suggests a consistent way of evaluating building performance across all projects. Developing a decision-making framework is critical for any endeavor and using data-driven design processes solves this problem by using simulations to guide decision-making. In this e-book, they outline 5 key steps design teams can use to simplify building performance and sustainable design analysis and help them implement a repeatable, data-driven process that can be used on hundreds of projects successfully. Site analysis, understanding energy benchmarks, and using a building performance analysis tool, the team can now run through a holistic cost vs energy optimization to test out all the possible combinations for different strategies and pick out the best one.

(IS-2022-152) The Agile and Efficient Digital Building

This report was authored by Panduit Corp and published on June 30, 2022. The report defines the Digital Building as showing the changes to space and amenities as employers are wooing a younger, more collaborative workforce that cares about things like the health and wellness of the workspace and flexible working conditions. The advantages of a digital building go well beyond energy savings and optimized building operations. The report discusses the significant IP network installed by Cisco and the true benefit of a highly connected building. Technology has the potential to transform the operation of buildings. Connecting disparate systems and devices to an IP network allows those systems to share data on occupancy, space usage, temperature,

and more, which makes buildings more responsive and efficient. This also leads to higher employee satisfaction and productivity.

(IS-2022-151) Rethinking Workspaces - Hybrid Workspaces Solutions and Use Cases Outlook

This report was authored by and published by Kontakt.io on March 4, 2022. Occupancy monitoring has become critically important especially as the need for workplace flexibility and safety has grown due to COVID-19 precautions. The report discusses the need to know how many people are in their buildings at any given time, who has been through the building, and what contacts they may have had. It suggests managers rethink the way their space is planned based on utilization data. Accommodating the new trend of hybrid workspaces depends not only on instant access to occupancy levels but historical data on space utilization. The report shows many of the sensors and software applications that provide the data for better occupant usage of the space and additional security and wayfinding capabilities to improve productivity.

(IS-2022-150) Lighting and Lighting Controls - Summer Edition

This eBook was authored by individual contributors for each article from the suppliers and consulting specifying engineers and published by CFE media on June 5, 2022. Each article describes the various ways that lighting control systems contribute to flexible, future-proof buildings. It includes suggestions on upgrading existing lighting systems, addressing cybersecurity, and contributing to energy efficiency. Design features for the health care and school buildings are provided. The eBook contributes to the education on the rapid advancements in lighting and controls from both the engineers' and suppliers' perspectives. Specifying the right system for each job starts with laying out all the design considerations — reliability, responsiveness, security and scalability — asking the right questions about integration, remote system access and system resilience and making sure the manufacturer you choose has a history of service and support that meets your client's needs now and into future.

(IS-2022-149) Lessons from a Heat Pump Retrofit at CityHousing Hamilton

This report was authored by Keith Burrows from The Atmospheric Fund and published on June 14, 2022. The Atmospheric Fund (TAF), working with CityHousing Hamilton (CHH), planned and implemented a pilot project at a three-story multi-family residential building with 40 units. They installed a heat recovery, variable refrigerant flow (VRF) air source heat pump (ASHP) system in three suites to test the performance of the technology under real-world conditions and to provide best practice recommendations. Results showed increased comfort with the addition of colling and while the heating loads were met there were no significant electrical savings when compared to the electric baseboard heaters previously used. This case study provides results, lessons learned, and recommendations. It includes significant detailed information on the measurement and verification methods including the tenant survey results.

(IS-2022-148) IoT for Smart Buildings

The IoT for Smart Buildings authored by Multi-Tech Systems and published June 13, 2022 covers

how wireless sensors, gateways, and analytics leverage the Internet of Things to enable real-time data collection and analysis. It addresses the shared needs of every building that include building security, temperature control, water leakage, and smart restrooms. In this new landscape, facilities managers must evolve to source products, connect devices, and implement processes, which in the past, had been siloed or watched over by a single operator. The report is a summary of key points for facility managers to address, as they look to leverage new advances in their planning and execution of a wide range of Smart Buildings technologies. It contains many case studies showing the benefits of the wireless approach and armed with these new technologies and a better awareness of how they work together, the possibilities are endless.

(IS-2022-147) Green Retrofit Economy Study

The Canadian Green Retrofit Economy Study is a collaboration between The Delphi Group and the Canada Green Building Council (CaGBC) published on June 10, 2022. This report is a summary of findings gained through primary and secondary research between March 2021 and June 2022, building on existing knowledge from thought leaders across Canada and globally. It shows the existing approach to retrofit projects will need to level up and transform into a more systematic ecosystem of aggregated project and investment opportunities. Building owners and managers will need expert support in developing and implementing transition plans to leverage building renewal cycles and market opportunities. It discusses the technologies available today and innovation in training the workforce. Both financing options and policy issues are covered and the different amounts of retrofit potential are shown.

(IS-2022-146) Future-Proof Building Operations to Optimize the Tenant Experience

This eBook was authored by BuildingEngines and published on October 18, 2021. The new normal of tenant experience is very different from pre-pandemic times. Now tenant experience (TeX) is all about cleanliness, air quality, workplace distancing, accurate and consistent communications, information flow, and most importantly—safety. With the average office occupancy rate in the United States currently down to 30 percent, versus normal times at 70 percent occupancy, improving the tenant experience is now a vital component of bringing people back to the office. Property teams and owners can do a lot to make tenants more comfortable and productive once they are back in their building. Occupants need to see a building as a safe space. To achieve this, tenant experience must now be about maximizing the comfort and confidence of occupants' experience in a building. To encourage re-occupancy and lay the groundwork for a successful post-pandemic building, property teams must understand their tenants have changed forever. While flashy amenities, discounts, and events might have won tenant loyalty in the past, tenants now place more value on spaces that promote health, safety, and well-being. This report covers the areas that need improvement.

(IS-2022-145) Energy Efficiency and Savings for Commercial Buildings

This ultimate guide to Energy Efficiency and Savings for commercial buildings was authored by buildingIOT and published on October 14, 2021. The guide explains the significant amount of energy with businesses, government, and commercial sites spending $190 billion every year on

energy-related costs. the EPA suggests that an average of 30% of the energy used in commercial buildings is wasted. Looking at the rising costs and understanding the primary energy-use and waste factors will enable building managers to identify potential areas to target for cost savings. The guide covers many of the areas for improvement. HVAC systems, Lighting, and energy-consuming equipment and devices can have building automation and use fault detection and diagnostics with continuous and actionable analytics that helps to regulate high energy-consuming equipment and devices. Achieving optimal energy consumption requires the collection and organization of essential data for evaluating and addressing energy efficiency over time. With the right analytics partner, you can put in place an analytics system to fulfill this role, enabling you to project future energy usage patterns, and develop goal-oriented energy efficiency and cost savings tactics.

(IS-2022-144) The CRE Playbook for Maximizing ROI on Sustainability

Building Engines, a JLL company, authored this CRE Playbook and published it on May 16, 2022. There is no choice but to face the current and future climate change-induced sustainability challenges for the CRE industry. CRE leaders must begin to do things differently in their buildings. Energy usage must decrease, and efficiency must improve. Tenant demands for healthier and more sustainable workplaces must be met. This playbook for achieving these goals involves technology. Technologies enable property teams to: enhance energy management practices; prioritize health, wellness, and air quality; perform proactive maintenance; prolong equipment lifetimes; measure and evaluate the effectiveness and efficiency of existing systems; plan for capital investments; and achieve key energy certifications.

(IS-2022-143) Smart Solutions - Boosting Revenue in Multifamily Properties

This Smart Solutions eBook was authored by Jennifer Kent at Parks Associates in partnership with SmartRent and published on May 23, 2022. The MDU market is unique for its multiple stakeholders, bulk deployments, and multiple locations for installations. End-user residents, MDU property managers, and building owners benefit directly from proptech. Other ecosystem players are also in a position to capitalize on new demand and value, including smart home solution vendors, ISPs, insurance agencies, security providers, and installers. This whitepaper addresses how connected devices benefit multifamily owners and property managers, from improving business efficiency to driving additional revenues, as well as opportunities in the emerging MDU market for product vendors and service operators. The research includes a snapshot of the current market for smart home solutions in MDUs and key considerations for both vendors and MDU owners and managers

(IS-2022-142) The Real Estate Leader's Guide to Decarbonizing Your Portfolio

This guide, authored by and published on May 2, 2022, by Jones Lang Lasalle (JLL), discusses the various trends from science-based targets to net-zero commitments, and how to start reducing carbon emissions to keep the commitment to climate action. It offers implementation strategies to help you measure carbon, track it on an ongoing basis, and decarbonize your buildings to achieve your ESG goals. Moving forward on climate goals remains a challenge and even with

strong leadership support, moving targets are everywhere. Amid increased scrutiny and market pressure, real estate leaders face a crowded and fragmented ESG space and a confusing array of regulations, pathways, and metrics. What is missing is a common understanding of how to successfully measure and reduce carbon emissions within the built environment. That is the next critical step needed for organizations to truly reduce their carbon footprints and advance their overall sustainability efforts.

(IS-2022-141) The Fast-Changing Future of Systems Integrators

This white paper by J2 Innovations a Siemens Company and published on January 14, 2022 discusses the various trends that are changing and driving success in the smart buildings sector, highlights how businesses can utilize the new technology offered by FIN Stack to deliver easier-to-use building automation and integrated smart buildings solutions in faster, more efficient ways. How building controls are changing and where the market is going and some of the key factors determining the changing direction of the buildings control industry. They include IoT in packaged equipment, end-user dashboards, remote management, the need for data cybersecurity, and competitive costing. Outdated software applications that are complicated to configure will lose out to newer “next generation software” able to offer end users and those who install and commission systems a simpler and easier way to interact and manage buildings. The adoption of data standardization will enable the various building systems to become more easily integrated than has been possible previously.

(IS-2022-139) Simplifying the IoT Edge-Smart spaces Best Practices

This white paper was authored by Kristen Hanich of Parks Associates in partnership with Technicolor and published on April 28, 2022. IoT adoption is growing across the world. This includes not just consumer smart home device adoption, but IoT deployments in industrial and business settings. IoT sensors and devices capture data and perform tasks, communicating over IP and other protocols with cloud or local systems to create intelligent systems and enable automation. This whitepaper addresses the demand and growth of IoT edge solutions in smart buildings and smart spaces. It investigates top verticals and use cases such as smart apartments and MDUs, retail and warehousing, and hospitality and building management. It looks at common challenges and best practices in deploying solutions into these environments and examines new open solutions compatible with many different networking technologies, such as the use of gateways with both Wi-Fi and new IoT radios, which can create, expand, and improve services in these new smart spaces.

(IS-2022-138) Lighting and Lighting Controls - Spring Edition

This eBook on Lighting and Lighting Controls was published by CFE Media on May 2, 2022. For non-residential buildings, lighting is controlled by smart networks of “internet of things” devices — relays, occupancy/vacancy sensors, photocells, button stations, touchscreens, etc. — that optimize lighting conditions and energy use dynamically according to performance-based design parameters. This eBook has articles and case studies from the contributors, on the issue of lighting sequence of operations, wireless controls, health care lighting, networking of lighting,

code compliance, and energy-efficient lighting with daylighting. Lighting and its controls need to address the visual comfort and productivity of the occupants and the possible energy savings that can be achieved with smarter lighting and controls.

(IS-2022-137) HVAC Spring Edition

This HVAC eBook was authored by Brandon Andow, Yovanni Cataño, Jose Colon, Jeremy Crowley, Ishai Oliker and others from the Consulting -Specifying Engineers, Air Solutions Company, Grunfos, and Raypack. It was published by CFE Media on April 29, 2022. This eBook has articles and case studies from the contributors, on the issue of solar gain on the design of buildings and building envelope improvements, the use of filters to protect HVAC equipment, the various methods of pumping, and the various options for boilers and a case study on district heating from a combined heat and power plant. HVAC options need to address the indoor comfort and productivity of the occupants and the possible energy savings that can be achieved with smarter HVAC equipment and controls.

(IS-2022-136) Green Quadrant: Integrated Workplace Management Systems 2022

This report was commissioned by Planon and prepared by Joy Trinquet with Susan Clarke of Verdantix Ltd. and published in March 2022. Applying the proprietary Verdantix Green Quadrant methodology, the analysis is based on two-hour live product demonstrations with pre-set usage scenarios and supplier responses to a 238-point questionnaire. To understand customer needs Verdantix reviewed the data from a survey of 285 real estate and facilities decision-makers. The in-depth benchmarking concludes that eight suppliers lead the market and they demonstrated an excellent breadth of functionality and strong market momentum. The analysis also reveals that other providers offer strong propositions in workplace management, space management, mobile solutions, and tenant-facing engagement.

(IS-2022-135) Global Insights IoT & The Future of Healthcare

This research report, commissioned by Schneider Electric, was prepared by Guidehouse Inc and published on April 28, 2022. It demonstrates how IoT-based, open, interoperable platforms enable hyper-efficient, people-centric, resilient, and sustainable healthcare facilities of the future. The report offers insights from 600 global healthcare facility executives into IoT investment priorities and a simple framework to help implement of an IoT-based platform in healthcare facilities. The report covers:

- The market drivers and barriers behind IoT platform adoption
- End-to-end system benefits of IoT-enabled platforms
- Practical use cases for IoT-based solutions in healthcare facilities

It describes the need for hospitals and clinics to consider benefits ranging from energy efficiency and sustainability to resilience and patient centricity.

(IS-2022-134) Cybersecurity for Building Automation Systems

Trane Technologies authored and published this paper on May 2, 2022. Building Automation Systems (BAS) offer significant operational advantages for commercial building owners and occupants. They provide the applications and interfaces that make it easier to effectively manage indoor environmental quality (IEQ) and optimize energy efficiency. As connected systems, they share many of the same cyber risks as traditional IT assets. The paper provides an introduction to the best practices in BAS cybersecurity. These best practices fall into three main categories. These include Isolation from other systems; Secure Access – both on-site and remote; Operation and Maintenance – establishing (and sticking to) set protocols and maintaining a regular system and software maintenance schedule to maintain security over the long term. With due diligence, the risks are manageable.

(IS-2022-133) Building Automation Guide - Factors to Consider When Selecting a Building Automation System

J2 Innovations, a Siemens company, authored and published this guide in June 2019. The Building Automation Systems for most new commercial buildings, have complex HVAC and other services-related equipment and require the coordination of the various installed equipment, while the demands of the maintenance function frequently require the site's systems to be remotely monitored. This guide sets out the various factors to consider, to help when specifying or evaluating competing system solution proposals. There are two ways competing propositions should be evaluated: according to the benefits they deliver and the technology they use to do that. It is important to choose a technologically modern system so that it does not become out-of-date too quickly or unable to be adapted over time to the new requirements that will no doubt continue to emerge.

(IS-2022-132) The Evolving Importance of Effective HVAC

This report was authored and published by Building Engines on March 28, 2022. From heating and cooling units to keep tenants comfortable throughout office buildings, to ventilation and purification units to ensure all occupants are inhaling clean air as they shop in retail centers or work in large warehouses, HVAC technologies play an integral role in property operations, as underscored by the COVID-19 outbreak. With COVID-19 being an airborne virus, the pandemic has cemented air quality as the top of mind for property teams and tenants alike. Building Engines fielded a national survey of nearly 300 building managers and engineers working within CRE properties in late 2020. As we go through the re-occupancy phase, the survey results can show how you can leverage technology to meet heightened air quality standards while securing tenants' trust and your organization's success in the long term.

(IS-2022-131) Smart Buildings eBook Winter 2022

This Smart Buildings eBook was authored by Aaron Szalaj, Bob Swanger, Timothy Howe, Marcus Myers, and Jeri Pickett from the Consulting-Specifying Engineers, Stantec, and Reliable Controls. It was published by CFE Media on March 29, 2022. This eBook discusses; The five steps to BAS

replacements; Engineering with automated fault detection and diagnostics; The Art of Building Sustainability; Deliver smart buildings using CSI Division 25, commissioning; Tap into a building automation system's data and maximize investment; a video link to Designing smart buildings. Today's available BAS connectivity just didn't exist when most commercial buildings were constructed. Antiquated systems typically used proprietary technology platforms available only through a stand-alone terminal with obscure terminology and simple graphics, which means, not much data from the facility was used to improve building performance. This paper shows how consulting engineers can help owners optimize their existing investments while taking advantage of new technology.

(IS-2022-130) Build it for Zero Carbon

This executive guide on achieving a zero-carbon future was authored by and published on March 30, 2022, by Schneider Electric SE. Buildings consume 30% of the world's energy and are responsible for 40% of CO2 emissions. If we can collectively work together toward net-zero 2030 targets, then the trajectory of the temperature rise will stay within 1.5%, helping us to avoid a host of climate-change-related impacts. There's also a growing recognition of the intersection between climate action and social justice. BIPOC (Black, Indigenous, and People of Color), low-income, and traditionally under-resourced and underrepresented communities have historically borne a greater burden from these impacts. This paper lays out Schneider Electric's holistic, replicable strategy for organizational decarbonization. With this proven roadmap, organizations of all kinds can define, set, deploy, and sustain decarbonization programs.

(IS-2022-129) Building Operating System

A TIA team of Bob Allan, Jeff Carpenter, Bill Moten, Laura Polas, Frank Straka, and Steven Zielke authored this paper which was published on March 24, 2022. The paper shows how today's smart buildings are data-driven, levering sub-system integration and analytics that improve functionality making them an operational and productivity asset. Effectively achieving smart building objectives starts with reevaluating the we they are designed, procured, and operated. The paper explores how to design and deploy a smart building based on an operating system model that ensures flexibility, reduced construction and operational costs, improved return on investment, and a better and more productive occupant experience. It examines how technologies like power over Ethernet (PoE) enabled edge devices, Digital Twins, and Single-Pair Ethernet (SPE) are emerging to deliver additional benefits and the potential for greater asset value.

(IS-2022-128) Top CRE Trends 2022

The Jones Lang LaSalle IP. Inc. research team, Richa Walia, David Barnett, Amber Schiada, James Taylor, Flore Pradere, and Marie Puybaraud contribute to this paper published on February 10, 2022. Business success lies in staying ahead of the curve and predicting the right step to take next for people, the planet, and profit. This 7th edition of the Top 10 Global CRE Trends report explores how firms can reinvent their corporate real estate strategies in response to ever-changing business priorities, a challenging operating landscape, and a volatile economic

environment. The global COVID-19 pandemic has proven to be an accelerant of change and transformation for many organizations. Some of the ensuing changes were a long-time coming, such as the increased push towards a more sustainable, tech-infused world. Other shifts, like evolving working habits, had been bubbling farther below the surface, accelerated by the ongoing pandemic. Hybrid and remote work, climate change, digital applications, and sustainability are all trends discussed. Leverage intelligence and best practices from the partnership ecosystem are needed to co-create innovative solutions and achieve organizational objectives.

(IS-2022-127) Thinking Smart - How the Foundations of the UK will be Defined by Smart Buildings

Johnson Controls commissioned Sapio Research to conduct an online survey to uncover how smart buildings helped the UK & Ireland through the COVID-19 pandemic and how smart technology would be used to help organizations and the country reach its goals in the future. The results of the survey were published on July 5, 2021. About 100 building decision-makers across the UK & Ireland covering central government, large-scale healthcare, pharmaceutical, higher education, and wider commercial real estate, such as retail and banking with500+ employees were interviewed. 99% of respondents saw the advantages of smart buildings. Smart buildings can help senior leaders in operational efficiency, sustainability, and occupant experience. However, as the research reveals, there is still some way to go with getting senior leaders on board for the journey. Therefore, it is incumbent on technology providers to both educate the market on the future of what can be achieved by smart buildings and demonstrate the tangible benefits their budget investment can yield along the way.

(IS-2022-126) The Way Forward for ESG - Firms are Adapting Business Strategy and Boosting Technology Investment

This research report was authored by Verdantix and published by Corty Software Inc on October 20, 2021. As Environmental, Social, and Governance (ESG) and sustainability are rising to the top of the priority list for many organizations, ESG performance continues to play a larger role in financial decisions and access to capital, and more organizations are actively aligning overall business strategy with ESG goals to remain competitive and resilient. Corty contracted research firm, Verdantix to investigate: 1) Where 50 executives across 5 industries fall on the ESG maturity scale; 2) The state of corporate sustainability culture; 3) How executives are using operational data to define overall ESG and sustainability strategies; 4) The role of Environmental, Health, and Safety (EHS) in supporting ESG performance; and 5) Which technologies firms are investing in to improve ESG performance. The results show that firms with ESG and sustainability strategies that pay attention to improving cultures, leverage data to improve performance and invest in developing technologies are best placed to benefit from sustainable growth.

(IS-2022-125) The Grid Interactive Building

This White paper was authored and published by Siemens on June 22, 2021. This whitepaper identifies the emergence of a new type of building, the ‘grid-interactive building’, at the grid edge. The energy system is changing. Driven by climate policy, enabled by the decentralization of

energy generation and digitalization of buildings and systems. Decarbonization of energy use is more technically feasible than ever before. This paper outlines some key concepts around the changing low carbon and energy efficiency landscape, and how the grid and smart buildings are starting to work together in new, connected ways as the grid-interactive building at the grid edge. It looks at the technology benefits for commercial buildings' energy users in relation to the grid. Lastly, it outlines steps that users could take to realize these smart benefits.

(IS-2022-124) The Future of Hybrid Work in Government

This White paper was authored and published by Samsung Electronics America Inc. and published on November 22, 2021. The paper shows that given remote work is here to stay, the future of hybrid work in government needs to be compliant in end-to-end solutions that empower agencies to achieve their missions more effectively. Samsung, the global leader in mobile, audio, and visual technology is helping governments improve their digital technologies creating a more secure and productive environment for all. They quote a McKinsey report that details what technology investments will enable the federal government to sustain a secure, productive, and resilient hybrid work model. These include mobile hardware, enterprise collaboration software tools, cloud security, and physical technology. A hybrid model can only be effective if conference rooms are outfitted with audio and visual equipment and high-speed Wi-Fi to support seamless collaboration. Remote work is not only favorable from an employee satisfaction and productivity standpoint but for economic and environmental reasons, too. Global Workplace Analytics estimates that making a government-wide shift to half-time telework could save taxpayers $11 billion a year in real estate, improved productivity, disaster outage prevention, lowered absenteeism and decreased turnover.

(IS-2022-123) Why You Can't Afford Not to Invest in a Sustainable Built Environment

This report, authored by Catriona Brady, Victoria Burrows, Ahmad Al-Musa, Sara Kawamura, Carolina Montano Owen, Arianna Palmieri, and WSP consultants for the World Green Building Council and published in February 2022, draws from and embraces the rapidly growing sustainability agenda across the built environment: the evolving scope of sustainability; a broadening of what is called 'green'; closer alignment with the UN's Sustainable Development Goals; and finally the rise in social value as not just a consideration, but a business driver for developers and investors. The report demonstrates seven irrefutable co-benefits for investing in a sustainable built environment, across both the financial and social value case.

(IS-2022-122) The Hybrid Workplace - The Return to Work Report

This report, authored by William Cowell de Gruchy of Infogrid and published on February 9, 2022, is a follow-up to Infogrid's previous Healthy Buildings Report. The importance of a healthy workplace has never been more prevalent, with 63 percent of employees saying that they are more concerned about it today than they were before the pandemic. This report analyses the results of a survey of 2000 employees on their thoughts around hybrid working and returning to the office. Some of the themes addressed are: the impacts of different modes of work on employee mental health; how the workplace can increase employee productivity; what

employees expect from their employers as they return to work; and how employers can increase employee retention and attraction.

(IS-2022-121) Smart Buildings 2022

This report was authored by Andrew Phipps from Cushman Wakefield & Tom Redmayne from WiredScore and published on March 8, 2022. IoT gives a building the ability to use a mass of different data points to inform and make decisions. Linking this to the operating model via cloud computing allows for on-demand management of the building from anywhere and at any time. We are now able to visualize data in a much more user-friendly manner to allow decision-making to be more informed and to offer more clarity. This report provides the WiredScore definition of a smart building as one that delivers outstanding outcomes for all users, through digital technology, to exceed their evolving expectations. These include an inspirational experience, a workplace that attracts and delights, with flexible and personalized services, and a sustainable building through a reduced whole-life carbon footprint by using technology to operate the building more efficiently. Cost efficiencies are created by optimizing the building's performance and using future-proof design to be able to adapt to new demands. To deliver user functionalities reliably, robustly, and consistently, a smart building needs firm technological foundation. This is a combination of infrastructure, technological architecture, governance, and policy. Technological foundations are critical to ensuring the success of any smart building through reliable technology, a strong governance framework. They mitigate the risks associated with smart buildings while maximizing the outcomes.

(IS-2022-120) Power Digitalization - Understand and Achieve Active Energy Management in Buildings

This report was authored by Tony Hunt of Schneider Electric - Energy Management Research Center and published in February 2022. Most public, commercial, and industrial buildings are not energy efficient, representing an enormous untapped potential for decarbonization and sustainability efforts, as well as utility bill savings. Power digitalization plays a foundational role in active energy management and efficient facility operations. For existing buildings, this can be done by retrofitting electrical systems with smart devices and using energy and power management software that improves energy efficiency and reduces risk. This power digitalization investment helps facility management and maintenance personnel make better decisions, resolve issues more quickly, minimize downtime, and use less energy. In this paper, we define power digitalization for buildings and describe a 3-step process to achieve it. Power digitalization transforms organizations from being uninformed and reactive to those that are insightful and proactive. An investment in power digitalization ensures that building owners and investors get real-time carbon tracking and transparency about their building's energy usage and it is essential in avoiding obsolescence.

(IS-2022-119) Future Ready Broadband Ubiquitous Connectivity For MDUs

This report was authored by Jennifer Kent and Tam Williams of Parks Associates developed for Cox Communities and published in February 2022. Building on advanced connectivity services,

MDU property managers and owners can leverage the benefits of smart home devices and smart property solutions to drive revenue and increase net operating income. This whitepaper addresses the growing demand for exceptional connectivity in MDUs. It evaluates the benefits of next-generation connectivity services for MDU property managers and residents, as well as the role of the service provider as a key partner in smart MDU living. 53% of consumers report they value technology more now than before COVID-19 and are willing to pay for those features applicable to their living conditions and objectives.

(IS-2022-118) Bringing Embodied Carbon Upfront

This report was authored by Matthew Adams, Victoria Burrows, Stephen Richardson, of the World Green Building Council with support from Ramboil and C40. and published in February 2022. Carbon emissions are released not only during operational life but also during the manufacturing, transportation, construction, and end-of-life phases of all built assets – buildings and infrastructure. These emissions, commonly referred to as embodied carbon, have largely been overlooked historically but contribute around 11% of all global as well as the embodied carbon of individual materials. Achieving net zero embodied carbon for the entire sector will require far greater collaboration along the whole value chain to support efforts to decarbonize industry and to develop and deploy more low embodied carbon alternatives. Such collaboration allows businesses and organizations to identify and have confidence in the environmental, social, and financial benefits of taking a leadership position in the transition to a decarbonized built environment. This 3-phase report describes the literature review of the challenges and the possible pathways to overcome them with a final review by many experts and stakeholders in the value chain to improve the recommendations.

(IS-2022-117) 2022 Facility Management Predictions

This report was authored by Dan Weltin, Editor-in-Chief, of Facility Market with contributions from Kelly Spinola, John Hajduk, Paul Head, Stormy Friday, and Stephen Ashkin and published by fnPrime in February 2022. The authors look at the trends affecting facility managers in 2022, including the Internet of Things, COVID-19, hybrid workplaces, and sustainability. Health and wellness initiatives matter to occupants and smart technology allows facility managers to know and manage occupancy patterns. In addition, IoT technology can help FMs be more strategic in their energy use to help meet energy efficiency goals, including net zero energy. Hybrid workplaces are a direct result of the pandemic and are here to stay. the report shows that climate change creates the need to embrace environmental initiatives and sustainability efforts will continue to matter, but maybe now more than ever.

(IS-2022-116) The Work Ahead in IoT - The Gap Widens Between IoT 'Haves' and Have-nots'

This report was authored by Euan Davis and Manoj Mathew from Cognizant and published on September 2, 2021. The report discusses how the Internet of Things (IoT) has gained market momentum with the manufacturing sector being the top adopter. More effective IoT deployments include artificial intelligence (AI) and machine learning (ML) underpinnings. The main takeaway is that IoT drives organizational performance outcomes by combining it with

other advanced technologies and gaining buy-in from the employees is essential to making digital initiatives possible.

(IS-2022-115) IoT Signal

This report was prepared by Microsoft and published in November 2021. The report provides insights into the current and future state of the Internet of Things (IoT). The main takeaway is that IoT, despite its technological complexity, continues to drive organizational productivity beyond the COVID-19 pandemic. To advance such growth, consideration needs to be given to several technologies and factors that underpin its success such as artificial intelligence (AI), Edge Computing, Digital Twins, and data security.

(IS-2022-114) Internet of Things - Societal Challenges & Scientific Research Fields for IoT

This report authored by Emmanuel Baccelli from Inria and published on October 26 2021 presents Inria's views on the main trends and challenges in the Internet of Things (IoT), and how Inria is actively conducting scientific research, software development, and technology transfer around these challenges. Furthermore, the report identifies key societal challenges in a world depending on IoT, ranging from ethical concerns to transparency, sovereignty, and education. Emphasis must be placed on substantial research, deep tech development, and the introduction of standards to ensure that IoT benefits society and the environment.

(IS-2022-113) Ericsson Mobility Report

This report was prepared by Ericsson and published on June 4, 2021. The report deals with the trends regarding the 5G communication standard, mobile devices and traffic, and the Internet of Things (IoT). The speed of 5G uptake, which is far higher than it was for the 4G communication standard, is driving innovation to bring new technologies to market. Other important trends include IoT applications will be largely supported by 4G/5G and smartphones and video will drive up mobile data traffic. As such, it is recommended that societies plan for and invest in high-quality digital infrastructure.

(IS-2022-112) The State of Energy Management

This report, developed by DEXMA and published in 2021, forecasts trends in the energy industry post-COVID. It illustrates survey results carried out on 400 energy management professionals worldwide. The content provides insights into the industry composition, priorities, challenges, and technologies they use. Results suggest that identifying cost-effective energy efficiency improvements quickly and budgetary restrictions are the core challenge while HVAC is the most energy-intensive component in their buildings. On the other hand, air quality has become a key issue for companies to monitor, and the use of Energy Management Software (EMS) is growing. In terms of technological trends, demand response as well as control and optimization solutions sit at the top of the spectrum.

(IS-2022-111) Rethinking Buildings Post COVID-19

This report published in 2021 by Honeywell Building Trends Series was prepared to measure the perception of the impacts on building strategies and practices after the pandemic with a greater focus on healthy buildings and indoor air quality (IAQ). It shows the result of a survey conducted among facility managers who operate buildings across different sectors in the United States, China, Germany, and Saudi Arabia. Findings suggest that as occupants are more aware of how buildings can affect their well-being, this results in buildings operators having to rethink their modes of operations and incorporate investments in smart solutions that drive efficiency or sustainability while improving occupant experience.

(IS-2022-110) Net Zero Buildings - Why Companies Need a Single Strategy for Sustainability and Digitalization

This report was developed by Alvin NG from Johnson Controls, and published in 2021. It was written to justify the synergy between sustainability and digitalization. It is known that while decarbonization has become the major theme of sustainability driven by emission reduction targets, digital technologies on their own use lower costs and maximize efficiency and productivity as a selling point. In this sense, platforms that rely on cutting-edge software are presented as the solution for buildings to monitor and control every key performance indicator of the operations from a single dashboard. It suggests that alignment of the two strategies, despite its evident benefits, can still be a challenging task; in particular, due to the variety of systems and volume of data in today's buildings. Nonetheless, early adopters of this approach will be in a better position to face the demands of a low-carbon future.

(IS-2022-109) Energy Efficiency of Smart Buildings - Towards Zero Consumption and Beyond

This report, developed by ABB and published in 2021, illustrates the array of building technologies readily available for energy and water consumption. The report argues that in smart buildings, savings depend upon the adjustability and controllability of systems. It exemplifies how variable speed drive (VSD) technology is instrumental to solve energy loss problems in buildings. It shows how high-efficiency motors, that allow partial load performance and integrated speed controls, offer excellent energy potential. Lastly, it suggests that Building Management Systems (BMS) coupled with digital services can take efficiency to new heights of performance and shorten returns on investments (ROI).

(IS-2022-108) Rate Designs Harnessing Vehicle Grid Integration Technology

This report was authored by Energy+Environmental Economics (E3) and published in May 2021. This report explores novel tariff designs that leverage active vehicle-grid integrations and electric vehicle charging aggregators to provide enhanced charging profiles that would benefit utilities, ratepayers, and drivers. The report presents a simulation for California that indicates moving from basic flat rates to time-of-use (TOU) would provide a 116% increase in net savings for drivers but may present other complications with the introduction of a secondary peak load. The report continues on to explore the inclusion of aggregators who can actively manage the

charging for several thousand chargers, ensuring the best price for the drivers, better utilization of the grid, and more flexible tariff schemes along with the utility to better match the operating costs.

(IS-2022-107) Adaptive Lighting in Outdoor Security Applications

This report was authored by Nicole Hathaway and Manual Lopez from California Lighting Technology Center at UC Davis and published in November 2021. The report explores the different types of technologies used for detecting motion in security applications and explains that adaptive lighting has not been widely adopted within these environments. A case study is provided to demonstrate the effects of adaptive lighting adoption in security applications and the results indicate that 36 - 44% of energy was saved, with 90% of participants suggesting that the lighting was equivalent to or better than the preexisting system.

(IS-2022-106) White Paper on Unified Glare Rating (UGR)

This report was prepared by Ian Ashdown, Steve Fotios, Matt Hartley, Glenn Heinmiller, and Nathaniel Jones, in collaboration with the National Electrical Manufacturers Association, and published on October 2021. The report provides insight into the proper use of the Unified Glare Rating (UGR) for lighting design to meet application and task visual needs. Consideration is given to the historical background of UGR, literature review, and standards to clarify the intended use, embedded assumptions, and correct lighting design use. The information provided will help organizations and individuals to create better lighting designs.

(IS-2022-105) Office Sublease Space at a Glance: North America Q4 2021

This report, authored by Cushman & Wakefield and published in February 2022, provides key themes and trends regarding office sublease space in the United States and Canada. Key themes include a decline in the U.S. sublease inventory, an increase in leasing activity, and the negative impact of the pandemic on the sublease space in Central Business Districts (CBDs). In Canada, sublease space declined in two of the four major Canadian markets, including Toronto and Calgary. There remains a sign of recovery for the sublease market in North America based on a decline in vacant sublease inventory in several major cities.

(IS-2022-104) Global Hotel Investment Outlook

This report, prepared by Jones Lang LaSalle (JLL) and published in January 2022, provides a forward outlook on the global lodging industry. Consideration is given to the impact of several factors on the industry including Covid19 pandemic, labor shortages, supply chain delays, operational costs, sustainability, and consumer demand. There is an overall favorable outlook for the industry based on an observed increase in global transaction volume, potential interest by investors, the industry's commitment to sustainability, and evolution in the physical use of available space.

(IS-2022-103) State Energy Efficiency Policy in a New Era, A Toolkit for Governors

This report was authored by Matthew Rogotzke, Jessica Rackley, and Dan Lauf from the National Governors Association and published in October 2021. The report provides insight for U.S. state governors on how to improve the energy efficiency policy for their states as efforts to decarbonize continue to grow. Recommendations are made to lead by example and capture cost savings, create jobs, reduce energy consumption, prevent pollution, and strengthen grid security. It is also suggested for states to engage utilities to provide affordable rates and increase access to energy efficiency projects.

(IS-2022-102) Reaching Today's Video Audiences - Platform Diversity and ROI

This report was authored by Paul Erickson and Tam Williams from Parks Associates and published in January 2022. The report discusses the growth in streaming video adoption and the expanding use of the "over-the-top" (OTT) video services. Device platforms used inside and outside the home to view video are considered. Information is provided regarding potential tradeoffs, complexities, and return-on-investment challenges presented when deploying broad platform support. Adoption of streaming video services is at an all-time high and video service providers need to ensure multi-platform device support.

(IS-2022-101) Energy Efficiency in Real Estate and Facility Management

This report was prepared by Dexma and published in September 2021. The report deals with an energy management strategy that real estate and facilities management companies can use to effectively manage multiple locations. A strategy is suggested that relies on data analytics and artificial intelligence to detect, analyze, and optimize the potential energy savings. Dexma's energy intelligence solution is proposed as a viable solution to achieving such savings. The reports find that efficient energy analysis and management of a portfolio, consisting of many buildings, requires a centralized energy analytics platform.

(IS-2022-100) Breath of Fresh of Air - How Clean Air Technology Can Give Your Building a New Lease on Life

This report, prepared by Johnson Controls and published in July 2021 presents survey results from 826 business leaders in Europe, the Middle East, Asia, and Latin America and presents the extent to which businesses have implemented clean air technology solutions. Key takeaways include air purification was implemented by 73% of the respondents and health care organizations and hotels are among the top leaders in implementing clean air technology. The report also offers a practical six-step strategy for achieving clean air in the workplace by considering ventilation, filtration, disinfection, isolation, monitoring, and maintenance.

(IS-2022-99) 70 Technology Trends That Will and Will Not Shape 2022

This report, authored by Stuart Carlaw of ABI Research and published in December 2021, presents key critical trends that will likely materialize in 2022 and those that will not. Main takeaways

include supply chain issues and a prediction that 5G will continue to struggle in the enterprise sector. Furthermore, Ultra-Wideband (UWB) will accelerate precise location technologies to the mainstream, and the Chinese vendor community will retain its stranglehold on the Internet of Things (IoT) module market. Overall, 2022 will be promising and full of opportunities.

(IS-2022-98) New Criteria for a New, Smart Building Era

This report, published in July 2021, discusses the key criteria for designing and constructing new smart buildings which include cybersecurity, modeling capability using digital twins, and the use of smart technologies for building monitoring and control. To ensure buildings remain future-proofed, the new technology that is installed must interact easily with other devices/control systems. Siemens Smart Infrastructure unit is proposed as a source of expertise for organizations intending to design and construct new buildings.

(IS-2022-97) Energy Market Outlook What to Expect in 2022 and Beyond

Enel X's 2022 Energy Market Outlook, published in January 2022, provides energy summaries of the biggest US regional and national stories that may affect end users and pairs them with 2022 forecasts and discussions of energy products. Suggestions are provided on energy strategy which can serve as a resource to help organizations with their energy roadmap. The main trends discussed include growth in renewable energy sources, electric vehicle investment, natural gas pricing, zero-emission commitments, and a decline in energy storage (battery) costs. The main takeaway is that organizations need to consider the main trends when setting their business goals.

(IS-2022-96) Home Security - A Redefined Market

This whitepaper authored by Amanda Kung from Parks Associates and published June 7, 2021 centers on the factors affecting the steady growth of the adoption of home security systems and professional monitoring services. Key trends include growth in self-installation of newly acquired security systems, strong new-start home sales with higher-than-average adoption of security, a rise in home renovations with more time spent at home, and increased second home sales in vacation areas. The main takeaway is that security dealers need to continue to seek unified solutions, have low support costs, and provide value for the customer.

(IS-2022-95) Adaptive, Sensor-Based Lighting for Security Applications

This report was prepared by California Lighting Technology Center & Hawaii Natural Energy Institute and published in November 2021. The report addresses adaptive lighting strategies, that include energy-efficient light sources and lighting controls, to reduce energy consumption and light pollution. The report provides in-depth coverage of available lighting technologies taking into consideration security guidelines. Results of field research and laboratory evaluation of lighting systems are included. Recommendations are provided for both general and high-security exterior lighting applications.

(IS-2022-94) 2021 Connecticut Public Utilities Annual Cybersecurity Report

This report was authored by Marissa P. Gillett from the State of Connecticut Public Utilities Regulatory Authority and published on January 7, 2022. The report deals with the growth of cybersecurity threats facing Connecticut's public utilities and the development of cybersecurity programs to mitigate such threats. Following the framework established by the Cybersecurity Action Plan, the key elements considered for the development of cybersecurity programs were corporate culture, threats, and the cybersecurity capability maturity model (C2M2). The main takeaway is that the success of a cybersecurity program relies on the commitment of all employees in an organization, as demonstrated by utility decision makers and support staff in Connecticut's utilities.

(IS-2022-93) Three Ways to Reduce Operating Costs of Power Generators with Remote Management

This report was prepared by HMS Industrial Networks and published April 2021. The report describes three ways in which remote management can be used in power generation to reduce the operating costs and improve control for a generator and engine combination (genset) fleet. They include predictive service of equipment based on usage, remote testing to avoid startup problems, and reduced fuel theft or leakage through remote sensor monitoring. Industrial examples of a communication gateway and a central management survey are provided. Benefits of remote monitoring include reduced operating costs, extended lifetime of equipment, and improved planning of service visits and refueling.

(IS-2022-92) Value Beyond Home Security: Expanding Product Ecosystems

This report was authored by Jennifer Kent from Parks Associates and published on March 8, 2022. The report discusses how the market growth of connected devices and new technology has led to an expansion of professional services beyond home security. Anticipated growth is expected in residential broadband, video analytics, AI capabilities, smart lighting, smart sensors, smart sirens, vehicle smart tags, and perimeter monitoring. The main takeaway is that market growth will create further opportunities for professionals to integrate new monitoring services into the home.

(IS-2022-91) Smart Home Market Dynamics Report – 2021

This report was authored by Blake Kozak from Omdia and published November 2021. The report assesses numerous smart home industry scenarios and presents alternate paths that the smart industry may take toward 2030 based on device and industry trends. Long term growth potential for the smart home industry is also presented. Included in the report are historical costs for device imports and exports such as thermostats and door locks. The main takeaway is that the adoption of Matter, a new home automation connectivity standard, will be the catalyst for smart home growth.

(IS-2022-90) Global Guide to CRE Investing in 2022

This report was published by Cushman & Wakefield, March 2022. The report presents a well-researched perspective for investing globally in the 2022 commercial real estate market. An overview of the commercial real estate market is provided across Asia, North America, Latin America, and Europe along with market drivers, capital markets, and investment recommendations. The main takeaway is that the global property market recovery will gain momentum in 2022-23 creating global opportunities for investors.

(IS-2022-89) 2022 Canadian Construction Forecast

This report was authored by Andrew Snook and Mary Van Buren from On-Site and published December 2021. The report presents a promising 2022 outlook for Canada's construction sector but underscores that labour and supply chain challenges will persist. Other key trends include the importance of apprenticeship programs, data sharing, collaboration, cybersecurity, and new delivery models. The report is useful for businesses to identify specific market signals to successfully navigate the changing construction landscape. The Procor construction management platform is promoted as a way for construction companies to digitally transform their business.

(IS-2022-88) Green Quadrant: IoT Platforms for Smart Buildings 2022

This report was authored by Dayann Charles Jeyamohan and Susan Clarke from Verdantix and published January 2022. The report includes a detailed comparison of the 17 most prominent Internet of Things (IoT) platforms for smart buildings available on the market. The market leaders include: JCI, Schneider Electric, Siemens and Spacewell. The majority of the platforms have evolved to include asset monitoring and maintenance, energy management, space monitoring, and building security. The report provides real estate owners and technology buyers insight to the leading offerings in the market and the vendors that will best meet their needs.

(IS-2022-87) Creating secure IoT device identities

This report was prepared by Intertrust and published February 2022. The report describes how to create secure Interne of Things (IoT) device and sensor identities, fostering data access and interaction across devices in a trusted ecosystem. Details are provided on how device and sensor identities function and the importance that public key cryptography plays in securing the identities. Consideration is also given to the provisioning process by which devices are provided an identity. A comprehensive, cost-effective, and a scalable solution developed by Intertrust is presented for the provisioning process.

(IS-2022-86) The 2022 Buyer's Guide for CRE Building Operations Technology

This report was prepared by Building Engines and published January 2022. The report provides commercial real estate owners and operators with a framework for selecting a building operations platform. The framework consists of the following five key elements: maximization of net operating income, effective and mobile friendly communication with tenants and operations

team, thoroughness in deployment and support, interoperability and connectivity, and enterprise capability. The Prism building operations platform is proposed as a viable solution.

(IS-2022-85) Blended learning without limits

This report was authored by Samsung and published January 2022. The report deals with Samsung's digital education platform that can empower educators to help their students succeed while improving their mental well-being and the end-to-end education experience. The platform includes vibrant interactive digital whiteboards and advanced classroom management software. The benefits of the platform include scalability, cross-device compatibility, reduced preparation time for teachers, improved student engagement and interaction, and better connectedness between students and teachers.

(IS-2022-84) PRASH: A Framework for Privacy Risk Analysis of Smart Homes

This report was authored by Joseph Bugeja, Andreas Jacobsson, and Paul Davidsson and published in the Sensors Journal September 2021. The report deals with a security framework, PRASH, for modeling and analyzing the privacy risks of smart homes. Its three modules (system model, threat model, privacy metrics) enable privacy risk assessment of a smart home system. PRASH capability enables early threat identification, improved risk management scenario planning, and attack mitigation. Overall, PRASH will help to preserve privacy rights of residents.

(IS-2022-83) Private Networks Vol.1 - Transforming Private Networks with Samsung 5G

This report was prepared by Samsung and published October 2021. The report deals with private networks and proposes Samsung's 5G network solution as a superior strategy as compared to existing Wi-Fi based networks. The advantages of 5G networks include reduced latency, improved mobility, security, reliability, flexibility, coverage, and capacity. The application uses cases considered include smart factories, transportation, logistics, smart cities, and medical devices. The details of Samsung's private 5G solution are also presented in detail and cover radio, core, and transport network, along with the network management system.

(IS-2022-82) How AI Edge Platforms Can Transform Smart Spaces

This report was prepared by Mobile World Live and published April 2021. The report explores how artificial intelligence (AI)-enabled edge computing platforms are reshaping the way cities, enterprises, and venues operate. The role of mobile operators is also examined since they provide the underlying connectivity and bring together the various stakeholders necessary to make this transformation. Furthermore, the importance of video data in smart space applications is examined and NVIDIA Metropolis is proposed as a video analytics platform that applies deep learning AI to video streams. Supermicro's servers are featured as a viable solution for edge computing.

(IS-2022-81) Global Security Insights Report

This report was authored by Rick McElroy from WMW are and published April 2021. Based on a survey of 3,542 information technology executives, the report deals with the challenges and issues facing businesses worldwide when it comes to escalating cyberattacks. It identifies trends in hacking and malicious attacks, and the impact of security breaches on organizations' finances and reputation. Insights are provided on organizations' plans for securing new technology, adopting a cloud-first security strategy, and dealing with the complexity of the current cybersecurity management environment.

(IS-2022-80) 5 Steps to Delivering Smart Buildings

This report was prepared by Johnson Controls and published September 2021. The report outlines the key steps required to successfully create smart buildings. Since each building is unique, each approach needs to be tailored to ensure that smart solutions work together to get the desired results. The key steps included identifying building's weaknesses, creating a strategy to meet business objectives, assessing the smart technology currently in the building, creating a plan to integrate existing and new smart technologies, and communicating with stakeholders while delivering on the plan.

(IS-2022-79) OTT Streaming Trends to Watch in 2022

This report was authored by Eric Sorensen and Paul Erickson from Parks Associates and published February 2022. Important trends in the evolution of streaming services (TV via the Internet) are reviewed. Key among these is the smart TV as a platform for accessing streaming stations, ad-supported streaming services (rather than pay-TV), and frequent churn as customers change streaming service providers. Streaming media players such as Roku are losing ground to smart TVs with built-in stream handling. The report recommends that providers focus on customer retention to overcome churn. The likelihood of mergers among streaming providers and the emergence of streams produced outside of the established distribution channels are discussed.

(IS-2022-78) How will offshore wind developments affect the U.S. power grid?

This report was authored by Maria Scheller, Thomas Rostad, Akanksha Goyal, and Ameya Ghodke of ICF and published in January 2022. The potential impact of large scale (28 GW) power generation by wind turbines offshore from the US Northeast and Mid-Atlantic states is analyzed. Offshore winds are more consistent than on land. Based on the model developed, local power prices should decrease as these wind-power sources increase. In some regions, transmission costs may increase to carry this power from the locations of the wind turbines. If the transmission grid cannot handle this power, the turbines may need to be curtailed. An alternative is to locate hydrogen production plants nearby to utilize this wind power.

(IS-2022-77) Health at Home: New Era of Healthcare

This report was authored by Jennifer Kent of Parks Associates and published in January 2022. The growth in the use of telehealth services by customers has accelerated from about 15% in 2019 to 60% in 2021 as a result of the pandemic in 2020. This growth is facilitated by changes in

reimbursement, regulations, funding, staffing shortages, device innovation, and customer demand. Telehealth encompasses virtual visits, remote diagnostics, chronic condition management, post-discharge monitoring, and hospital at home. Remote care can be enhanced with remote diagnostic tools. Issues with such technologies are presented. Sensors for passive monitoring are discussed.

(IS-2022-76) Extreme Weather and Regional Grid Resilience; Lessons Learned from Texas Winter Storm Uri

This report was authored by Bruce Rising and 13 others and published by Siemens Energy, Inc. in January 2022. System failures in the regional management of electricity generation and distribution that led to massive power disruptions in Texas in February 2021 are analyzed. Cold weather is noted as a greater threat to supplies than hot weather. Suggestions for improvement include coordinating wind power with gas turbines, increasing gas storage, and preparing equipment for operation in cold weather. Improvements are recommended for each part of the electric grid starting with generation. Recommendations for the Texas grid to interconnect with other multi-state grids on a limited basis are included.

(IS-2022-75) Decarbonization | Addressing decarbonization at the grid edge

This report was authored by Delta-EE, a research and consultancy company, for Siemens Industry, Inc. and published in October 2020. Decarbonization can reduce energy-related costs and can benefit the reputation of the company brand. Decentralization and digitization are facilitating decarbonization. Countries are deciding between emissions trading and a carbon tax. Energy generation is moving to the edge of the grid at the customer site with sources such as wind, solar, and storage, the electrification of heat and transportation, and generation of hydrogen from excess renewable energy. Use cases are presented for microgrids, virtual power plants, and e-mobility. Business strategies for achieving decarbonization are presented.

(IS-2022-74) Parks Associates 2022 Top Tech Trends

This report was authored by Jennifer Kent and others from Parks Associates and published in 2022. Five researchers at Parks Associates offer predictions for trends in the home systems market. Among the notable trends are the predicted mergers of media companies even as customers have more choices in video streams. "Personal Emergency Response Systems" and remote monitoring will increase for older consumers. Some customers expect health care providers to support remote monitoring. Product interoperability will continue to be challenging unless competitors agree to cooperate (such as the Matter initiative). Builders of multi-family units will be increasing the adoption of smart home technology. Solar panels, storage batteries, and smart thermostat adoption will depend on government and utility incentives. Internet providers will be offering smart Wi-Fi applications.

(IS-2022-73) The Disruptive Potential of Managed Wi-Fi

This report by Parks Associates, published in 2021 discusses what constitutes broadband Internet

speeds and how there are differences among US government minimum standards for broadband (25 Mbps download and 3 Mbps upload) and minimum speed requirements for various streaming video services. There are further variations according to desired resolution (typically 3 Mbps for standard definition TV, 5 Mbps for high definition TV, 25 Mbps for 4K definition TV) and latency (delays that affect online gaming). 13 million US homes have no high-speed Internet access. As more people work from home, managed Wi-Fi service is growing in popularity to maintain connectivity and segregate work data from family data.

(IS-2022-72) Smart Products: Building the Modern Home

This report was authored by Patrice Samuels from Parks Associates and published in 2021. It provides an overview of the market growth in smart home devices. Such devices cover a large variety such as computers, smartphones, smart TVs, smart speakers, heart rate monitors, and sleep monitors. By 2025, US broadband households with broadband Internet service are predicted to have an average of 20 connected devices. Smart home controls applications include access control, lighting, energy management, safety systems, and water management. Some smart product features include a refrigerator that adapts to minimize energy usage, indoor air-quality monitoring, a package delivery portal to the house, and energy storage batteries for home power.

(IS-2022-71) Future-Ready Broadband: Ubiquitous Connectivity for MDUs

This report was authored by Jennifer Kent and Tam Williams from Parks Associates and published in 2021. The market for broadband connections in multi-dwelling units (MDUs) grew during the pandemic that started in 2020 as about 60% of occupants were working or learning from home. Property managers may offer better services at lower rates than if the tenant purchased service directly from an Internet service provider. 40% would like Internet access to be included in their rent payment; 77% are willing to pay higher rent for Internet access. This report explains how MDU managers could benefit from networked devices that monitor energy usage, water leakage, and control building services such as lighting.

(IS-2022-70) Home Security: Choice is the Ultimate Value Proposition

This report was authored by Jennifer Kent and Tam Williams from Parks Associates and published in 2021. The home security market grew about 10% in 2021 to reach 33% of households with broadband services (compared to 19% in 2016). 56% of new installations were self-installed. Most consumers want a unified application (app) experience as they add devices. Consumers have more choices of contracts, installation, and service at lower prices. Broadband service providers are adding home security to complement network security offerings. Some offerings are for monitoring security and other devices chosen by the customer. The market leaders among purchasers are parents and those forming new households.

(IS-2022-69) Home Energy Management: Driving Consumer Engagement and New Revenue

Effective energy management in a house requires timely information about solutions that are

easy to use. Consumers are responding through "mindful actions" such as adjusting lights and thermostats, home improvements, and "extreme measures" such as installing solar panels. Consumers show a "lack of enthusiasm" for data about energy usage. Saving money is an incentive for energy management. Messages from utilities should be personalized for the customer. Connected devices in a home can offer opportunities for energy management especially if automated in smart devices. Consumers prefer energy management through automation with very little manual input. This report was written by Parks Associates and published in 2021.

(IS-2022-68) AI-enabled Data: Key to Video Service Optimization In Partnership

This report by Parks Associates, published in 2021, explores applications of artificial intelligence (AI) and machine learning (ML) to help providers and customers optimize the delivery of streaming TV services. 82% of those households with high-speed Internet access subscribe to at least one streaming service; the average is 5.6 streaming services. There is frequent churn in subscriptions except for Netflix (subscribed for 48 months), Amazon Prime (38 months), and Hulu (28 months). The churn rate is 44% especially among one-quarter of customers. Options for providers to retain customers are discussed using AI and ML tools. These tools are can help with enhancing revenue, customer experience, content, churn detection and prediction, subscriber retention, audience analysis, and improving returns-on-investment.

(IS-2022-67) The Changing Landscape for EPCs in Canada - An Industry Perspective

This White Paper by MCW and KWM Consulting, provides a multi-faceted overview of the current state of Energy Performance Contract (EPC) services delivery in Canada, an industry MCW has supported for 30 years through MCW Custom Energy Solutions Ltd., our dedicated performance contracting division. The White Paper aims to provide unbiased evidence of historical success and recommendations regarding EPC project structures to policy-makers, regulatory organizations, and prospective EPC clients in the Canadian public sector. MCW looks forward to the future of the EPC model in Canada, which we believe remains a key solution to enacting important energy conservation, cost saving and de-carbonization solutions in existing building stock – a critical component of our collective ongoing climate change mitigation efforts.

(IS-2022-66) Using Data to Drive Workplace Innovation and Sustainability

In the facility management (FM) industry, both sustainability and workplace optimization have shifted from long-term goals to urgent, short-term priorities. With buildings currently accounting for around 40% of global carbon emissions, the need to improve the environmental performance of our buildings has never been greater. This white paper by Frost & Sullivan reveals the benefits of integrating building management solutions on a single technology platform, actionable data and tangible solutions to improve the management of buildings, how to leverage data to improve efficiency and tackle the sustainability challenges of the future and how to use integrated data insights to improve the way we design, build and operate buildings; comply with regulations; report our emissions; eliminate waste; and reduce operating costs and minimize risk.

(IS-2022-65) The Sustainable Real Estate Program Handbook

The 33-page handbook, by Stok LLC, covers critical factors in both developing and managing a Sustainable Real Estate Program. Each section provides a clear, step-by-step approach that seeks to codify and simplify what is, for most companies, a complex exercise in change. The handbook also uncovers insights behind key success factors: leadership, data, stakeholder buy-in, communication, and strategic approach.

(IS-2022-64) The Plumbing of Internet of Things

Today's device builders are scrambling to create feature-rich connected devices with digital experiences around them. But developers face challenges when adopting technology for an IoT implementation. This whitepaper by Siemens Digital Industries Software reviews ways to help manage potential risk factors.

(IS-2022-63) HVAC Winter 2022

This eBook was authored by Consulting-Specifying Engineer, Air Solutions Company and, Grundfos and published by CFEMedia on January 26, 2022. The eBook covers topics on the use of louvers to prevent snow intake, filters for HVAC, specifying roof top units, pumping systems, integrating BAS in designs and improving indoor air quality. Each topic explains the challenges and opportunities in these HVAC applications with case studies and AHSRAE standards and other regulations that could apply. New controls and building automation capabilities are shown to provide better control, monitoring, and reporting to improve performance and avoid breakdowns.

(IS-2022-62) How Tech is Helping Companies Optimize a Hybrid Future

As more and more companies invest substantial time and money into the ideal hybrid workplace, it is becoming ever more critical to have a crystal clear understanding of what occupiers really want out of their new flexible, hybrid spaces. In this report by Smarten Spaces published February 2022, the author explores the hybrid workplace priorities for enterprise office occupiers, and discuss a range of strategies which firms in a range of industries can use to provide these workplaces cost effectively, from technology to layouts and beyond.

(IS-2022-61) Combining OpenADR and EEBUS for Energy Control

In this whitepaper, by OpenADR and EEBUS, published January 2022 explains how these two established industry standards provide a solution available today to handle rapidly growing power demands. The paper details how secure capacity & tariff management and building control provided by both OpenADR and EEBUS together can enhance energy management and the smart grid. The paper examines the two standards often considered for energy management and smart grid applications. It helps to identify the key criteria that decision makers should be evaluating when designing a solution in terms of performance, reliability, scalability, interoperability, and security.

(IS-2022-60) Building a Better Hybrid Workplace

Hybrid work is the future. But how do we improve and adapt our spaces to operate successful hybrid models? Learn how companies use data to build better workplaces that are safe, efficient and empower people to do their best work. This report covers: where employees prefer to work using heatmaps of floorplans, creating safer spaces using occupancy data and displays, and building better workplace experiences by protecting employee privacy.

(IS-2022-59) Beyond IR Thermography How Continuous Thermal Monitoring Improves Performance and Equipment Protection

For many years, scheduled infrared thermography inspections have been the accepted method for reducing the risk of fire by identifying faulty or loose connections in electrical distribution systems. Continuous thermal monitoring offers a safer, more effective way to detect thermal risks on a system-wide, 24/7 basis before they occur. This report, by Schneider Electric, discusses how thermal monitoring reduces risk of fire more effectively than IR thermography.

(IS-2022-58) Accelerating the Path to Design Buildings that Satisfy Performance and Comfort

This report, authored by Ruben Cabanillas Ramosf at Skidmore, Owings & Merrill (SOM) and published on January 14, 2022 by Cove.tool reviews a case study and describes the process and methodology, required climate data and various tools to bring moisture, temperature and air into the proper comfort zone. By adding cove.tool to their existing workflow, the designers at SOM found value in the way cove.tool helped them organize their data and reduce the number of steps and approvals in their original workflow. It also helped teams save countless hours through a simplified workflow that increased collaboration.

(IS-2022-57) A New Way to Work Requires a Novel Approach to Technology Investments

This report was authored by contributors to and staff at Frost and Sullivan and published in December 2021. The report is a compilation of 4 Chapters that describe the way business is adopting digital technologies and cloud services to enhance the work environment and increase productivity. The hybrid work environment, where employees, regardless of their location, have high-quality access to the tools and information they need to carry on their work, connect and collaborate with other team members, in a seamless, fully secure, uninterrupted way, is here to stay. API and integration unlock the full potential of Cloud communications and collaboration.

(IS-2022-56) The State of Commercial Real Estate Building Operations for 2022

This report was authored and published by Building Engines in January 2022. They partnered with BOMA (Building Owners and Managers Association International) to survey commercial property professionals about the state of CRE (commercial real estate) today, and their intentions and expectations for 2022. The survey results suggest an optimistic outlook for the commercial real estate industry in the year ahead. 93 percent of the CRE professionals we surveyed said their

property portfolio had stayed the same or gotten bigger in 2021. And 98 percent of them expected their investment in CRE software to stay the same or increase in 2022. Property teams are increasingly aware of the carbon footprint of commercial buildings. They are taking action to address this, with 71 percent of survey respondents prioritizing energy efficiency for 2022. And they are conscious of a change in tenant expectations, with 63 percent of respondents looking to address health, wellness, and air quality in their buildings.

(IS-2022-55) The Growing Demand for Resiliency Solutions as Extreme Weather Increases

This report was authored and published by Bloom Energy and Wood Mackenzie Power and Renewables in January 2022. The Department of Energy (DOE) estimates that power outages cost the U.S. economy $150 billion annually. Both the proliferation of more extreme weather events and America's aging power grid due that has much of the transmission and distribution built in the 1950s and 1960s. This aging grid is more vulnerable to outages caused by extreme weather. And utility initiatives to harden the grid against extreme weather are expensive, costs that will ultimately be passed down to ratepayers. In this report, Bloom Energy compares the various options for backup power with regards to costs, response time and environmental impacts.

(IS-2022-54) State of the Hybrid Workplace Report

This report authored and published by VergeSense in January 2022 analyzes workplace utilization data drawn from over 40M square feet from across the world, covering various industries and enterprises. Averaging utilization across company working hours it was found that office utilization has increased by 135% since the start of the pandemic. New space planning ratio is one collaboration space for every two desks vs. the previous one collaboration space for every six desks pre-pandemic. Since the start of the year (Q1 2021) the average number of collaborative spaces per floor has increased by 35%. The average number of individual spaces per floor has stayed the same. Utilization of collaborative spaces has increased by 50%. In Q3 2021, the most frequented work-from-office days were Tuesdays and Wednesdays with 46% of total office utilization happening on those days. This report underscores that the future of the office is highly collaborative and agile, and the following data will help equip business leaders to make informed decisions regarding their real estate portfolios and office spaces.

(IS-2022-53) Smart Building Connectivity Shaping the Always-on Business of Tomorrow

In this December 2021 CommScope discusses three consistent needs emerging as enterprises embrace the efficiencies of intelligent buildings: The need for mobile connectivity within the enterprise, as fewer employees are bound to desks but need ubiquitous wireless coverage. The need to lay a future-ready infrastructure foundation for the still-evolving, ever-growing internet of things (IoT). The need to converge many disparate or proprietary networks onto a single, unified IP over Ethernet physical network layer Each chapter includes specific recommendations you can put to work in your enterprise network to create a more intelligent, more efficient building that better serves the needs of your growing business.

(IS-2022-52) Intelligent Buildings - A Technical Overview

This July 2021 report released by the Center for Energy and Environment, based in Minneapolis, provides an overview of the state of intelligent building technologies. The authors look at what can be currently deployed to increase the efficiency of building operations, promote greater occupant comfort and productivity, and serve as an energy resource to the electrical utility grid. Details are provided on what it means for a commercial building to be intelligent and opportunities that can bring to building owners, operators, and occupants, as well as the grid.

(IS-2022-51) Intelligent Buildings Literature Review

This report by the Center for Energy and Environment came out in September 2021. In highlighting the areas that impact intelligent building energy use, this report focuses on the importance of ensuring that potential strategies are aligned with current design trends, market structure, building operation/maintenance, and work practices. Energy efficiency opportunities that intelligent buildings can provide are discussed along with their market potential.

(IS-2022-50) Smart Home Ecosystem Growth Opportunities

This report by Harbor Research (August 2021) highlights that smart home market is fragmented with competing networking standards, a myriad of multi-purpose hubs, and legacy-entrenched technology that tend to focus on single applications (e.g., home security, energy, entertainment). Further challenges include incomplete platforms, narrow point-solutions, and software incompatibility. Technical recommendations are proposed for greater industry collaboration to remove barriers to adoption, improve the overall user experience and lower cost.

(IS-2022-49) What Gets Measured Gets Managed - The Role of Real-Time Insights in Construction Project Success

This report from Procore Technologies (May 2021) explains how construction managers can improve product quality, overall efficiency, and productivity by having better visibility into project performance. Various strategies for gaining those real-time insights into projects are discussed, including performance monitoring systems (construction- specific platforms and point solutions) and artificial intelligence (AI) or machine learning technologies. The research suggests that companies can still improve their performance by shifting away from manual data collection and reporting tools and adopting integrated platforms that deliver real-time performance metrics.

(IS-2022-48) Grid-Edge DERMS - An Enterprise Platform Built to Manage DERS at Scale

This 2021 report from New York-based EnergyHub focuses on how electricity grid operators can manage distributed energy resources (DER) on both sides of the meter - at the grid-edge - using a combination of DER Management Strategies (DERMS). Following discussion of key challenges in managing grid-edge DERs, the authors examine five key capabilities required, including customer-centric aggregation, grid-edge situational awareness and a robust infrastructure.

Illustrations of operating models and examples of successful deployments are provided including one focusing on electrical utility Arizona Public Service.

(IS-2022-47) Draft Heat in Buildings Strategy - Achieving Net Zero Emissions in Scotland's Buildings

This draft strategy by the government of Scotland (February 2021) sets out actions and proposals for transforming the country's buildings and the systems that supply their heat, ensuring all buildings reach zero emissions by 2045. A framework for the country's long term local heat and energy efficiency, dubbed LHEES, is outlined. Strategic priorities include supporting those least able to pay; strategic investments in technology; showcasing net zero Leadership; and investing in Innovation and demonstration to drive forward competitive advantage. Under the £1.6-billion LHEES program, over two million homes and 100,000 non-domestic properties will transition from fossil fuel powered heating to non-fossil fuel energy efficient systems, by 2034, and, to zero emissions heating and cooling systems by 2045.

(IS-2022-46) Equipment Reliability - Basics Matter Now More Than Ever

This 2021 branded content report by GE Digital and Utility Dive produced by studio is subtitled "How changing operations and market dynamics put a renewed focus on cost- efficient plant-wide reliability." Power plant owners and operators are expected to continue to face greater reliability challenges. This report highlights that combining the workflows and fundamentals – that have always been essential to reliability – with advanced software and analytics that monitor all of the components of a power plant, traditional power generators can become more reliable even as their operations change.

(IS-2022-45) PoE Lighting Improves Firefighting Preparedness and Response

This 2021 report by the Siemon Company examines the ability to integrate a digital lighting system with an existing emergency alert system. A case study focusing on the Evendale Fire Department located in Cincinnati, Ohio, is provided. In the case study, it was possible to program the lights in the bunk room to gradually illuminate and wake the firefighters more gently when calls came. The benefits included more efficient response times and improved cognitive functioning, a more aesthetically-pleasing environment, and cost savings from less energy consumption and maintenance. The report suggests that PoE lighting is rapidly gaining traction in the commercial construction industry and the market is expected to continue growing in the years to come.

(IS-2022-44) Optimal Installation - The Key To A Successful HVLS Investment

This 2021 report from Hunter Fans proposes simplified framework for users to select a high-volume, low-speed (HVLS) fan for a facility. Outlining that temperature control and air quality are the primary reasons of fan installation, the report explores the technicalities and installation considerations to ensure that it is installed in the most cost- and time-efficient manner. Factors such as square footage of the space envisaged, ceiling height, the type of structure where the

fans will be mounted to, electrical requirements, and fan control options are explained.

(IS-2022-43) Energy Efficiency and Demand Response - Tools to Address Texas' Reliability Challenges

In this report for October 2021, ACEEE examines seven residential energy efficiency retrofit measures that could be adopted in Texas in light of the state's electricity reliability problems. Power shutoffs over the winter (February 2021) and the tight summer supply situation during the same year illustrated that Texas lags behind other states in deploying energy efficiency and demand response programs. The authors provide a preliminary analysis intended to offer ballpark estimates for what energy efficiency and demand response could accomplish quickly in Texas. An estimation of benefits (peak demand reduction, lower energy bills, reduced need for utility capital expenditures) to Texas consumers and power generation utilities is also carried out.

(IS-2022-42) Community Choice Aggregation and Energy Efficiency - Opportunities, Challenges, and Lessons Learned

This 2021 report by ACEEE examines the opportunity presented by Community Choice Aggregation (CCA) energy efficiency initiatives in the United States. It identifies the key obstacles, contextual regulatory and legislative factors that influence program opportunities, and offers a set of improvement opportunities for the CCA role in supporting energy efficiency in their local context. The analysis shows that a majority of CCAs operating nationwide are not currently offering energy efficiency programs. Findings suggest that communities pursuing energy aggregation can be more successful at realizing the benefits of energy efficiency programs by addressing resource funding, developing partnerships, and leveraging community support.

(IS-2022-41) Lighting for Health - Human-Centric Lighting

This 2021 report by Luminus Devices, Inc. from 2021 examines human-centric lighting (HCL), a decades-old concept that now through scientific and LED technology advancements is supported by more sophisticated approaches not previously seen. The analysis highlights that creating basic HCL schemes requires selecting fixtures with the appropriate color temperature and brightness that reach circadian standard targets while optimizing for human productivity, comfort, and rest. The report outlines what "healthful light" means and discusses the role of existing standards such as the WELL Building Standard, which provides an evidence-based system for calculating healthful light.

(IS-2022-40) Landlords Must Adopt and Refine Flex Strategies to Survive a Rapidly Changing Real Estate Market

In 2021, Essensy undertook to understand current trends in real estate related to flex spaces — and user and landlord expectations and strategies in a post-pandemic world. The findings reported here reflect data collected through an interview format across the UK, North America,

and Europe. Building occupant expectations highlighted the importance of technology in buildings, remote working, interior environments that support employee productivity. From the landlord perspective, the most common strategies cited were flexible meeting spaces, premium serviced offices and short lease office spaces. The analysis concludes that demand for flex space will become more common in the market and that a digital ecosystem can unlock new revenue generation opportunities to monetize more building services.

(IS-2022-39) Bringing Clean Energy Home

This October 2021 report from RMI, an independent nonprofit, is subtitled “Unlocking Innovation and Policy to Align US Household Energy Use with Ambitious Climate Targets.” It describes the challenges, opportunities, barriers, and emerging solutions associated with aligning household energy decisions with ambitious climate policy targets. The authors conclude with recommendations for solutions providers, policymakers, regulators, and utilities, and an assessment of an example household energy service that could help unlock clean energy for U.S. households. The latter item involves in-depth look at the energy savings potential that can be realized through solutions like Nest Renew, providing customers with features that enable demand response and energy efficiency.

(IS-2022-38) Home Unbound - Transitioning Back to the Office After COVID

This 2021 report was by Brivo, a prover of cloud-based access control and video surveillance, and WhosOnLocation, a people presence management software company. The analysis showcases the results of an online survey of five hundred thirty-eight respondents in all U.S. states. The aim is to gauge people's willingness and main concerns regarding to the office. Human interaction with clients and colleagues was cited the main reason for returning to the workplace. Nonetheless, 59% of survey respondents expressed concern about returning to an office and worker proximity was identified as a major worry for all sectors. The report concludes that one-third of workers will eagerly return to the office, one-third will stay at home, and a final third will take a hybrid approach.

(IS-2022-37) U.S. & Canada Office Fit Out Guide

This 2021 report from JLL provides a useful tool to compare office construction fit-out costs across U.S. and Canadian markets relying on robust data collected by the company from several projects in the region. The analysis uses three different offices fit out styles and space configurations to assist the user to make better and more informed real estate decisions at the planning stage of the project. It suggests that while National average costs could increase by 3.5 to 5.5 percent over the course of 2021, salaries are forecast to keep rising at a steady pace in the range of 2 to 5 percent. The trends about how designs are adapting to the post pandemic world, are similar in both, Canada and the United States.

(IS-2022-36) Smart Home Light Based Service Oriented Architecture and IoT

This academic article was published by IOP Publishing in February 2021. The report presents an

application of Service Oriented Architecture (SOA) and Internet of Things (IoT) to build a control lighting system for smart homes. Based on the Raspberry Pi microcontroller, the system includes security features and can be deployed remotely using an Android smartphone.

(IS-2022-35) Machine Learning in Wireless Sensor Networks for Smart Cities - A Survey

This academic article appeared in MDPI's *Electronics* journal in April 2021. The report presents an in-depth literature survey of machine learning methods as an optimization tool for regular wireless sensor networks and Internet of Things (WSN-IoT) nodes deployed in smart city applications. The survey results indicate that the supervised learning algorithms have been most widely used (61%) as compared to reinforcement learning (27%) and unsupervised learning (12%) for smart city applications.

(IS-2022-33) How using smart buildings technology can improve indoor environmental quality in educational buildings

This report was published by EDP Sciences in April 2021. The report presents a case study of an architectural project for an elementary and junior high school academic campus in the state of Nuevo León, Mexico. The project takes into account extreme climate conditions, while applying the best alternative and bioclimatic strategies through the implementation of inmotics, a responsive architectural skin, sustainable construction systems, and native vegetation. The result of the project is a comprehensive environmentally friendly building that is based on the latest environmentally oriented systems and technologies.

(IS-2022-32) Artificial Intelligence Evolution in Smart Buildings for Energy Efficiency

This academic article that appeared in the MDPI journal *Applied Sciences* in January 2021. The report provides an in-depth review of recent studies on the application of artificial intelligence (AI) technologies in smart buildings through the concept of a building management system (BMS) and demand response programs (DRPs).

(IS-2022-31) An Automatic Aggregator of Power Flexibility in Smart Buildings Using Software Based Orchestration

This academic article appeared in the MDPI journals *Sensors* in January 2021. The report presents a software-based modular and hierarchical building energy management system (BEMS) to control the power consumption in sensor-equipped buildings. This system is able to aggregate the controls of the all-controllable resources in building to realize its flexible power capacity. The main novelty of this system is that it can handle the heterogeneity of the installed hardware system along with time bound changes in the load device network and its scalability; resulting in low maintenance requirements after deployment.

(IS-2022-30) The Guide to Smart Building Technologies

This October 2021 report by Cisco discusses how the COVID-19 pandemic accelerated the need to create “smart and intuitive” buildings. By providing a sense of health and well- being for users, these buildings also maximize space utilization around social distancing and other mandates. Architects, developers, and building operators have opportunities to leverage technology to add value to planned or existing structures. Through design with technology, they can build “trusted workplaces” featuring improved health and safety, more intuitive spaces, and reduced costs and resource usage, all while increasing sustainability.

(IS-2022-29) Advanced Supervision of Smart Buildings Using a Novel Open-Source Control Platform

This article which appeared in the MDPI journal *Sensors* deals with an advanced supervision model for continuous online monitoring and analysis of process behaviour in smart buildings or other industrial control systems. The model is developed using open- source tools and includes an artificial operator to autonomously supervise the process. The model has been successfully tested in a simulation and a practical case study of a two-storey family house.

(IS-2022-28) A Unified Methodology to Predict Wi-Fi Network Usage in Smart Buildings

This report was published in the journal *IEEE Access* in January 2021. The report looks at the use of Wi-Fi network association information as a basis for the design of intelligent systems for smart buildings. The proposed methodology enables the user to evaluate and to create machine learning models for energy efficient smart building management systems. The authors report that the model can be used to predict occupancy with an 87% accuracy.

(IS-2022-27) Emerging Trends in Wireless Infrastructure

This report by Rohde & Schwarz was released in August 2021. The report describes the emerging infrastructure trends of wireless networks for 4G, 5G, and beyond 5G. These trends provide more opportunities to service providers for network deployments, network customization, and network optimization. The analysis provides commentary on some of the key drivers, including spectrum, densification and coverage extension methods, virtualization and cloudification, and network customization and intelligence. These trends, which are presented in detail, are expected to continue in the coming years with the advance of 6G deployments.

(IS-2022-26) Consumer Systems and Home Automation - A Disruptive End to Silo Thinking

This report appeared in *Euromonitor International* in August 2021. The analysis focuses on the importance of consumer systems, rather than product silos, to reap new incremental profit opportunities with new business models. Key elements to creating new business models include holistic thinking, improving user experience, and creating partnerships. Business case studies are presented regarding pay-per-wash and Internet of clothing (IoC) initiatives.

(IS-2022-25) Demand Flexibility in New York City Buildings - Benefits Beyond Carbon

This report by RMI (May 2021) focuses on how electrical power demand flexibility provides benefits to New York City. Community level benefits include improved air quality, reduced pollution, and reduced operating costs. Buildings need to be incentivized to combine the electrification of heating with controls that allow their demand to be flexible. Compliance with Local Law 97 (LL97) will be supported with system wide decarbonization, combined with efficiency, demand flexibility, and electrification.

(IS-2022-24) BIPV Solutions in Europe - Competitiveness Status & Roadmap Towards 2030

This report from the Becquerel Institute, a research institute focusing on solar PV, was released in May 2021. The authors examine the "competitiveness" level of various building integrated photovoltaics (BIPV) solutions in key Western European markets. Competitiveness is assessed using a method of total costs and revenues of ownership to clearly identify the intrinsic economic attractiveness of BIPV as a building envelope solution. The methodology includes an "extra cost" assessment to consider the role of building components fulfilled by BIPV elements and consequently the avoided expenses for the façades or roof claddings. Findings highlight that as electricity generating units, BIPV systems can be competitive and an attractive investment.

(IS-2022-22) State of the Electric Utility Survey Report 2021

This report from Utility Drive was released in March 2021. Findings from a national survey of hundreds of utility leaders across the United States are presented. Survey results indicate that COVID-19 has impacted an increase in remote working and loss of revenue. The main drivers on the electrical load changes were the shifts that took place during the pandemic, and energy efficiency programs. Utilities expect an increase in use of grid-scale solar energy, distributed energy resources, grid-scale battery storage, and wind. Top priorities for utilities going forward are renewables, sustainability, and the environment.

(IS-2022-21) Utilizing Existing Copper Infrastructure for Deployment of Fiber-grade Services

This report from the Broadband Forum was released in January 2021. The report deals with fiber access extension as an alternative to existing copper infrastructure, one that provides service providers an architecture to deploy fiber services cost effectively. This architecture consists of a network where the fiber is extended by using a copper medium without causing significant degradation in quality of user experience as compared to the fiber to the home topology.

(IS-2022-20) Powering Forward to Net-Zero - AEP's Climate Impact Analysis

This 2021 report was authored AEP, a large power producing company in the Mid- Atlantic Region. The analysis focuses on the progress and direction of the company to achieve Net-Zero by 2050. The challenges to get to all renewables is complex and difficult. Nicholas addresses employment, technology, corporate responsibility, and technical obstacles that must be tackled to be successful. Having a large coal generation base requires much investment, training, tremendous building projects.

(IS-2022-19) Getting Control of Comfort and Energy: The Benefits of Upgrading to Automated Shades and Advanced Lighting in Commercial Buildings

This report by Denver Net Zero from May 2021 describes how upgrades in terms of automated shades and advanced lighting will help the energy effectiveness of building lighting systems as well as healthy working environments. Five key steps are outlined: 1. Focus on occupant improvements, what needs are not being met by the building; 2. Engage a single entity to provide turnkey design, installation, commissioning, and long- term system support for the system; 3.Get stakeholders at the table early, including the IT department, facilities managers, and key occupants and staff. Communicate the benefits of the new systems to generate buy-in from occupants; 4. When conducting a cost-benefit analysis of system upgrades include occupant health benefits such as improved comfort, well-being, and productivity. Pursue energy efficiency incentives to support the project; 5. Maximize your savings by bundling HVAC retro-commissioning, lighting upgrades, advanced lighting controls, and other advanced technology solutions.

(IS-2022-18) Denver's Net Zero Energy (NZE) New Buildings & Homes Implementation Plan

Denver's "NZE" plan was set out in this 168-page document prepared by the New Building Institute and Denver Climate Action, Sustainability & Resiliency (released in January 2021). The stated objectives focus on clean energy job growth, economic recovery, and improved energy equity through enhancements to the Denver Building and Fire Code with the goal of all new buildings achieving net zero energy by 2030. The plan envisages, in particular:

- Net zero energy, all-electric new homes in the 2024 Building Code
- Net zero energy, all-electric new buildings in the 2027 Building Code
- New buildings performing as designed with performance verification in the 2030 Building Code

(IS-2022-17) Seeds of Opportunity - How Rural America is Reaping Economic Development Benefits from the Growth of Renewables

This report by RMI was published in January of 2021. This report sets out to quantify the scale of the economic development opportunity from the growth of onshore wind and utility-scale solar projects in rural areas, and demonstrates what that means for communities through case studies of existing projects from three different regions. The report offers recommendations for local, state, and federal leaders to unlock this opportunity. In total, the analysis suggests that the approximately 600 GW of new wind and solar projected to be built between 2020 and 2030 would generate $220 billion in lifetime value across rural America.

(IS-2022-16) Renewables in Cities 2021 Global Status Report

This article by REN21, a renewable energy policy think tank, was published in May 2021. The article provides insight to the progress that has made over the last 20 years and that current challenges and opportunities in relation to future progress. City governments in more than 830

cities in 72 countries had set renewable energy targets in at least one sector (power, heating and cooling, and/or transport), the analysis shows. Over 610 of these cities had set 100% renewable energy targets.

(IS-2022-15) From Traditional to Smart Building Materials in Architecture

This report was published by IOP Publishing in June 2021. A comparison between intelligent materials and traditional building materials for building efficiency is provided. The authors include an overview of the types of materials that can be used in construction and architecture, thus offering a new perspective on innovative techniques that will be available, or are already available, paving the way for improvements in both disciplines. Consideration is given to smart and sustainable design with emphasis on maintaining thermal, visual and acoustic comfort.

(IS-2022-14) Smart Materials in Architecture for Actuator and Sensor Applications A review

This academic article published by SAGE in August 2021 reviews smart materials-based technologies which are currently applied or developed for application in civil structures, focusing on smart material applications for actuation or sensing. Applications of the investigated materials are discussed, including shape memory materials, electro- and magnetostrictive materials, piezoelectric materials, ionic polymer-metal composites, dielectrical elastomers, polyelectrolyte gels as well as magneto- and electrorheological fluids, are presented for the fields of architecture and civil engineering.

(IS-2022-13) Smart Home Modification Design Strategies for Ageing in Place - A Systematic Review

This report was published in the *Journal of Housing and the Built Environment* in August 4 2021. It presents findings from a literature review of 34 scholarly articles regarding the current strategies and approaches directed to integrate innovative technologies in the home modification process to support independent living and ageing. The findings indicate that both home modification and smart technologies can support older adults' independent living, especially with fall prevention and indoor accessibility. The fundamental requirements in smart home modification phases are customization, minimum life interference, and extensible technologies to cope with the ageing process.

(IS-2022-12) Live, Work, Connect

This November 2021 report by WiredScore reports on the results of a survey of those who transitioned to home working or studying throughout Europe during the pandemic. The findings and analysis show that productivity levels when working from home have increased across Europe during the COVID-19 pandemic. As well, the desire to remain constantly connected has brought to light the need for the best digital connectivity, no matter the location. The authors highlight that while digital solutions are being implemented within buildings, a significant knowledge gap exists, leaving many unable to use the technology to its full potential.

(IS-2022-11) Smart Buildings - Our Future is Smart

This April 2021 report was released by SmartScore. With little agreement in the industry on fundamental questions for the smart building — how to create one, how to work with the supply chain, or even what 'smart' means – this report sets out to sharpen the meaning of the smart building with a user-centric, outcome-orientated approach. The report argues that smart buildings must above all use digital technology to deliver "outstanding outcomes" for users and exceed their expectations. The outcomes that users care most about, according to the authors, are an inspirational experience, a sustainable building, cost efficiencies, and a "future-proof by design" building.

(IS-2022-10) The Untapped 87% - Simplifying Controls Technology for Small Buildings

This December 2021 report was authored by James Dice and published by Keyframe Capital Partners, L.P. BAS are generally only installed in larger buildings—those above 75,000 square feet. But solving the climate crisis and maintaining a resilient electric grid depends on reducing complexity for ALL buildings, including the 5.5 million buildings under 50,000 square feet. This report delves into, among other aspects: the value of controls technology to small building owners and other stakeholders; how layers of complexity stack upon each other, and how to remove them; and innovative trends in small building controls. The analysis shows that scaling controls solutions to all buildings is a vital next step. Scalability will be enabled when the whole complexity stack comes together and is fit to each exact subset of this heterogeneous market.

(IS-2022-9) Decarbonizing Canada's Large Buildings - Summary Report

This report by RDH Building Science in collaboration with Dunsky Energy + Climate Advisors was released by Canada Green Building Council (CaGBC) in December 2021. The report evaluates the potential pathways to decarbonized building operations, including the estimated deep carbon retrofit costs for Large Buildings. Nearly all office building archetypes can reach net zero carbon operations, while at the same time achieving a positive net present value. The authors highlight that large building retrofits can reduce building-sector emissions by up to 51 per cent (21.2 million tons), the report notes.

(IS-2022-8) Net-Zero Energy & Net-Zero Carbon — Design Strategies to Reach Building Performance Goals

This report by cove tool was published on October 12, 2021. The reports highlights that architects, engineers, and all parties involved in the building design process must begin implementing sustainable strategies into their workflows to make a significant impact in the fight against climate change. In this e-book, the differences between net-zero energy and net-zero carbon are illustrated, along with key design strategies to help architects and engineers meet performance targets.

(IS-2022-7) The Financial Impact of Healthy Buildings

This report from the MIT Real Estate Innovation Lab appeared in October 2021. Using the commercial real estate data platform CompStak and healthy building public databases from Fitwel and WELL, a real estate hedonic model was created in order to ascertain the value of healthy spaces on the effective rent of offices spaces in ten U.S. cities. Findings show healthy building rents transacting between 4.4 and 7.7% more per square foot than their nearby non-certified and non-registered peers. This “premium” for healthy spaces exists independently of all other factors such as LEED certification, building age, renovation, lease duration, and submarket. These results indicate that healthy buildings are seen as an asset that correlates with employee or tenant well- being and productivity.

(IS-2022-6) SMART BUILDINGS Fall 2021 | Consulting-Specifying Engineer Ebook

This ebook by *Consulting - Specifying Engineer* produced in collaboration with Siemens focuses on chiller energy optimization systems versus building automation systems, highlighting four demand factors beyond COVID-19 prevention for smart buildings. The report explains that a chiller energy optimization system continuously looks at all of the operating equipment and seeks to minimize the overall chiller plant electric demand.

The technology has the ability to monitors and adjusts setpoints and equipment speeds, and it's this flexible readjusting of established control loops that makes the device "smart" — a system working in conjunction with the BAS to optimize the operation of the chiller plant without human intervention.

(IS-2022-5) Build Up 2030 Framework for the Transformation of Real Estate

This September 2021 report was authored by the Institute for Market Transformation (IMT). Along with the changes resulting from the COVID-19 global pandemic, the real estate industry is also transforming its understanding of and approaches to how buildings contribute to the economy and to healthy communities. IMT’s "Framework for Transformation" comprises 10 principles it recommends real estate professionals and companies to use to actively transform their business practices and communities. Drawing on discussion with a coalition of 20 real estate industry leaders from across the U.S, IMT proposes vision that was informed by the "realities and potential seen by professionals" in terms of industry transformation.

(IS-2022-4) Modular Software Architecture for Local Smart Building Servers

This academic article was published in MDPI's *Sensors Journal* in August 2021. It presents the architecture and construction of a novel plug-and-play system for optimal monitoring and control of energy and water consumption in smart buildings. Based on the Raspberry Pi microcontroller, the system is cloud-based and includes nine modules that inter-communicate. The system was tested on fifteen social housing units was able to detect abnormal energy consumption.

(IS-2022-3) A Smart Home Architecture for Smart Energy Consumption in a Residence With Multiple Users

This academic article published in the journal IEEE Access presents an evaluation of a Smart Energy Control Systems (SECS) architecture called SmartCom. The system provides an accurate identification of electrical equipment through near field communication (NFC) between smart outlets (SO) and appliances. The results indicate that the system can achieve a rebalanced residential energy consumption 87.3% of the time with minimal disruption to users' comfort.

(IS-2022-2) Luminaire Level Lighting Controls and the Future of Healthy Buildings

In this report from May 2021, researchers with the Energy Studies in Building Lab at the University of Oregon describe ways to improve utilization of the presently disparate LLLC and BAS data streams to support energy efficiency and improve human comfort and human health outcomes. Published by BetterBricks, a commercial resource produced by NEEA (Northwest Energy Efficiency Alliance), the report outlines key potential benefits that include: improved ventilation management to support improved cognitive function; improved vertical field lighting scene management to reduce glare and improve circadian exposure; and data integration and situational awareness to support building operations that will reduce pathogen transmission risk. There are, however, notable obstacles to delivering on that vision, ranging from poor hardware and software interoperability and privacy/security concerns to the (complex) need to optimize the number and types of sensors in a network.

(IS-2022-1) Grid-Interactive Efficient Buildings Made Easy

This June 2021 report by RMI recommends actionable steps for GSA building managers to implement low- and no-cost measures that result in utility cost savings and greenhouse gas emissions reductions. The best candidates for grid-interactivity adjustments are buildings that are subject to time-of use utility pricing, are all-electric or have future electrification planned, or have existing energy storage and renewable energy capabilities, the authors note. Upcoming renovations or equipment replacement projects present ideal opportunities to add GEB measures. Moreover, building managers should consider “GEB-ready” measures, such as requiring smart controls on lighting, HVAC equipment, and other electric fixtures and equipment and integrating all new equipment into a central EMIS.