# Wells Fargo Innovation Incubator (IN$^2$)

## Webinar Series

*May 26, 2020*

# Agenda

## Welcome from IN$^2$

- Trish Cozart, IN$^2$ Program Manager, NREL

## Cleantech Commercial Building Trends

- Todd Allmendinger, Director of Consulting & Research, Cleantech Group
- Anthony Deorsey, Consultant, Cleantech Group
- Louis Brasington, Senior Associate, Cleantech Group
- Holly Stower, Analyst, Cleantech Group
- Ian Hayton, Senior Associate, Cleantech Group

# About the Wells Fargo Innovation Incubator ($IN^2$)

Launched in 2014 with an initial $10 million commitment by the Wells Fargo Foundation, and expanded in 2017, the Wells Fargo Innovation Incubator ($IN^2$) is now a **$30 million program** supporting innovative technologies and innovators. The program is managed and run out of the National Renewable Energy Laboratory (NREL).

$IN^2$ provides technical assistance that leverages the capabilities, facilities, equipment and the deep expertise that exists at NREL and the Donald Danforth Plant Science Center to help companies **de-risk technologies and ease their path to market adoption and deployment.** $IN^2$ also fosters the cleantech ecosystem through our Channel Partner awards program.

Technology Incubator

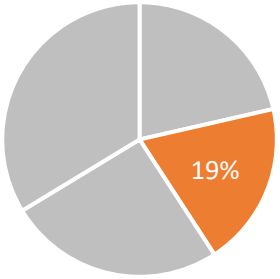
Channel Partner Awards Program

# Cleantech Group Award for 2020 Technology Briefing Series

- Define the value chains, business activities and relate the trends to stakeholders and portfolio companies
- Geographic focus in North America
- Focused on the technology sectors of $IN^2$

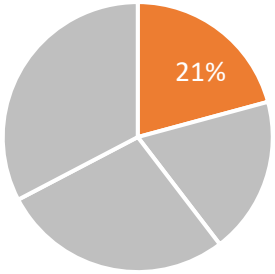
# IN² Focus Areas

## COMMERCIAL BUILDINGS



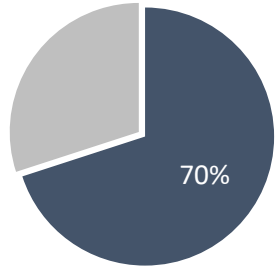

Consumes 19% of the U.S. energy

## HOUSING




Consumes 21% of U.S. energy

## AGRICULTURE




Consume 70% of world's water supply and 14% of energy

Buildings responsible for 40% global GHG emissions

- Data Infrastructure
- Energy Analysis
- Energy Management
- Energy Storage
- HVAC Systems
- Smart Glass
- Water

- Advanced manufacturing & construction process
- Materials
- Community and district-level technology and planning tools
- Energy-efficient technologies

24% global GHG emissions

- Crop Production
- Plant Science
- Precision Agriculture

# Briefings Schedule

| | |
|---|---|
| April 3 | Macro Trends |
| Today | Commercial Buildings |
| June 23 | Sustainable Agriculture |
| Sept 15 | Housing |

Cleantech Group

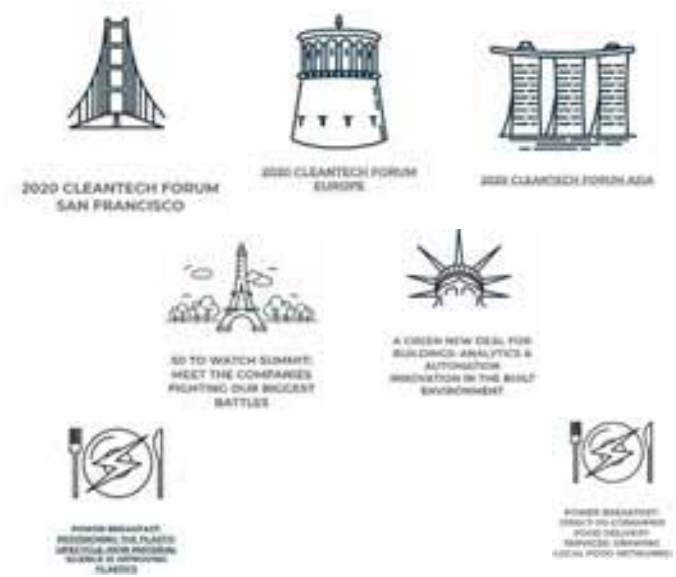
# Briefing

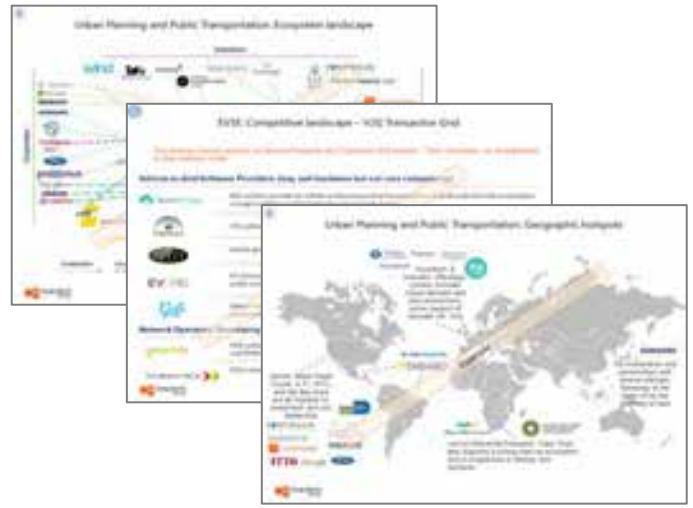
*Commercial Buildings*


26 May 2020

# Cleantech Group: Introduction

*Our research, consulting and events catalyze opportunities for sustainable growth powered by innovation.*

## Research

Markets change. Companies evolve. Our research delivers the insight you need to stay ahead of the trends. For deep dives into the market, our expert analysts publish Sector Insights, Investment Insights and provide customized briefings.

## Events

Engage with industry leaders and innovators from across the breadth of the global sustainable innovation ecosystem. Find capital, advisors, partners and co-investors at our international events. In person events or through Cleantech Interactive - a single platform that will introduce you to an entire community every month.

## Consulting

Build strategies to engage external innovation and thrive as your industry transforms. We'll help you set priorities and determine where and how to find the partners and investment opportunities that take your business forward.

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# Sustainable Innovation is our focus

**AGRICULTURE & FOOD**

**ENERGY & POWER**

**MATERIALS & CHICALS**

**RESOURCES & ENVIRONMENT**

**TRANSPORTATION & LOGISTICS**

Enabling technologies, Business models and Themes

Cleantech Group

# Our research methodology

We help corporate strategy teams, investors and innovators identify, evaluate and connect with the best of global innovation

## Inputs

### Secondary Information

**Public Data**
Public news, reports, data
Global web crawling

### Primary Information

**Start-up interviews**
Business model
Traction
Partnerships

**Proprietary Information**
Ecosystem interviews
Boards and roundtables
CTG events insights

## Resources

### Proprietary database

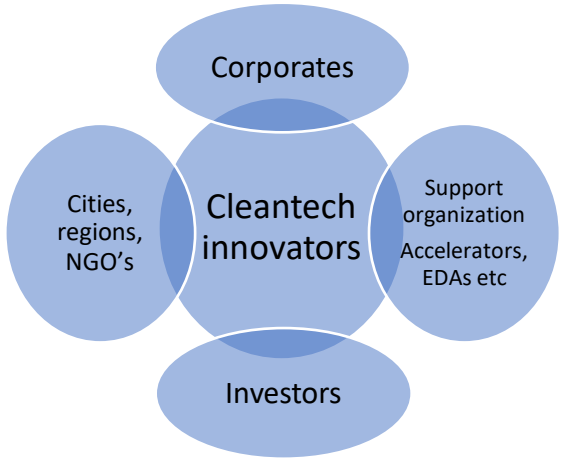
i3

30k+ companies
20k+ rounds
21k partnerships
4k M&A events

+

**Experienced Analysts**

**Established ecosystem relationship**




## Market Intelligence

- **Innovation:** business model and/or technology – creating or capturing new sources of value
- **Opportunities and disruption:** from business activities all the-way up to and across whole industrial sectors
- **Companies:** what are innovative companies doing? how do they make money? how do they compete and differentiate themselves?
- **Where to watch:** for new sources of innovation
- **Who** is funding, investing, partnering to grow and commercialize innovative companies

Cleantech Group

Ian Hayton, Lead Analyst, Materials & Chemicals

Louis Brasington, Lead Analyst, Energy & Power

Holly Stower, Lead Analyst, Resources & Environment

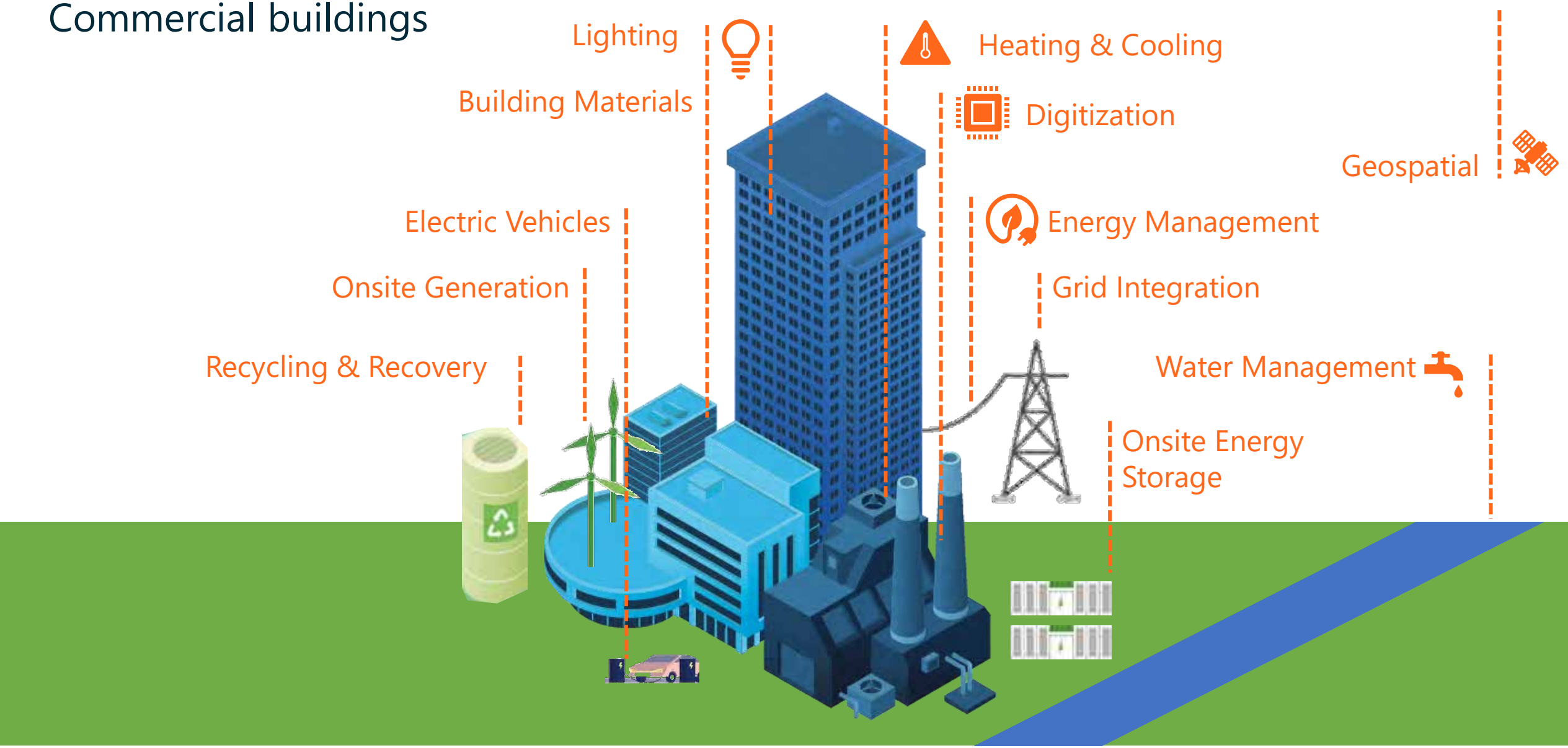
# Commercial Buildings

## Overview

Business Activity

- Circular Economy
- Decarbonization & Electrification
- Cities & Urbanization
- Digitalization, Decentralization, Automation
- Resilience

# Commercial buildings

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# Key Trends

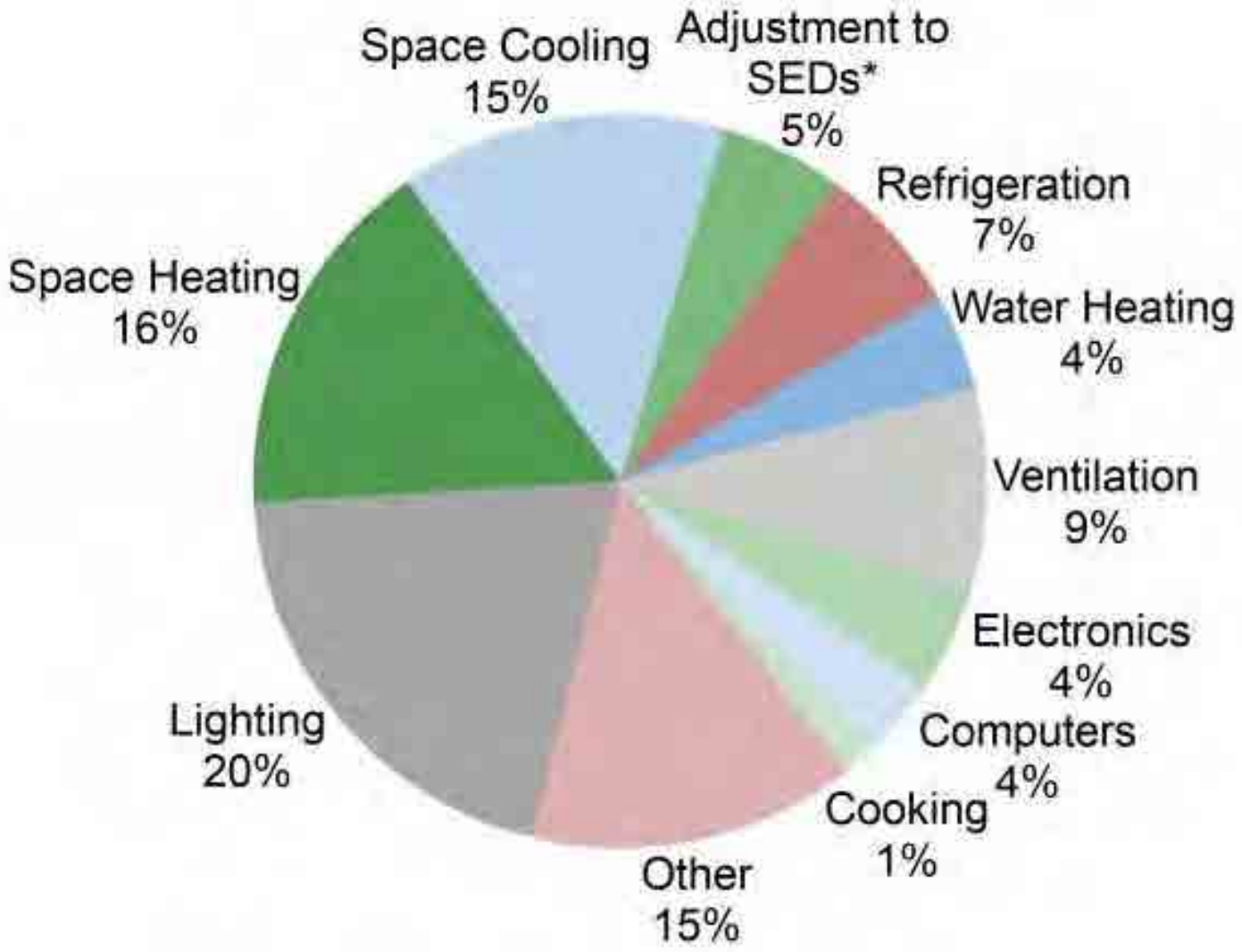
**Efficiency / lowering carbon footprint**

**Digitize, automate**

**New business models**

**Design / materials**

## US Commercial Building Sector End Use, 2018




*Source: University Of Michigan*

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# Challenges

**Legacy systems / Existing building stock**

**Regulatory / ability to participate in energy markets**

**Fragmented offerings / buyer complexity**

**Automation will increase energy use**

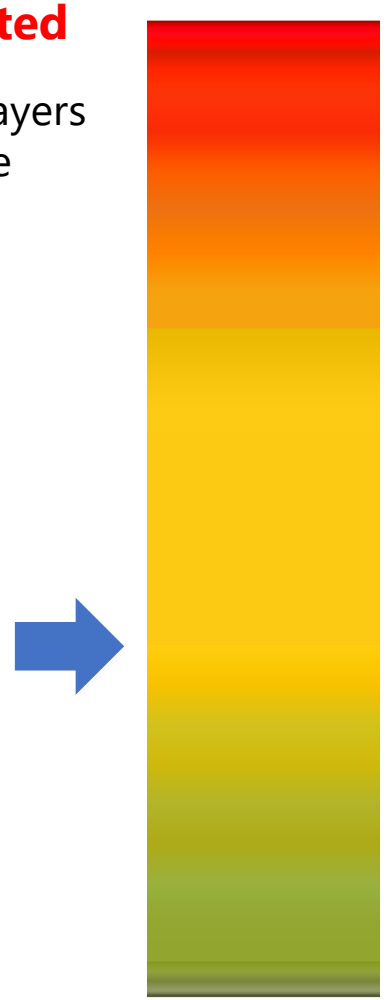
**Technical requirements**

**Market Concentration**

**Consolidated**

1-5 major players dominate

**Building automation systems**



**Fragmented**

Multiple players no dominant leader

Source: CTG; Mordor Intelligence

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# Covid-19: US Commercial Buildings Impact

**Declining energy demand**

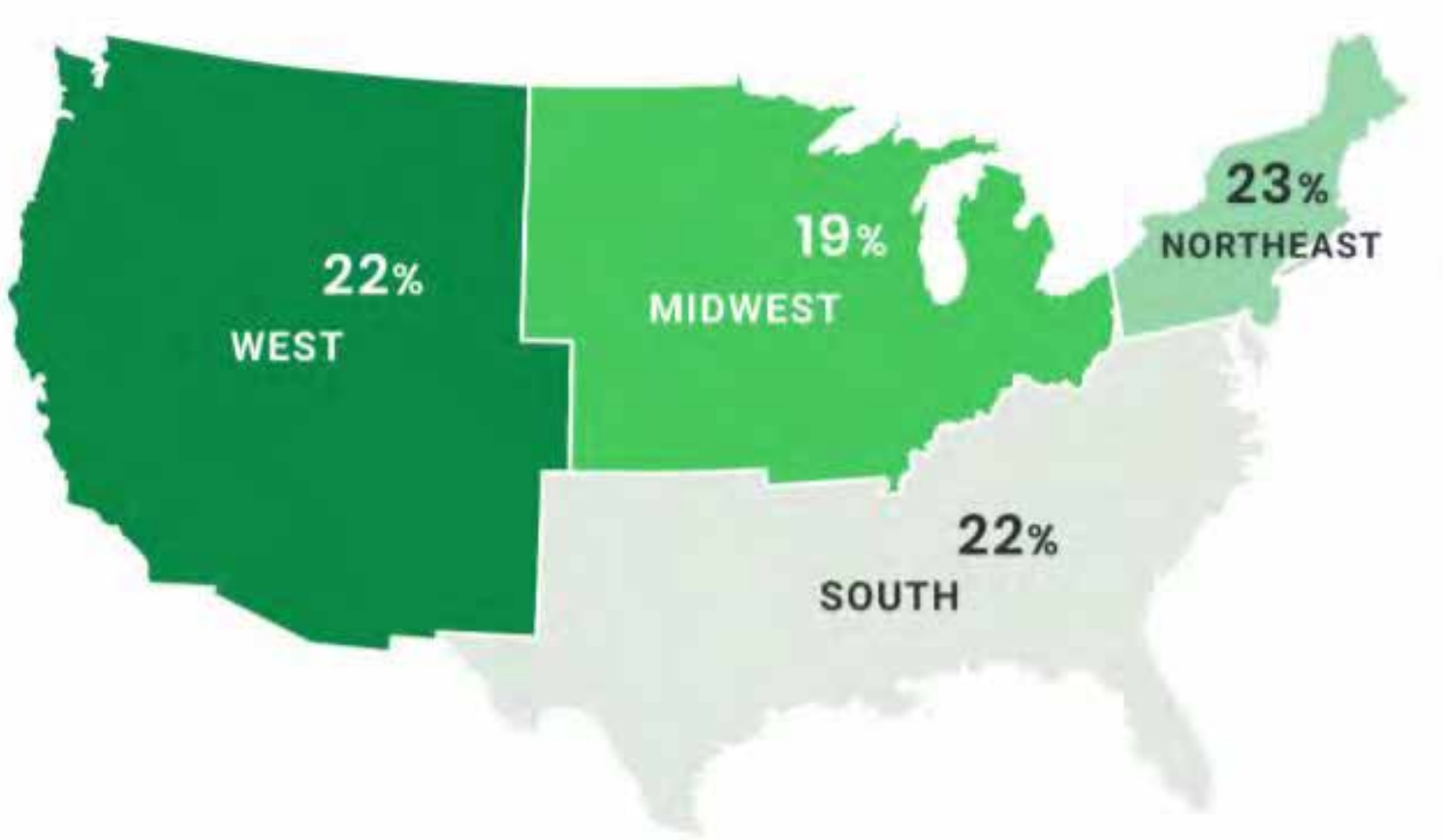
**Continued operation**

**Energy management**

**Indoor environmental monitoring**

**Commercial Building Energy Reduction**

*March 1st- April 4th, 2020*




Source: Hatch Data, April 2020



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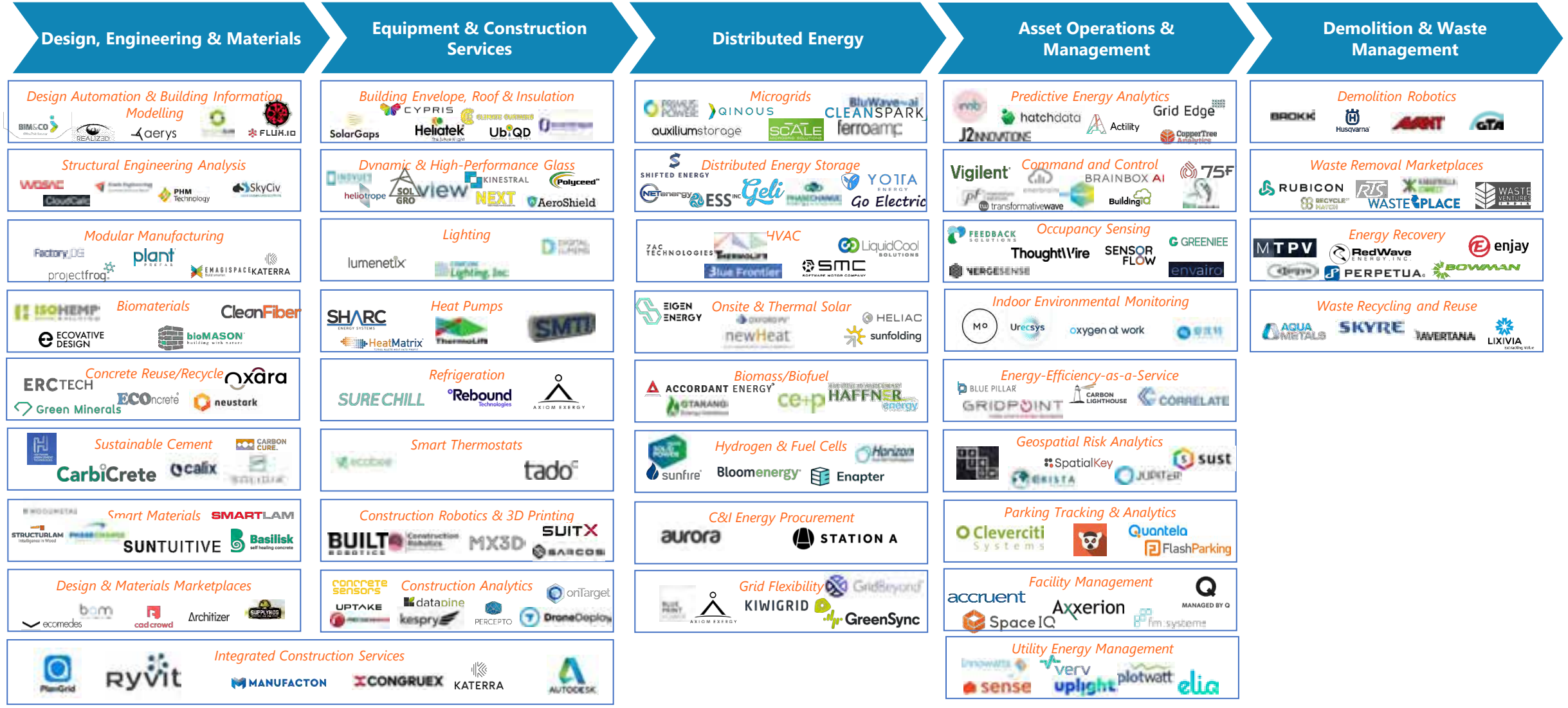
# Commercial Buildings: Business activities across the value chain

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# Commercial Buildings

## *Five Macro Trends*

**Resilience**

**Circular Economy**

**Digitalization, Decentralization, Automation**

**Decarbonization & Electrification**

**Cities & Urbanization**

# Commercial Buildings

***Business activities for deep dives***


Geospatial Risk Analytics

Microgrids

Building Envelope

Energy Recovery

Smart Materials

Concrete Reuse/Recycle

Predictive Energy Analytics

Command and Control

Distributed Energy Procurement & Management

Sustainable Cement

Energy-efficiency-as-a-service

DC Grids in Buildings

Occupancy Sensing

Parking Tracking & Analytics

Indoor Environmental Monitoring

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# Energy Recovery

**Description**

- Minimizing building energy input
- Recovering heat from air, water and refrigerant

**Trends**

- Capturing and using low-grade heat <250 degrees
- Utility initiatives as the starting points
- Refurbish and new build are very different

**Opportunity for innovation**

- Heat recovery from components (eg pumps)
- Additional value of thermal energy
- New materials (eg thermoelectric)

## Commercial Waste Heat Recovery


Source: Enjay

# Energy Recovery: Innovators and ecosystem

**Enjay (NO) -** Energy recovery unit for greasy commercial kitchen ventilators. 2019, raised $3.5 million equity. Currently operating with Burger King Scandinavia (500 locations), expanding outside Nordics in 2020/21

**Exergyn (IRE)** – Shape-memory alloys, converting low-temp waste heat to power. Go-to-market strategy focused on replacing engine radiators with industrial heat producers

**Hyperborean (US) -** Air conditioning compressor that converts waste heat into a power source for HVAC&R. In Dec 2019, raised $2 million in pre-seed funding for field tests and to grow of the team and sales channels

**TEGnology (DK) -** Thermoelectric materials, converting low-temp waste heat to power. March 2020, accepted onto Free Electrons cohort

## Investors

## Ecosystem

# Smart Materials

**Description**

- Responding to changes in condition / environment
- Adapting to optimize building energy efficiency

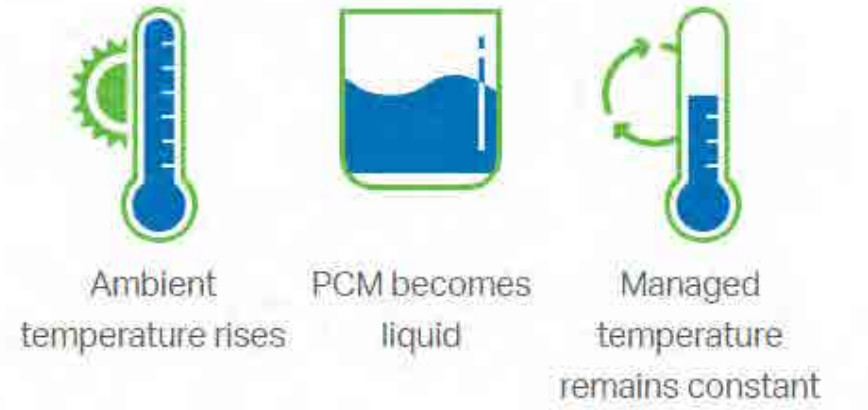
**Trends**

- Smart glass solutions are developing. Integrating into connected buildings, or for energy generation
- Phase Change Materials (PCM) are gaining traction for energy savings

**Opportunity for innovation**

- Self heating materials at pilot
- Adaptive glass solutions using novel materials
- Organic-based material solutions

## Heat Storage




## Heat Release


Source: Phase Change Energy Solutions

# Smart Materials: Innovators and ecosystem

**Basilisk (NL) –** Micro-organism-based technology for self-healing concrete. 2019, SENTIALL biotechnology used for self-healing concrete was brought to market

**EnKoat (US) -** Paint, plaster and stucco with embedded phase-change materials which reduce HVAC energy use. 2019, began testing roof coating product at ASU

**Ubiquitous Energy (US)** – Transparent photovoltaic coating generates electricity to power smart windows. 2020, installed first truly transparent solar window façade at its headquarters

**Pleotint/Suntuitive (US) –** Thermochromic technology that adapts glass tint level in response to direct sunlight. December 2018, raised undisclosed amount in Series A round

## Investors

## Ecosystem

# Concrete Reuse/Recycle

**Description**

- Reusing waste concrete / replacing waste aggregates as feedstock material
- Reducing construction waste and input emissions

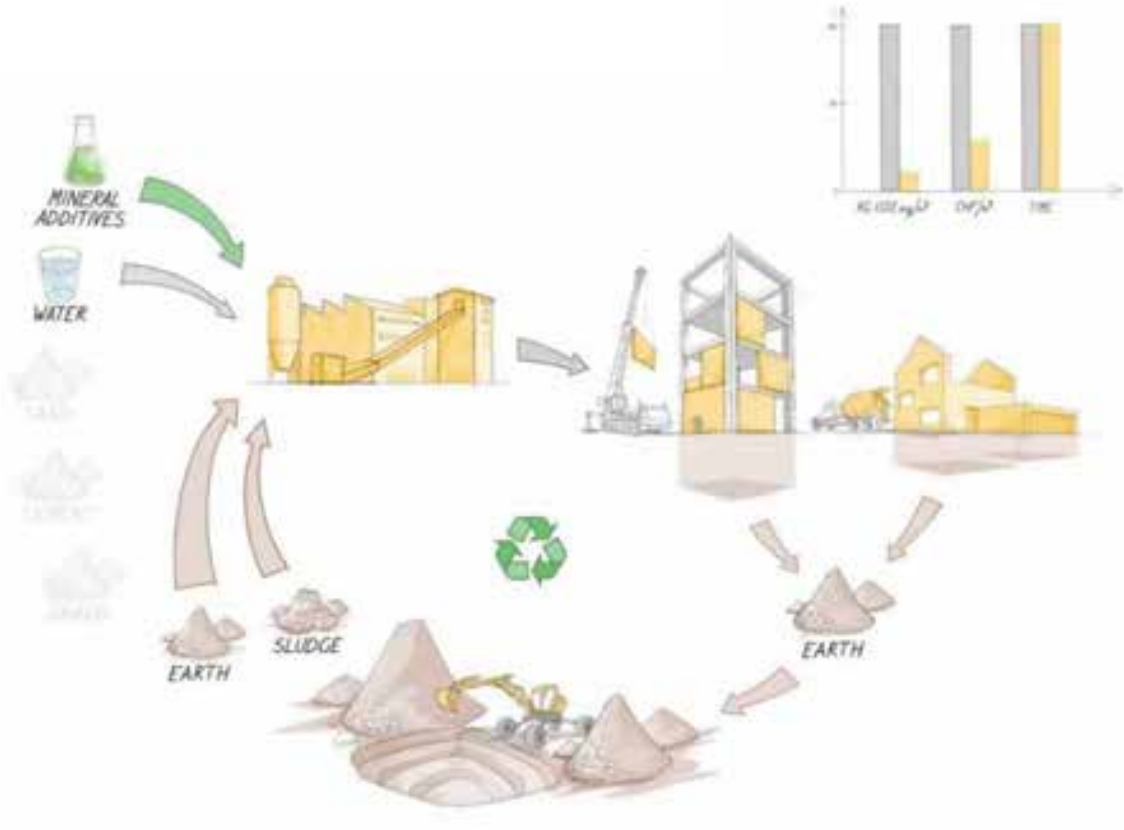
**Trends**

- Concrete recycling common practice across sector
- Incumbent's implementing proprietary recycling technologies
- Startups focusing on upcycling and recycling with CO2 capture

**Opportunity for innovation**

- Opportunity for technologies which upcycle, or at least recycle
- 100% recycle concrete

## Closing the Circle




Source: Oxara

# Concrete Reuse/Recycle: Innovators and ecosystem

**Neustark (CH) –** Carbonated aggregates for concrete from demolished concrete aggregate and captured CO2. 2019, received $100K funding. support from Climate-KIC accelerator, partnered with Climeworks. Plan for commercial plant in 2020

**Oxara (CH)** – Process to produce earth concrete using locally available landfill waste (excavation materials) and additives. 2019, pre-seed funding and support from Venture Kick

**ERC-TECH (CZ) –** Developer of 100% recycled concrete. 2019, Skanska started to use recycled concrete, termed Rebetong which was developed in cooperation with ERC-TECH

**Green Minerals (NL)** – Additives for recycled concrete produced from CO2 captured in cement production and olivine. Developed with Heidelberg Cement /RWTH Aachen University for CO2MIN

## Investors

HEIDELBERGCEMENT

LafargeHolcim

## Ecosystem

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***Business activities for deep dives***

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Microgrids

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**Sustainable Cement**

**Energy-efficiency-as-a-service**

**DC Grids in Buildings**

Occupancy Sensing

Parking Tracking & Analytics

Indoor Environmental Monitoring

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# Sustainable Cement

**Description**

- Low clinker factor, CO2 curing, lower cement usage
- Reducing process emissions or reducing lifecycle emissions

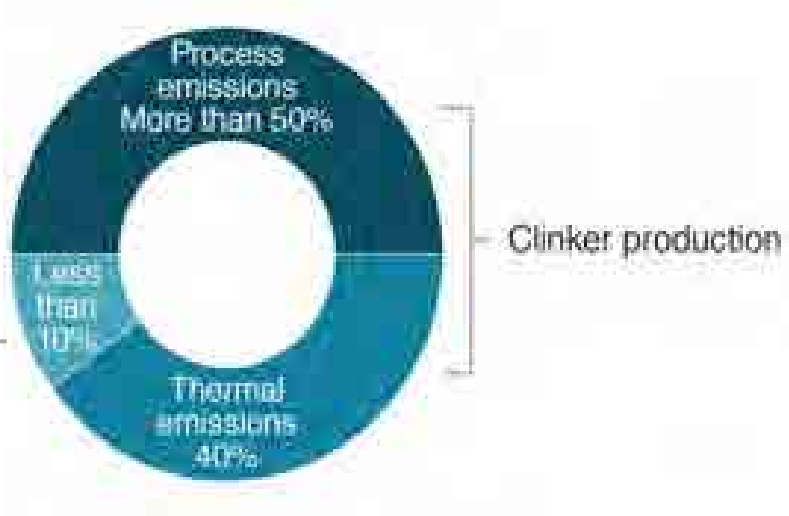
**Trends**

- Cement corporates implementing proprietary recycling technologies
- Increasing interest and projects for CO2 capture
- Scaling CO2 curing/mineralization market

**Opportunity for innovation**

- Production methods for reduced emissions (eg geopolymer, calcium sulphoaluminate cements)
- Process electrification and solar powered manufacture

## CO2 emissions in cement production




- Quarrying & transport
- Grinding & preparation of raw materials
- Cooling, grinding, mixing

Source: Chatham House/BBC

# Sustainable Cement: Innovators and ecosystem

**Solidia (USA)** – Calcium silicate cement as part of a two-part system with a CO2 cured concrete. 2019, received $20M growth equity from BP Ventures. LafargeHolcim used product mid-2019

**Calix (AU)** – Low Emission Intensity Lime & Cement (LEILAC). 2020, announced construction of LEILAC 2 plant with HedielbergCement. Will capture 100,000tpa of CO2 and will be operational by 2024

**Carbicrete (CA) -** SCM concrete that enables the production of cement-free, carbon-negative concrete using industrial by-products and captured CO2. 2019, raised $2.3 million Series A from steelmaker

**Hoffman Green Cement (DE)** – Limestone calcined clay cement, H-EVA, which has a low clinker factor. July 2019, entered a partnership with Bouygues Construction to develop and test concrete

## Investors

## Ecosystem

# Energy-Efficiency-as-a-Service (EEaaS)

**Description**

- Bundling, products, services and financing
- Providing end-to-end busses model

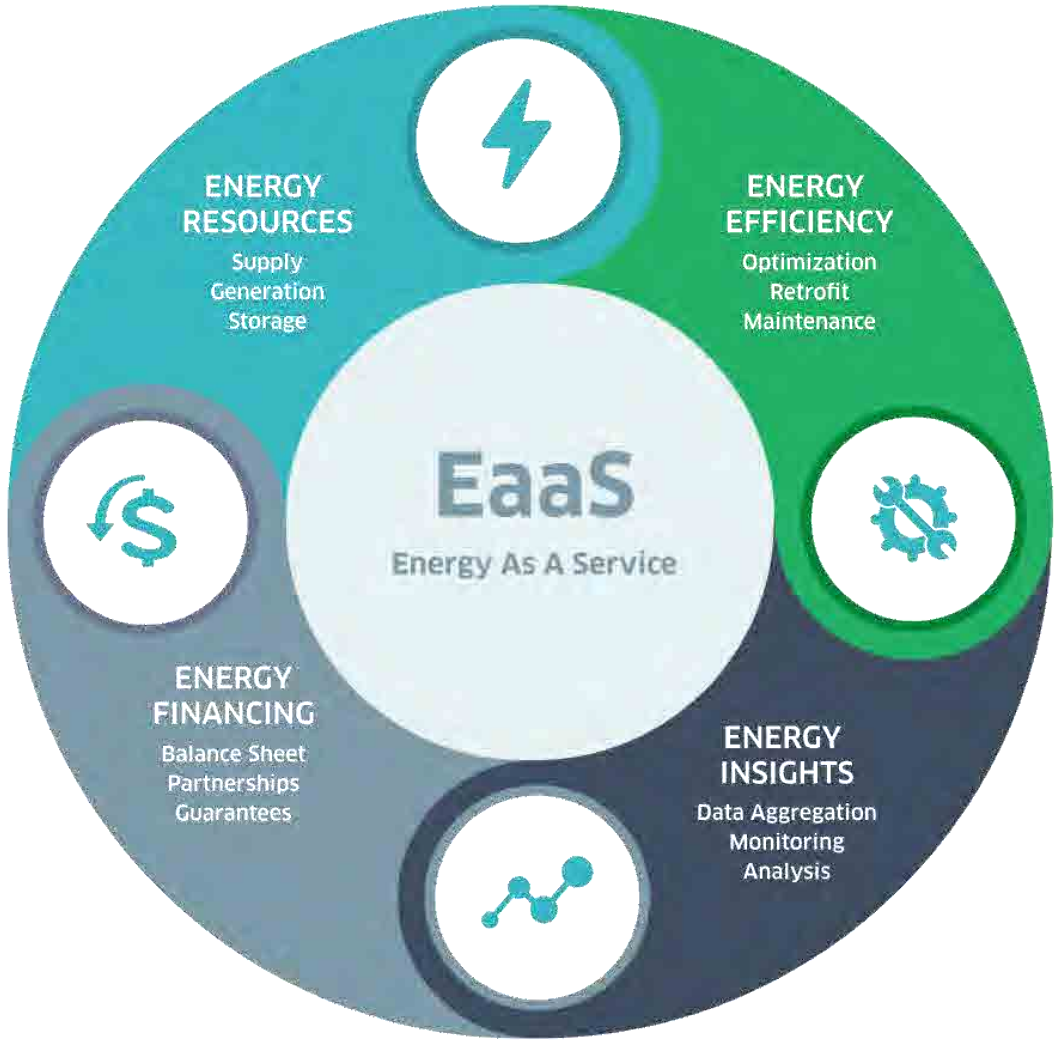
**Trends**

- Energy companies moving downstream
- US corporate climate targets driving adoption
- Differentiated product offerings (eg products, financing options, active management)

**Opportunity for innovation**

- Building automation and EEaaS
- Actively management services
- Company partnership strategies

## Complete Energy Service Offering




Source: Engie

# Energy-Efficiency-as-a-Service: Innovators and ecosystem

**Barghest Building Performance (SG) –** Closed loop control for C&I HVAC&R, via EEaaS model, reducing consumption by 10-40%. Raised $33 million from KKR, for regional development, Jan 2019

**Sparkfund (US)** – Fin tech partnering with contractors, ESCOs and manufacturers to embed EEaas options into sales process. Raised funding, Nov 2019, Hannon Armstrong, to support model. Recently partnered with Shell and tech provider Gridpoint, enabling Shell to offer Building Subscription Service

**Carbon Lighthouse (US) -** Actively managed energy EEaaS. Raised $32.6 million equity from Cox and others to scale across US and for hiring

**J2 Innovations (US) –** Open framework for building automation and IoT applications, acquired by Siemens, March 2018

## Investors

## Ecosystem

# DC Grids in Buildings

**Description**

- Removing AD/DC conversion to reduce energy usage
- Installing DC bus network, linking DC devices (e.g. storage, lighting, EVs) to DC power supplies (solar, storage)

**Trends**

- Accelerating penetration of large DC systems (solar, batteries, EV fast charging)
- AC-coupling inefficient for future grid resiliency
- Trials active, but lack of commercial success/backing

**Opportunity for innovation**

- B2C DC-based commercial building nanogrid control platforms
- DC-based localized energy trading

## DC Nanogrid


Source: Ferroamp

# DC Grids in Buildings: Innovators and ecosystem

**Arda Power (CA) –** DC-connected platform and DC/DC converter for commercial buildings. Accepted on Ecofuel Spring 2020 cohort, March 2020

**Eloncity (US)** – DC-based blockchain energy trading system for local energy networks. Raised $20 million Series A 2018, and completed first commercial campus project, 2019

**Arriba Tech (UK) –** DC-ready energy component manufacturer and DC grid management system

**Ferroamp (SWE) -** Smart grid inverter integrating commercial and residential PV and storage in a local DC Microgrid/Nanogrid. Completed mini public listing on NASDAQ FIRST NORTH SWEDEN, Feb 2019 raising $4.36 million

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***Business activities for deep dives***

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DC Grids in Buildings

**Occupancy Sensing**

**Parking Tracking & Analytics**

**Indoor Environmental Monitoring**

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# Occupancy Sensing

**Description**

- Occupancy sensing, analytics and insights
- 50% of global commercial office space empty/ underutilized (pre-covid)

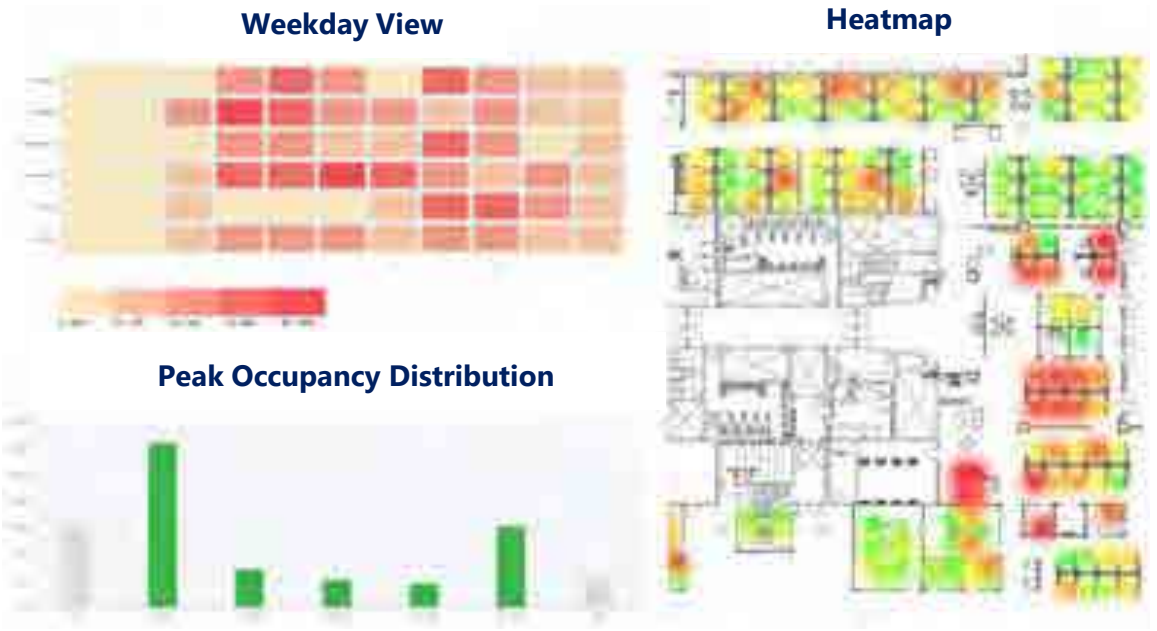
**Trends**

- Energy benefits secondary to non-energy
- Building certification covering health / wellbeing
- 200 players, 49% based in EMEA mainly Europe

**Opportunity for innovation**

- Optimizing spatial efficiency
- Integration of more datapoints
- Increased employer retention and productivity

## Office Building Occupancy Heat Map




Source: Steerpath

# Occupancy Sensing: Innovators and ecosystem

**Feedback Solutions (CAN)** – Sensor for real-time occupancy data to efficiently control HVAC systems. 2019 enrolled onto Cleantech Open and Canadian Technology Accelerator

**Sensor Flow (Sing)** – Wireless IoT solution that monitors, analyses and automates hotel rooms. 2019, raised $2.7 Series A funding from 7 investors

**Vergesense (US)** – AI-powered occupancy sensing for facility management. May 2020, raised $9 million from Allegion Ventures, JLL Spark, Metaprop, Y Combinator, Pathbreaker Ventures, and West Ventures.

**Hearth Labs (US)** – Thermal radiation sensors and LIDAR to scan space utilization to measure and control thermal comfort. March 2020, enrolled onto Hax Accelerator and Free Electrons cohorts

## Investors

## Ecosystem

# Parking Tracking & Analytics

**Description**

- Providing B2B parking infrastructure analytics
- Providing B2C driver services (booking, payment)
- Increasing revenue, offering flexible pricing

**Trends**

- Increasing use of AI to predict /optimize parking occupancy
- Smart city integration (intelligence traffic systems and connected vehicles)

**Opportunity for innovation**

- Leveraging vehicle connectivity, smart infrastructure, and IoT applications
- Sensor-enabled real-time space availability and maintenance

## Parking Tracking Analytics

Source: SpotVision

# Parking Tracking & Analytics: Innovators and ecosystem

**Cleverciti Systems (GE) -** AI-based technology maximizing use of parking assets; participated in the EIT Digital Accelerator, raised $15 million Series A round, 2018

**Spotvision (NL)** – B2B and B2C parking application showing drivers locations of vacant parking spots; participated in 2019 Rockstart Accelerator program and NVIDIA Inception program

**Quantela (US)** – AI platform that enables remote monitoring, control and optimization of infrastructure; raised $10 million Series A from Digital Alpha in November 2018

**FlashParking (US)** - Cloud-enabled technology providing transparency into parking assets and analytics to improve decision-making and planning; raised $60 million from L Catterton, Jan 2020

## Investors

## Ecosystem

# Indoor Environmental Monitoring

**Description**

- Monitoring / controlling indoor environment (eg temp, air quality, gas, noise)
- Indoor air pollution top five environmental risks to public health

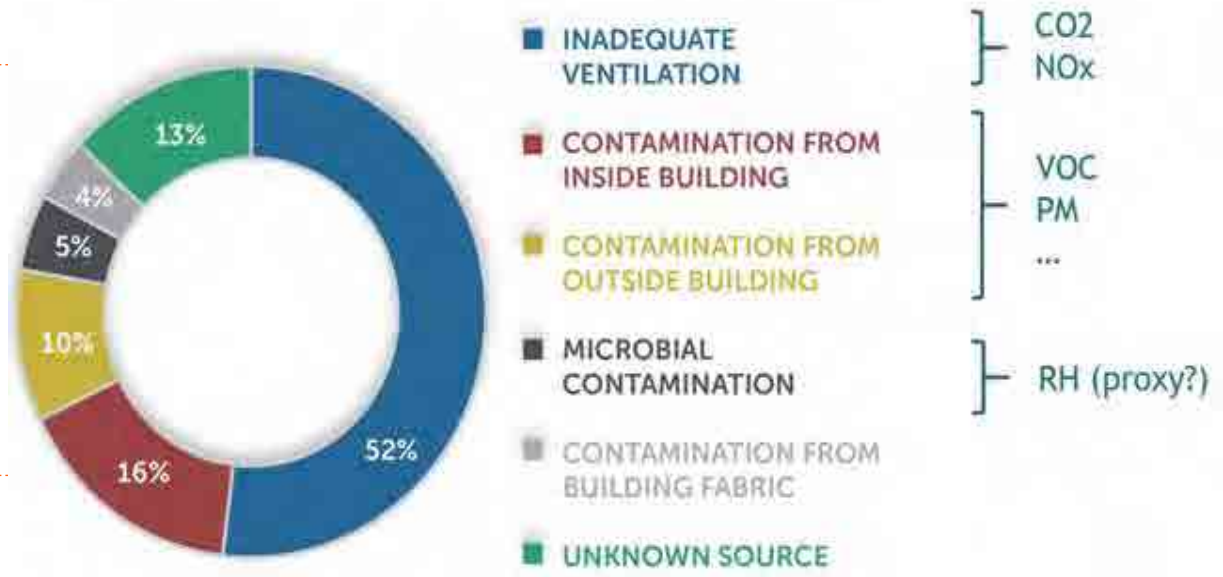
**Trends**

- 9.4% annually growth, $3.9 billion by 2025.
- North America driving growth
- Fragmented vendor market offerings

**Opportunity for innovation**

- Web-enabled air purification systems
- Real-time data integration
- Decreasing cost of sensors

## Sources of Indoor Air Quality




Source: Gresb

# Indoor Environmental Monitoring: Innovators and ecosystem

**Air Quality (CH)** – Air conditioning purification filters, intelligent air quality detectors and monitoring software. Raised $10 million equity round September 2018

**Molekule (US)** – Internet-connected air purification devices for commercial and residential buildings. February 2020, raised $58 million in a Growth Equity round

**Oxygen at Work (SWI)** – Office plant, design and air monitoring service, which improve indoor air quality and increase HVAC efficiency, joined 2019 cohort for the Energy Startup Day

**Urecsys (ISR)** – Indoor air pollution software to monitor in real-time. March 2020, Urecsys raised $4 million in a Series A round

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Cleantech Group

# Predictive Energy Analytics

**Description**

- Forecasting energy use, comfort and carbon
- Reducing maintenance costs
- Mitigating against "Critical Callouts"

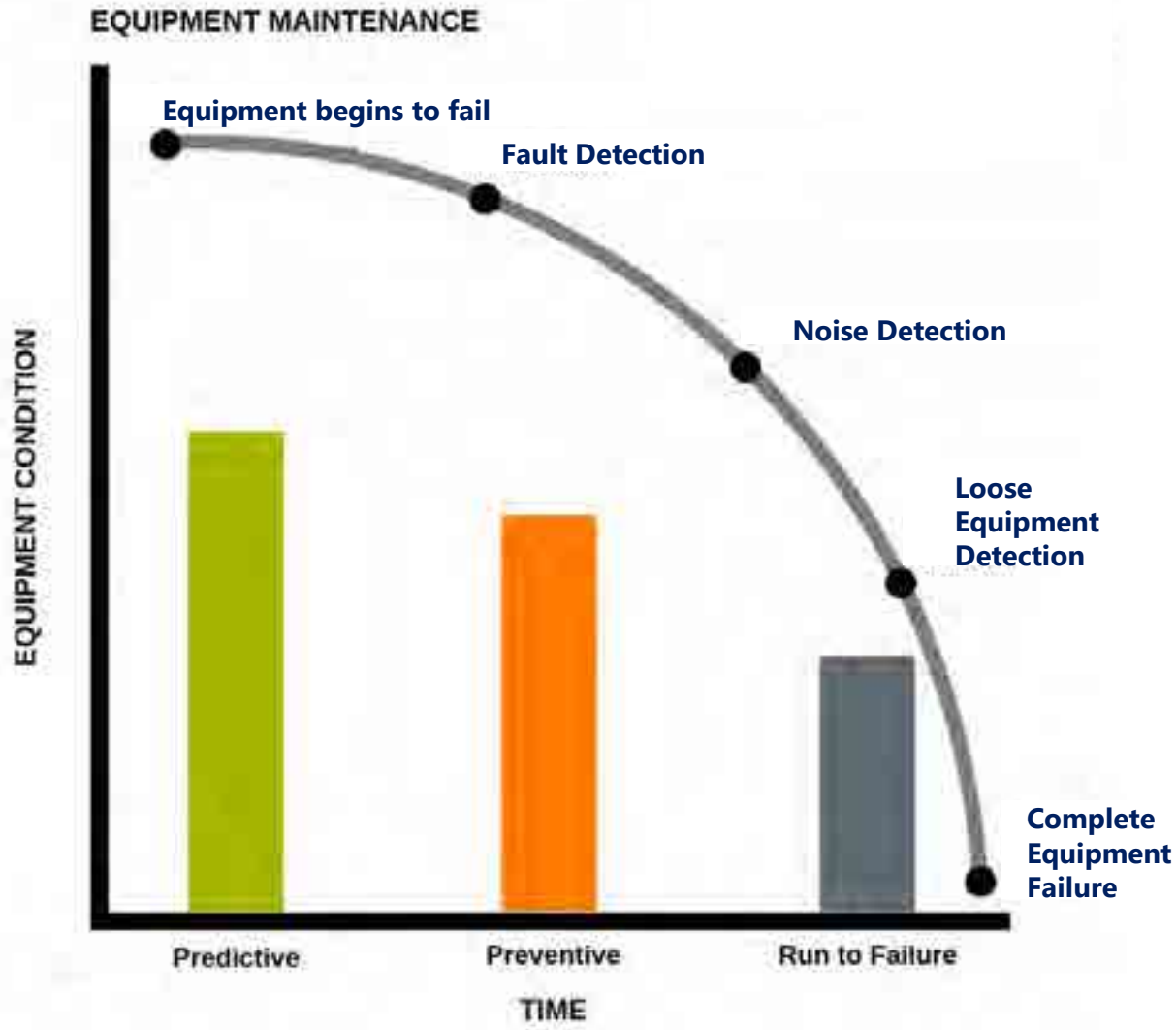
**Trends**

- 83% commercial building owners engaged in predictive analytics
- Demand for integration with existing building management systems
- Asset generalist vs. specialist

**Opportunity for innovation**

- Increasing sophistication of advanced sensors
- Edge-based processing
- Improving mean time between failures

## Maintenance Technology




Source: CTG, Hubhead

# Predictive Energy Analytics: Innovators and ecosystem

**Grid Edge (UK)** – Predictive building energy management analytics SaaS. Appointed as tech lead, Feb 2020, for low carbon smart energy grid planned for central London and the West Midlands, UK

**R&B (CH) –** AI software platform for smart energy/asset insights for commercial and industrial processes. Raised $3.6 million Series A, Jan 2020 led by BP Ventures

**Hacthdata (US)** – Performance monitoring and productivity platform for commercial building owners and operators. Raised equity, Oct 2019, Windsail Capital Group

**Ibis Networks (US) –** Plug-level energy monitoring and control to solve energy and asset management problems for the enterprise.

## Investors

## Ecosystem

# Command & Control

**Description**

- Dynamically optimizing of energy flow in building
- Using real-time environmental conditions and historical data

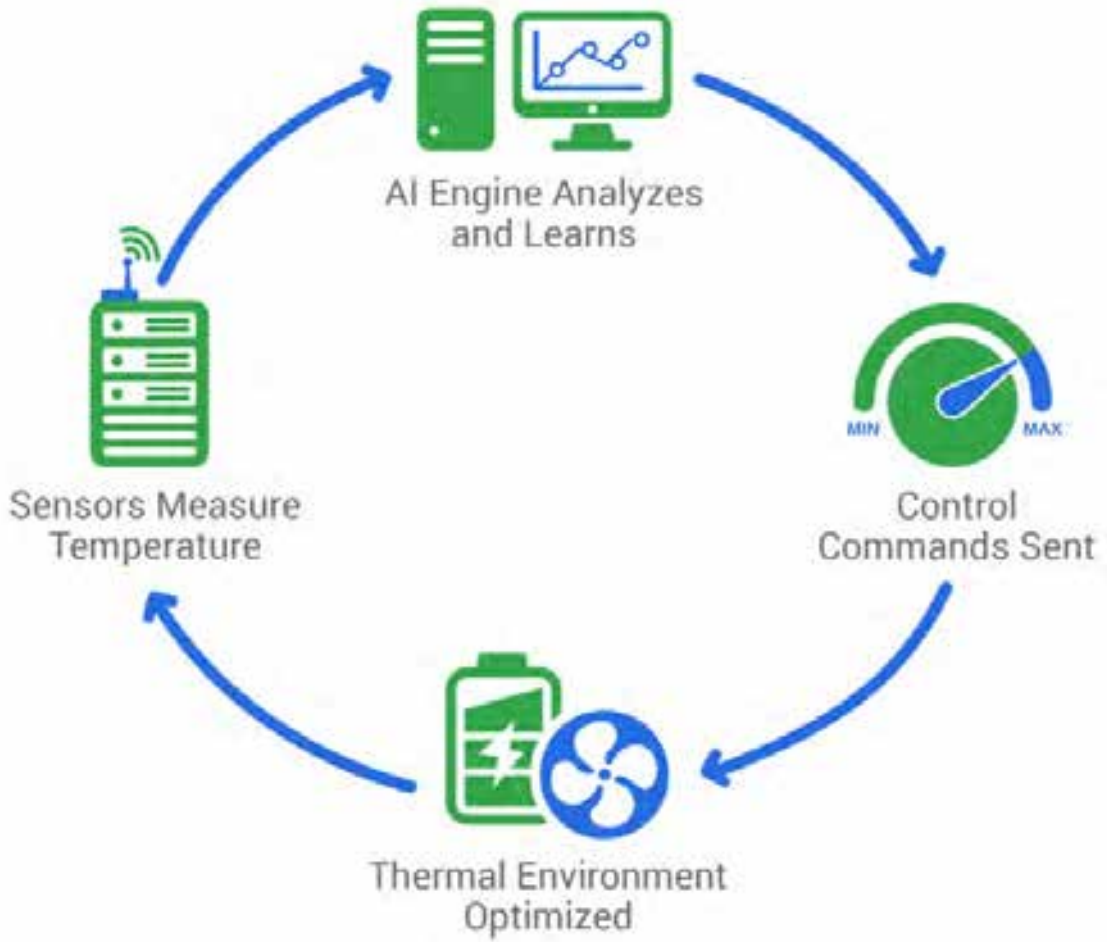
**Trends**

- Innovators are engaging with OEMs via platforms/marketplaces
- Transition from hardware to cloud & edge
- Customers remain hesitant towards automation

**Opportunity for innovation**

- Commercial HVAC control automation
- Increasing sophistication of algorithms
- Potential for grid integration

## Dynamic HVAC Optimization




Source: Vigilent

# Command and Control: Innovators and ecosystem

**75F (US) -** IoT platform coupled with cloud computing to create a predictive and proactive building automation system. Enrolled onto Free Electron 2020 cohort and raised $18 million Series A Sept 2019

**Brainbox AI (CA)** – Proactive deep learning AI control software for commercial HVAC. Completed first US installation, Dec 2020, with multiple other national projects underway

**Minibems (UK) –** Demand management system for complex heating systems (commercial, domestic, district, communal). Raised undisclosed seed, Sept 2019 for expansion across UK and Europe

**BeeBryte (FR) -** Integrated IoT infrastructure (nano computer with 3G router) and AI for real time chiller and HVAC system control. Partnered with Germany eng. Corp, Emutex, Nov 2019, to improve energy efficiency in commercial buildings and factories

## Investors

## Ecosystem

# Distributed Energy Procurement & Management

**Description**

- Procuring onsite and aggregated generation and storage
- Optimizing management of distributed energy assets

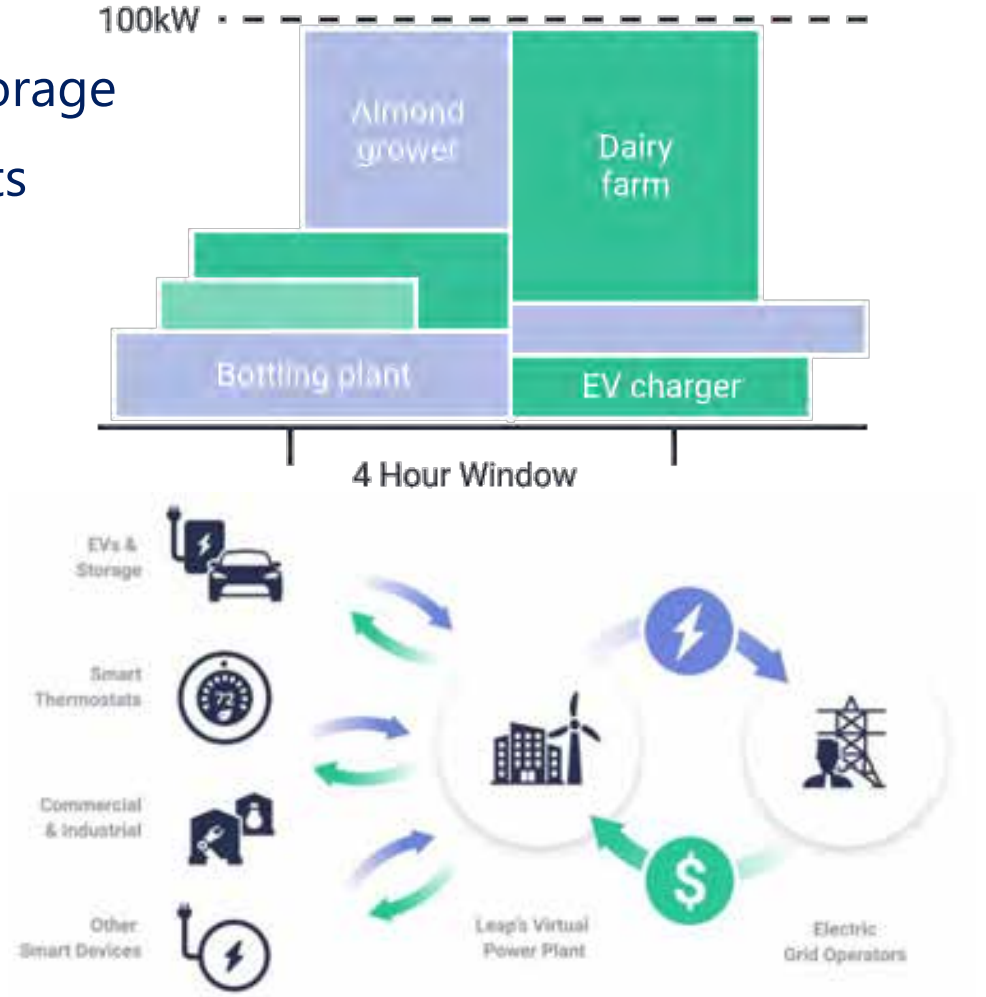
**Trends**

- Reducing "Soft costs", which are significant % of overall project cost
- California lead national efforts (regulation, demand for resiliency)
- Regulatory / ability to participate in energy markets

**Opportunity for innovation**

- Further interaction between building and distributed energy
- Localized, real-time flexibility management
- Automated energy procurement

## Aggregation of Distributed Assets




Source: Leap

# Distributed Energy Procurement & Management: Innovators and ecosystem

**Onswitch (US) -** Aerial technology and a market platform for buying solar for commercial buildings. Enrolled onto E8 Angles incubation program, 2019

**Station A (US)** – Platform automating clean energy development, originate design, execute projects. Released Station A card, Dec 2019, providing clean energy recommendations for building developers

**Leap (US) -** Flexibility aggregation platform for distributed energy resources. Partnered with Google's Nest and Axiom Exergy, 2019, enabling aggregation of commercial building load for grid services

**Go Electric (US) –** Turnkey microgrid and energy resiliency solutions, acquired by Saft (Total), June 2019

## Investors

USV

CONGRUENT VENTURES

nationalgrid

POWERHOUSE

ANDREESSEN HOROWITZ

ALUMNI VENTURES GROUP

## Ecosystem

E8

idealab

energy web

InnoEnergy

IN

ELEMENTAL EXCELERATOR

Climate-KIC

cleanenergytrust

Cleantech Group

# Commercial Buildings

Overview

Business Activity

- Circular Economy
- Decarbonization & Electrification
- Cities & Urbanization
- Digitalization, Decentralization, Automation
- **Resilience**

# Commercial Buildings

***Business activities for deep dives***

**Geospatial Risk Analytics**

**Microgrids**

**Building Envelope**


Energy Recovery

Smart Materials

Concrete Reuse/Recycle

Predictive Energy Analytics

Command and Control

Distributed Energy Procurement & Management


Sustainable Cement

Energy-efficiency-as-a-service

DC Grids in Buildings

Occupancy Sensing

Parking Tracking & Analytics

Indoor Environmental Monitoring

Cleantech Group

# Geospatial Risk Analytics

**Description**

- Analyzing climate-related risk factors from geospatial data inputs
- Measuring physical asset and financial risk

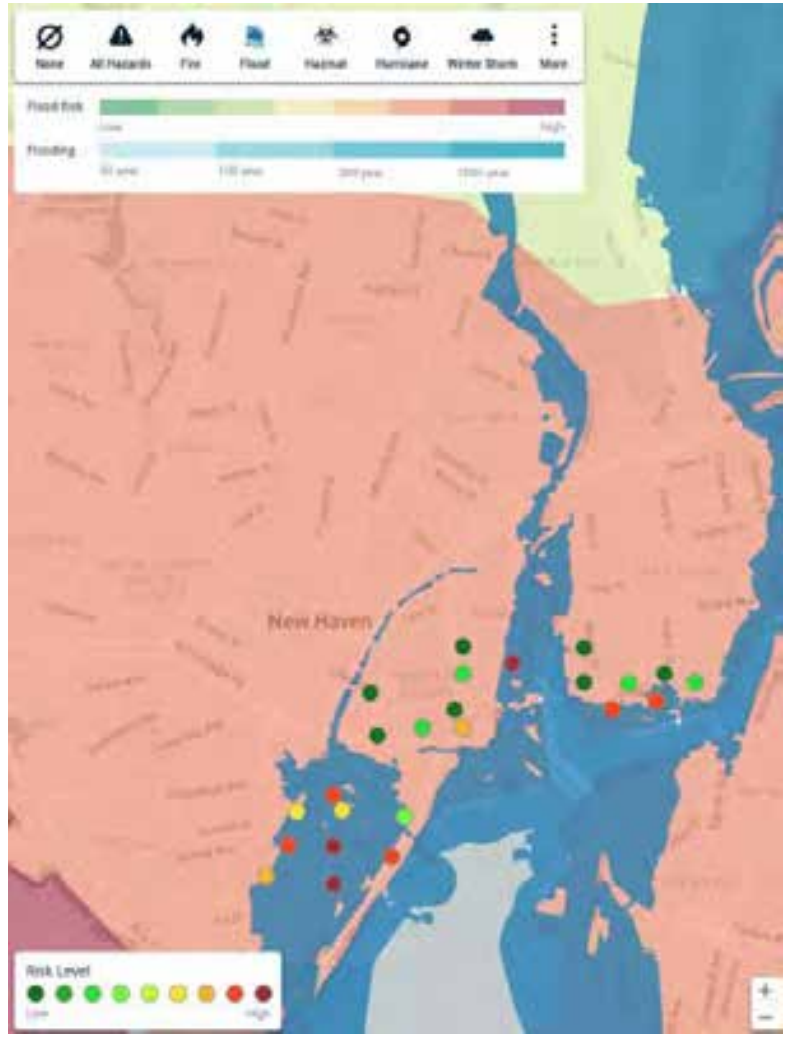
**Trends**

- Voluntary climate risk reporting advantage
- Mandatory climate risk reporting
- Inefficient incumbent vendor offerings

**Opportunity for innovation**

- Integration of multiple hazards
- Integration of commercial building data points
- Use of long-life, low-power sensors

## Asset Exposure to a Hurricane




Source: Geospiza SWIFT hazard warning interface, 2020

# Geospatial Risk Analytics: Innovators and ecosystem

**Jupiter Intelligence (US) –** Climate/weather data using satellite imagery for risk mitigation, site selection, engineering and design. In September 2019 received $1 million grant funding from Elemental Excelerator

**Geospiza (US) –** Climate risk analysis, weather risk to commercial buildings, supply chains and company portfolios. Raised $725K, May 2019 in seed round from TechStars, GAN Ventures and Alumni Ventures

**Ambisence (IRE)-** Environmental risks assessment and management services. May 2019 raised $1 million. Recently provided analytics and underfloor gas monitoring for commercial building conversion

**HazardHub (US)-** Geospatial risk database for physical risks for property insurers. Partnered with insurance software company, March 2020, integrating real-time geographical risk data into its core suite for property and casualty risks

## Investors

insurity

ignitionpartners

GAN

ATLANTIC BRIDGE

## Ecosystem

ELEMENTAL EXCELERATOR

eit Climate-KIC

ENTERPRISE IRELAND
where innovation means business

techstars

Cleantech Group

# Microgrids

**Description**

- Managing energy independent from grid
- Offering flexible energy architecture

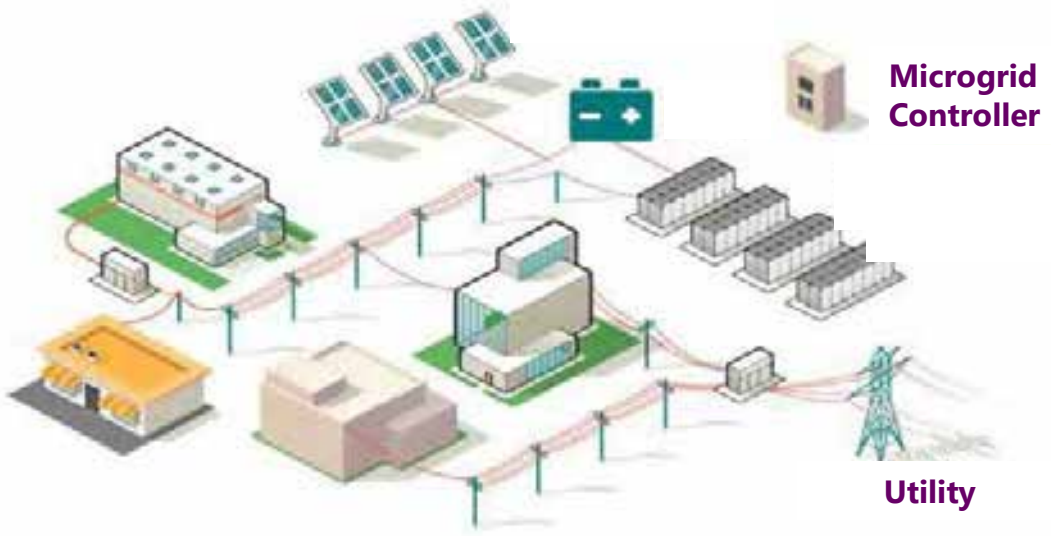
**Trends**

- Increasing reliability concerns
- US yearly power outages cost $150 billion
- Projects largely one off

**Opportunity for innovation**

- Inclusion of new services (eg EV charging, storage, grid services)
- Decreasing cost of microgrid systems

## Microgrid Energy System




Source: Bloom Energy, CTG

# Microgrids: Innovators and ecosystem

**Auxilium Energy (SWI) –** Commercial building solar + storage for grid-tied microgrids. Raised undisclosed seed funding, March 2020 from TGI Solar to expand across Europe

**Scale Microgrid Solutions (US) -** Designer, builder, operator, and financer of on-site power systems for C&I facilities. Raised $300 million project finance equity, Jan 2020, Warbus Pincus

**Yotta Energy(US)** – Modular solar + storage solution and software control and grid optimization software for commercial building customers, partnership with California State University, Feb 2020.

**Helia (US)** – Microgrid DER integration platform for commercial buildings and Utilities. Partnered with SimpliPhi Power, Sept 2019, for technology platform development

## Investors

## Ecosystem

# Building Envelope

**Description**

- Externally applied coatings, panels, facades
- Mitigating against urban heat island effect, high winds, fires, flooding

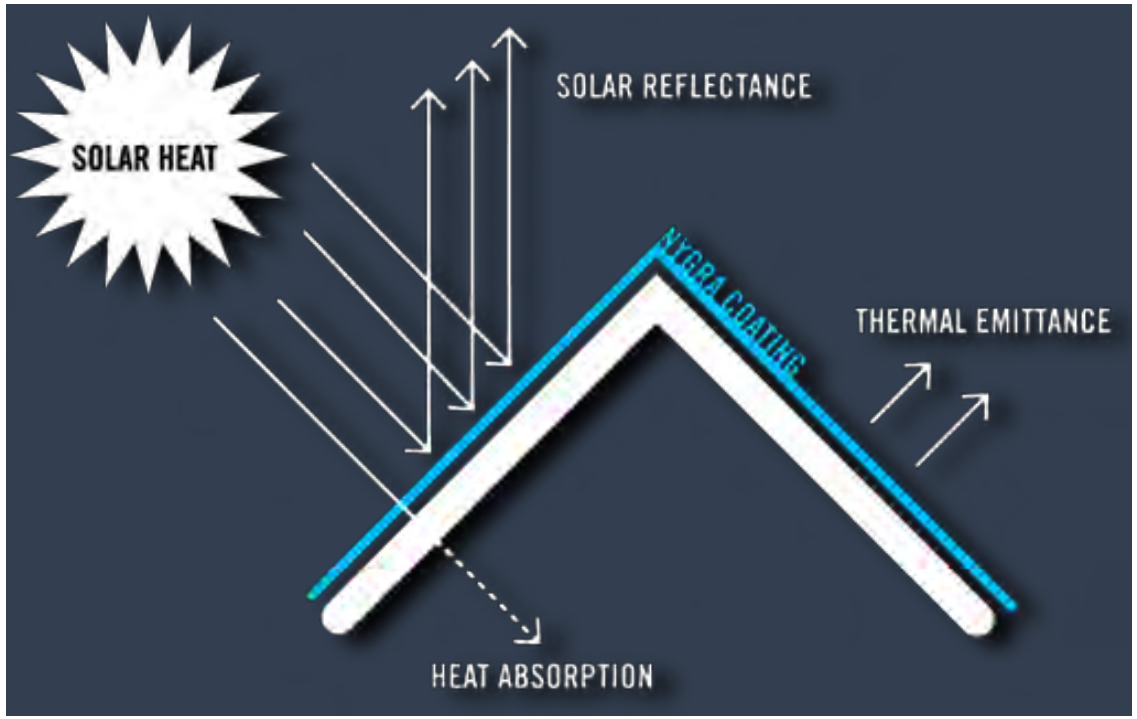
**Trends**

- Paints and coatings for reduced corrosion and heat reflection
- Application of green facades/walls and roofs

**Opportunity for innovation**

- Multifunctional coatings, tunable properties, heat reflection and color
- Adoption of new plans and sedum for green roofs, mats and carpets

## Reflective Coating Mechanism




Source: Nygra Coatings

# Building Envelope: Innovators and ecosystem

**Cypris (US)** – Tunable, paintable coatings which selectively reflect UV, visible and near-infrared radiation. Founded in 2019

**Nygra Coatings (US) –** Heat reflective advanced polymer roof coatings which resist extreme weather, dirt and chemicals. 2019, raised $2.5 million (structured debt)

**Airlite (UK/IT) –** Advanced multifunction paints with antimould, antibacterial, dirt resistance and/or heat reflective properties

**Urbangreen (SE) –** Green roofs, roof landscapes and sedum cultivation. 2019, installed $350k green sedum roofs at Albano Campus of Stockholm University

## Investors

## Ecosystem

# Championing Sustainable Innovation, Catalyzing Business Opportunities

*Cleantech Group's research, consulting and events catalyze opportunities for sustainable growth powered by innovation.*

Cleantech Group

Contact us at research@cleantech.com