Cleantech Forum
Asia
Singapore | November 13-14, 2018

Cleantech Forum **Asia** | Singapore

The “Smart” Innovation Showcase: Meet International Innovation Companies Looking for Capital & Partners

“Smart” Innovation Showcase Moderator

KUAN HSU

Co-Founder & General Partner, KK Fund

"Smart" Innovation Showcase

STÉPHANE GERMAIN

President & CEO, GHGSat

GHGSat

GLOBAL EMISSIONS MONITORING

CTF Asia – November 2018

MONITORING INDUSTRIAL EMISSIONS FROM SPACE

GHGSat uses its own satellites to monitor greenhouse gas (GHG) emissions from industrial facilities, anywhere in the world

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WHY MONITOR EMISSIONS?

ECONOMICS

Many methane emissions can be reduced profitably

INVESTORS

GHG emissions disclosures demanded by investors

HEALTH & SAFETY

Methane explosions are hazards in several industries

REGULATIONS

Carbon pricing/taxes, leak monitoring, climate-related risk disclosures

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WHY MONITOR FROM SPACE?

ECONOMIES OF SCALE

Each satellite can measure any site in the world, every two weeks

EASE OF DEPLOYMENT

Can measure any site within days of request, as often as needed, with no deployment cost

PERFORMANCE

Can detect and quantify emissions more precisely and at lower cost than most existing methods

CONSISTENCY, TRANSPARENCY

Same method used for all sites, everywhere, for anyone

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DEMONSTRATION SATELLITE: **GHGSAT-D (“CLAIRE”)**

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LAUNCHED IN 2016

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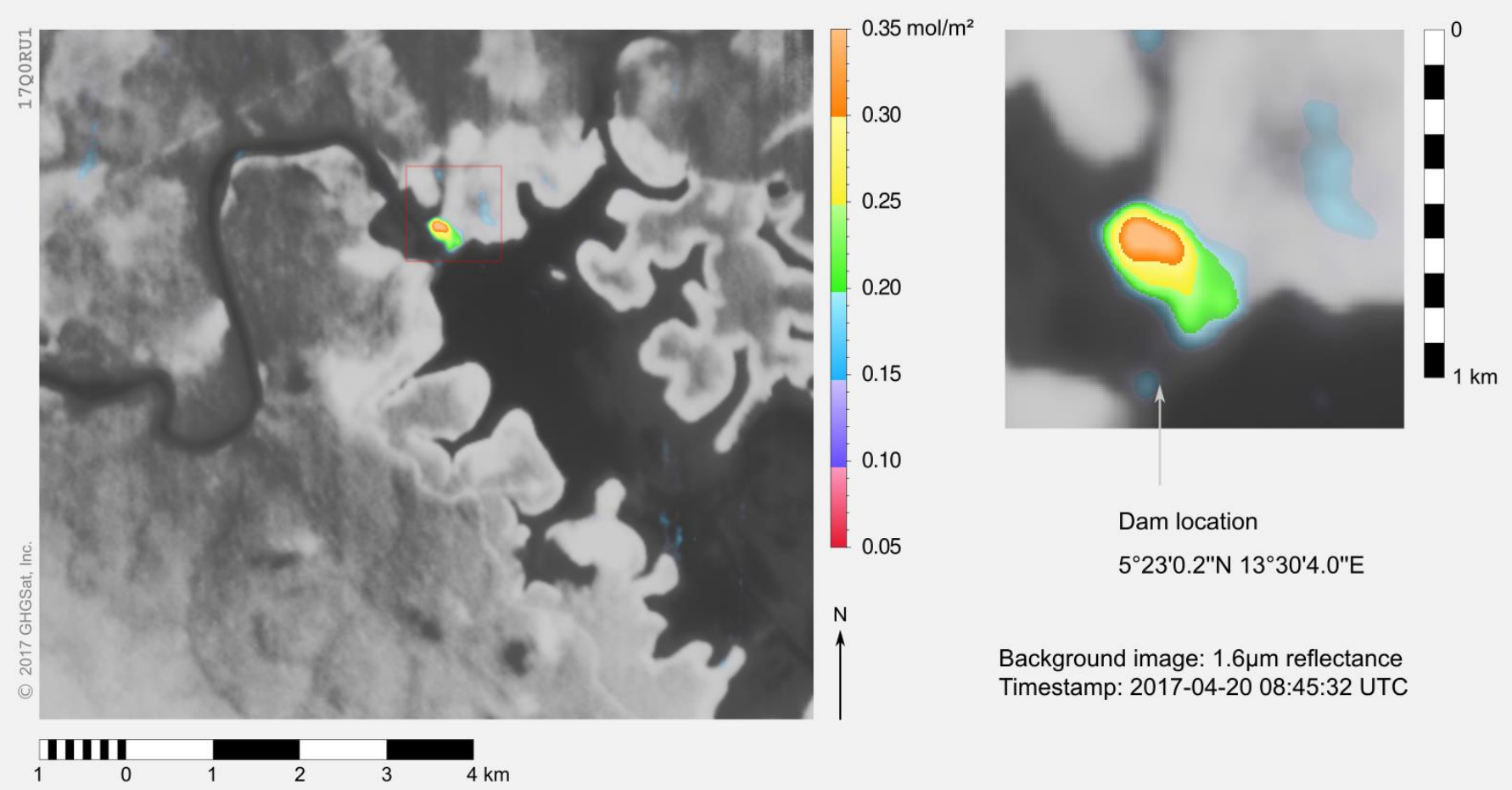
EXAMPLE: **METHANE FROM HYDROELECTRIC DAM LOM PANGAR, CAMEROON**



View of water flow from dam

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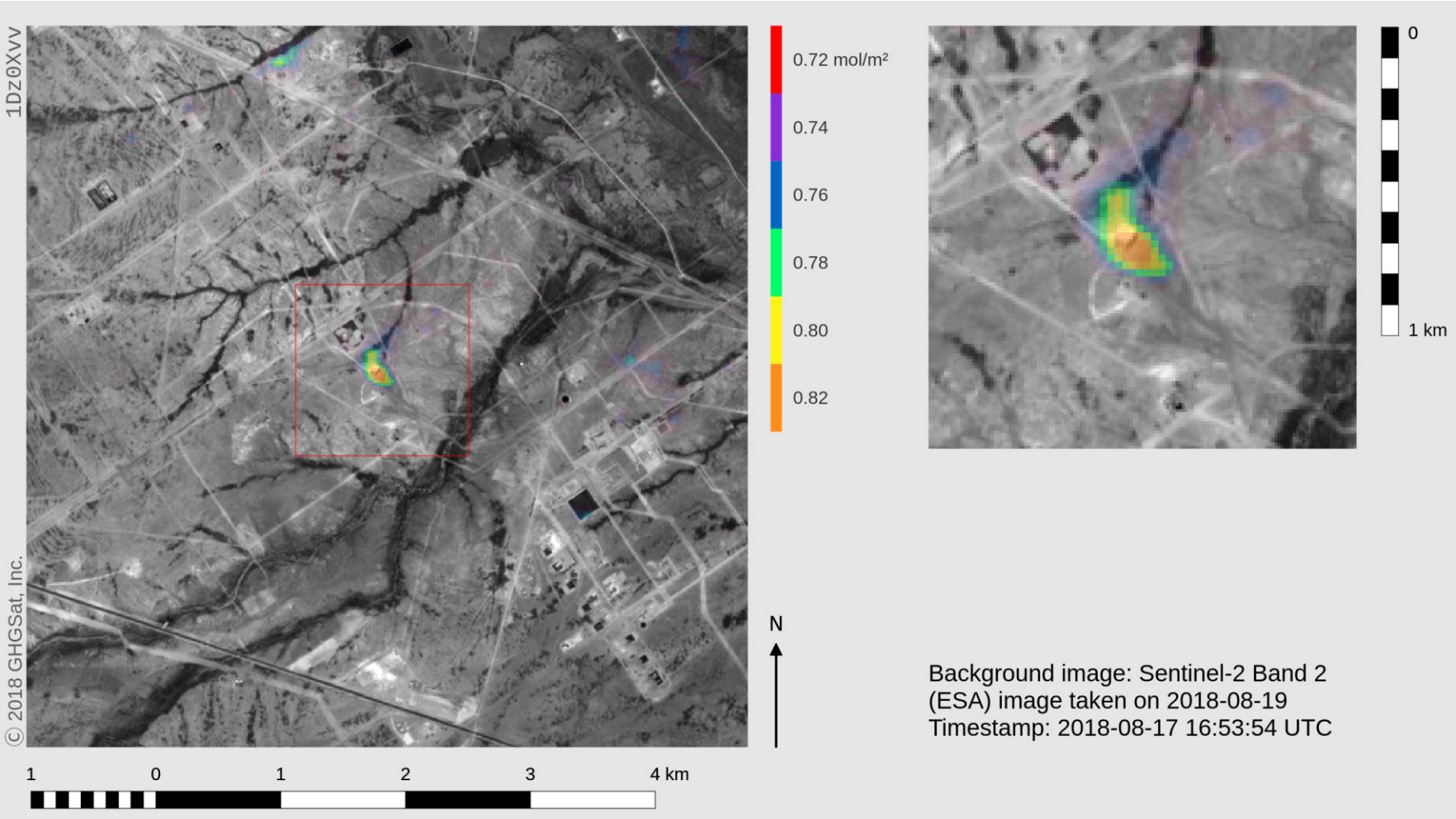
EXAMPLE: **METHANE FROM SHALE GAS OPERATIONS PERMIAN BASIN, TX**



Typical midstream facility in Permian Basin

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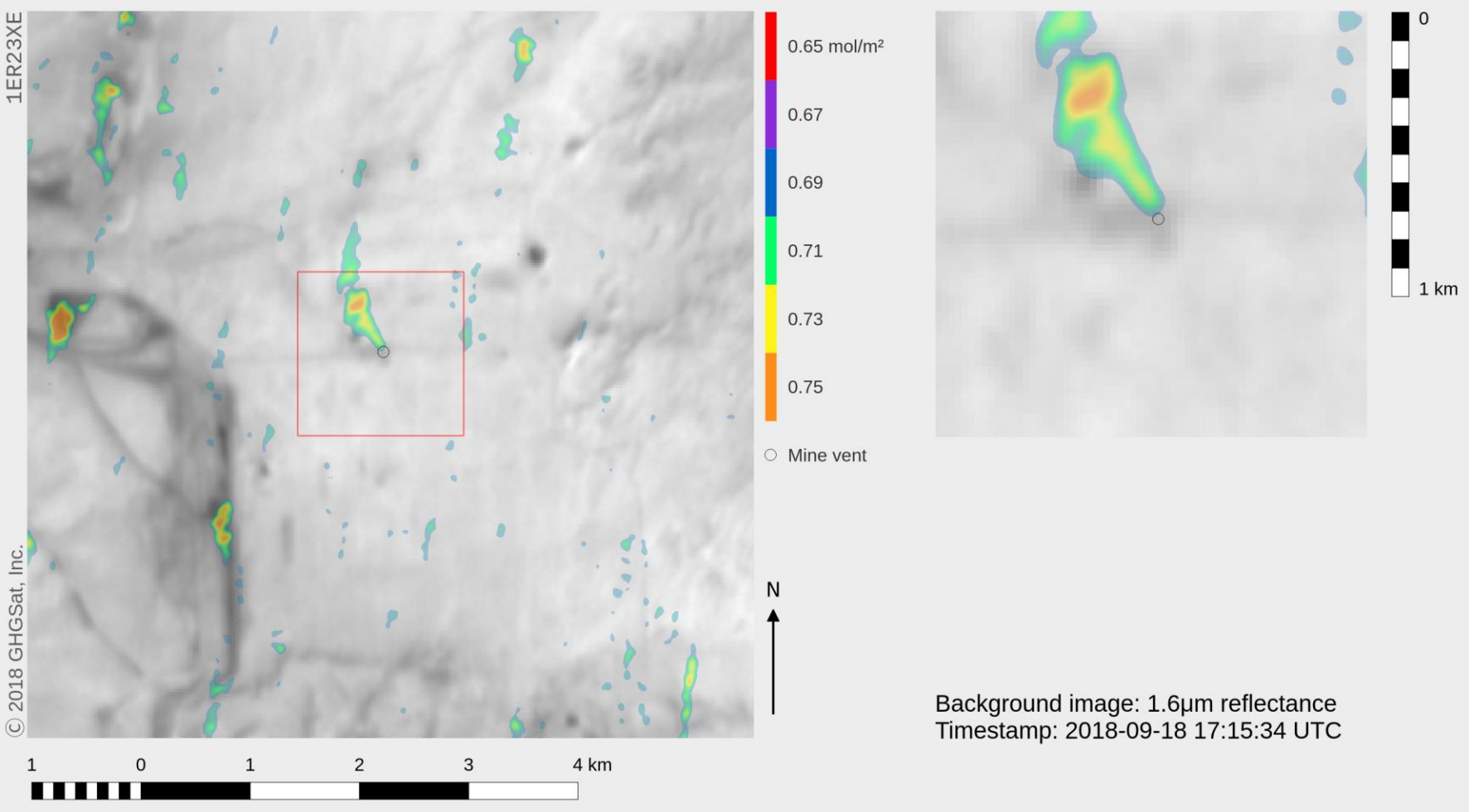
EXAMPLE: **METHANE FROM COAL MINE VENT SAN JUAN, NM**



View of San Juan generating station and mine coal piles

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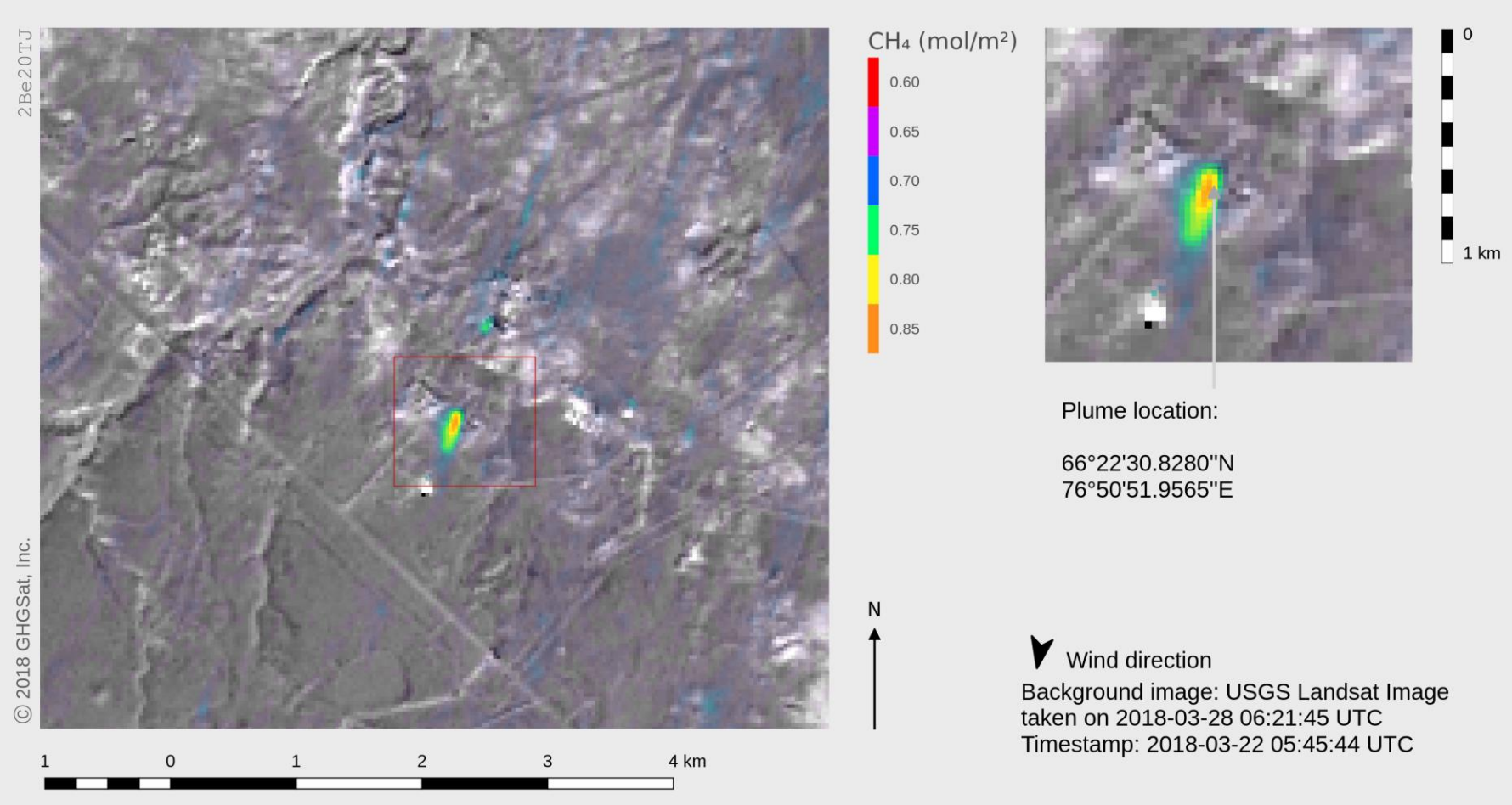
EXAMPLE: **METHANE FROM COMPRESSOR STATION URENGOY, RUSSIA**



Compressor station in Urengoy oil & gas field

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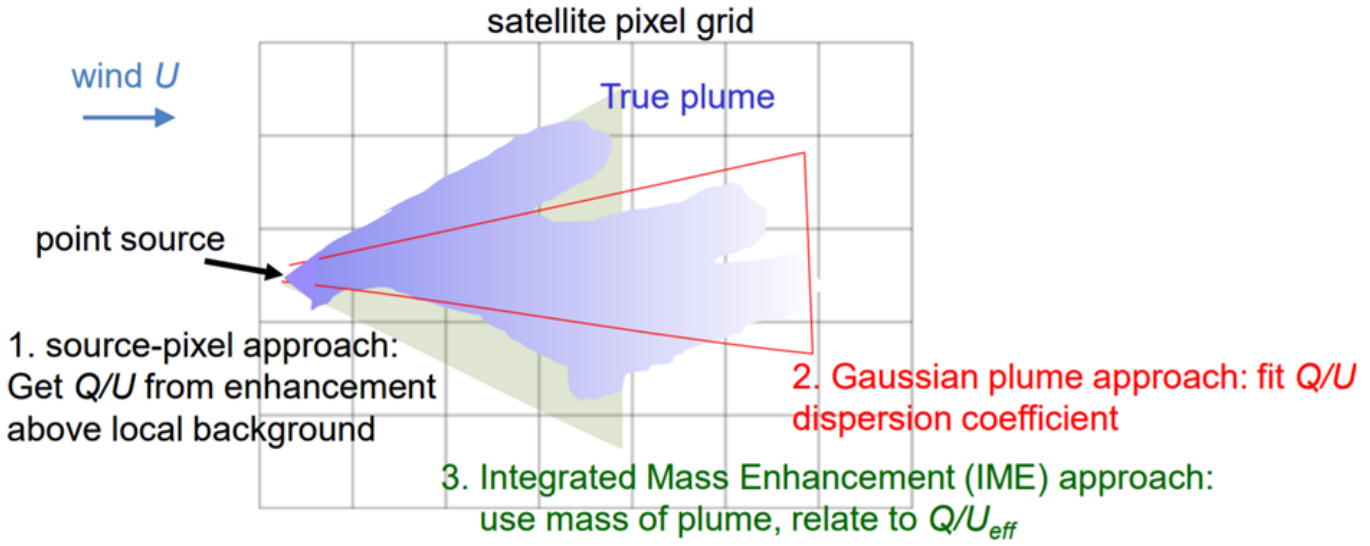
ANALYTICS

- **Analytics** for plume enhancement
- **AI** for automated plume detection & emission rate estimates



- **AI** for monitoring production rates, based on emissions
- **AI** for predicting methane leaks in shale gas basins

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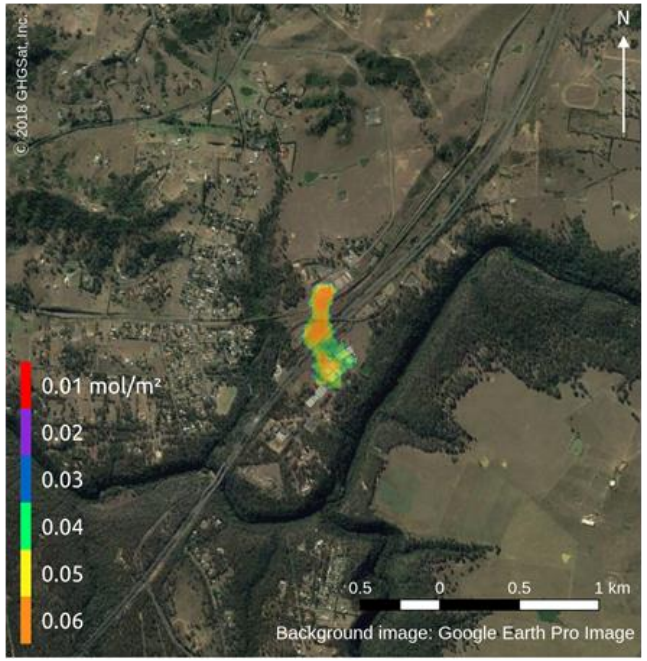
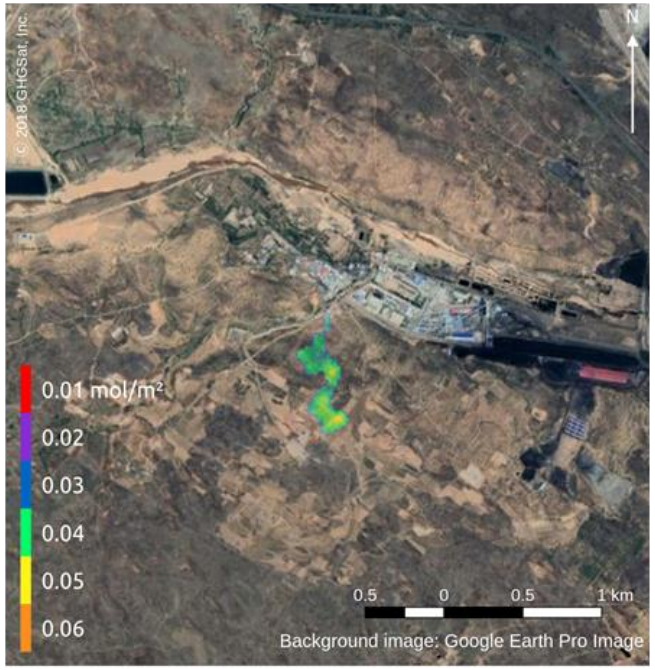
EXAMPLE: **PLUME ENHANCEMENT (TIME-AVERAGING)**

Camden, Australia



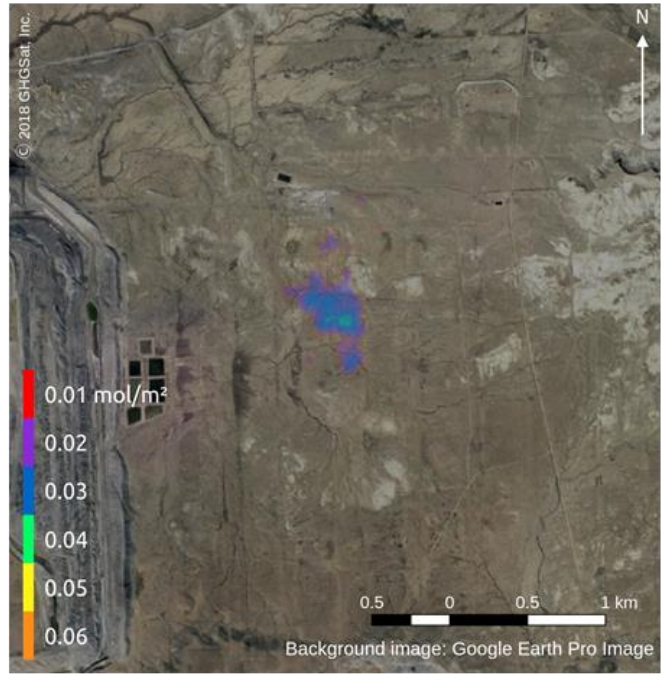
Inferred Source Rate (kg h^{-1})
IME Method: 2200
X-Flux Method: 4000
Previous: 1000-10800 (CSIRO)

Bulianta, China



Inferred Source Rate (kg h^{-1})
IME Method: 1400
X-Flux Method: 2000
Previous: n/a

San Juan, USA



Inferred Source Rate (kg h^{-1})
IME Method: 1150
X-Flux Method: 1500
Previous: 360-2800 (Frankenberg 2016)

Time-averaging and source rate quantification analytics by Varon et al. (Preliminary Results)

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GHGSAT IS BECOMING THE INDUSTRY CHOICE

Oil & Gas

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BUILDING MORE SATELLITES

- Building on lessons learned
- Targeting order of magnitude performance improvement

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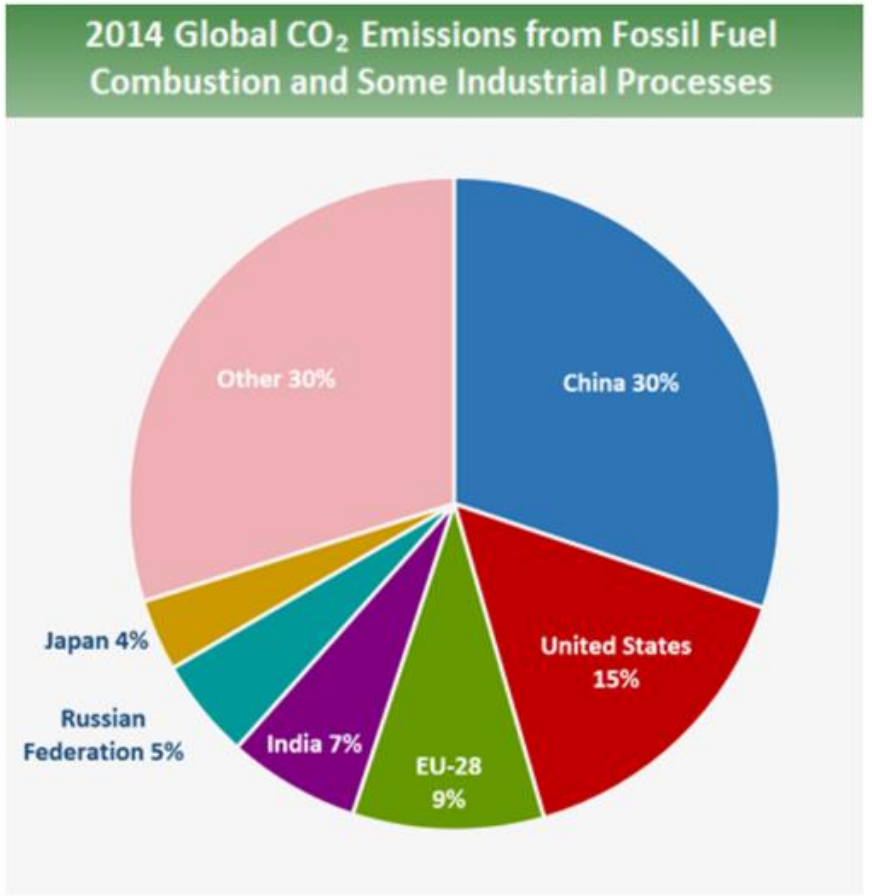
GHGSAT IN ASIA

- Focus is on China and India
- Largest growth in Asia is from fossil fuel combustion (e.g. coal-fired thermal power generation)
- Growing interest in LNG and shale gas and landfill gas



Source: Boden, T.A., Marland, G., and Andres, R.J. (2017). National CO2 Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring: 1751-2014, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, doi 10.3334/CDIAC/00001_V2017.

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GHGSat
GLOBAL EMISSIONS MONITORING

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www.ghgsat.com

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"Smart" Innovation Showcase

ELODIE HECQ

Head of Sales, Singapore, BeeBryte

BeeBryte

Energy Intelligence & Automation

Artificial Intelligence for greener and cheaper electricity

A BIT MORE ABOUT US

Founded in **2015**

Team of **20**

Offices in **FRANCE & SINGAPORE**

Selected customers

NGEE ANN POLYTECHNIC

picard

DHL

MAIRIE DE PARIS

voltalia

THE LINDE GROUP

SNCF

SOLVAY

Accelerated by

intel

TechFounders

Supported by

CNR

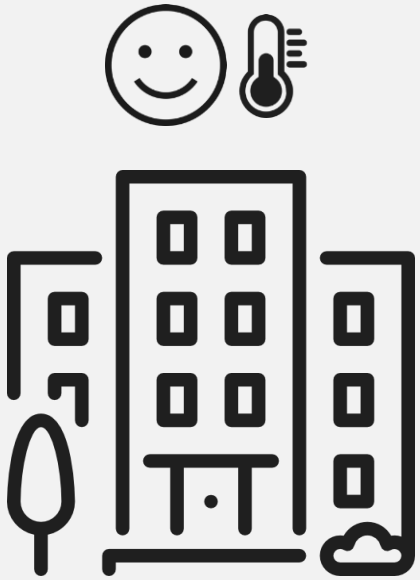
bpifrance

ADEME

Energy Market Authority

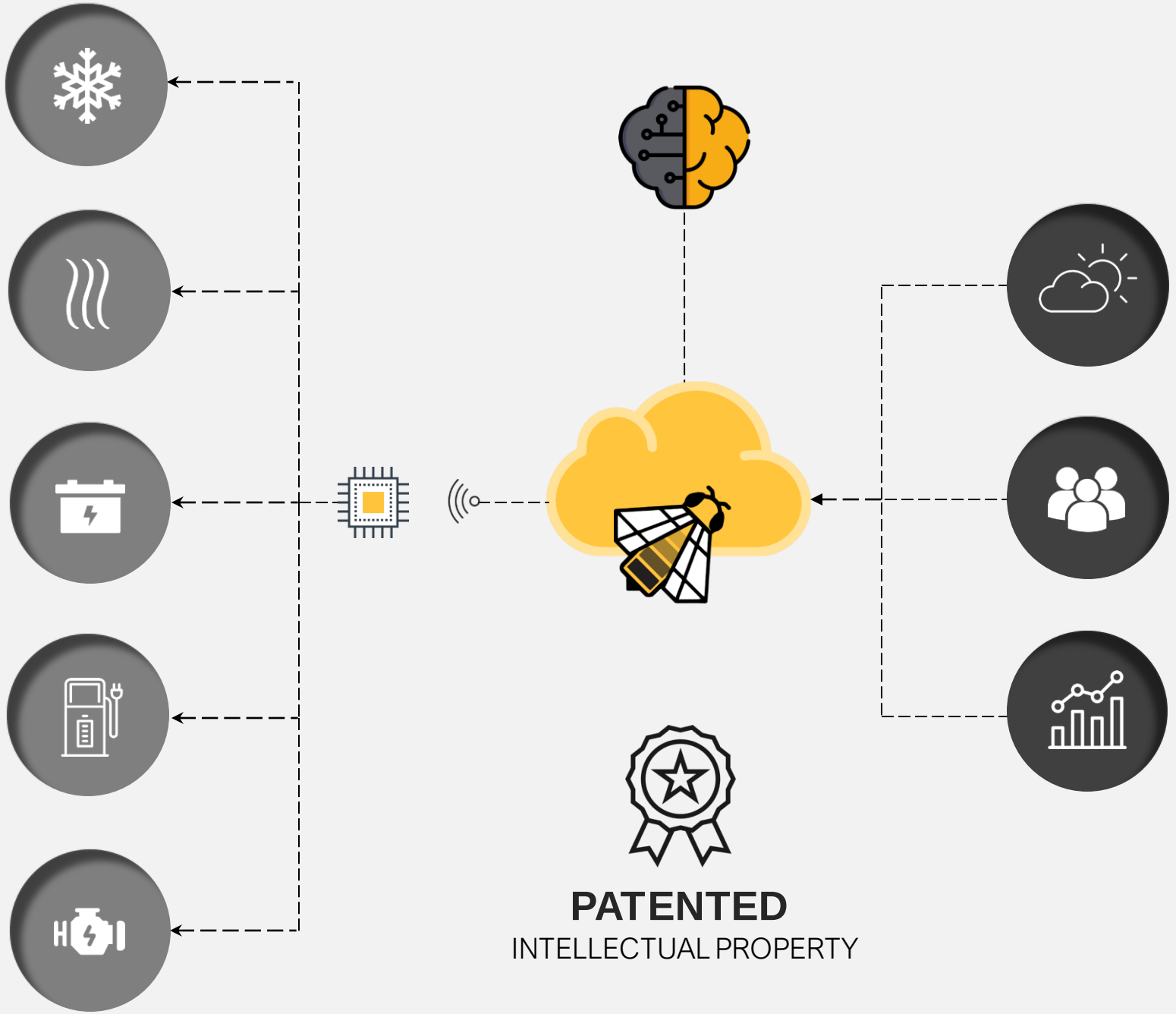
Smart Energy, Sustainable Future

OUR SOLUTION



40%

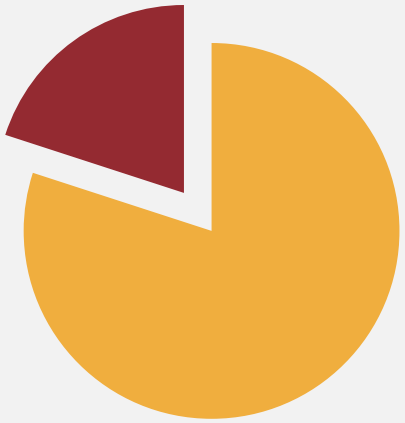
ENERGY COST SAVINGS



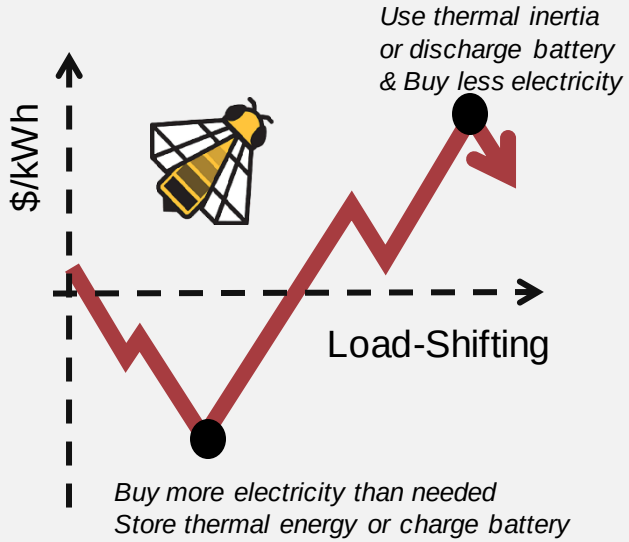
PATENTED

INTELLECTUAL PROPERTY

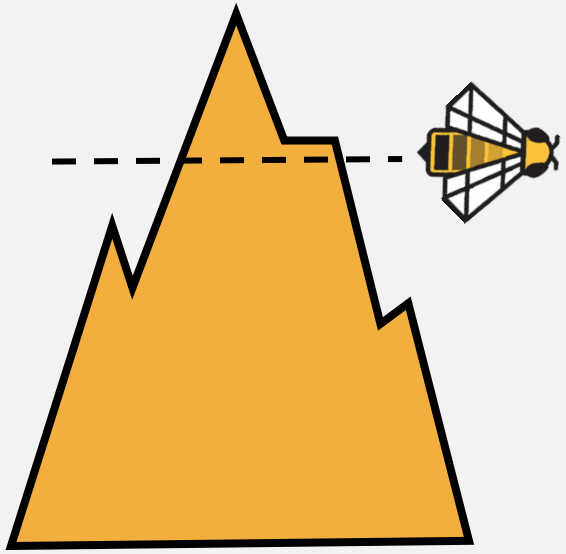
VALUE POOLS



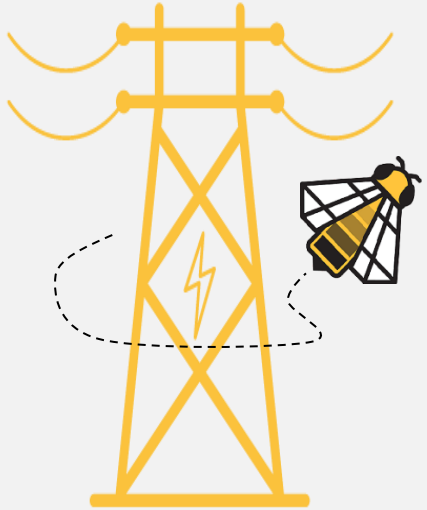
Energy Efficiency
Reducing kWh



Price Arbitrage



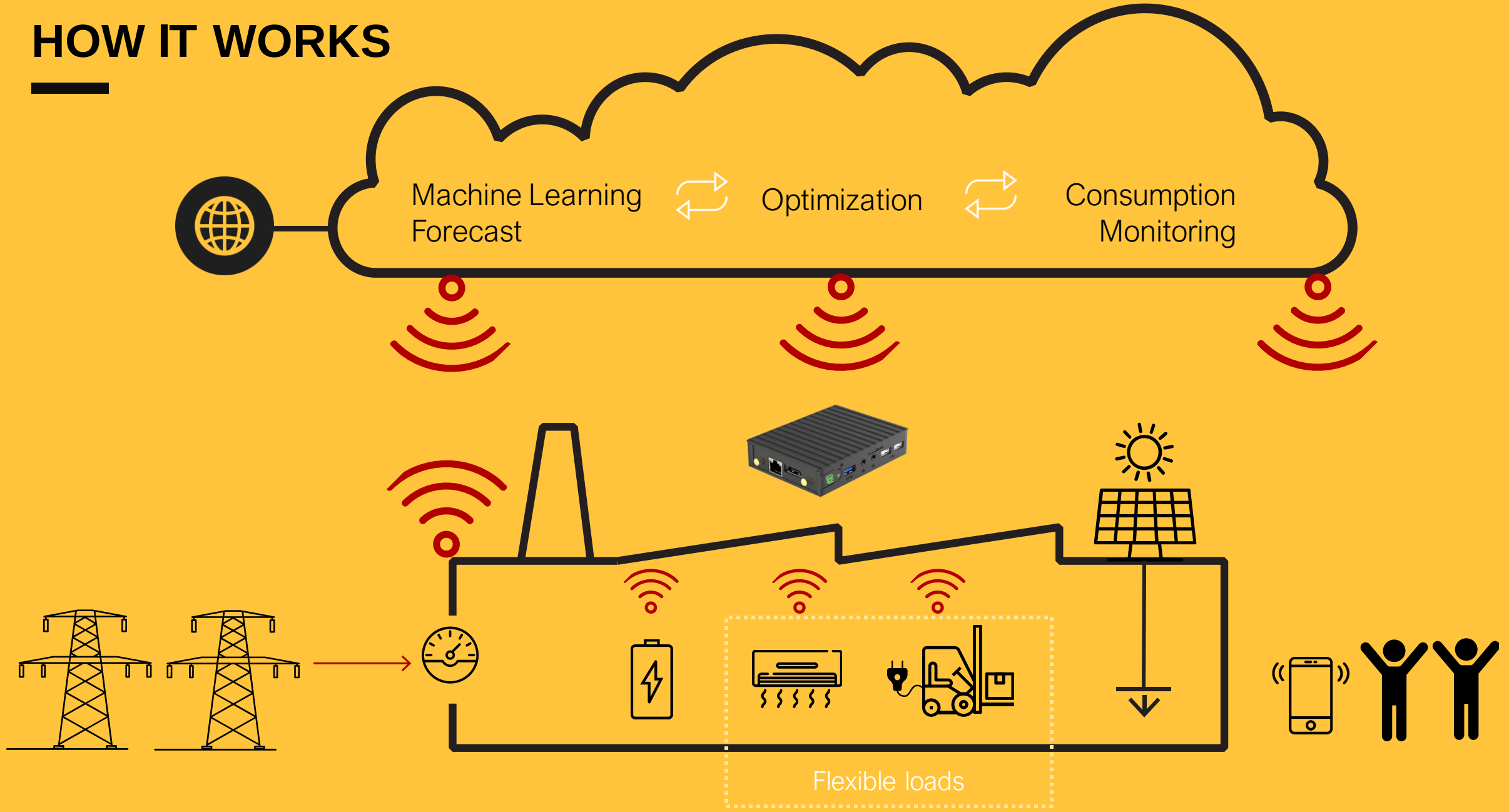
Lowering contracted
capacity



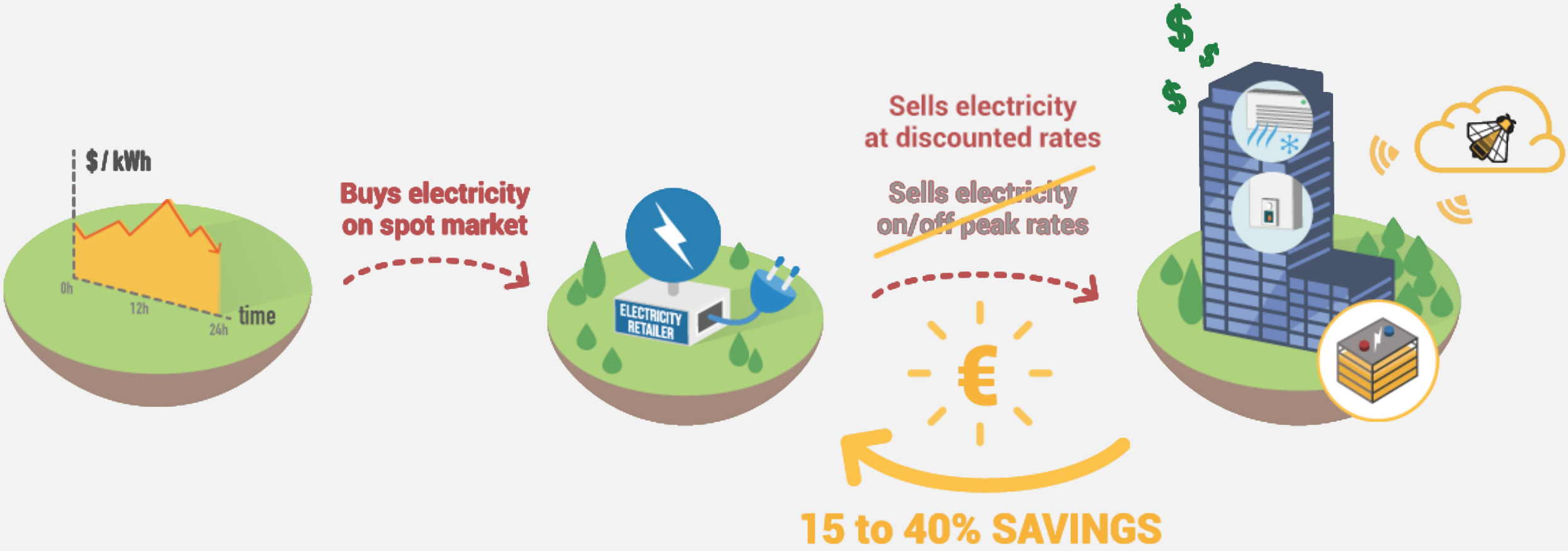
Demand-Response
Frequency Regulation

+ Maximizing Solar Power Self-Consumption

HOW IT WORKS


Machine Learning
Forecast
Optimization
Consumption
Monitoring
Flexible loads

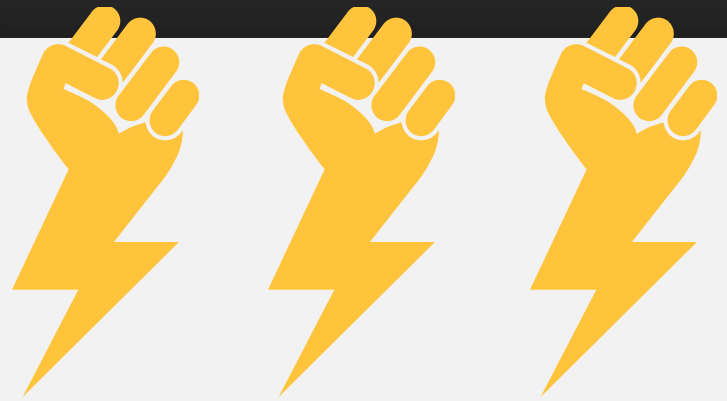
HIVE SUPPLY | DIGITAL UTILITY 2.0



BeeBryte

Energy Intelligence & Automation

Join us in the electric revolution!



www.beebryte.com

CONTACT

elodie.hecq@beebryte.com
+65 9145 9676

TIMELINE

Hardware Installation
4-5 days

Site visit
1-2 days

Hive Vision

*Monitoring, learning and **baseline** determination*

Hive Optimal

2 weeks

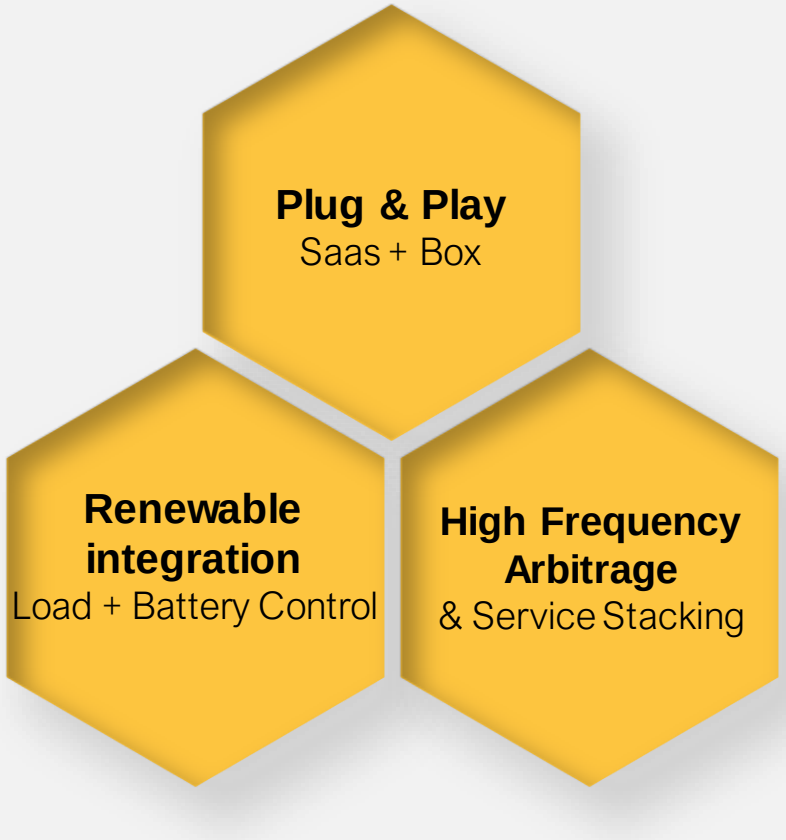
1-2 months

*Automatic tailored control, fault detection… & **Savings** !*

Contract proposal and signature

Baseline agreement

COMPETITIVE ADVANTAGE



	Hardware Control		Value Pools Leveraged By Software Capabilities		
	Flexible Load + Self-Gen	*Batteries + Self-Gen*	*Real-Time Price Arbitrage*	*Customer-Side Energy Mgmt*	*Grid Services*
BEEBRYTE	✓	✓	✓	✓	✓
Group 1A: Building Energy Management Software (BEMS)	✓	X	X	✓	X
Group 1B: Energy Storage Providers	X	✓	X	✓	✓
Group 2: Grid Services Software (VPP)	✓	✓	X	✓ X	✓

"Smart" Innovation Showcase

WILLIAM TEMPLE,

Co-Founder & Director, Ampotech

William Temple

Co-Founder, Director

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What makes a building smart?

Smart building wish list

- Understand what happens inside
- Detect and respond to faults/failures
- Optimize resource utilization
- Improve occupant comfort/experience

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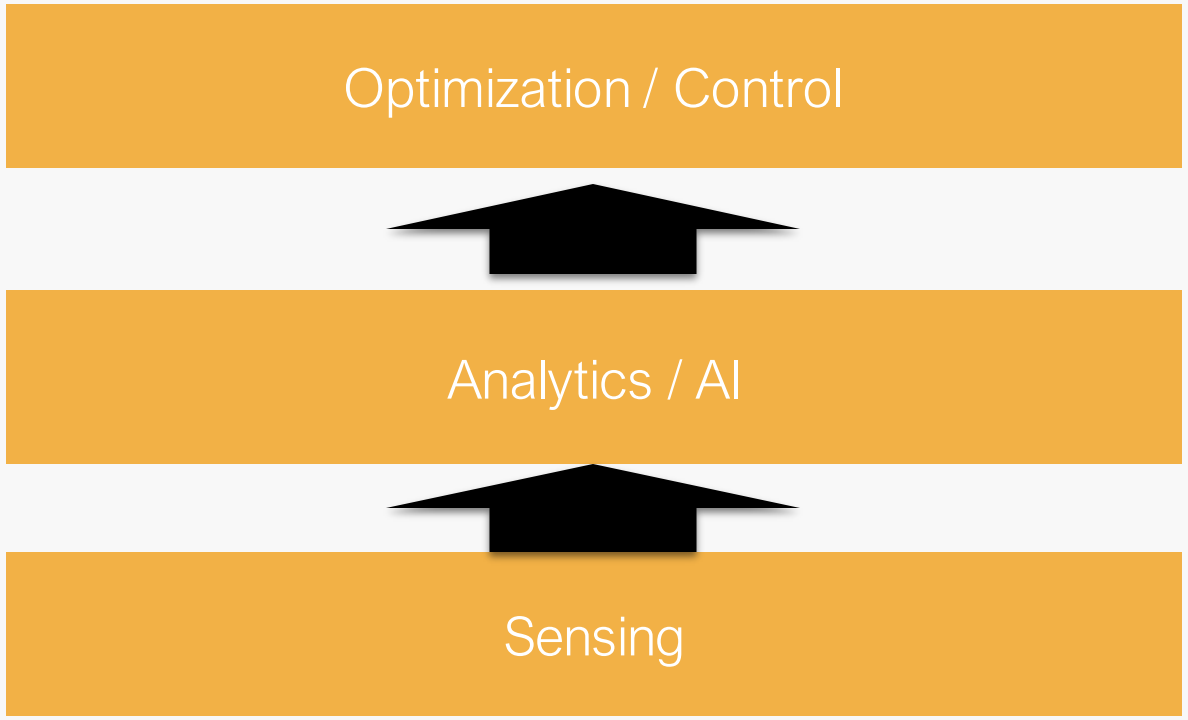
Smart building technology stack

Affordable, easy to deploy sensors are the fundamental enabler for smart buildings



Smart building wish list

- Understand what happens inside
- Detect and respond to faults/failures
- Optimize resource utilization
- Improve occupant comfort/experience

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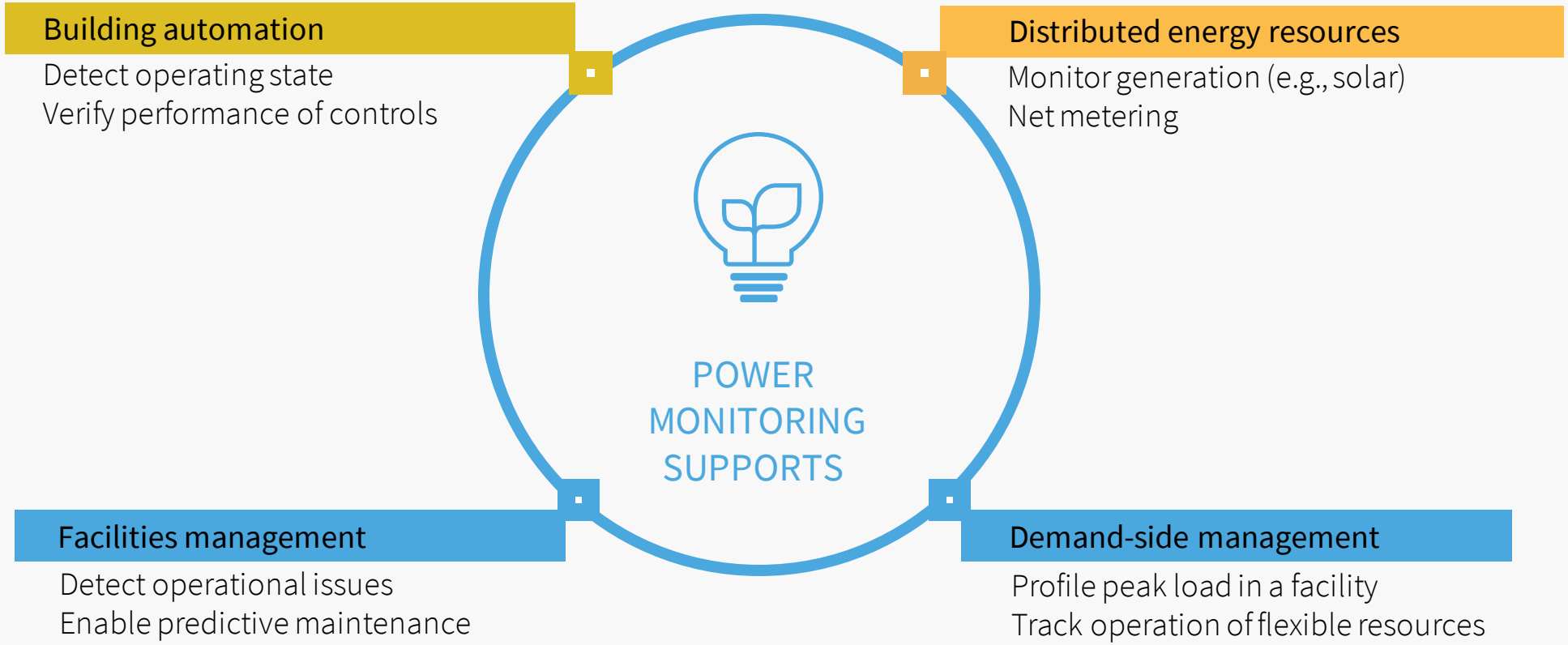
We believe power data is most important



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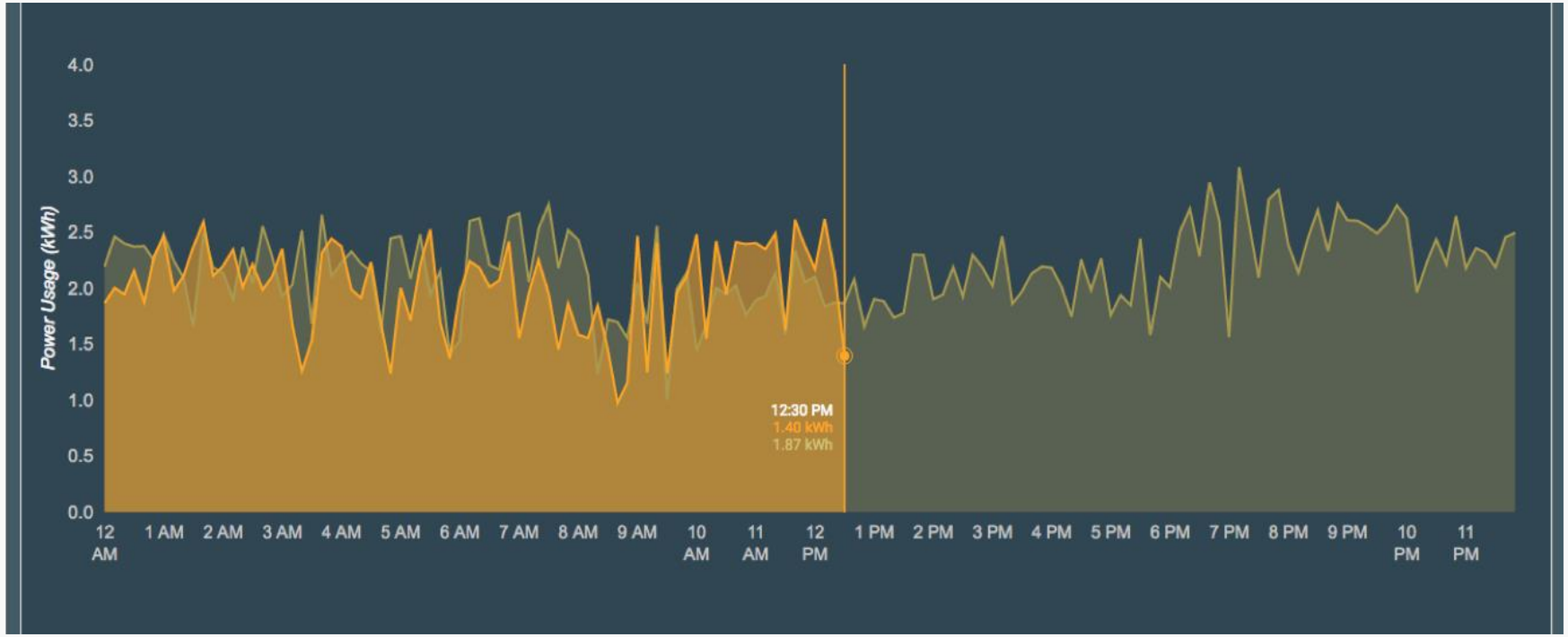
Don’t we have meters today?

Yes, but…



…typically you need more extensive monitoring of zones & assets for actionable information

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Unique challenges for power monitoring

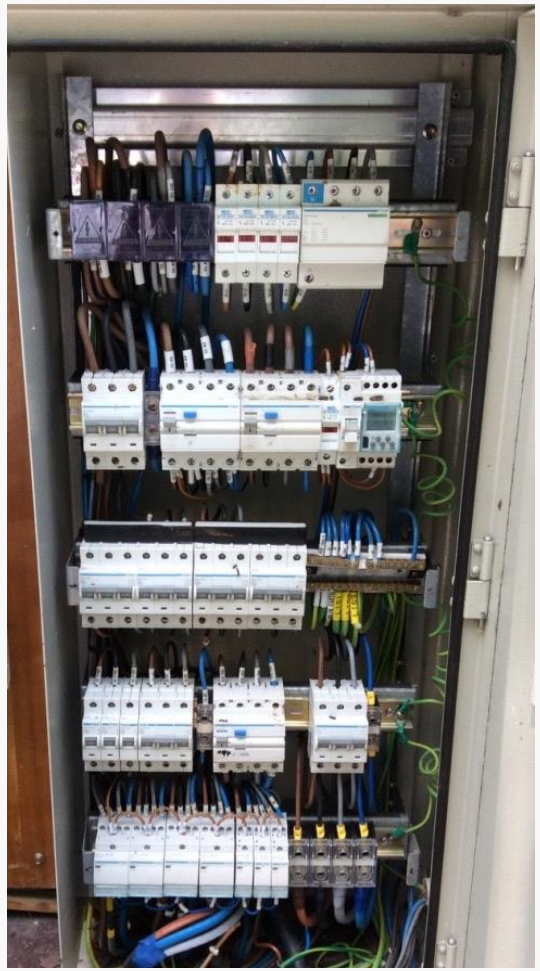
AMPOTECH
BETTER METERING. BETTER INSIGHT.

Operational Constraints

- Power shutdowns
- Lack of space in old electrical panels
- Difficulty servicing

Installation Cost

- Cost of devices
- Cost of installation labor
- Cost of wiring, system integration, etc.



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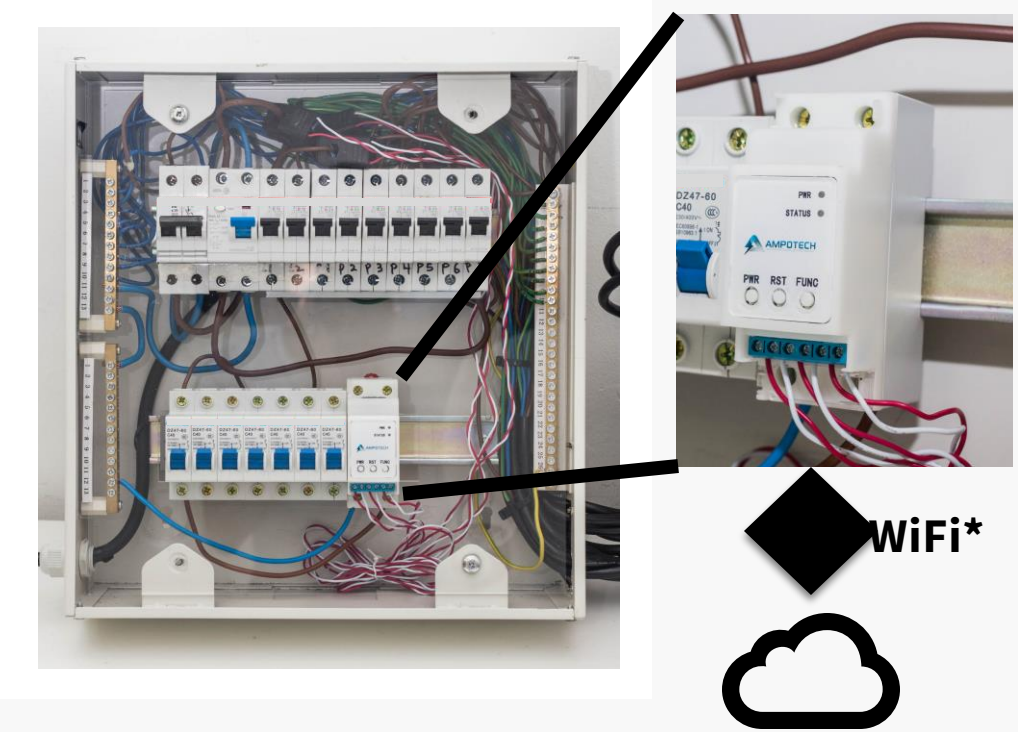
Our solution

AmpoHub: a compact and powerful wireless meter that is easy to use in existing buildings



Wireless connectivity

Avoid costly cabling and get up and running faster

Real-Time Visibility

Monitor individual single and three-phase equipment or specific zones in the facility

Analytics & Alerts

Detect unusual operating hours, loss of power, and other anomalies.

* Can be expanded to support other network technologies

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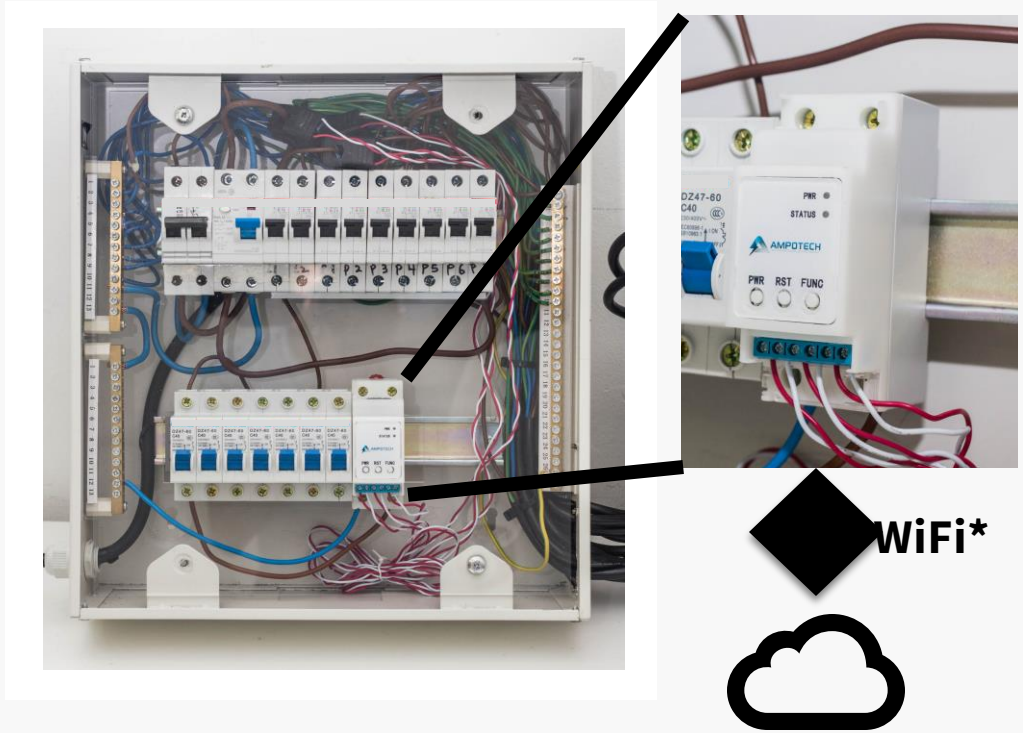
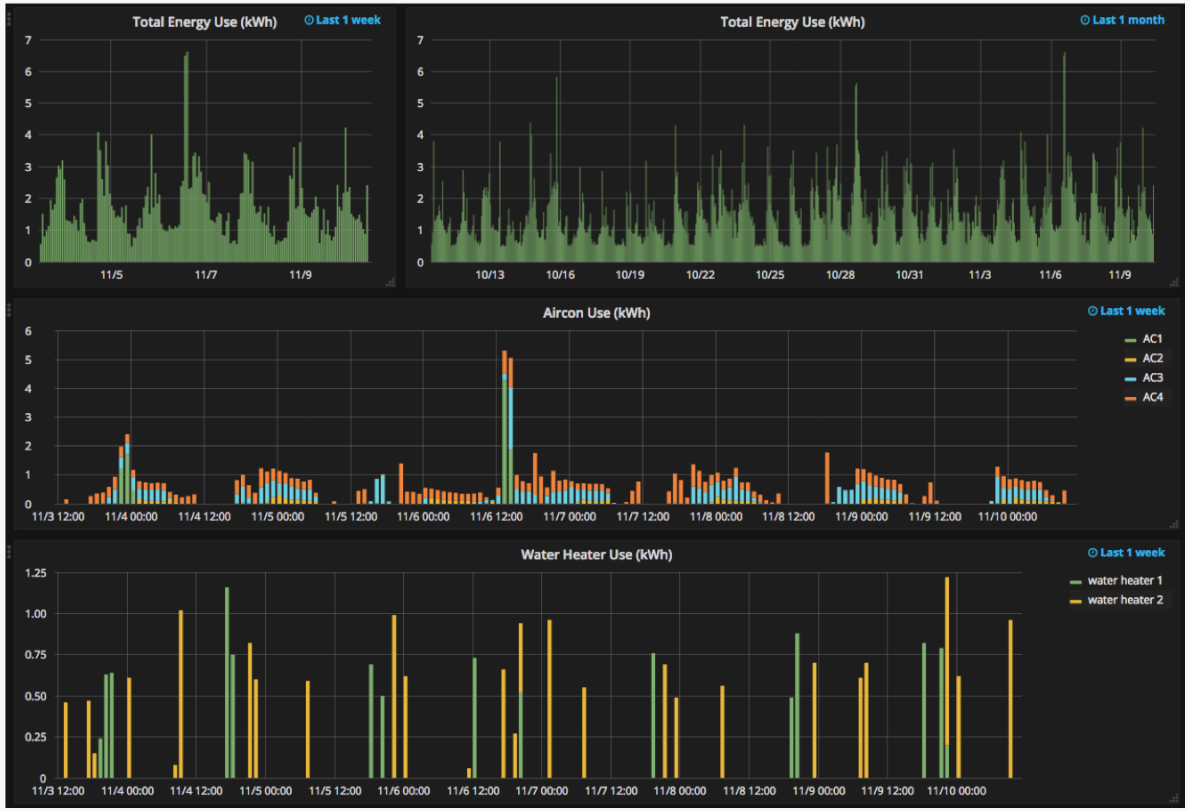
Our solution

AmpoHub: a compact and powerful wireless meter that is easy to use in existing buildings





* Can be expanded to support other network technologies

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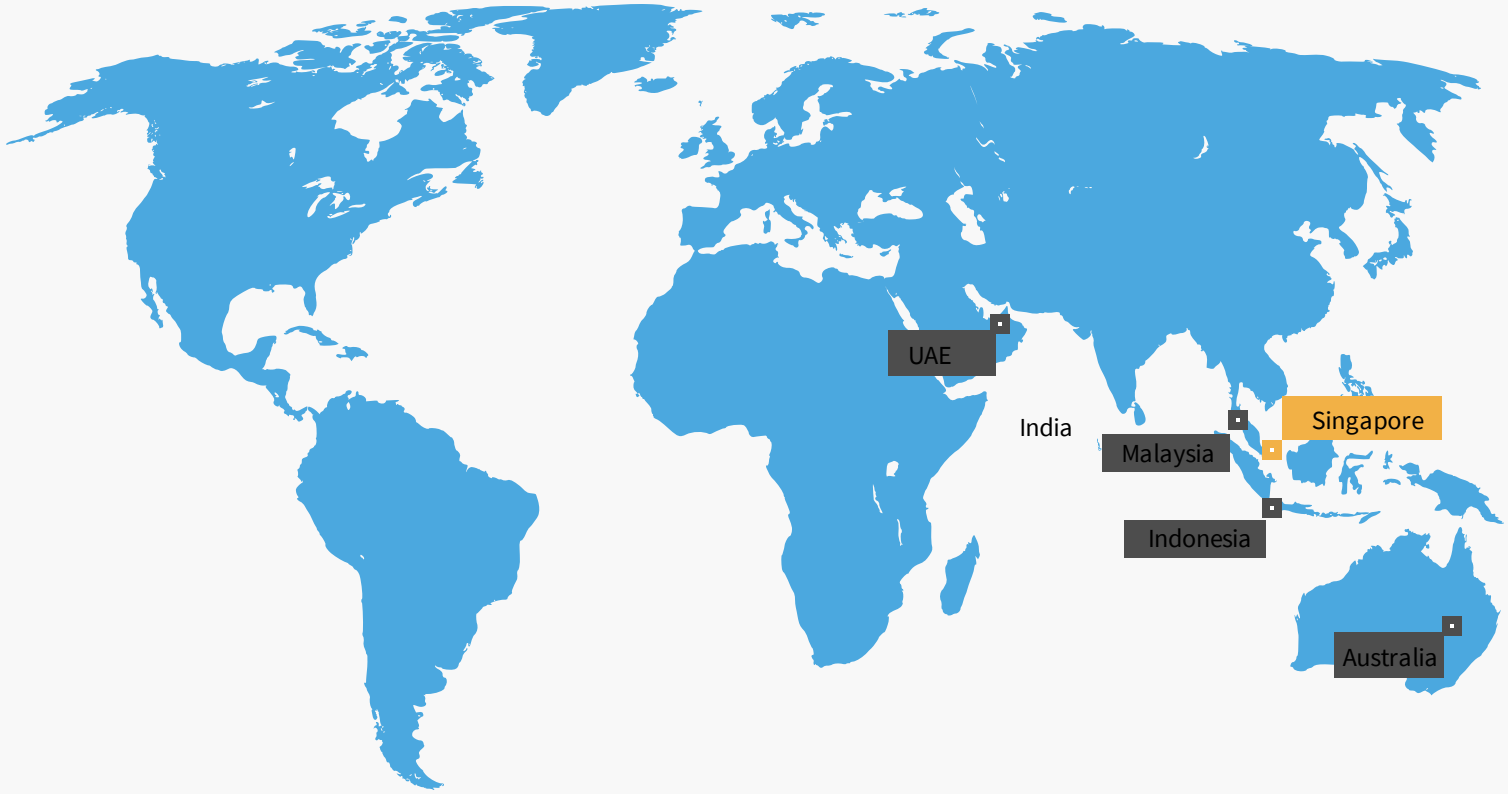
Our network



Headquartered in Singapore

Partners

BUILD21 www.build21.net

Smart building solutions

ROMTECK

Industrial IoT solutions

Infineon Security Partner Associated

Cybersecurity & Co-innovation

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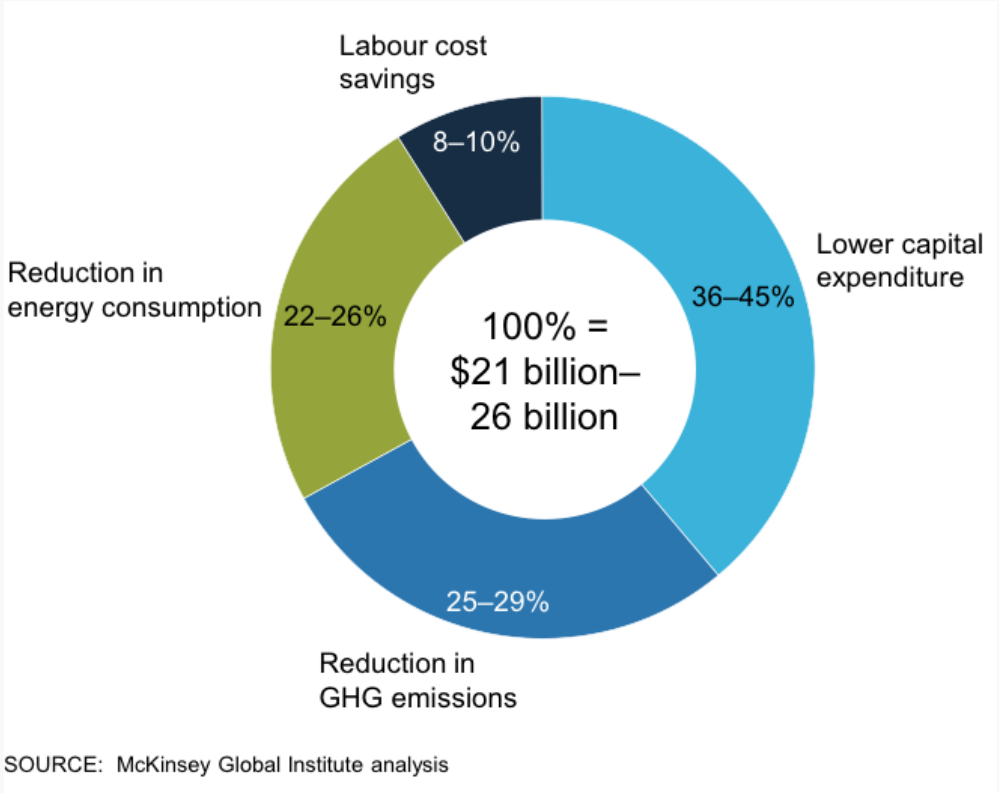
Relevance to Southeast Asia

Value creation from smart solutions for built environment in Southeast Asia



SOURCE: McKinsey Global Institute analysis

Our experience

- Modular, interoperable solutions are important
- Product-driven business is easier to scale than service-driven business due to market differences
- Fast pace of new construction but significant market for existing commercial/industrial buildings

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Questions?

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william@ampotech.com

Linkedin.com/in/williamtemple

General Information

www.ampotech.com

twitter.com/AmpotechSG

Connect with us to explore projects & partnership

- Facilities management companies
- Telecom and electric utilities
- System integrators
- Property developers

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"Smart" Innovation Showcase

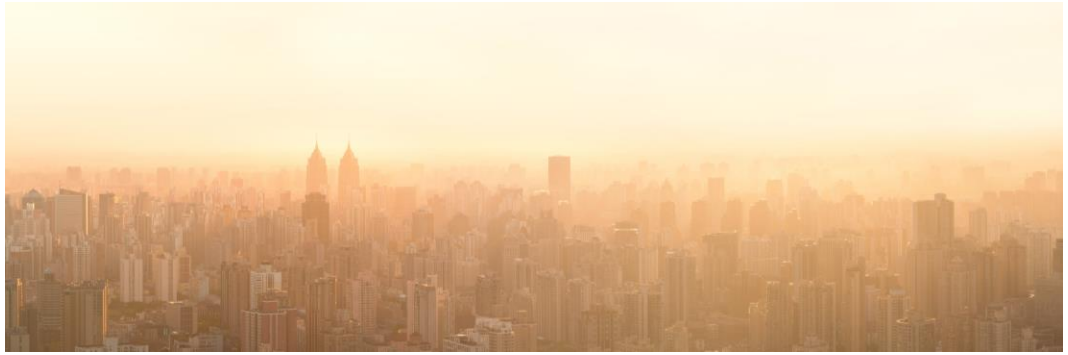
SEAN WIHERA

Director of Business Development,
Clarity Movement

clarity

LEADING THE CLEAN AIR MOVEMENT

GLOBAL AIR POLLUTION CRISIS



AIR POLLUTION CAUSES 7 MILLION PREMATURE DEATHS PER YEAR AND RISING…

WORLD HEALTH ORGANIZATION

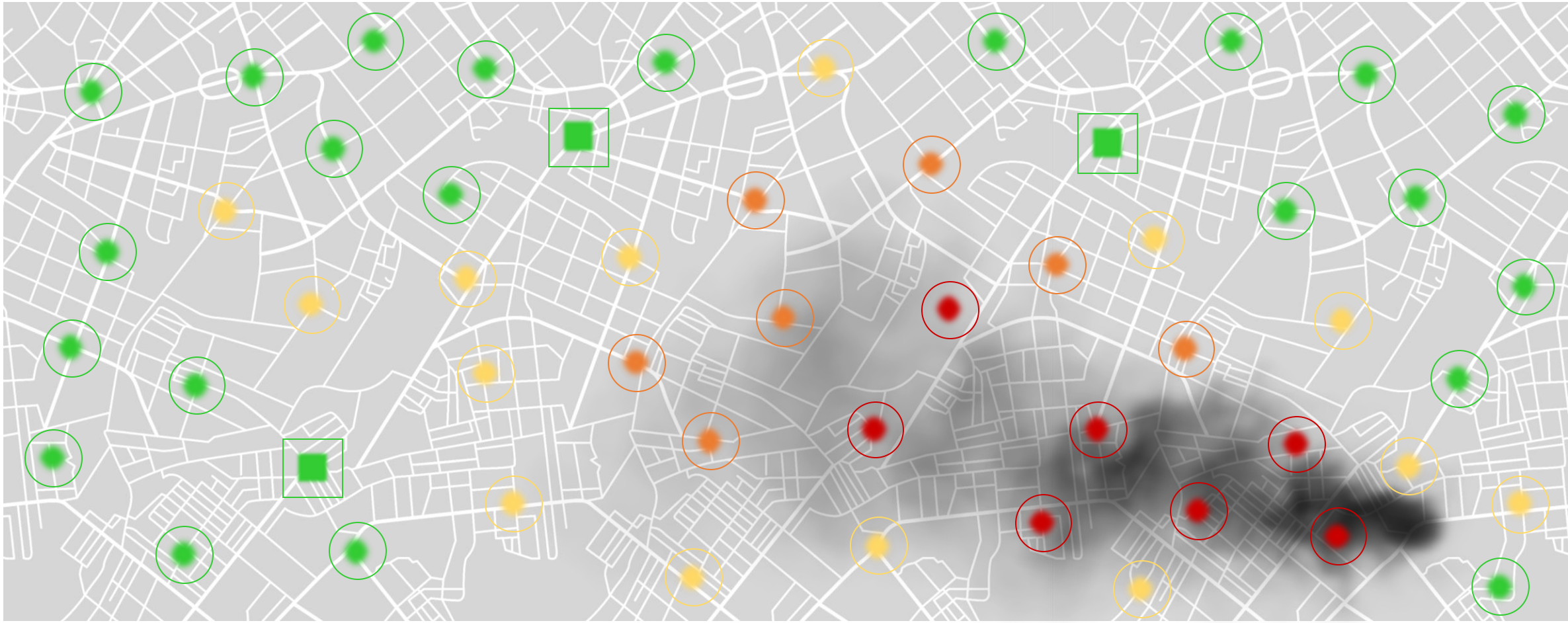
…& COSTS THE GLOBAL ECONOMY MORE THAN $5 TRILLION ANNUALLY IN WELFARE COSTS.

WORLD BANK + INSTITUTE FOR HEALTH METRICS & EVALUTION

Sources: WHO | WB/IHME

WHAT'S THE PROBLEM?

CLARITY AIR QUALITY MONITORING



EXAMPLE 50 NODE DEMO NETWORK

CONFIDENTIAL

"IF YOU CAN'T MEASURE IT, YOU CAN'T MANAGE IT, AND YOU CAN'T FIX IT."

MICHAEL BLOOMBERG
Entrepreneur, philanthropist, 108th Mayor of New York City

WHAT'S THE SOLUTION?

AIR QUALITY MANAGEMENT PROCESS

MEASUREMENT → QUALITY ASSURANCE → ANALYSIS → ACTION

CLARITY AIR QUALITY MONITORING

NODE NETWORK

CLARITY CLOUD + SMART CALIBRATION

MODELING + ANALYSIS

CLARITY ENABLES GOVERNMENTS TO TAKE EFFECTIVE ACTIONS VIA IMPROVED MEASUREMENTS & INSIGHTS.

CLARITY AIR QUALITY MONITORING

02 CLARITY CLOUD + SMART CALIBRATION

- Modular Communication
- Secure Cloud Storage & Data Access
- Intelligent Data Accuracy Correction

03 MODELING + ANALYSIS

- Pollution Hotspot Analysis
- Policy Evaluation & Planning
- Better Prediction Models

01 CLARITY NODE NETWORK

- $PM_{2.5}$, PM_{10}, NO_2, O_3, tVOC, CO_2, Temperature, Humidity
- Easy Self-Guided Deployment

INSIGHTS | HOTSPOT DETECTION EXAMPLES

- **Location:** Paris, France
- **Client:** City of Paris, Airparif
- **Use Case:** Demonstrate agility of hyperlocal monitoring

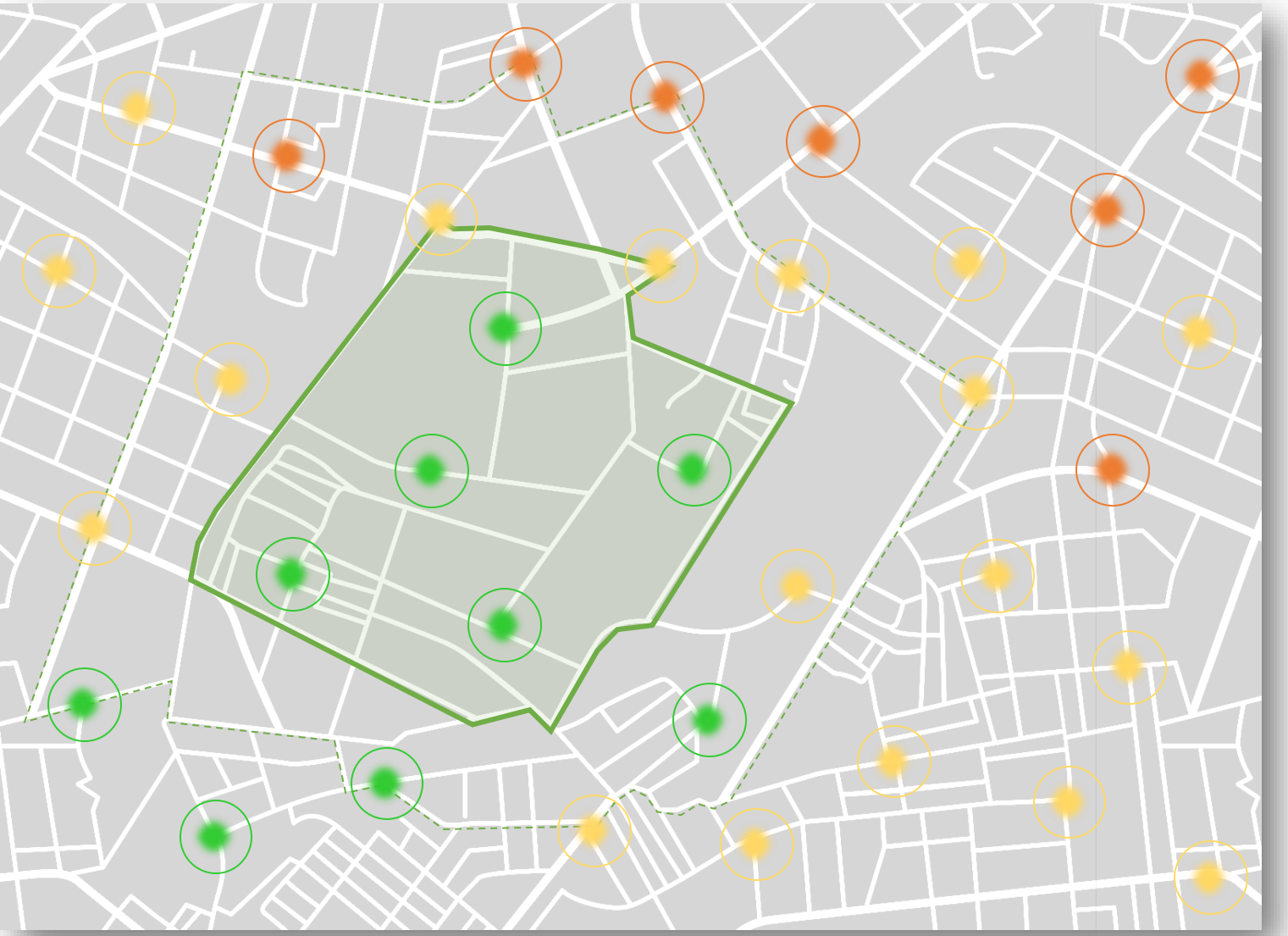
MAIRIE DE PARIS

- **Location:** Cupertino, California
- **Client:** City of Cupertino
- **Use Case:** Detect transboundary pollution sources

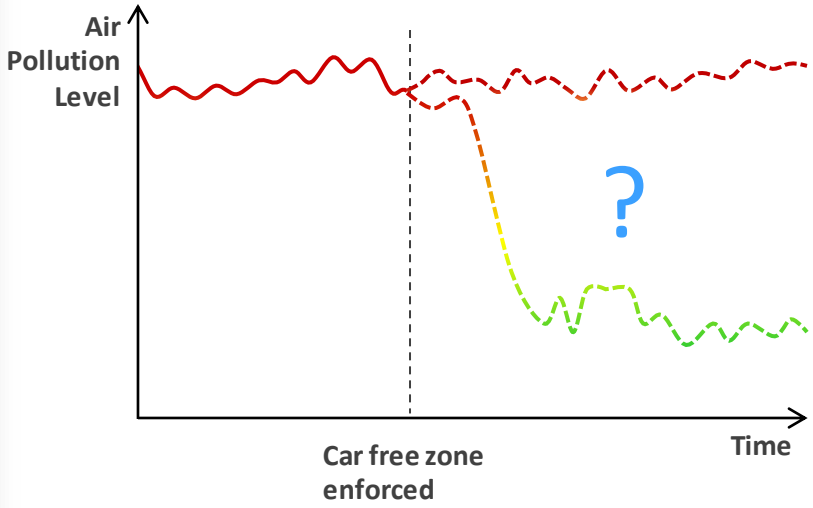
CITY OF CUPERTINO EST. 1955

- **Location:** Richmond, California
- **Client:** California Air Resources Board
- **Use Case:** Quantify and address environmental justice concerns

CALIFORNIA AIR RESOURCES BOARD



CHANGE IN AIR QUALITY AFTER CAR FREE ZONE IMPLEMENTED



- **Location:** Kuala Lumpur, Malaysia
- **Client:** UN-Habitat, City of Kuala Lumpur
- **Use Case:** Evaluate effectiveness of alternative transportation campaigns

UN HABITAT
FOR A BETTER URBAN FUTURE

- **Location:** Mexico City, Mexico
- **Client:** City of Mexico, SEDEMA
- **Use Case:** Design human-centric programs to mitigate youth exposure to traffic emissions

CDMX
CIUDAD DE MÉXICO
SEDEMA
SECRETARÍA DEL MEDIO AMBIENTE

CAN CAN

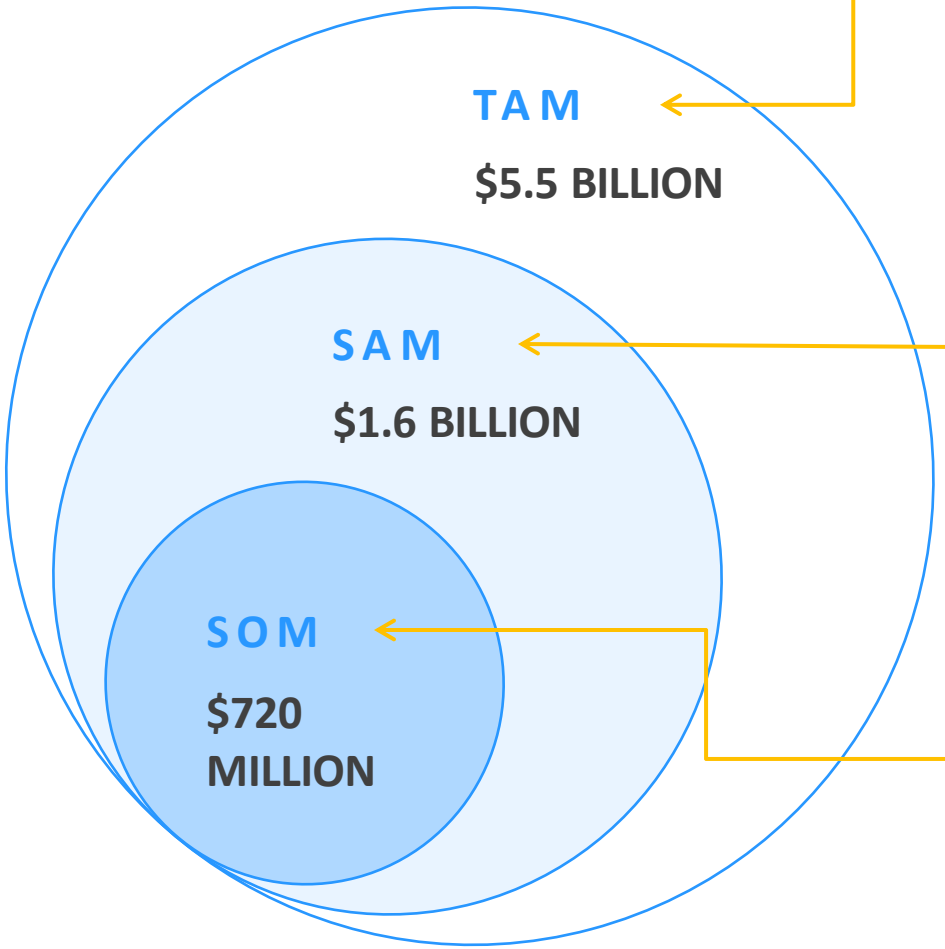
"IF YOU ~~CAN'T~~ MEASURE IT, YOU CAN~~'T~~

MANAGE IT, AND YOU CA~~N'T FIX~~ IT."

CAN

-CLARITY TEAM

MARKET SIZE



TOTAL AVAILABLE MARKET

"Air quality monitoring market to reach $6 billion by 2022."
(P&S MARKET RESEARCH, LINK)

"The global air quality monitoring market is projected to reach $4.90 billion by 2022"
(MARKETS & MARKETS, LINK)

SERVICEABLE AVAILABLE MARKET

"The outdoor monitors segment is expected to witness the highest growth rate [accounting for 28.9% of total market]."
(MARKETS & MARKETS, LINK)

3000 cities in 103 countries currently monitor air quality.
(WORLD HEALTH ORGANIZATION, LINK)

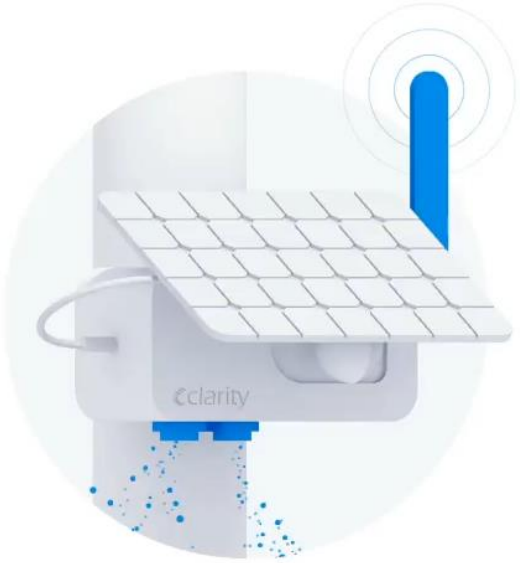
SERVICEABLE OBTAINABLE MARKET (TARGET MARKET)

Clarity's current sales channel can reach to ~1400 cities in 45 countries.

REVENUE MODEL

CLARITY NODE NETWORK

Hardware starts at $700 USD / Node



CLARITY CLOUD + SMART CALIBRATION

Data licenses are $600USD / Unit / Year

MODELING + ANALYSIS

Varies with Project Scope

OUR JOURNEY AND MILESTONES

THE NUMBERS AT A GLANCE

2018 REVENUE est. | ~$1.5M	REVENUE IN PIPELINE | $7.5M

2017

clarity + SENSIRION THE SENSOR COMPANY

AUSPICIOUS BEGINNINGS

After developing and licensing a particulate matter (PM) sensor to Sensirion, Clarity enters the smart city space to create solutions that revolutionize the way cities understand and respond to air pollution.

2018

SUEZ environnement CISCO

GLOBAL PARTNERSHIPS

Clarity leverages a network of partners and distributors with leading institutions around the world.

2019

48 CITIES IN 28 COUNTRIES

Clarity has deployed nearly 1000 Nodes in 48 cities across 28 countries to date.

2020

100 CITIES

Clarity's goal is to have 100,000 nodes in 100 cities by 2020.

THANK YOU!

LEARN MORE AT **CLARITY.IO**