EMPOWER EUROPE

EXHIBITION
JUNE 14–16, 2024
MESSE MÜNCHEN

CONFERENCE
JUNE 18–19, 2024
ICM MÜNCHEN

Part of THE smarter EUROPE

WEBINAR

Beyond Boundary Meters

March 12, 2024

Partner

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THE INTERNATIONAL EXHIBITION FOR ENERGY MANAGEMENT AND INTEGRATED ENERGY SOLUTIONS
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Your project in our focus
A BETTER WORLD


Independent Energy Monitoring and Management
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DBU
Deutsche Bundesstiftung Umwelt
Innovationen für Energie und Klimaschutz
Discover the most EASY
Energy Management System
for Commercial Energy Projects
PHOTOVOLTAICS
E-MOBILITY
BATTERY STORAGE

OVERVIEW

The smarter E Europe:
Europe's Largest Alliance of Exhibitions for the Energy Industry

inter solar EUROPE

The World's Leading Exhibition for the Solar Industry

ees electrical energy storage

Europe's Largest and Most International Exhibition for Batteries and Energy Storage Systems

POWER DRIVE EUROPE

The International Exhibition for Charging Infrastructure and E-Mobility

EMPOWER EUROPE

The International Exhibition for Energy Management and Integrated Energy Solutions

WEBINAR

Our Guests

Moderator

Marion Malafosse

Head of Policy

smartEn

Speaker

Marcia Poletti

Head of European System Change

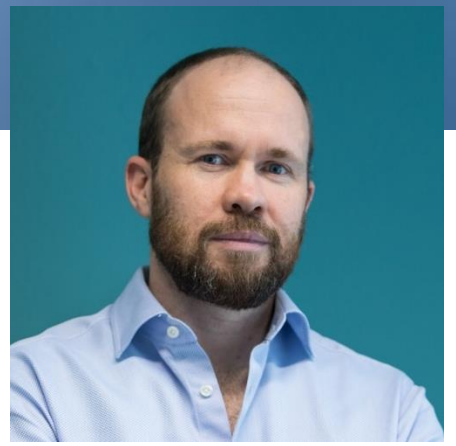
Octopus Energy

Speaker

Michael Jary

Managing Director EMEA & APAC

Sense



Speaker

Barry Lynham

Managing Director

Knauf Energy Solutions

Speaker

Philipp Rechberger

Head of System Technology

Fronius

Boundary Meters and More

March 2024

octopus energy

A low cost energy system needs smart meters, but DMDs are also an essential part of the mix

- As the penetration of renewables increase, the cost of integrating renewables increases - adding system flexibility helps, but
- **For consumers to receive the full benefit of wholesale arbitrage currently, they need smart meters**
- Smart meter data is often not available in a timely manner
- Beyond wholesale arbitrage, consumer flexibility is remarkably useful and can provide redispatch services (e.g. Balancing mechanism in the UK), and ancillary services.
- **Dedicated metering devices solve some of the problems**, and can provide access to further revenue streams for customers

As the penetration of renewables increase, the cost of integrating renewables increases

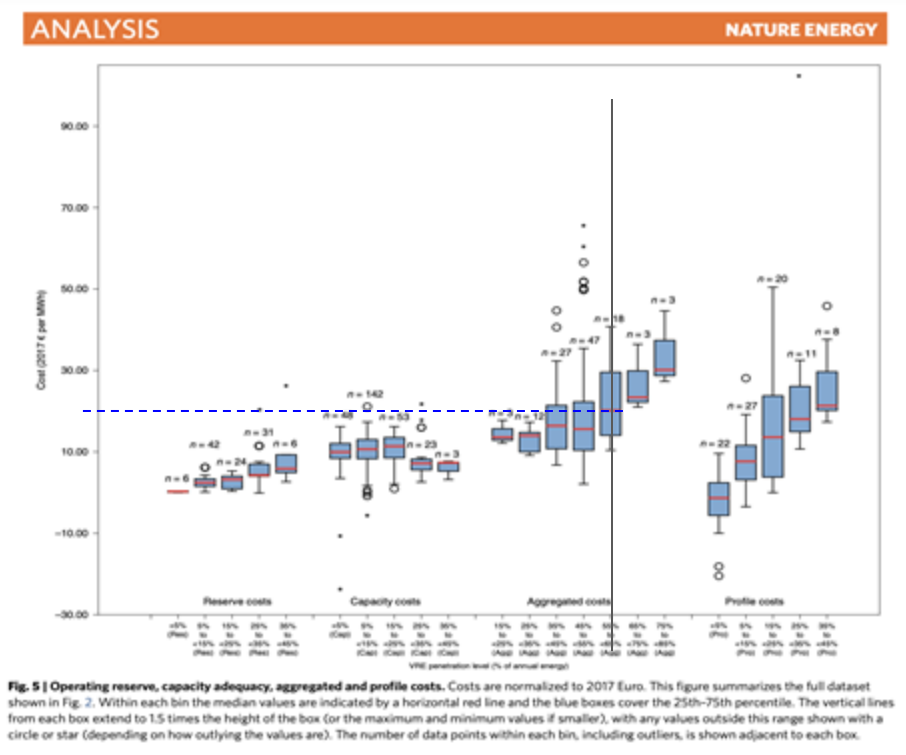


Fig. 5 | Operating reserve, capacity adequacy, aggregated and profile costs. Costs are normalized to 2017 Euro. This figure summarizes the full dataset shown in Fig. 2. Within each bin the median values are indicated by a horizontal red line and the blue boxes cover the 25th–75th percentile. The vertical lines from each box extend to 1.5 times the height of the box (or the maximum and minimum values if smaller), with any values outside this range shown with a circle or star (depending on how outlying the values are). The number of data points within each bin, including outliers, is shown adjacent to each box.

Without flex, once VRES penetration gets above 55% TWh, integration costs increase to around €20/MWh. Total cost of integration driven by

- a mix of factors related to geography and the unit size of VRE generators (**grid costs**).
- unpredictability of output or forecasting errors (**balancing costs**);
- lack of correlation between output and demand, which affects the net load met by non-VRE generation (**profile costs**); and

Europe is likely to be above 55% VRES penetration in 4 years (based on expected TWh generated by each source)*

Source: **A systematic review of the costs and impacts of integrating variable renewables into power grids**, Philip J. Heptonstall and Robert J. K. Gross, https://doi.org/10.1038/s41560-020-00695-4, Nature Energy | VOL 6 | January 2021 | 72–83 |

* Project installed renewable capacity 951 GW, rating 27.5%; 346 GW nuclear and combust, rating 61%

Flexibility (interconnectors, demand side response and storage), reduce total system cost…

- Flexibility decreases total system cost compared to the low flexibility scenario by up to £10bn per year
- Cost savings driven by lower generation capital costs (don't need as much generation)

Figure 6: *Cost saving relative to lowest flexibility scenario, split by cost category (high demand, 5g/kWh carbon intensity)*

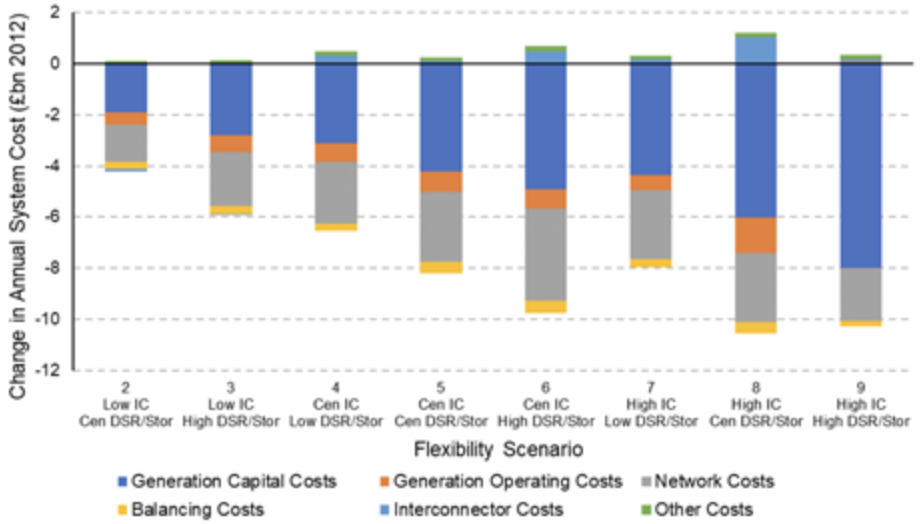
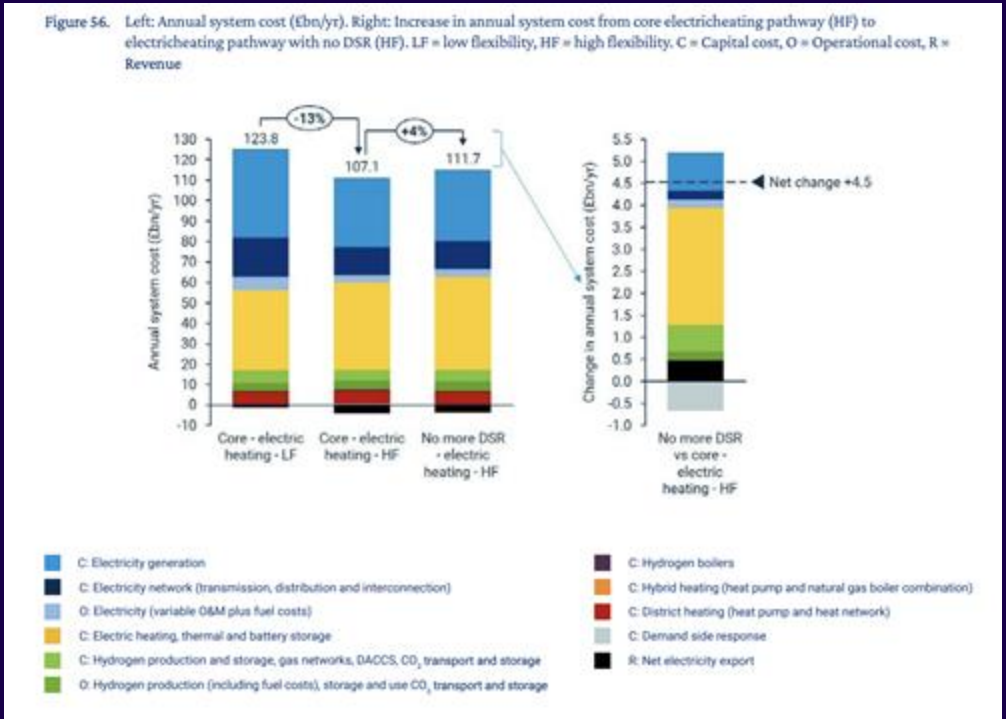


Figure 6 shows the change in annual system cost in each flexibility scenario compared to the lowest flexibility scenario (scenario 1). Results are shown for the minimum cost deployment mix that meets a 5g/kWh carbon intensity in the high demand scenario. Costs are split by category; 'network costs' include both transmission and distribution network costs, 'other costs' include carbon costs and unserved energy costs

Source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1003787/smart-systems-appendix-i-electricity-system-flexibility-modelling.pdf

… but DSR is necessary: without demand side flexibility, could cost around £5bn more per annum in 2050*



If DSR (smart appliances, I&C DSR, and EV smart charging and V2G) cannot be used in an otherwise high flexibility scenario, **the modelling suggests that the remaining portfolio of technologies cannot replace all of the value DSR delivers**

Smart Meters enable customers to be rewarded for the benefit of better matching their consumption to intermittent renewable generation

- MID Class M compliant
- Can be used for billing and supply

*Carbon Trust and Imperial College London (2021), Flexibility in Great Britain, https://publications.carbontrust.com/flex-gb/(page 106)
MID Measuring Instruments Directive

Smart meter data often has limited availability

- Smart meter data often not available in a timely manner
- Lack of availability limits innovation (e.g. tariff offerings for consumers) and the development of grid insights
- Digitalisation of the energy system requires near real time data sharing. Delays of 24 or 28 hours driven by incumbency and capability gaps
- Data needs to be open and available; **consumers should have the right to share their data with whomever they wish.**

DMDs solve some of the problems, and provide access to further revenue streams for customers

- DMD provides a clearer, often more frequently available data feed.
- DMDs can reduce system cost where OEM telemetry can be leveraged but DMDs need to be accurate (and it should be possible to use for billing purposes)

If the data collected by sub-meters and meters were available to all on an equal basis (with appropriate consumer consent), then the difference between a sub-meter and a dedicated metering device would be minimal.

However, currently a sub-meter is MID Class M compliant and can be used for billing/supply purposes and are relatively expensive, whereas a DMD cannot (but is more ubiquitous, and comes integrated as part of a device, or as a cheaper add on). The other challenge with many DMD currently (e.g. the DMD of an EV, the EV's telemetry data), is their accuracy - there is currently a significant range in performance.

DMD data exchange background data

EV telemetry will be determined by the OEM, but there is significant variability

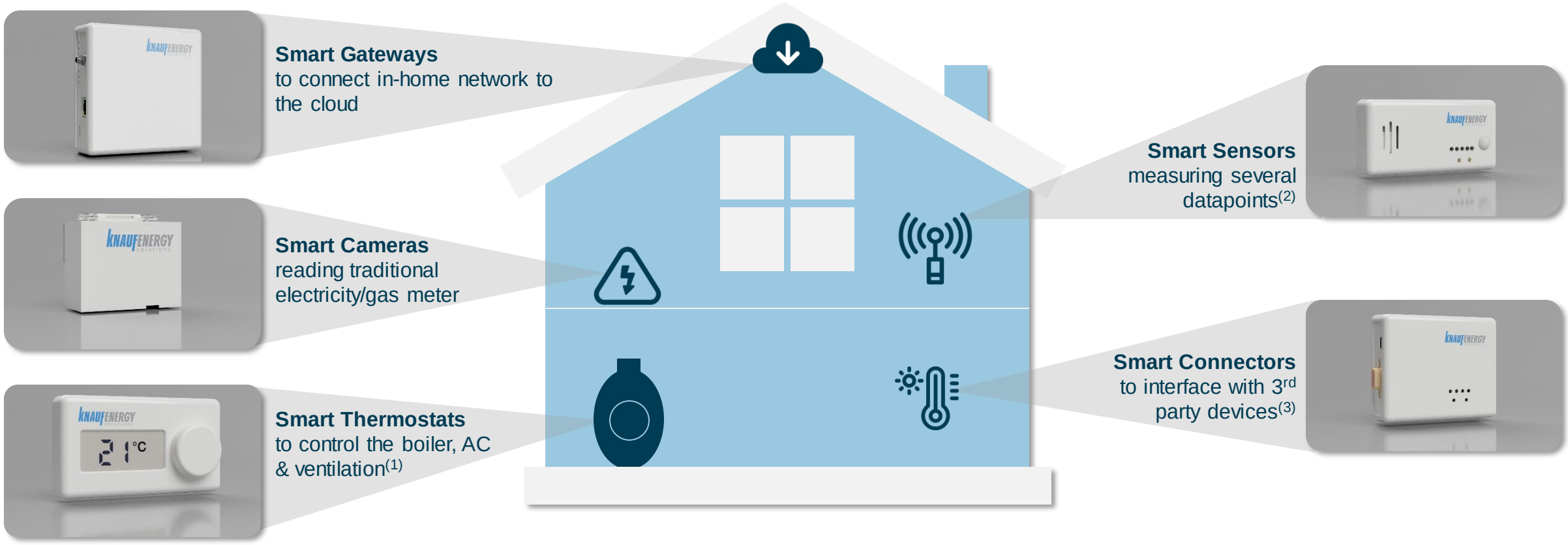
Characteristic	Comment	Range
Frequency Intervals	to understand current charging activity is to be able to monitor and report	1 second (ideal) 1 minute (very good) 15-30 minute (ok - poor)
Frequency of telemetry delivery	For frequency >1 minute, an alternative approach would be to receive a heartbeat to indicate that the vehicle is still in communication with OEM.	1 second (ideal) 1 minute (very good) 15-30 minute (ok - poor)
Accuracy of telemetry		+/- 2.5% (CoP11) (ideal) +/- 10% (good) > +/- 10% (poor)
Reliability		100% Ideal >=95% <98% Good <90% Poor

KNAUF ENERGY solutions

Because Performance Matters

How Smart Meter Enabled Energy Performance Metrics will Support the Energy Transition

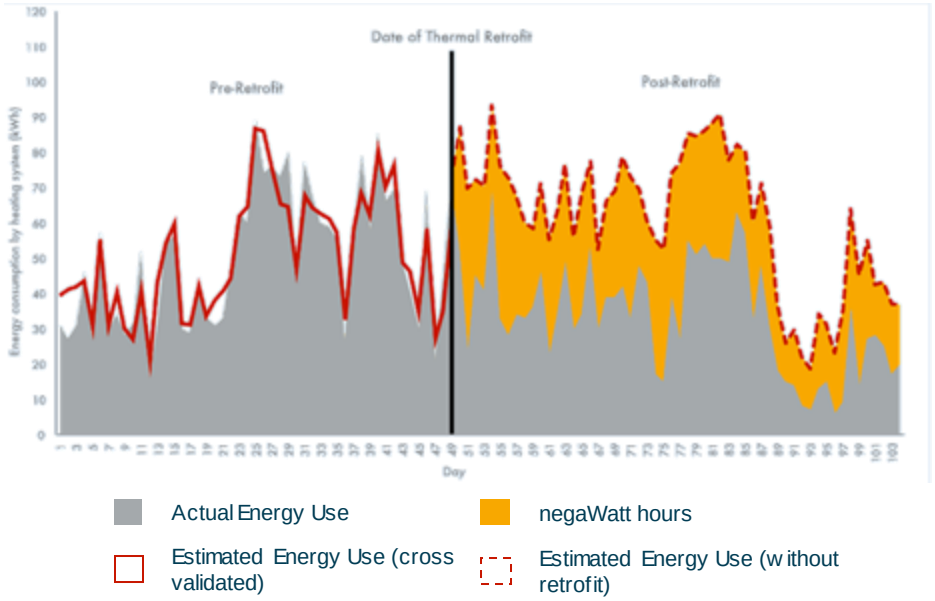
Smart Meter Data Coupled with Sensor Data



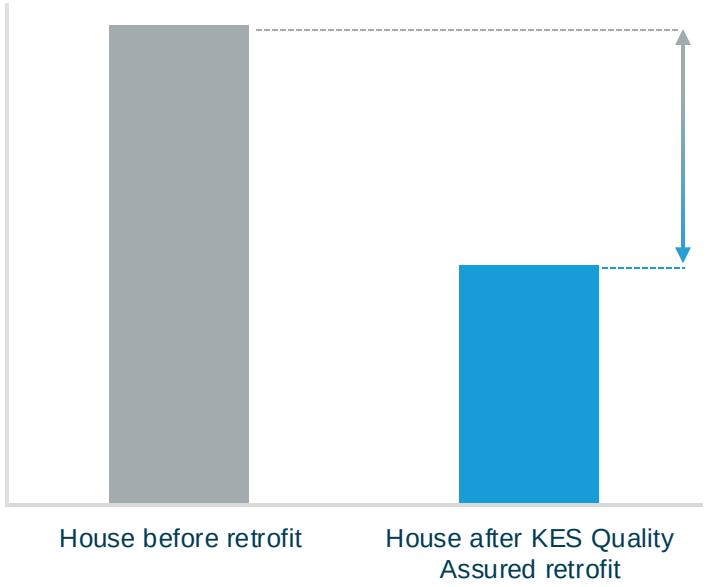
Note: (1) In development; (2) Motion, temperature, humidity, light levels, volatile organic compounds (VOCs) & carbon dioxide (CO_2); (3) Smart Meters, heat meters and boilers

Data Plus Algorithm Provides Insights

Actual, estimated and saved heating system energy use (trial in UK)



Energy Demand Indicator (kWh/ m²)



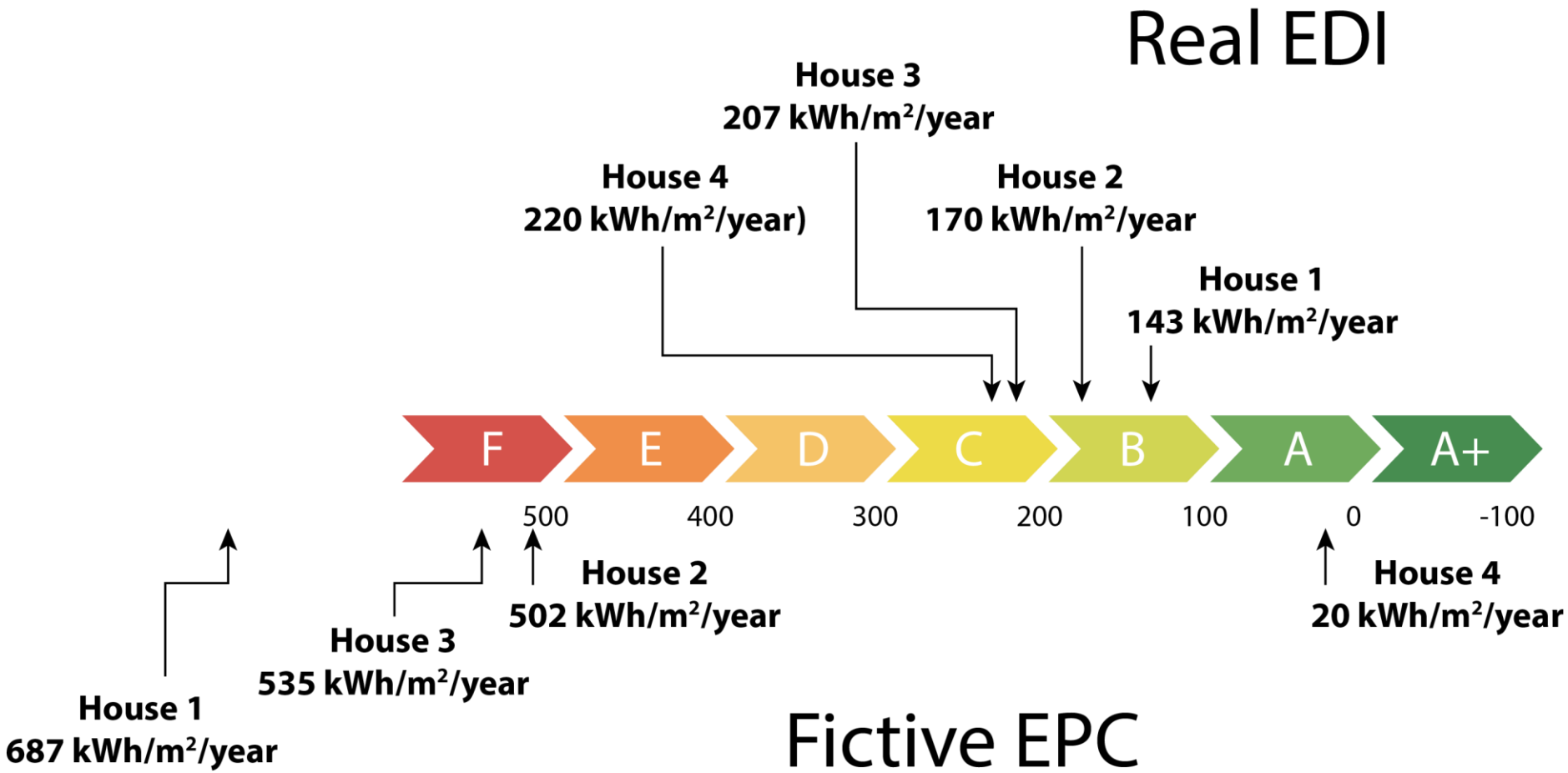
Energy performance improvement means a lower Energy Demand Indicator

For the first time proprietary algorithms can measure **real quantum of energy saved by a renovation – NegaWatt Hours (nWh)**

Energy Demand Indicator (EDI) is a derivative of the nWh algorithm, providing the first ever **highly accurate 'miles per gallon' energy rating**

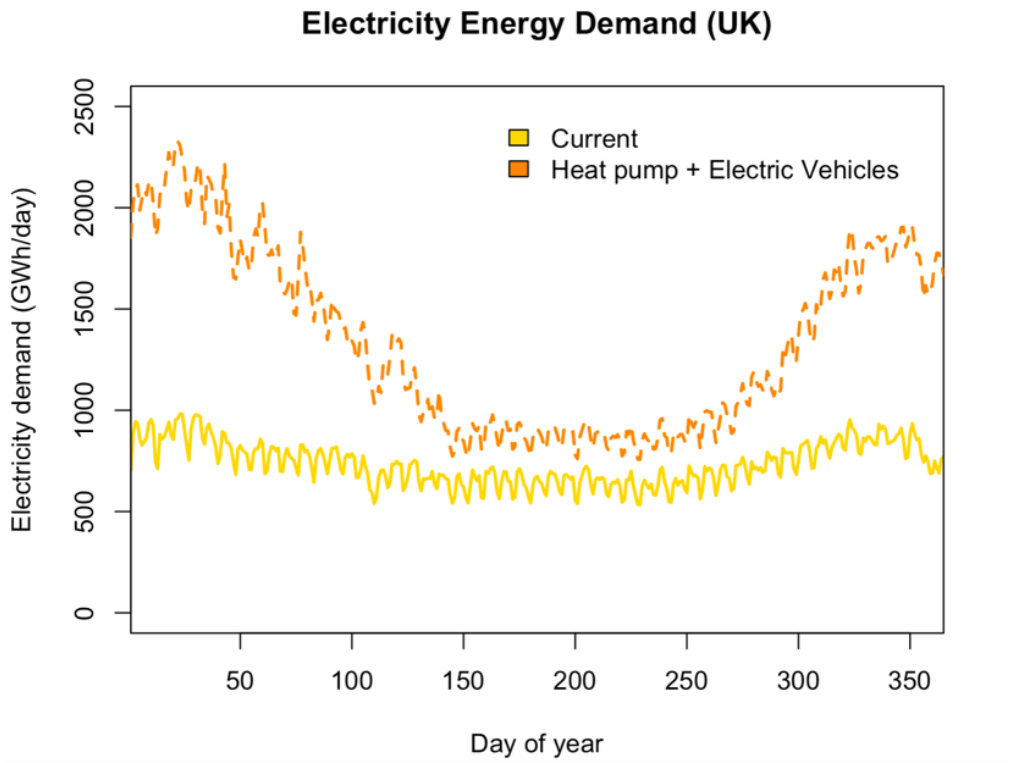
KES uses bespoke machine learning algorithms, fed by our proprietary sensors, as well as 3rd party weather data, to understand **the precise energy dynamics** of **each and every house**

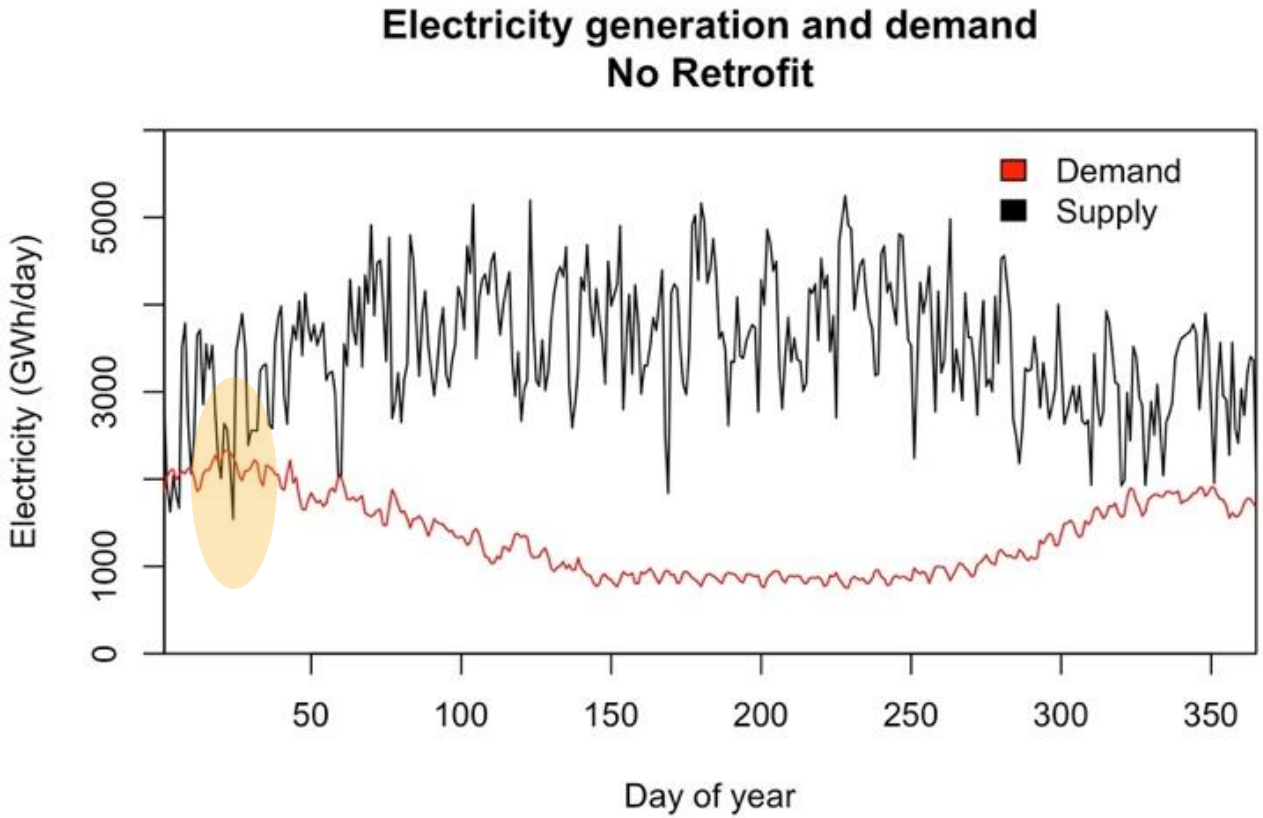
Important as Existing EPC's Are Not Fit For Purpose



Wrong Rating. Wrong Order. Wrong Scale.

Electrification Creates Major Challenge

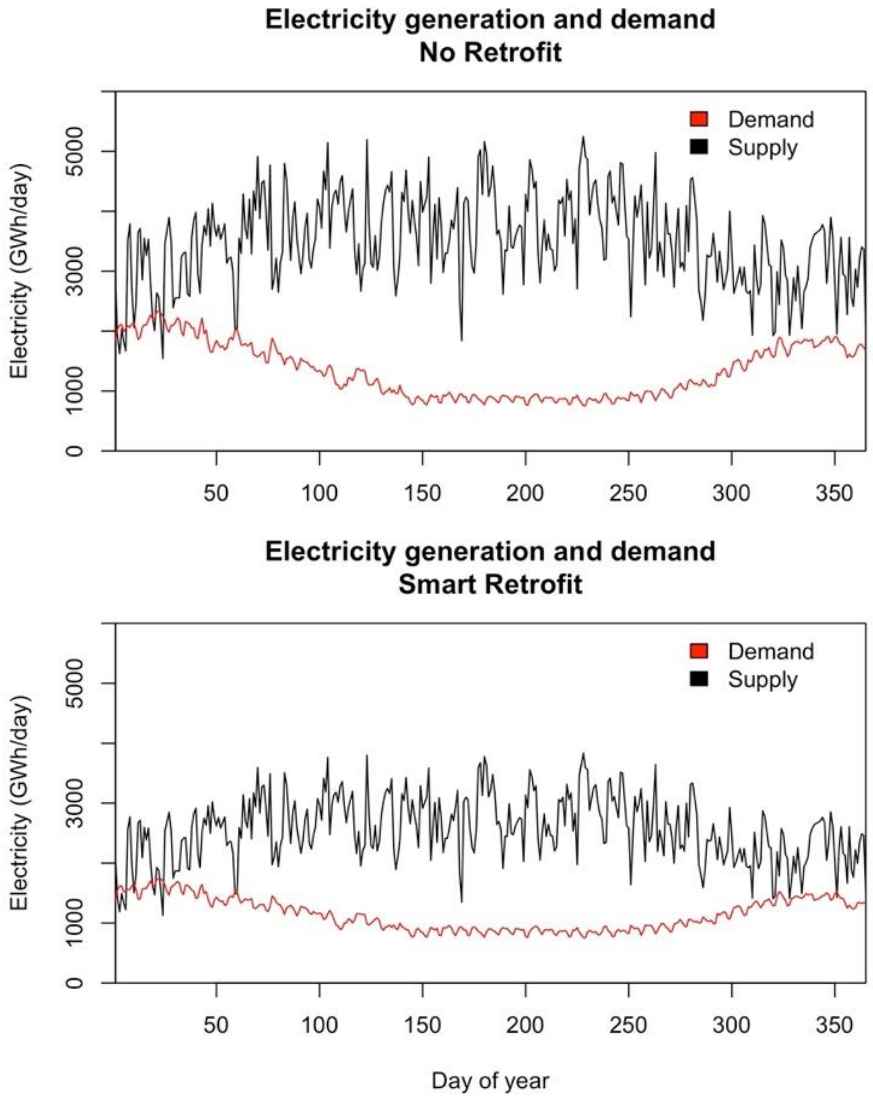




Energy Efficiency Has Oversized Impact on Capacity

KNAUF ENERGY solutions

4.7x



- It Is Not the Tech That Matters
- It’s the Ability to See

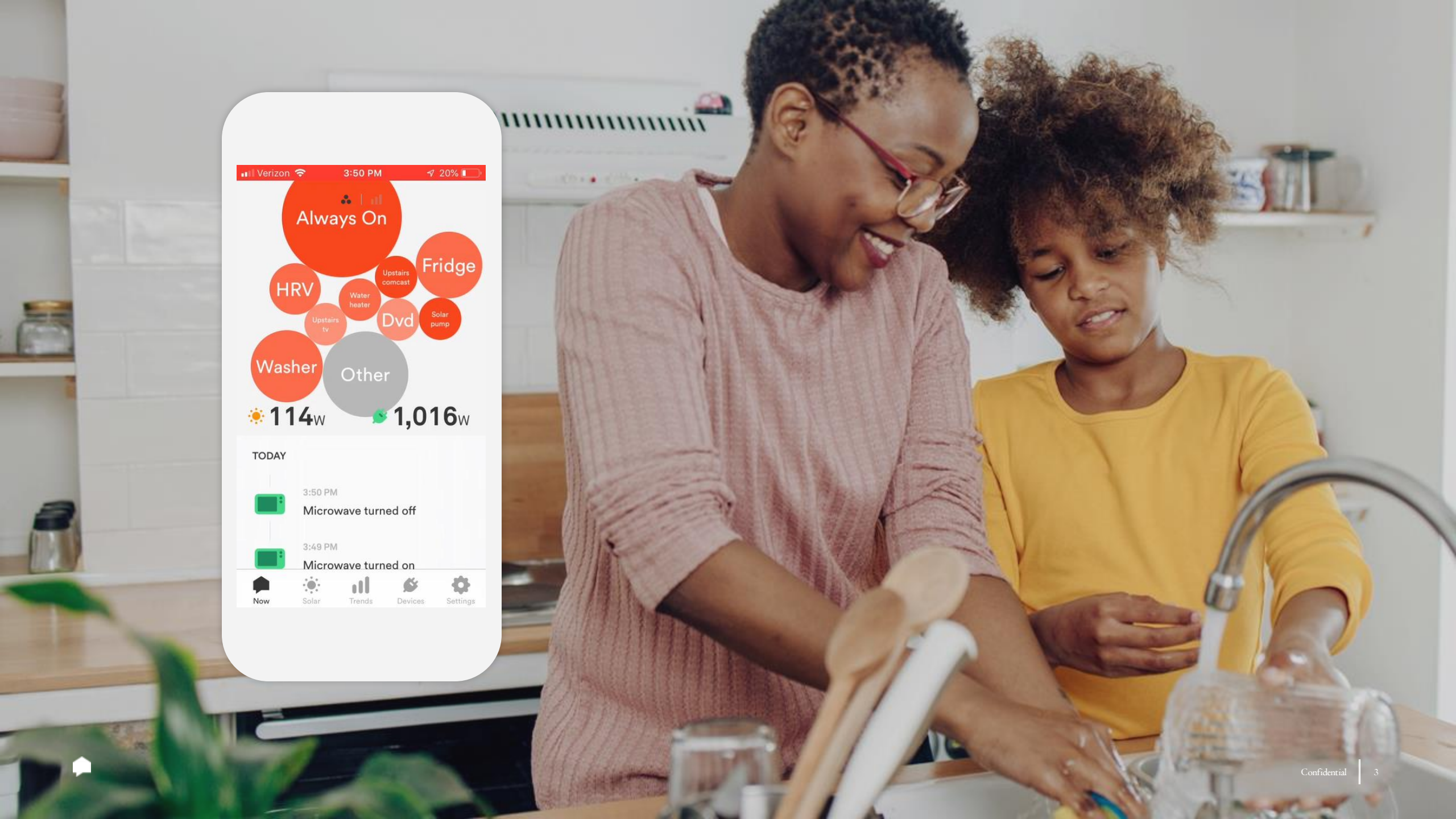
Next-Gen Smart Meters, Dedicated Device Measurement and Grid Edge Intelligence

A case study from California

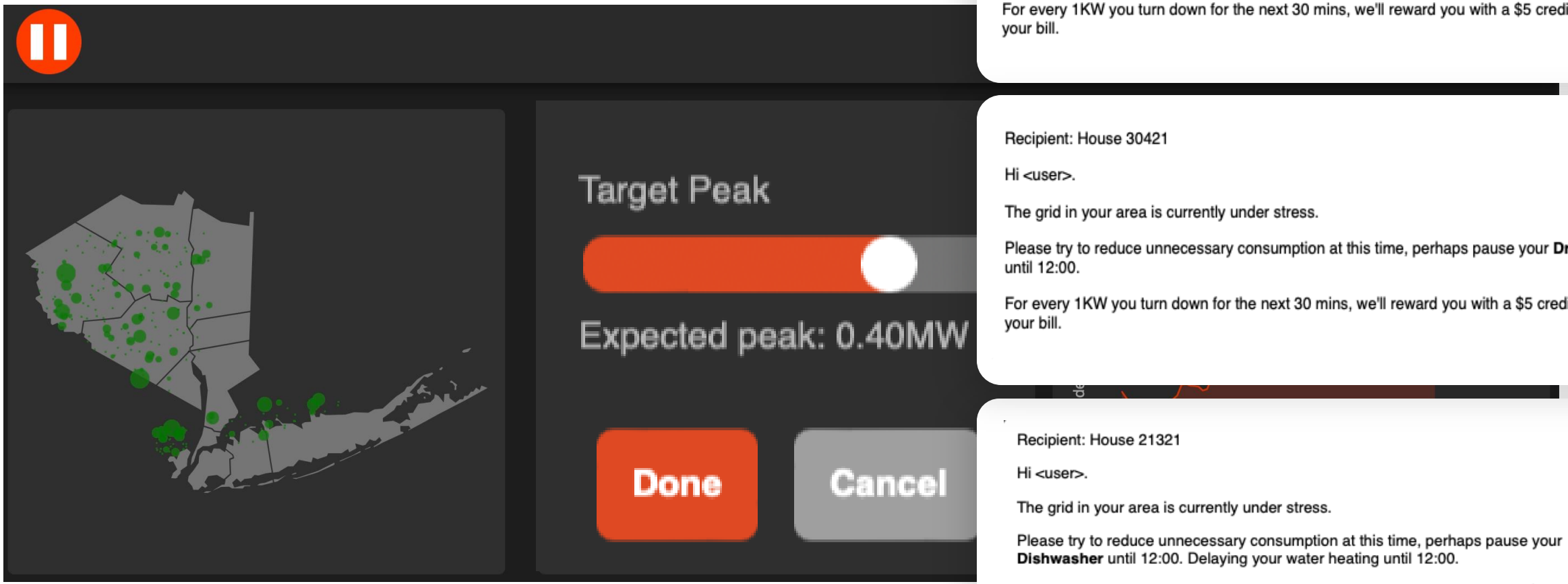
Michael Jary

Managing Director, APAC and EMEA

Next Gen Smart Meter
+
Machine Learning
+
High Resolution Data
+
DMD or Sub-meters


Verizon
3:50 PM
20%
Always On
Fridge
HRV
Upstairs comcast
Water heater
Upstairs tv
Dvd
Solar pump
Washer
Other
114W
1,016W
TODAY
3:50 PM
Microwave turned off
3:49 PM
Microwave turned on
Now
Solar
Trends
Devices
Settings

Using real time device detection to shift load at scale



Recipient: House 4122

Hi <user>.

The grid in your area is currently under stress.

Please try to reduce unnecessary consumption at this time, perhaps pause your **Dryer** until 12:00. Delaying your water heating until 12:00.

For every 1KW you turn down for the next 30 mins, we'll reward you with a $5 credit to your bill.

Recipient: House 30421

Hi <user>.

The grid in your area is currently under stress.

Please try to reduce unnecessary consumption at this time, perhaps pause your **Dryer** until 12:00.

For every 1KW you turn down for the next 30 mins, we'll reward you with a $5 credit to your bill.

Recipient: House 21321

Hi <user>.

The grid in your area is currently under stress.

Please try to reduce unnecessary consumption at this time, perhaps pause your **Dishwasher** until 12:00. Delaying your water heating until 12:00.

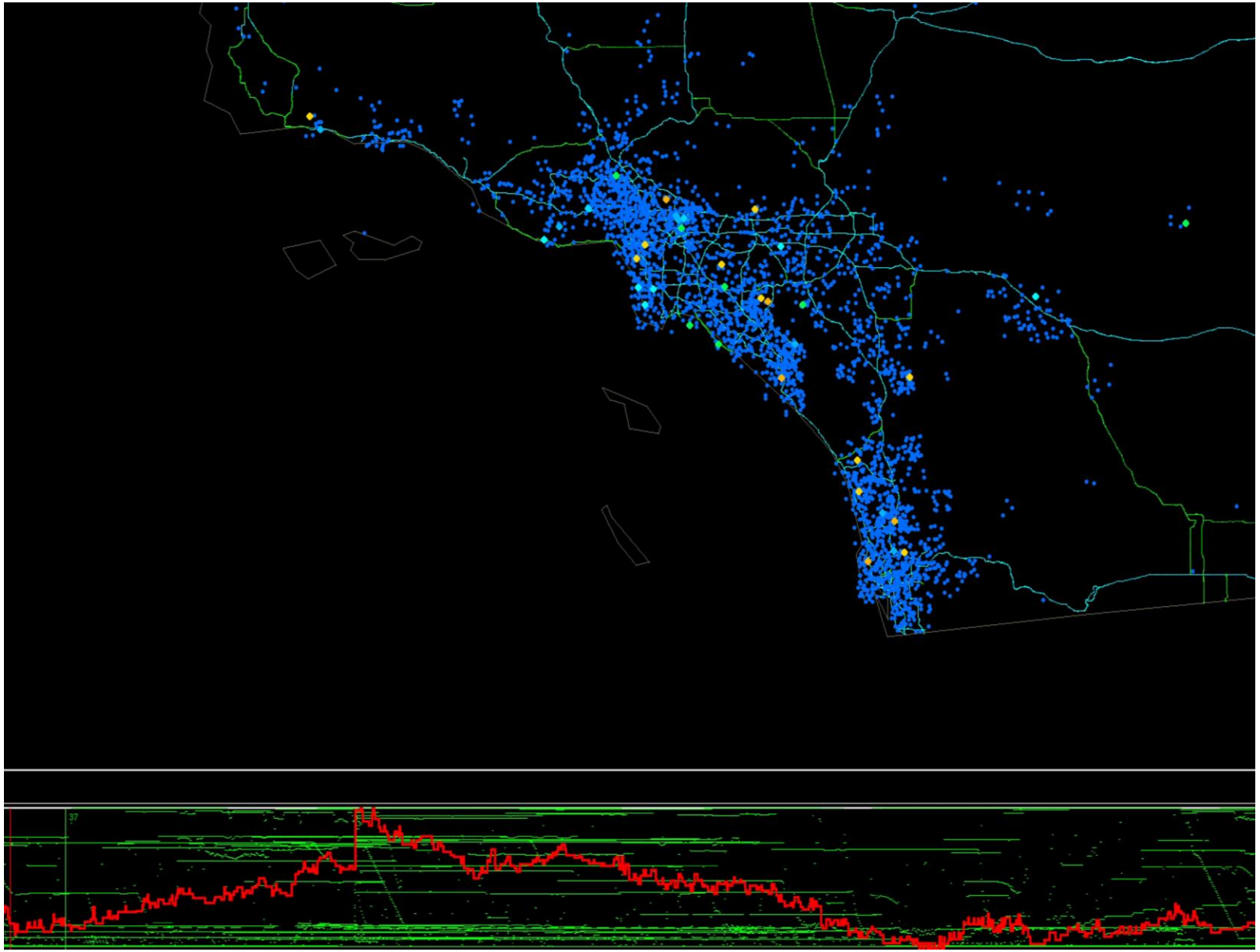
For every 1KW you turn down for the next 30 mins, we'll reward you with a $5 credit to your bill.

California Case Study

Using real time device detection to shift load

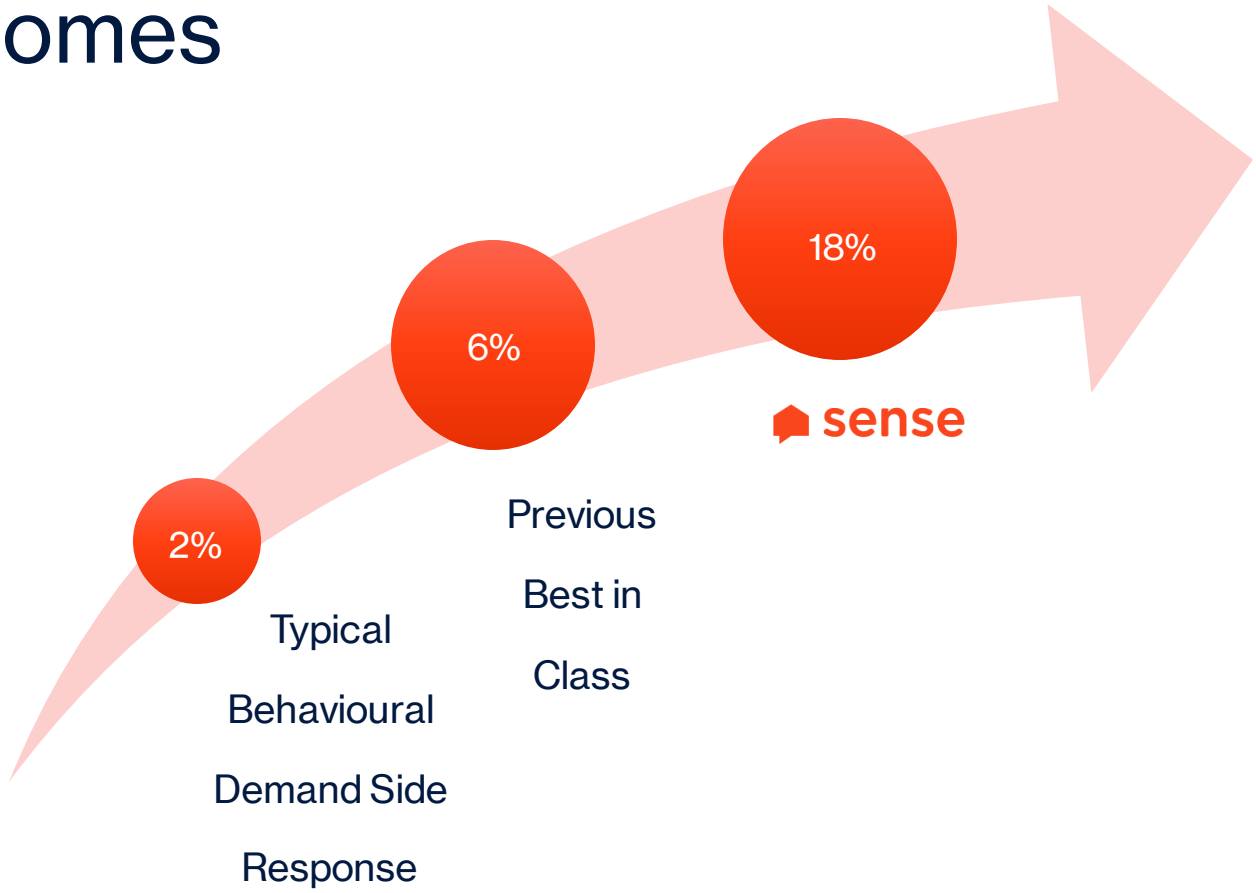
ohmconnect

sense



Load shift potential

1GW for 3m homes



Next Gen Meters + Machine Learning + High Resolution Data + DMD =

18%

peak load shifting

5m

Contracted smart meters

Thank you

Sense.com

Additional Meters – Additional Benefits?

Fronius International, Philipp RECHBERGER, 12.03.2024, Information Class: Confidential

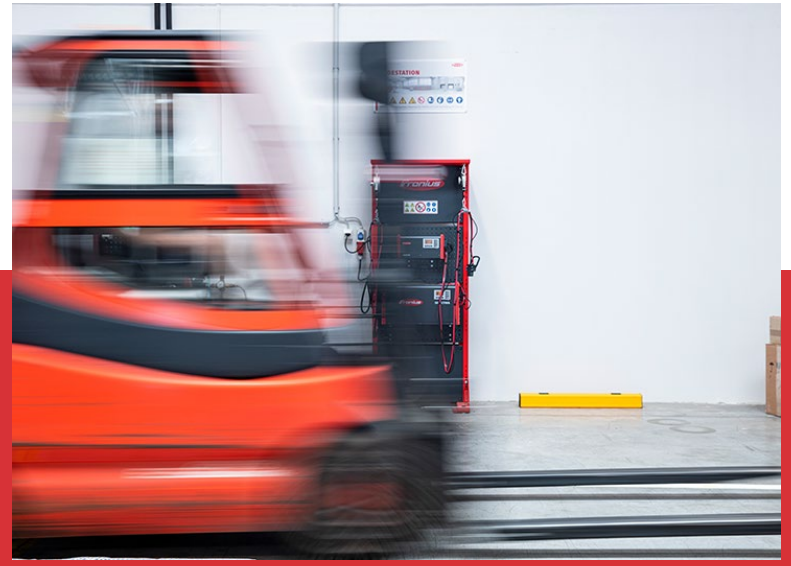
Business Units

Perfect Welding

A pioneer in
welding technology

Solar Energy

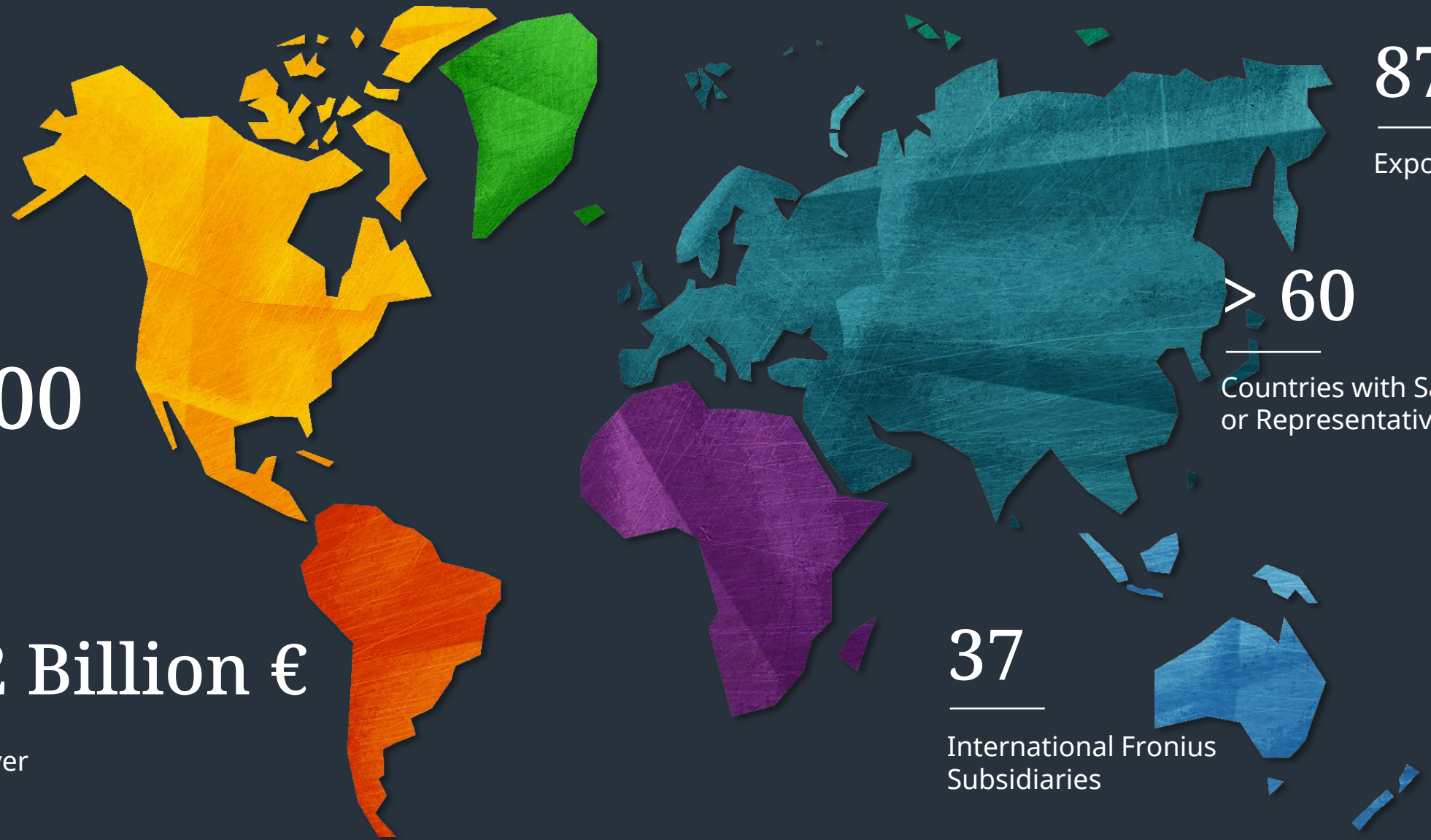
Providing solutions for a
sustainable future



Perfect Charging

Balancing sustainability
and efficiency

Facts & Figures



1.446

Patents

>7.000

Employees

1,2 Billion €

Turnover

87 %

Export Rate

> 60

Countries with Sales Partners or Representatives

37

International Fronius Subsidiaries

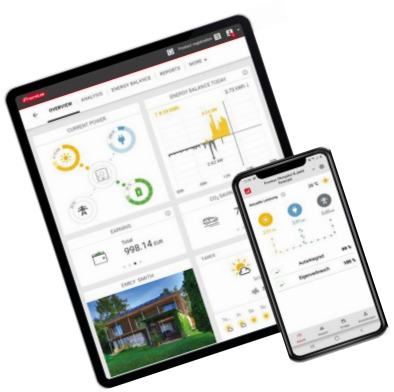
Solar Energy

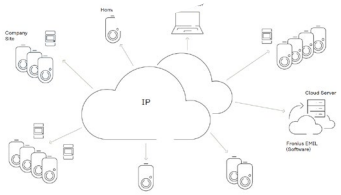
- Founded in 1992
- A pioneer in renewable energy

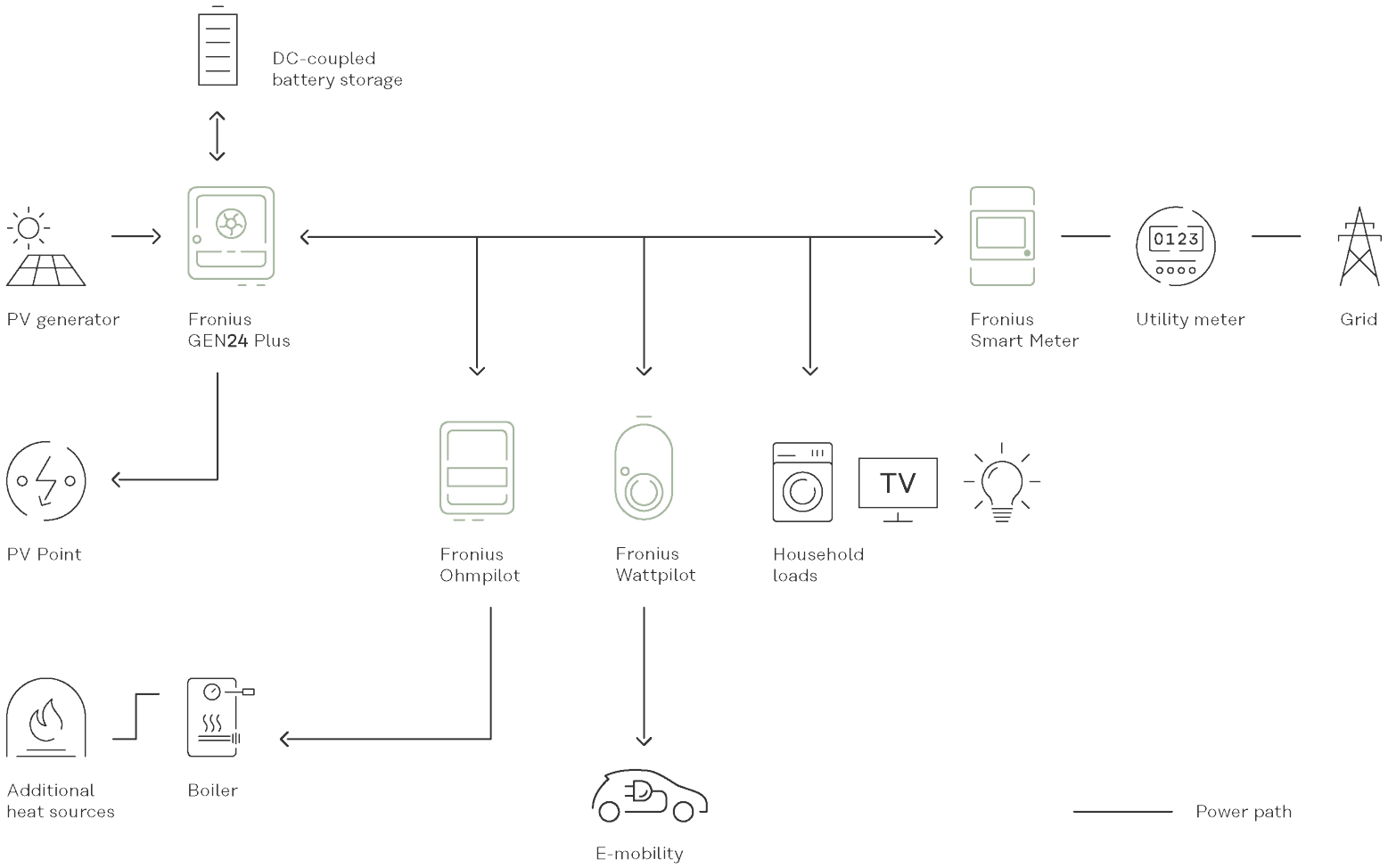
Generate distribute, store and **consume:** We've been harnessing solar energy for more than **30 years –** around the clock and regardless of the season.

We are 24 hours of sun.

Holistic energy solutions from a single source



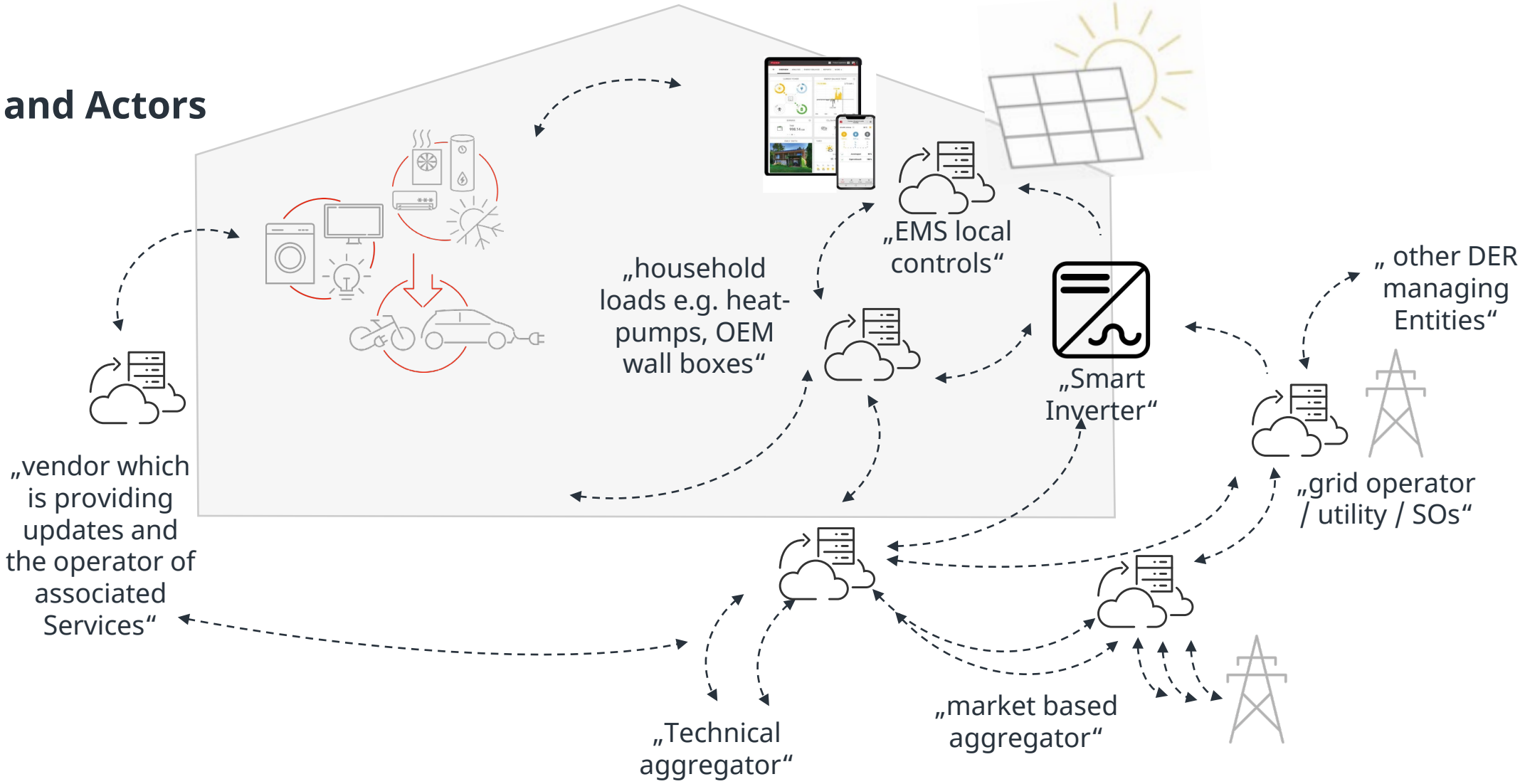




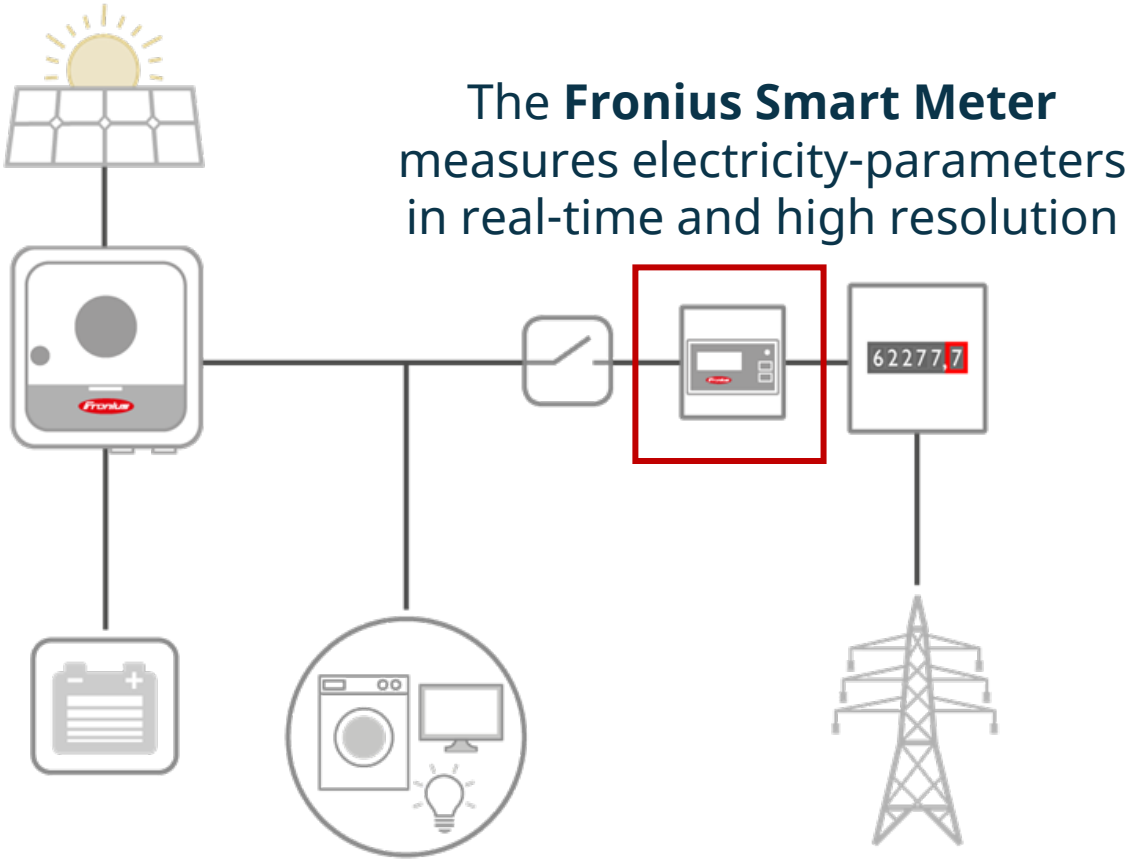
Maximizing the PV self-consumption rate is just the bottom line!

The inverter is at the center…

Roles and Actors



...but it needs active support



Why using separate meters?

Freedom that pays off

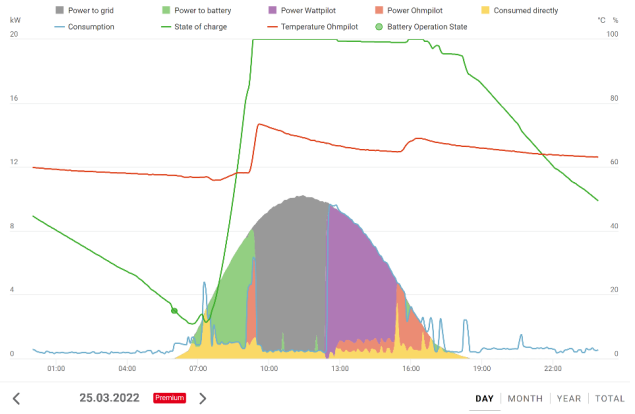
- Grid meters are different, inhomogeneous, technically inconsistent
- Our Smart Meters are intelligent electricity meters
  - Bidirectional to measure energy flows out of and into the grid in real-time and high resolution
  - Worldwide available and easy to install
- Data collection for visualizing (Fronius Solar.web), control, and optimization of energy flows in the home-energy (PV) system
  - Analysis und visualization of consumption and production data, key for monitoring and advice, check on expenses & savings, creating Visibility
  - Using PV energy and flexible tariffs for home appliances, heating, driving or just storing for later use.

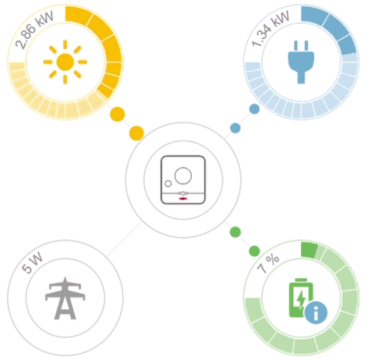
System data-streams

- PV inverter and smart meter are in the center
  - 2+ fully established measurement devices
  - Generating a lot of energy related data
- Multiple communication channels are provided
  - Local APIs for optimization of household loads and EV wall-boxes, heat-pumps, etc.
  - Remote APIs for ancillary services, remote control (advanced grid controls), VPP, monitoring, visualization, etc.
  - O&M channels for support, channel monitoring, device configurations, firmware upgrades etc.
- Platforms are storing/processing data related to device telemetry, customer accounts, geo locations and relevant smart-metering information etc.

Communication channels

Directly	Demand Response Modes
	Metering point controls
	Local device controls
Cloud	Controls and Service APIs
	Ancillary Service APIs
	Fleet management APIs
	3rd Party APIs





- Active and reactive power control for frequency and voltage stabilization
- External energy management
- Dynamic feed in and purchase
- Power throttling
- Grid disconnection
- Shifting the load point
- Energy storage curtailment
- Adanced grid control (AGF) schemes
- Fleet and asset management of DERs
- Using Flexibility

Innovations for Flexible Energy

- The available grid-metering infrastructure is not sufficient for the flexible prosumer and grid of the future
  - Energy has to be controlled in real time and high resolution
  - High diversity of devices and (local) interfaces, significant delays (e.g. 15 min data from the day before)
  - More than just one supplier

In use at 100 000+ customers

- Fronius provides technology and services
  - Very well trained partners: our installers know how to install and configure our assets in the right way
  - At least two class 1 meter available (inverter plus dedicated meter). Grid parameters like voltage and frequency are necessary but available to act accordingly.
  - Using new interoperability standards like IEEE 2030.5, we ensure that the data exchange accuracy is insured by a high data granularity.

Interfaces and data service to control assets available to market players


Ready when you are.
You too can become part of the energy transition!
Fronius Solar Energy. Energize your life.

Philipp RECHBERGER
rechberger.philipp@fronius.com
+43 664 88635266

Fronius International
Solar Energy
System Technology

Froniusplatz 1
4600 Wels
Austria

WEBINAR

Thanks to our guests

Moderator

Marion Malafosse

Head of Policy

smartEn

Speaker

Marcia Poletti

Head of European

System Change

Octopus Energy

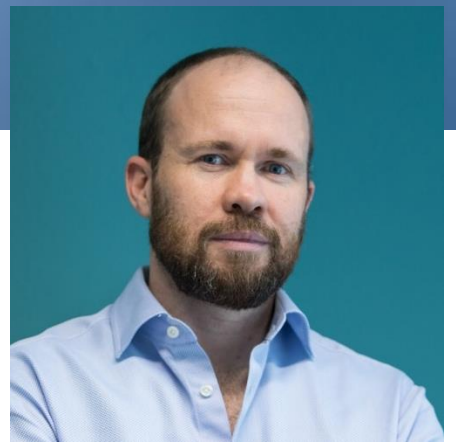
Speaker

Michael Jary

Managing Director

EMEA & APAC

Sense



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Fronius

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Agrivoltaics Industry Forum

Solarthermie und innovative Wärmesysteme

Tagung Zukünftige Stromnetze

Green Hydrogen Forum

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- Start-Up Deep Dive: How They Can Be a Driver of the Energy Transition
  Jan Lozek, Managing Partner and Co-Founder, Future Energy Ventures
- Smart Buildings: The Future of Energy Efficiency & Climate Action
  Ivan-Asen Ivanov, Energy & Climate Policy Officer, Eurelectric.
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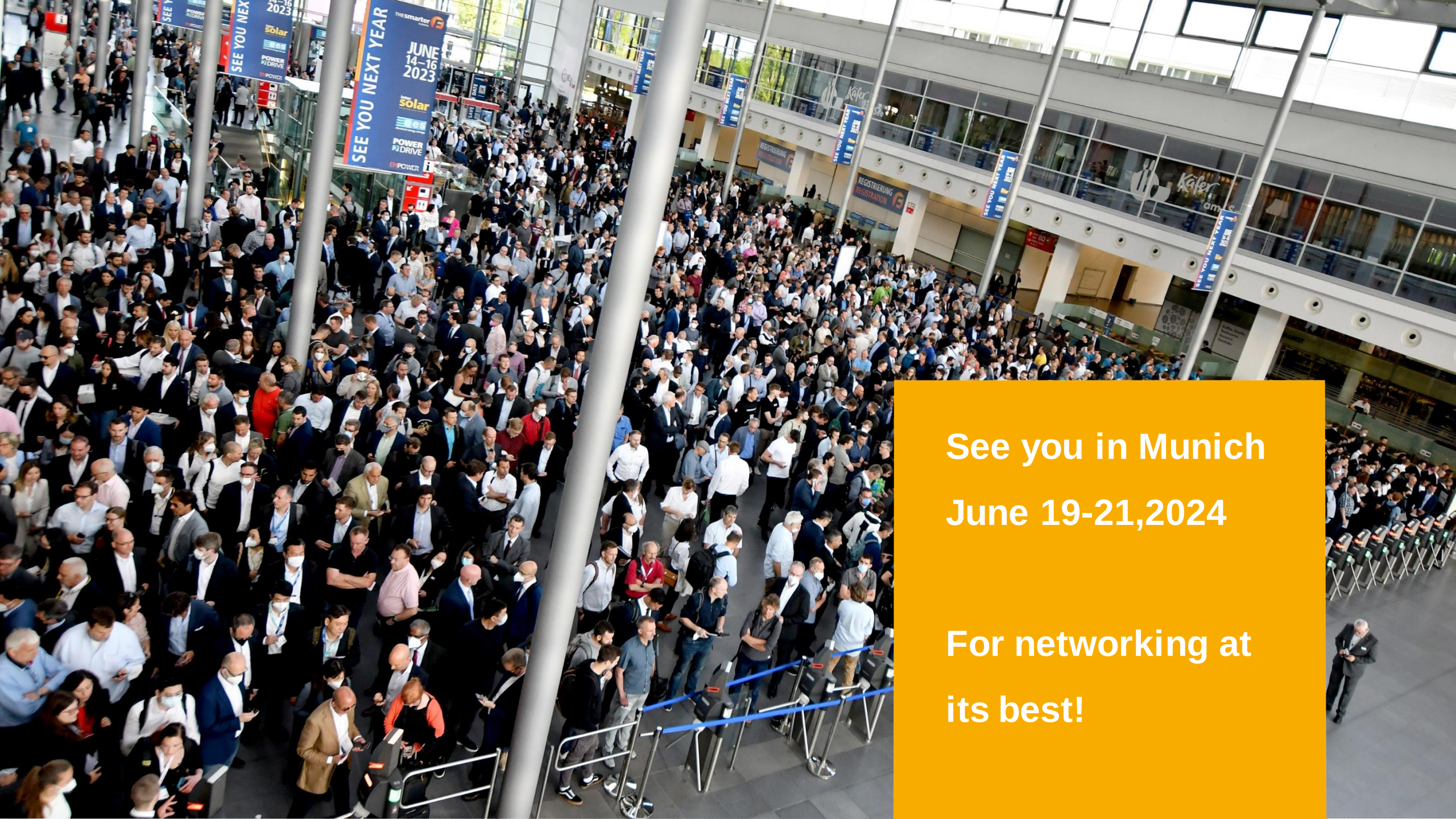

See you in Munich

June 19-21,2024

For networking at its best!

EMPOWER EUROPE

Organizers

Solar Promotion GmbH

Kiehnlestraße 16
75172 Pforzheim
Tel.: + 49 7231 58598-0
info@solarpromotion.de
www.solarpromotion.de

FWTM – Freiburg Wirtschaft Touristik und Messe GmbH & Co. KG

Messe Freiburg, Neuer Messplatz 3
79108 Freiburg i. Br.
Tel.: +49 761 3881-3700
TheSmarterE@fwtm.de

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