

SOLUTIONS We will evolve the way energy is sensed.

Seensy sensing energy efficiency



BOOSTING SMART COMMUNITIES



SEENSY helps smart buildings/companies/cities to the next energy level

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by supporting decision-makers to identify energy efficiency gaps and potential solutions and evaluate the costs and benefits of various interventions.



by improving energy efficiency services and increase competitiveness.



by integrating energy efficiency into procurement, financing, buildings, transport, energy assessments and urban planning.



by saving energy and reduce emissions.



by helping understand opportunities, measures for energy efficiency improvements, prioritise actions and define constraints.



by engaging end-users and rising awareness in innovative ways.

Identify ineffficiencies **Define effective measures** Save energy costs

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TECHNOLOGY

learning, interpretation, prediction, reasoning

101

- Power Campaigns
- Gamification
- Incentives

HUMAN

awareness, participation & comfort

Understand inefficiency combining different factors and parameters Demand forecasting and identify peak loads Identify areas for interventions (Human+Building)



- Energy business model
- Cost savings

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"Energy Trading"





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- Minimal invest for project start project financed by savings
- Pilot to clarify savings potential & business case clear decision base for invest
- Energy savings of up to 50% and risk sharing business model
- Cutting edge technology platform (Artificial Intelligence) & behaviour modification approaches
- **Green image** / reduction of carbon footprint







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COMPETITIVE ADVANTAGES

Boosting energy efficiency by understanding the human needs and business challenges and push technology to its limits to intelligently serve them.



Ability to simulate shifting activities based on the forecasted consumption through Artificial Intelligence technology based on EU FP7 funded research.



Advanced analytics and technology based on 10+ yrs experience in the field.



Value co-creation and risk sharing with our customers.



Better results thanks to deeper user experience on informational and emotional level giving end-users the chance to sense the infrastructure, data and her/ his impact on energy efficiency.



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Seensy Solutions

iEMIS - intelligent Energy Management Information System

Understand your inefficiency and consumption behavior



Demand Response -**Daily Optimization Plan**

Empower (end)user engagement through collaboration design

Optimize energy consumption combining different energy sources (solar, wind, etc.)

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Seensy iEMIS

Benefits

Energy saving up to 48% by optimizing energy consumption.

Functions

- Monitor energy at different hierarchical topologies: \bullet office, sector, building, city, region ... depending on the user setup.
- Accurate forecasting based on various information sources.
- Identify trends in energy consumption by comparing various \bullet parameters (occupancy, cloudiness, etc.).
- Customized reports per case (based on our analytics tools). \bullet

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Dashboard Jsage of energy (since Oct 1 3332.51 kWh 1686.99 kWh 333.25 El ice - lighting Office lighting ridor 1 - lighting orridor 1 - lighting 986.64 kWh 98.66 EUR 29.61 dor 2 - lighting orridor 2 - lighting rridor 3 - lighting ridor 4 - lighting Lighting table orridor 3 - lighting .62 kWh 0.76 EUR 0.2 0.00 kWh 0.00 EUF ridor 5 - lighting Corridor 4 - lighting 41.33 kWh 14.13 EUR 4.24 irs - lighting 18.48 kWh 11.85 EUR 3.56 eting Room - lighting orridor 5 - lightin 4.27 kWh 3.43 EUR 1.0 chen - lighting Stairs - lighting 35.08 kWh 3.51 EUR male Toilet - lighting 9.52 kWh 0.95 EUR 0.29 ale Toilet - lighting Meeting Room - lighting 0.00 kWh 0.00 chen - lighting 26.30 kWh 2.63 EUR 0.79 ting Room - PC emale Toilet - lighting 176.18 kWh 17.62 EUR 5.29

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ting Room - mon

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| Home |
|-----------------------------|
| 즈 |
| 168.70 EUR |
| 108.24 kWh 10.82 EUR 6.42% |
| 720.33 kWh 72.03 EUR 42.7% |
| 4.87 kWh 0.49 EUR 0.29% |
| 3.83 kWh 0.38 EUR 0.23% |
| 112.03 kWh 11.20 EUR 6.64% |
| 16.17 kWh 1.62 EUR 0.96% |
| 18.56 kWh 1.86 EUR 1.1% |
| 21.82 kWh 2.18 EUR 1.29% |
| 44.19 kWh 4.42 EUR 2.62% |
| 185.26 kWh 18.53 EUR 10.98% |
| 437.65 kWh 43.76 EUR 25.94% |
| 11.75 kWh 1.17 EUR 0.7% |
| 1.81 kWh 0.18 EUR 0.11% |
| 0.25 kWh 0.03 EUR 0.01% |
| 0.23 KMb 0.02 EUR 0.01% |







In figures...

Area coverage: 45.500 m2 : 11.500 m2 Office space 34.000 m2 Production / Storage ~ 1.500 occupants 650 Parking spaces

20 Loading docks

Annual electricity needs ~ 7.964 MWh

Seensy installation

Tested area: ~ 300 m2

52 sensors installed

Energy savings (electricity): up to 48%

Estimated cost savings: ~ 232.962 € / Year

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Advanced analytics, forecasting and learning behaviour

Sensor data

Fusing different information sources (internal and external context)

Data Fusion & Enrichment

Complex events processing

Forecasting

Knowledge generation



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Seensy iEMIS - Dashboard

The dashboard gives a summary of energy consumption and inefficiency

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| HT Hig | c th Tech Campus Vienna |
|-----------|----------------------------|
| Navi | gation |
| - | Dashboard |
| | Predefined Visualizations |
| Laul | Custom Visualizations |
| ۷ | Мар |
| | Data availability |
| 4 | Alarms |
| | Lighting table calculation |
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| Dashboard | |
|--|-----------|
| Usage of energy (since Oct 1) 3332.51 kWh | |
| | |
| Office lighting | 249.39 |
| night | 4.51 |
| Corridor 1 - lighting | 986.64 ki |
| night | 406.84 ki |
| Corridor 2 - lighting | 8.61 |
| night | (|
| Corridor 3 - lighting night | 7.62 |
| Corridor 4 - lighting | 141.33 |
| night | 118.48 |
| Corridor 5 - lighting | 34.27 |
| night | 9.9 |
| Stairs - lighting | 35.08 |
| night | 9.52 |
| Meeting Room - lighting | 58.93 |
| night | (|
| Kitchen - lighting | 51.16 |
| night | 26.30 |
| Female Toilet - lighting | 176.18 |
| night | 148.54 |

| | | Home |
|----------------------------------|--|-----------------------------|
| | Direct inefficiency (since Oct 1) 1686.99 kWh | Д |
| 333.25 EUR | | 168.70 EUR |
| 24.94 EUR 7.48% | Office - lighting | 108.24 kWh 10.82 EUR 6.42% |
| | Corridor 1 - lighting | 720.33 kWh 72.03 EUR 42.7% |
| 0.68 EUR 12.21% | Corridor 2 - lighting | 4.87 kWh 0.49 EUR 0.29% |
| 0.86 EUR 0.26% | Corridor 3 - lighting | 3.83 kWh 0.38 EUR 0.23% |
| 0.76 EUR 0.23% | Corridor 4 - lighting | 112.03 kWh 11.20 EUR 6.64% |
| vh 0.00 EUR 0% | Corridor 5 - lighting | 16.17 kWh 1.62 EUR 0.96% |
| 14.13 EUR 4.24% | Stairs - lighting | 18.56 kWh 1.86 EUR 1.1% |
| 3.43 EUR 1.03% | Meeting Room - lighting | 21.82 kWh 2.18 EUR 1.29% |
| 0.99 EUR 0.3% | Kitchen - lighting | 44.19 kWh 4.42 EUR 2.62% |
| 3.51 EUR 1.05% 0.95 EUR 0.29% | Female Toilet - lighting | 185.26 kWh 18.53 EUR 10.98% |
| 5.89 EUR 1.77% | Male Toilet - lighting | 437.65 kWh 43.76 EUR 25.94% |
| Vh 0.00 EUR 0% | Office - PC | 11.75 kWh 1.17 EUR 0.7% |
| 5.12 EUR 1.54% 2.63 EUR 0.79% | Office - Monitor | 1.81 kWh 0.18 EUR 0.11% |
| 17.62 EUR 5.29% | Meeting Room - PC | 0.25 kWh 0.03 EUR 0.01% |
| 14.85 EUR 4.46% | Meeting Room - monitor | 0.23 kWh 0.02 EUR 0.01% |

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Seensy iEMIS - Measuring Energy Footprint

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Dashboard

Usage of energy (since Oct 1) 3332.51 kWh

| Office lighting | 249.39 |
|----------------------------------|----------|
| night | 4.51 |
| Corridor 1 - lighting | 986.64 k |
| night | 406.84 k |
| Corridor 2 - lighting night | 8.61 |
| Corridor 3 - lighting night | 7.62 |
| Corridor 4 - lighting | 141.33 |
| night | 118.48 |
| Corridor 5 - lighting | 34.21 |
| night | 9.9 |
| Stairs - lighting | 35.06 |
| night | 9.52 |
| Meeting Room - lighting night | 58.93 |
| Kitchen - lighting | 51.10 |
| night | 26.30 |
| Female Toilet - lighting | 176.18 |
| night | 148.54 |



Total energy usage.

For each topology, Seensy presents consumption in different usage periods (day, night, holidays, etc.).

This gives the "energy footprint" of each topology.

Seensy supports different aggregations at different granularities (sections, building, neighborhood, etc.).





Total Inefficiency (energy spent and cost).

Inefficiency is the unnecessary energy spent.

Calculations are done based on complex scenarios and combinations for each topology:

- Indoor lighting vs. Occupancy vs. physical lighting.
- Use of PC/ Monitor vs. Occupancy.
- Heating/cooling vs. Occupancy.
- Heating/cooling vs. Occupancy vs. weather conditions (in progress).

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| Direct inefficiency (since Oct 1) 1686.99 kWh | <u>ل</u> |
| | 168.70 EU |
| Office - lighting | 108.24 kWh 10.82 EUR 6.42 |
| Corridor 1 - lighting | 720.33 kWh 72.03 EUR 42.7 |
| Corridor 2 - lighting | 4.87 kWh 0.49 EUR 0.29 |
| Corridor 3 - lighting | 3.83 kWh 0.38 EUR 0.23 |
| Corridor 4 - lighting | 112.03 kWh 11.20 EUR 6.64 |
| Corridor 5 - lighting | 16.17 kWh 1.62 EUR 0.96 |
| Stairs - lighting | 18.56 kWh 1.86 EUR 1.1 |
| Meeting Room - lighting | 21.82 kWh 2.18 EUR 1.29 |
| Kitchen - lighting | 44.19 kWh 4.42 EUR 2.62 |
| Female Toilet - lighting | 185.26 kWh 18.53 EUR 10.98 |
| Male Toilet - lighting | 437.65 kWh 43.76 EUR 25.94 |
| Office - PC | 11.75 kWh 1.17 EUR 0.7 |
| Office - Monitor | 1.81 kWh 0.18 EUR 0.11 |
| Meeting Room - PC | 0.25 kWh 0.03 EUR 0.01 |
| Meeting Room - monitor | 0.23 kWh 0.02 EUR 0.01 |

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Seensy iEMIS - Predefined Visualizations

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Predefined visualizations reports all possible scenarios in different topologies.

Aggregations/clustering and scenarios to be examined are configurable to different customer particularities and needs.





Users can visualize energy behavior patterns and identify potential trends e.g. excessive energy (lights, HVAC, other) spent at nights or holiday periods

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Seensy iEMIS - Predefined Visualizations (Reports)

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Seensy iEMIS - Custom Visualizations

Custom visualizations allow for reporting and comparing different energy cost centers in different topologies (e.g. occupancy vs. light usage vs. cloud coverage)

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| H | TC gh Tech Campus Vienna | Select par | ameters | | | | |
|----|---|------------|---------|--------------|----------|-----|---|
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| 8 | Dashboard Predefined Visualizations | | | Start and e | end date | | 2016-10-01 - 2016-10-31 |
| 2 | Custom Visualizations | | | Sampling | Interval | | |
| • | Map Data moltability | | | | | | Raw |
| 4 | Alarms | | | Aggreg | ate type | | Nothing selected |
| | Lighting table calculation | | | | | | |
| | ۲ | | | | | | Add series Delete last series Add chart |
| | | Chart | | | | | |
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| | | | 1 | 1600 | | 1 | |
| | | | 0.75 | 1200 | 0. | .75 | |
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| | | | 0.25 | 400 | 0. | .25 | |
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Seensy iEMIS - Data Availability

Data availability reports the flow of information from of all data sources

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| 80 | Dashboard | | | | | |
| | Predefined Visualizations | | Nov ' | Jan '16 | Mar '16 | May '16 |
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| | | | | | | Office1 – Temperature |
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| | | | | | | Office1-Outlet1-PC-Watts |
| i I | | | | | | Office1-Light |
| 1 | | | 1 | | | Office1-Humidity |
| | | | 1 | | | Office1-Outlet2-Monitor-KWI |
| | | | | | | Office1-Outlet1-PC-KWH |
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| 1 | | | | | | Office1-Window-LastTrip |
| | | | | | | Office1-Window-Tripped |
| | | | | | | Office1-Occupancy-LastTrip |
| | I | | | | | Office1-Occupancy-Tripped |
| | | | | | | Corridor 1 - Temperature |
| | | | | | | Corridor1-Humidity |
| | | | | | | Corridor 1 - Hannarty |
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| | | | | | | Corridor2-Humidity |
| | | | | | | Corridor2-Light |
| | | | | | | Corridor2-Temperature |
| | | 1 | | | | Corridor3-Humidity |

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Seensy iEMIS - Alarms

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Alarms can be set for both system and usage information.

- System information: Reporting data streams flow and potential problems.
- Usage information: Values below or above thresholds.

Usage alarms are configurable per case.

| Alarm! Seensy WatchDog is not running! (last check: 3497 months ago) | × |
|---|---|
| OK! QMiner HTC is running! (last check: 3497 months ago) | × |
| OK! DataCleaning HTC is running! (last check: 3497 months ago) | × |
| | |

Seensy Sensor streams

OK! Forecast.io HTC is running! (last component check-in: 3497 months ago)

| # | Sensor | Status | Last |
|----|-------------------------------|--------|--------------|
| 0 | Office1-Temperature | Alarm | 4 months ago |
| 1 | Office1-Outlet2-Monitor-Watts | Alarm | 4 months ago |
| 2 | Office1-Outlet1-PC-Watts | Alarm | 4 months ago |
| 3 | Office1-Light | Alarm | 4 months ago |
| 4 | Office1-Humidity | Alarm | 4 months ago |
| 5 | Office1-Outlet2-Monitor-KWH | Alarm | 4 months ago |
| 6 | Office1-Outlet1-PC-KWH | Alarm | 4 months ago |
| 7 | Office1-Door-LastTrip | Alarm | 4 months ago |
| 8 | Office1-Door-Tripped | Alarm | 4 months ago |
| 9 | Office1-Window-LastTrip | Alarm | 4 months ago |
| 10 | Office1-Window-Tripped | Alarm | 4 months ago |
| 11 | Office1-Occupancy-LastTrip | Alarm | 4 months ago |
| 12 | Office1-Occupancy-Tripped | Alarm | 4 months ago |
| 13 | Corridor1-Temperature | Alarm | 4 months ago |
| 14 | Corridor1-Humidity | Alarm | 4 months ago |

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Seensy iEMIS - Physical Lighting Model



Seensy creates a physical lighting model for each topology, which is used in defining the lighting inefficiency.

Lighting model considers both external (cloud coverage) and internal light levels in different timeframes.

| | clear | partly cloudy | cloudy |
|---------|-------------|---------------|-------------|
| morning | 0.00 (0) | 1000.00 (1) | 532.50 (2) |
| day | 1000.00 (7) | 767.24 (117) | 663.17 (29) |
| evening | 93.00 (1) | 20.00 (5) | 0.00 (0) |
| night | 0.00 (0) | 9.17 (12) | 0.00 (0) |



Seensy iEMIS - Forecasting

Seensy applies complex forecasting algorithms combining different information sources (weather, behavior, etc.)

| CARBON FOOTPRINT so far this week 28.8 Kg CO2 | | > | | TEMPERATURE now 18.5 C | | | |
|---|------------|---------|------|------------------------------|------------|--|--|
| last year 1976.7 Kg CO2 | | | | predicter 6.8 C | d tomorrow | | |
| ENERGY USE | COMPARISON | SAVINGS | FORE | CAST | | | |

Energy Use Tomorrow Actual CSI consumption vs predicted consumption, 2014 - now, hourly



Nov:

-600

Aug

2014

Sep

+ Sync Chart Timeline Export data

Oct

Actual CSI consumption vs predicted consumption, 2014 - now, hourly: buildingtotalconsu

Data and interface are from the initial NRG4Cast EU project in 2015.

Dec

Jan I

2015

Feb

Mar

| 0 | CLC toda 40 9 prec | OUDCOVE | R | | ඊ | | HUM today 77 % predic | IDITY | orrow | | •• | • |
|---------|-----------------------------|------------|-------------|------------|---------------|-------------|--------------------------------|----------|-------------------------|---------|--------------|--------|
| | 0.46 | 55 | | | | | 0.69 % | g. | | | ADVANCED | SEARCH |
| Actu | al CSI cons | umption vs | predicted o | consumptio | n, last three | e days - ye | sterday, | , hourly |] | | | |
| mption_ | predicted | (kW), Act | tual consul | mption (k\ | M | | | | | | | |
| | M | 11 | | | | | | (kW) | buildingtr Actual co | nsumpti | umption_pred | licted |
| pr | Мау | Jun | Jul | Aug | Sep | Oct | Nov | | | | | |

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no central defined trainings autonomy

> behavioural change psychology

communication sciences

> behavioural economics

real awards

brain-based motivation techniques

smart scenario planning

Seensy Collaboration Design in Power Campaigns



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SEENSY Demand Response - Daily Consumption Plan

Optimized usage of Renewable Energy Installations through Seensy forecasting and analytics capabilities. Solution in concept

Benefits:

- Optimized usage of RES and Conventional Energy lacksquareconsidering multiple parameters and forecasts (demand, energy prices, weather, etc.).
- Energy cost reduction / Energy gains (through Energy selling) Seensy creates the "energy consumption plan" for the next day. This ulletto the Grid). will result in hourly or quarterly periodic plans for using electricity either from RES or from the Grid. RES Energy that will not be used Improved demand response in buildings. ulletwill be sold to the Grid. ullet
- New business models for prosumers in Energy Management ("Energy Trading").



Functions:

Seensy analytics are able to forecast tomorrow's demand based on energy consumption profiles, weather forecasts, forecasted energy prices.

This daily plan is updated during the day with new suggestions, based on collected data streams.





SEENSY for ISO 50001

ISO 50001-2011

- Energy review
- Energy baseline
- Energy Performance Indicators

- Implementation & operation
- Documentation, recording

- Monitoring, measurement and analysis
- Internal audits
- Corrective actions
- Preventive actions
- Control of records



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SEENSY for ISO 50001

Supporting ISO 50001-2011 implementation through automation (information processing) and user engagement

| | ISO 5001-2011 | EMIS | Seensy (additional to EMIS) | | |
|-------|---|---|---|--|--|
| Plan | Energy review Energy baseline Energy Performance Indicators | Define control points Performance indicators Alerts | Performance simulation Define complex scenarios for energy usage Roadmap with PIs for energy efficiency | | |
| Do | Implementation & operation Documentation, recording | Monitoring | Roadmap implementation Customized reports Trend analysis | | |
| Check | Monitoring, measurement and analysis | Control Reporting | Behaviour analysis Anomaly detection Forecasting Power campaigns | | |
| Act | Internal audits Corrective actions Preventive actions Control of records | Automation-control Assess basic energy performance | Power campaigns Action plans (system, user) Comparison analysis and learning | | |

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References – Seensy iEMIS

Current Installation

Pilot project **HIGH TECH CAMPUS** OFFICE CENTER

WIENERBERG, VIENNA





Core technology with "intelligence components" is used by:

Bloomberg



Seensy iEMIS is the solution was tested in the context of NRG4Cast FP7 project by:





Detailed consumption monitoring in 1 office building (Turin). Electrical and district heating in 34 Turin public owned buildings.





National Technical University of Athens

Electricity consumption in 47 buildings. Thermal comfort in 1 building.



Monitoring and predicting demand in district heating.



The New York Times





Municipality of Miren-Kostanjevica

Street lighting management





Smart charging algorithms for electric vehicles

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TEAM & FOUNDERS DREAM

Thomas Fiedler CEO Marketing & Sales, Partner Management >15 yrs re-structuring, start-up & operation of ICT companies in B2B (as CEO)

Simon Mokorel CBDO **Business Development** >20 yrs R&D in automotive, starting-up companies in product design and regional development

> Mitja Jermol СТО Technology, AI

>15 yrs research & development in cybernetics and artificial intelligence, head of JSI centre for knowledge transfer and UNESCO chair for open education

Save energy by understanding, identifying & avoiding inefficiencies in energy consumption!

> Kostas Kalaboukas COO **Product Development, Operations** >15 yrs project & quality mgmt. in complex European ICT projects

Urska Starc-Peceny CCO

Strategy & Communication, Power Campaigns >20 yrs in strategy & communication in innovation, co-founding companies in Europe and Middle-East

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Be part of this evolution. Change the way energy efficiency is sensed!





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