

ALSTOM Grid

Solutions for Development and Integration of Smart Grids

19-20 September 2011

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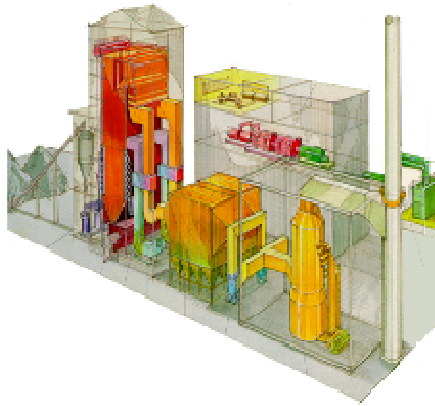
ALSTOM Grid

Smart Grid Business Development Manager



ALSTOM

Complete Offering in Clean Energy & Transportation Infrastructures



Products & Services

Power

- Nuclear, thermal & Renewable
- Carbon Capture & Storage
- Automation

Grid

- HVDC
- Network management
- Substations

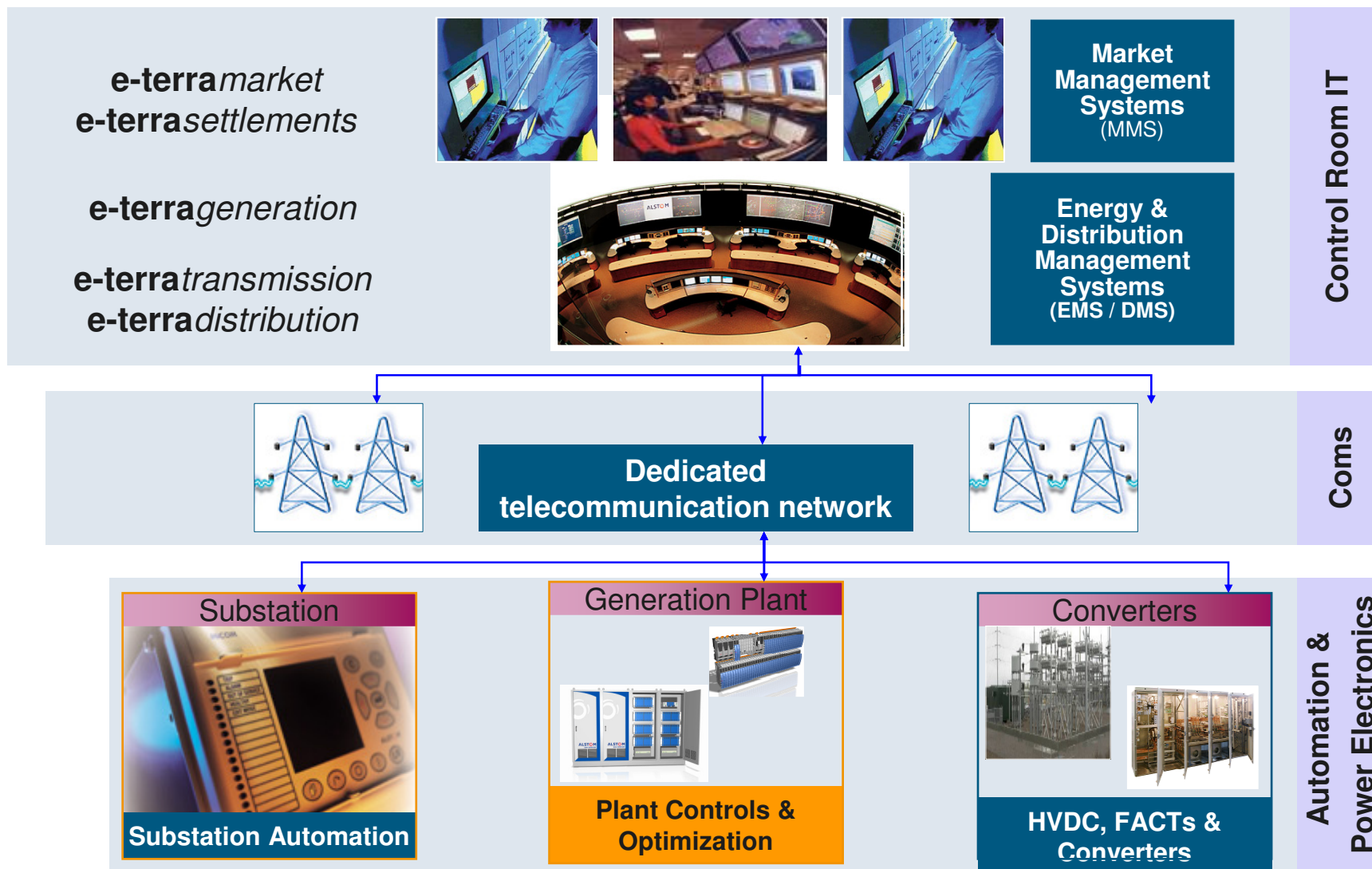
Transport

- Rolling Stock
- Infrastructure & systems
- Systems & Services

Transversal Technologies

- Power Electronic Converters
- Automation & Embedded Controls
- Energy & Asset Management Software

ALSTOM Smart Grid Critical Technologies



Alstom Grid's technologies and solutions are at the heart of the Smart & Super Grid



**Alstom Grid is N°1 leader
in Network Management
Solutions**

New applications deployed for Smart Grid network management



On-line stability

ENERGINET/DK



Renewable integration



Integrated DMS

new energy solutions
EMRIX
FOR SMARTER CITIES



Eco-Cities

Classic



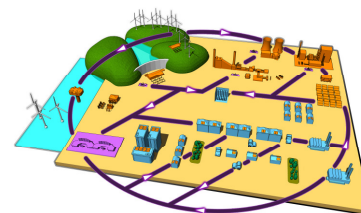
- Vertically integrated
- Cost-based operation
- Physical infrastructure

Competition

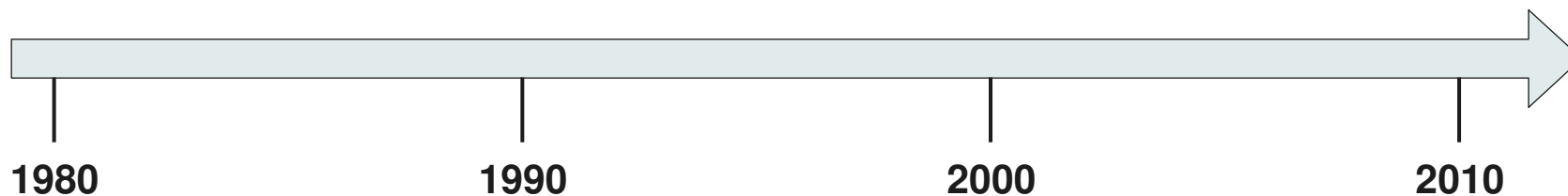


- Open grid access
- Genco divestiture
- Wholesale electric mrkt

Smart-Grid

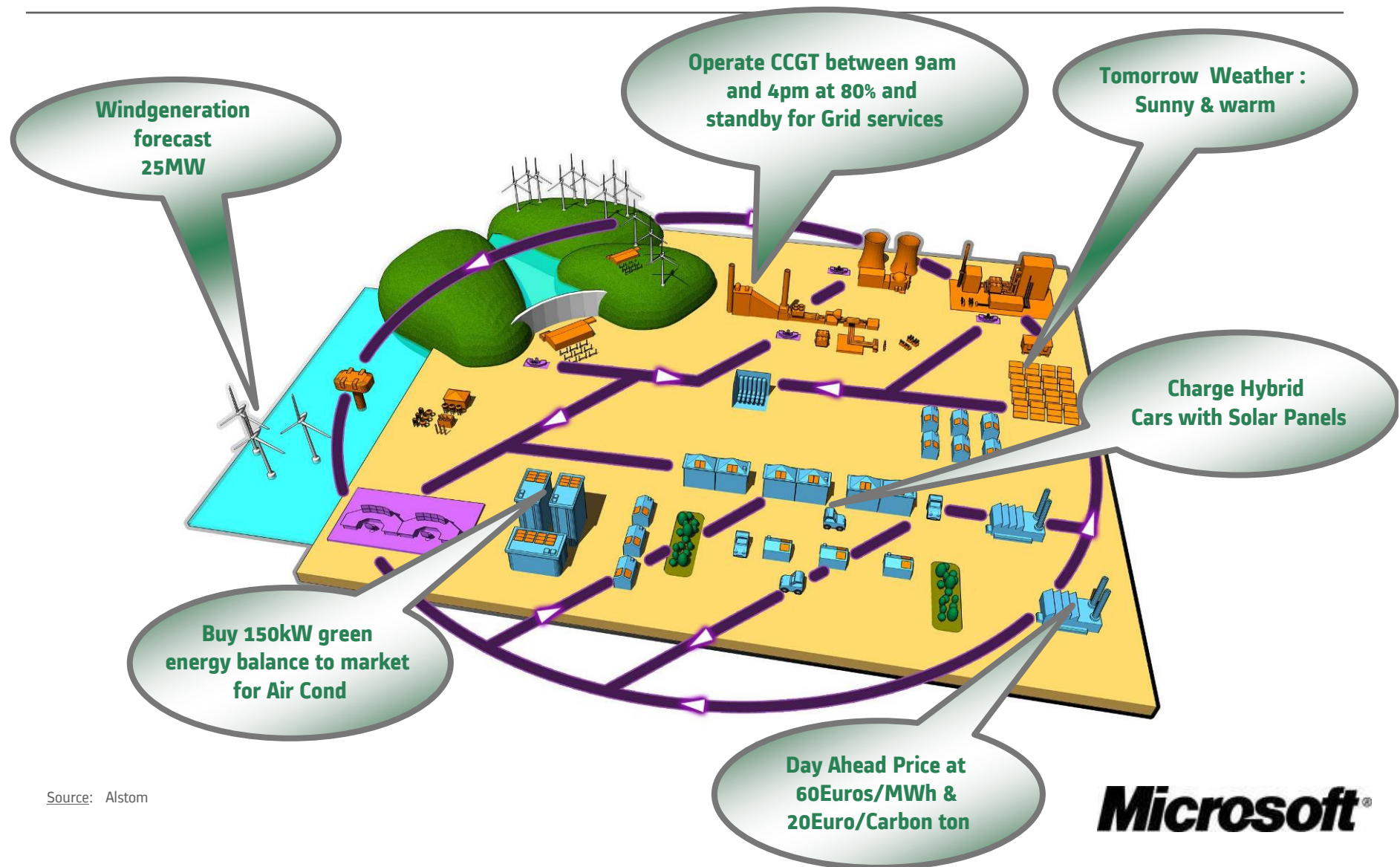


- Distributed intelligence
- Customer choices
- New energy eco-system
- Micro-grid



SmartGrid : supply to end use

ALSTOM



Source: Alstom

Microsoft®



▶ **1. Maximize CO2 free energy and reduce environmental impacts**

E.g.: Europe over 50% of generation investment until 2020 is in renewable energy

- Enable renewable grid connection and improve thermal generation flexibility
- Maximize dispatch of intermittent renewable generation (wind, solar)
- Integrate distributed generation, eco-buildings and electric vehicles
- Develop new energy storage capabilities



▶ **2. Improve energy efficiency across the value chain**

E.g.: USA, \$4.6Bn federal investment in smart grid technology deployment

- Optimize real-time CO2 free energy delivery to end-users
- Maximize energy flow in constrained and aging grids
- Enable end-users dynamic participation to the market (“prosumers”)
- Integrate smart metering and demand side information integrate



▶ **3. Increase Grid Reliability and Stability**

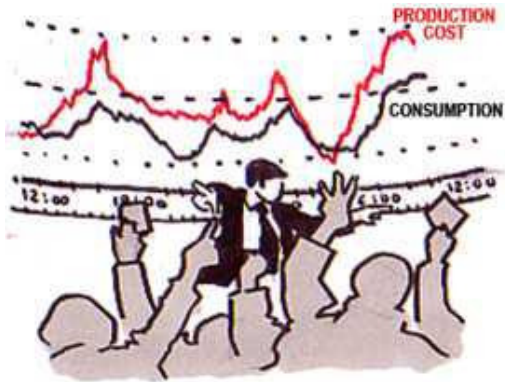
E.g.: Annual costs of power interruptions to US electric consumers: \$79Bn

- Estimate Grid Asset condition through real-time and react accordingly
- Prevent transmission blackouts and minimize outages in distribution
- Monitor Grid stability / oscillations and implement Defense plans/Grid self healing

Driver 2. Improving system wide energy efficiency



Managing demand response could help decrease peak consumption from 5 to 20%!



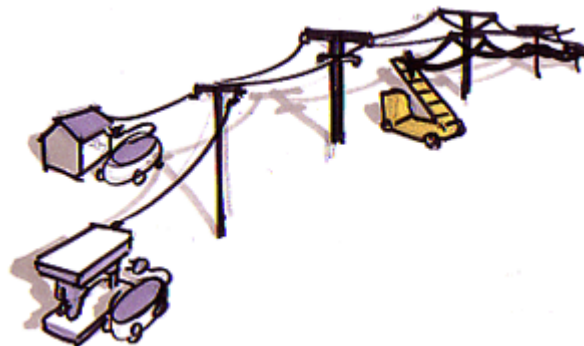
Smart homes can monitor, control and adjust local consumption... and generation !



Consumers become pro-sumers contributing to green energy generation



Electric vehicles will call for new network infrastructure and load management systems

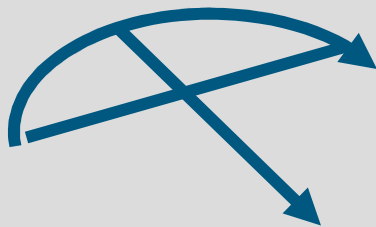


The Grid of the 21st century: towards a two-way flow of energy and information



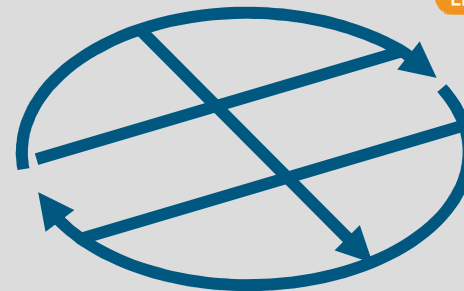
From a traditional
top-down network...

Centralized generation



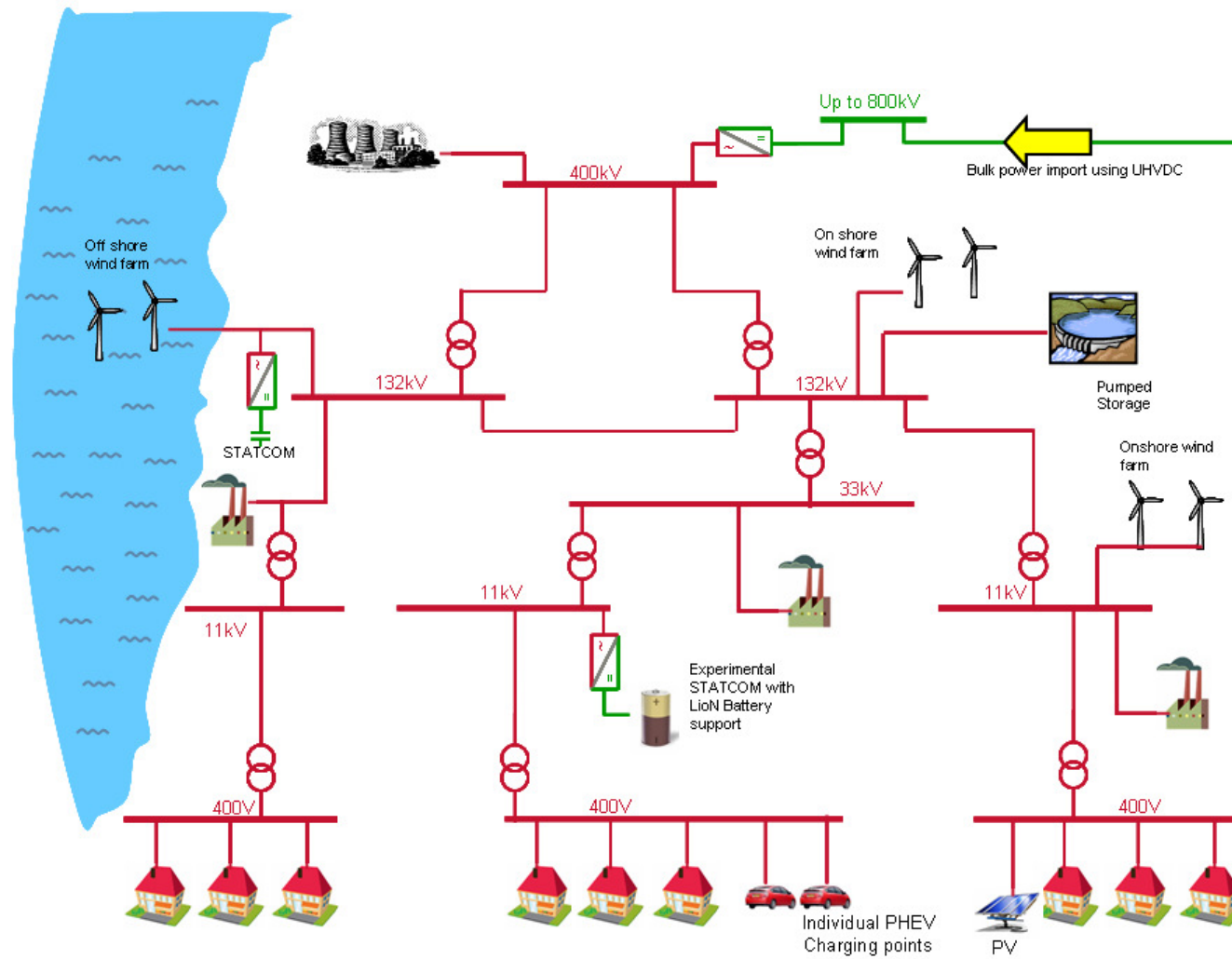
... to a meshed network with two-way
flow of energy and information

Centralized + Distributed generation

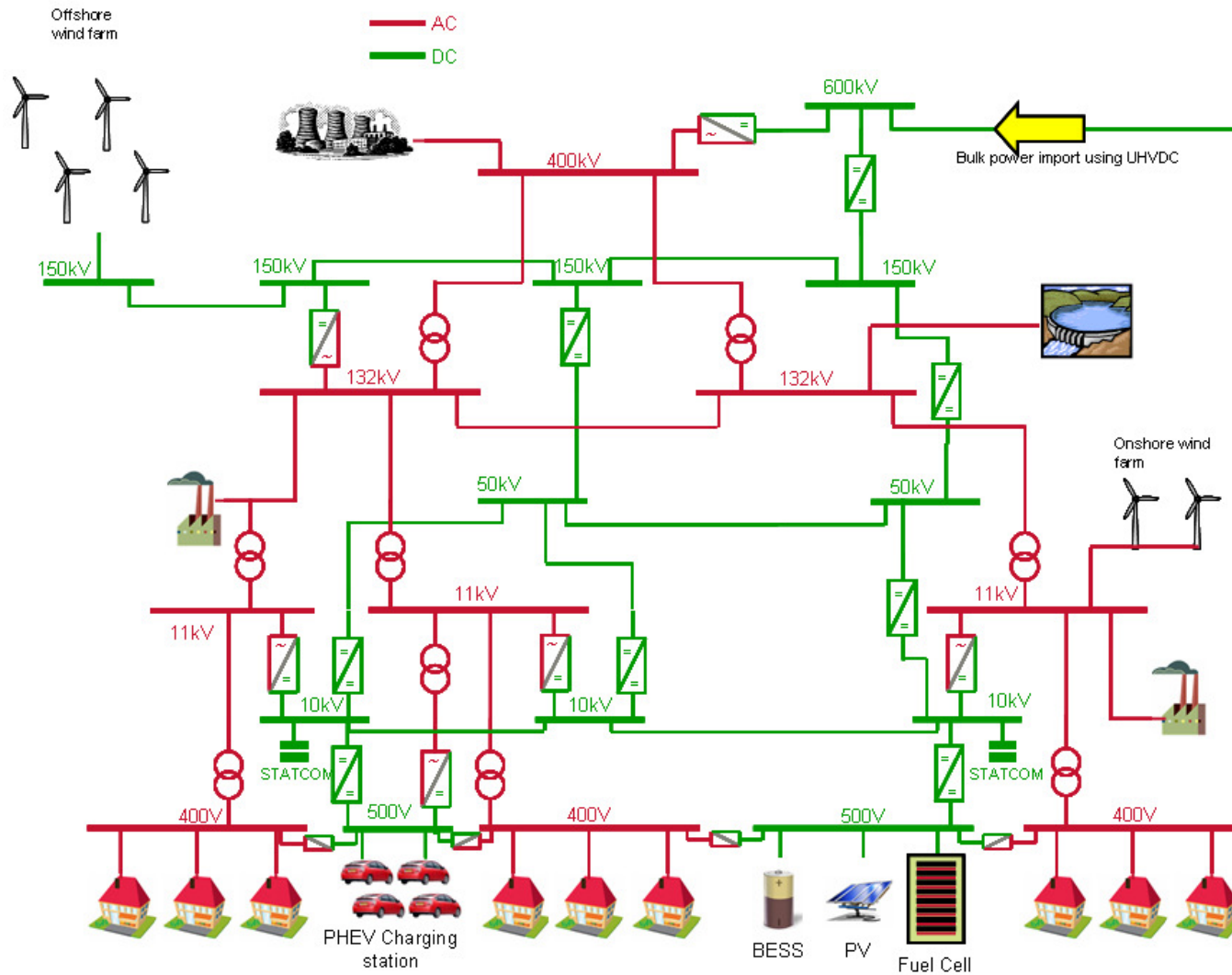


Prosumers

Todays AC Grids



Future : Hybrid AC/DC Grids



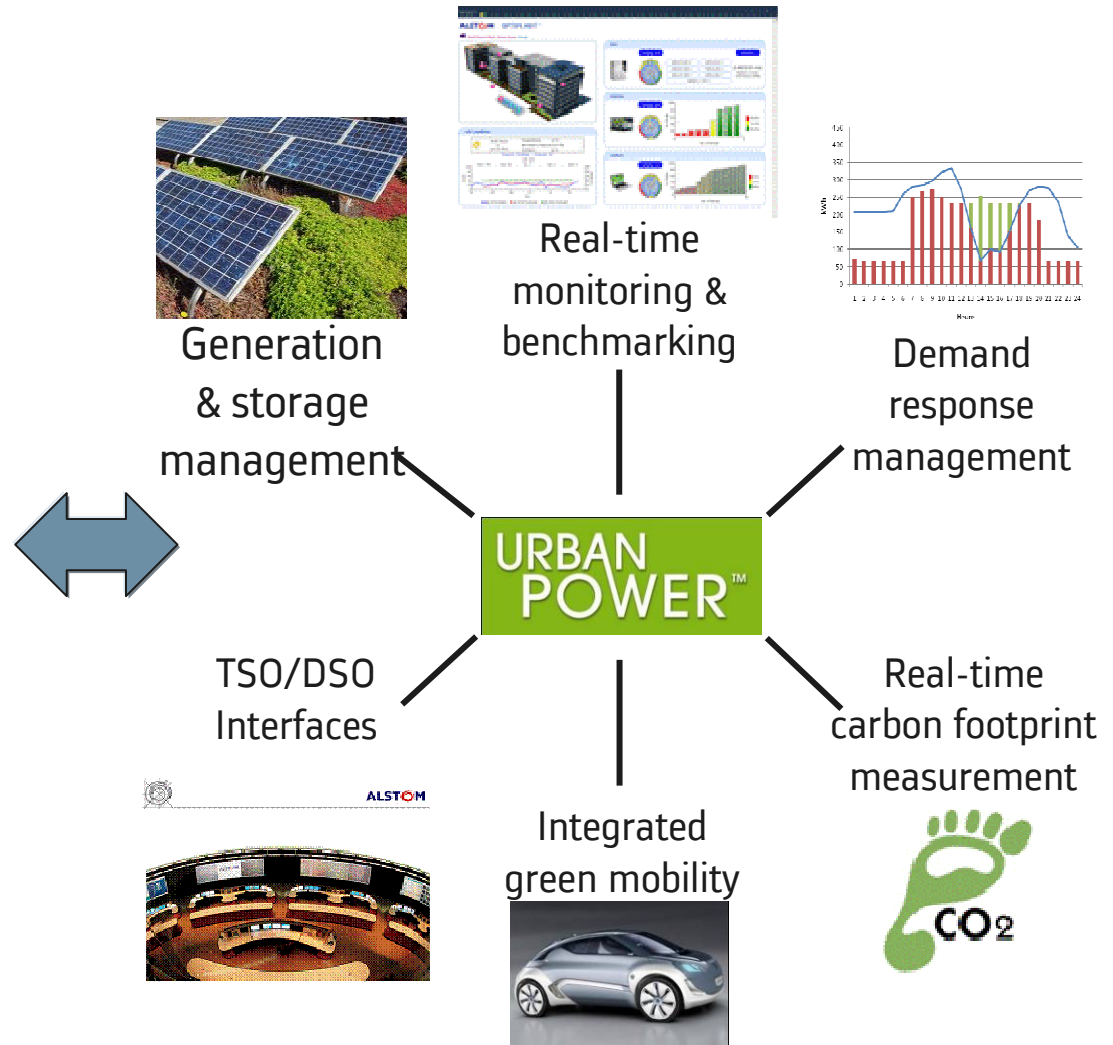
New requirements for Distributed Energy Balancing at City Scale



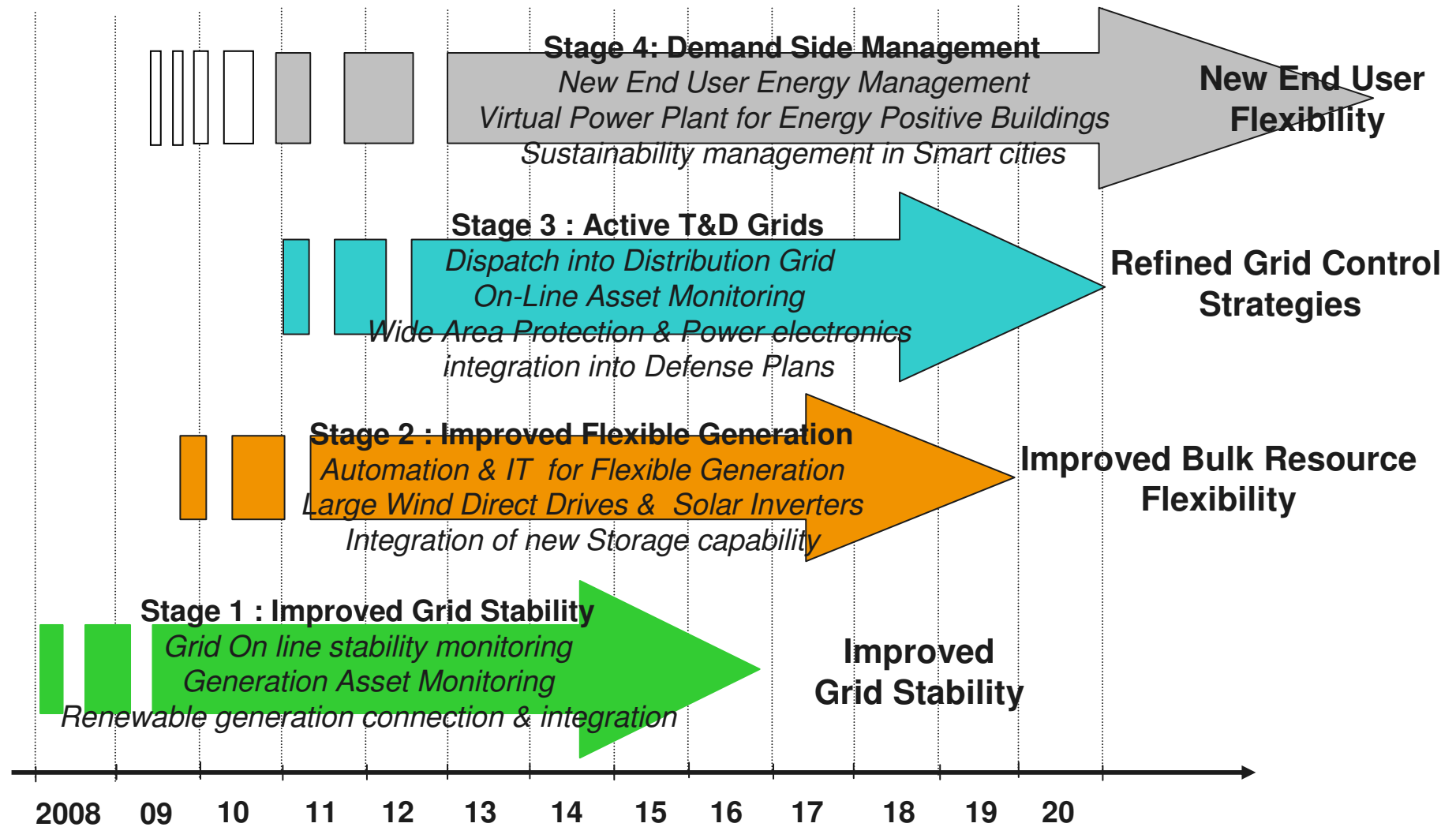
new energy solutions
EMRIX
FOR SMARTER CITIES



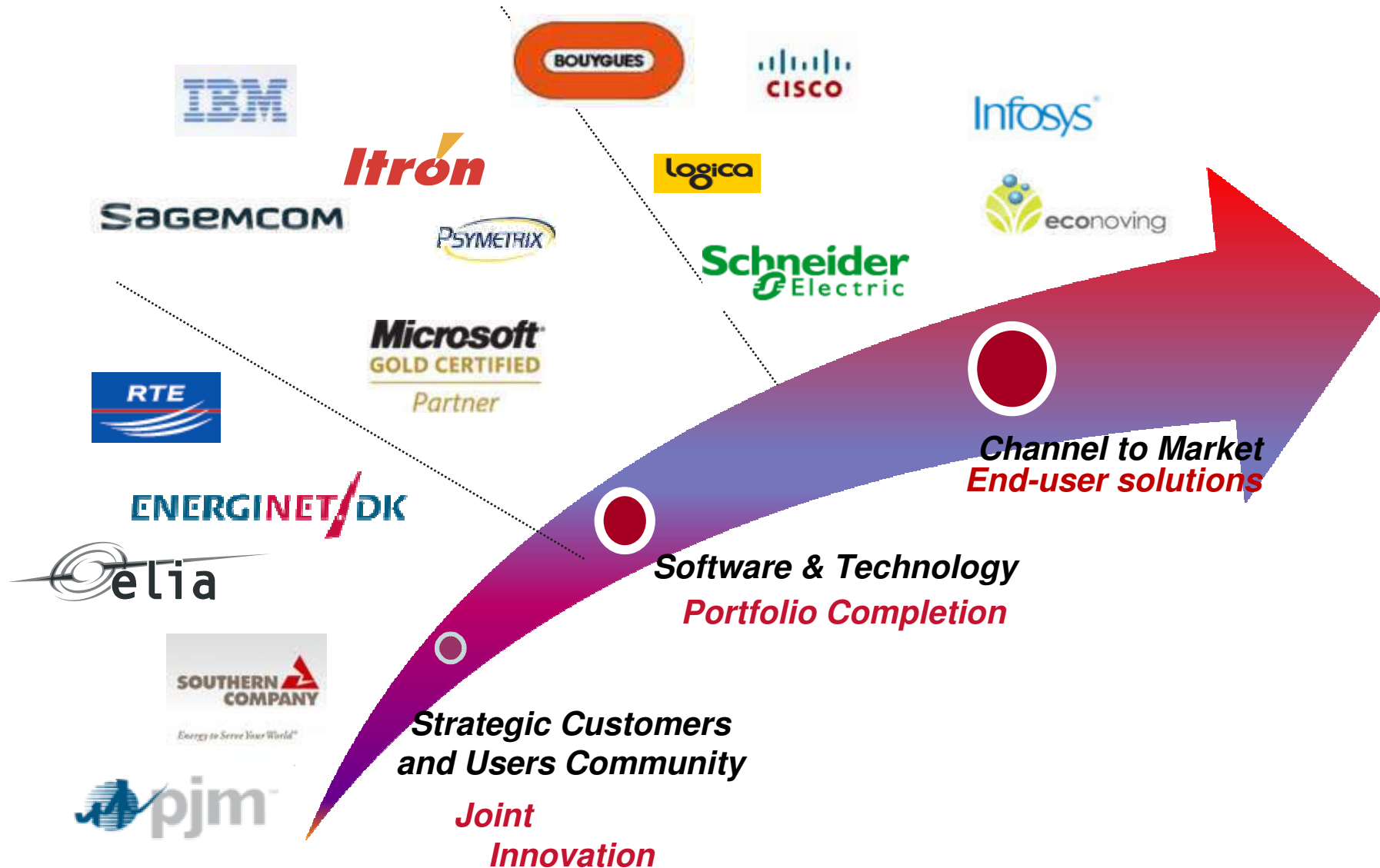
**Ecocities / ecodistricts /
Portfolio of smart buildings**



High Level Smart Grids Roadmap



Partnerships : development of an ecosystem of partners to leverage Smart Grid synergies



Typical demonstrations currently developed in Europe



- **Example: TWENTIES EC project**
Objective: prepare European networks for a massive wind penetration (26 partners, led by Red Electrica de Espana)

<i>Integrate intermittent generation</i>	<i>DEMO: Services by wind farms</i>
	<i>DEMO: Flexible demand</i>
<i>Prepare offshore grids roll-out</i>	<i>DEMO: DC breaker</i>
	<i>DEMO: Storm control for wind farm</i>
<i>Make grids flexible</i>	<i>DEMO: WAMS and advanced operational tools</i>
	<i>DEMO: Novel FACTS and network management</i>

Alstom Grid involved with a budget of
nearly 3 million EUR



Grid stability improvement



•Example: NCG, China

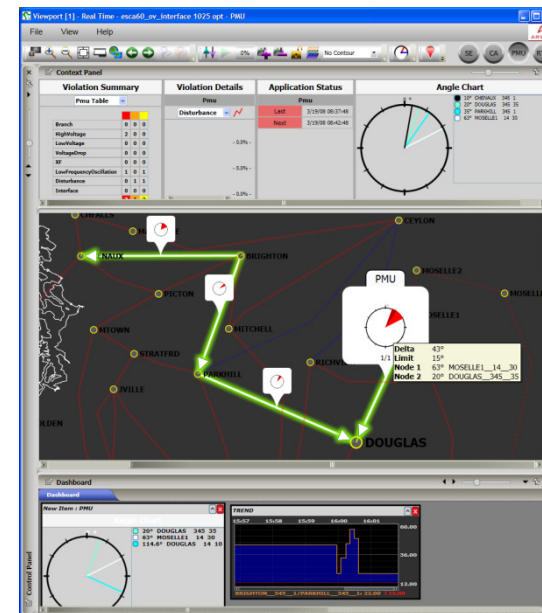
Customer challenge

- Prevent transmission blackouts in the context of extreme load conditions



Solution

- e-terra On-line Stability integrated with NCG Energy Management System



Distributed generation management



Example: Energinet.dk

Denmark - 1980



Denmark - 2010



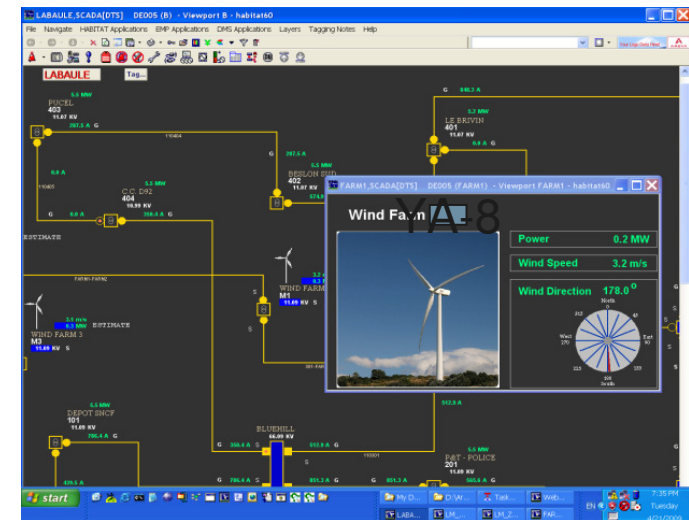
- Central power plant
- DCHP unit
- Wind turbine

Customer challenge

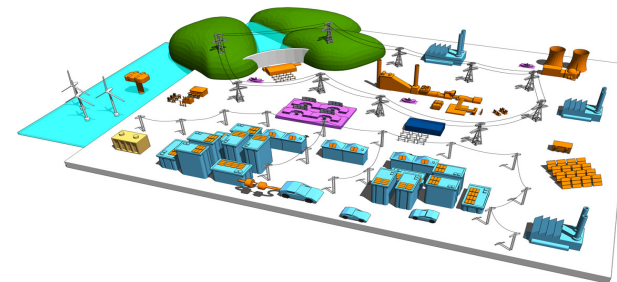
- Manage large portfolio of intermittent and distributed generation units

Solution

- e-terra Renewable Desk integrated in Energinet control center



- Smart “Grid” can deliver **real-time monitoring and control** of electricity generation, transmission, distribution and demand (C&I, residential)
- Smart Grid is about **optimisation of energy dispatch**, and not only about smart meters
- All **four elements** (electricity **generation management**, transmission, distribution and demand) **need to be addressed**
- SmartGrid is likely to expand through eco city clusters
- **Standards** are key



Help to achieve 20/20/20



Clean Power Today !

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