Adding intelligence to grids

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New Opportunities and Challenges..

Siemens has a long tradition in grid automation, but new things are happening …

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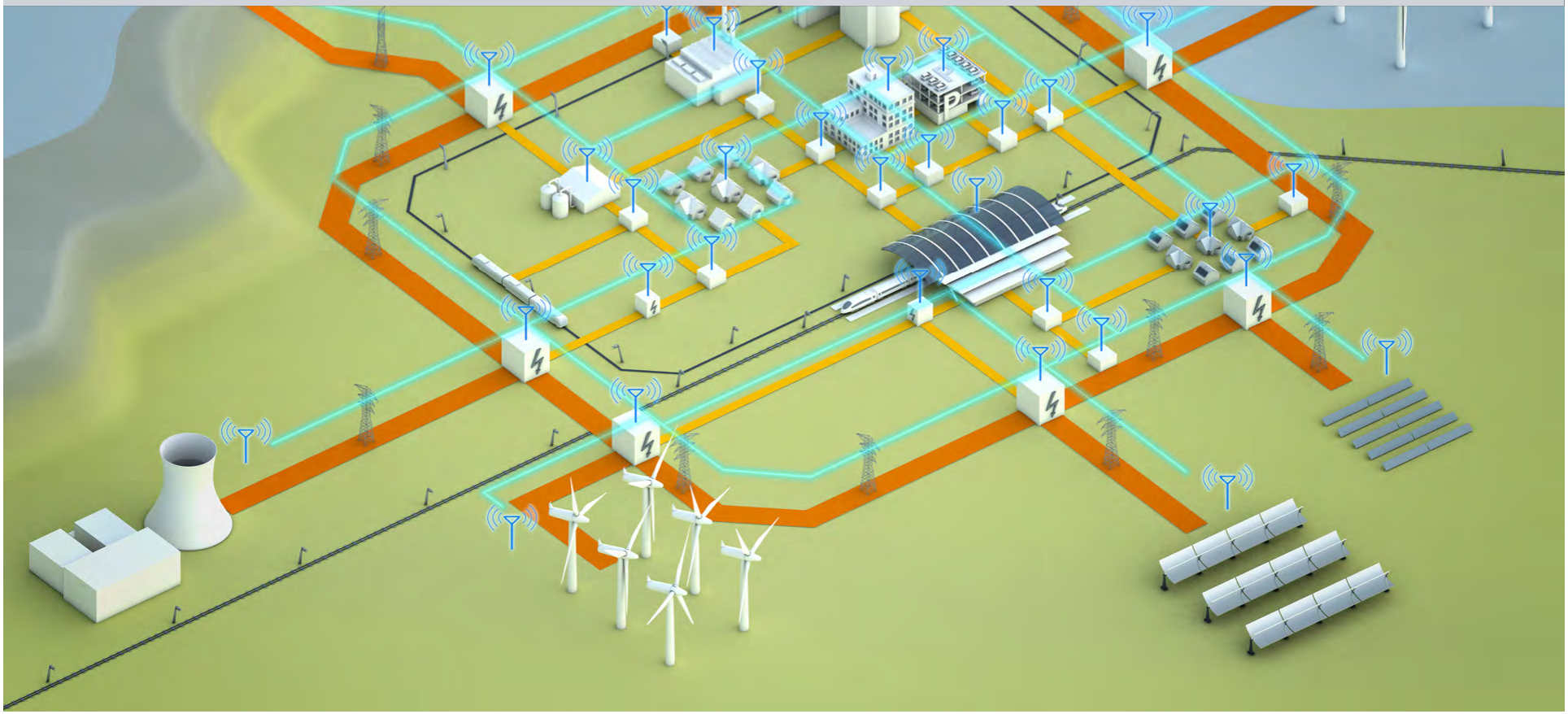

Massive growth potential driven by urbanization

Urban Population is growing by 2 citizen per second

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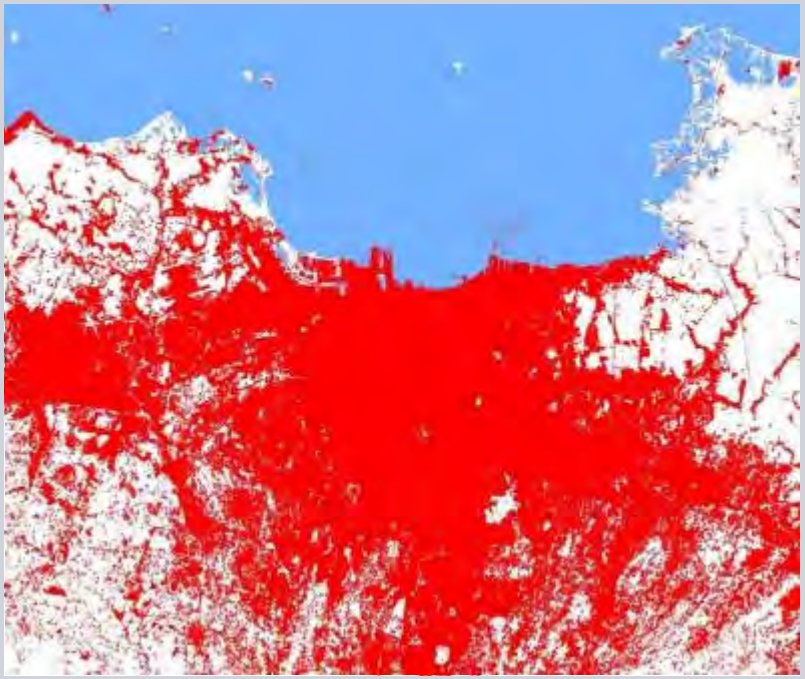
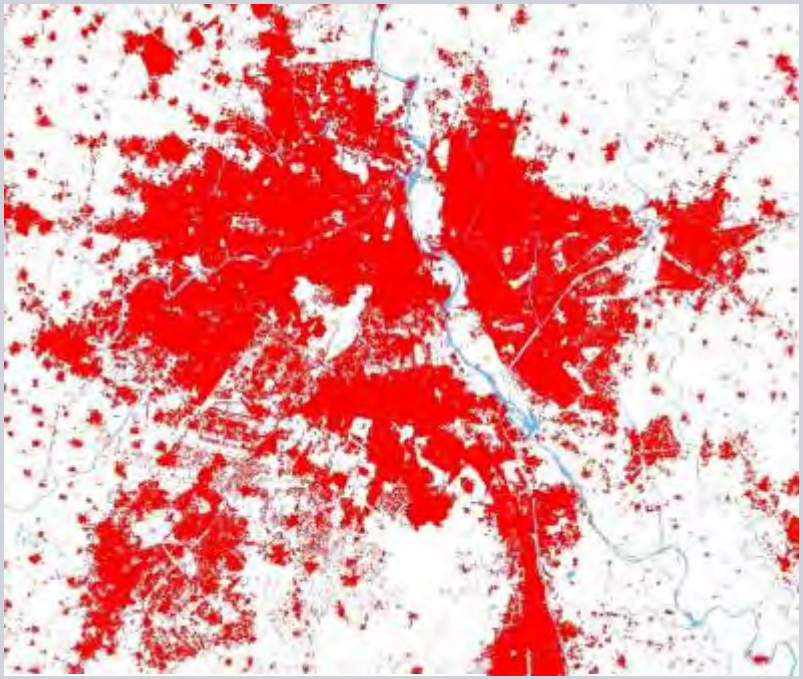
Jakarta 2010—9.2 Mio



Delhi 2010—22.2 Mio



Challenges to meet Demand

Source: Deutsches Zentrum für Luft- und Raumfahrt, UN World Urbanization Prospects: The 2009 Revision

Solar power in various forms is representative of a worldwide push into renewables

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Changing infeed patterns challenge existing grid infrastructures

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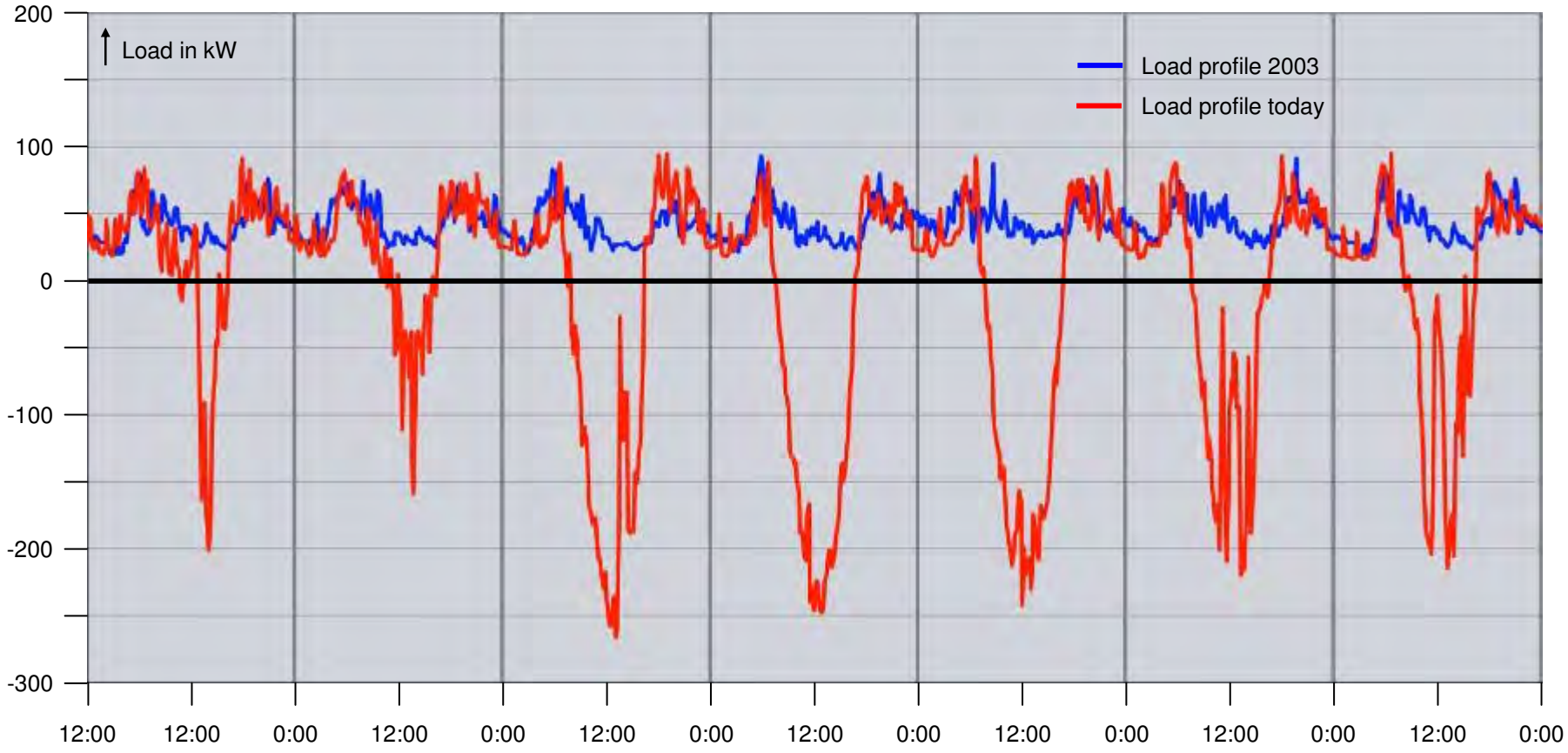
Weekly burden of a transformer station in the rural area the LEW-Verteilnetz GmbH – 2003 and today



Source: LEW

Main Brazilian Distribution System Operators forfeit 5.8 % of the energy due to non technical losses

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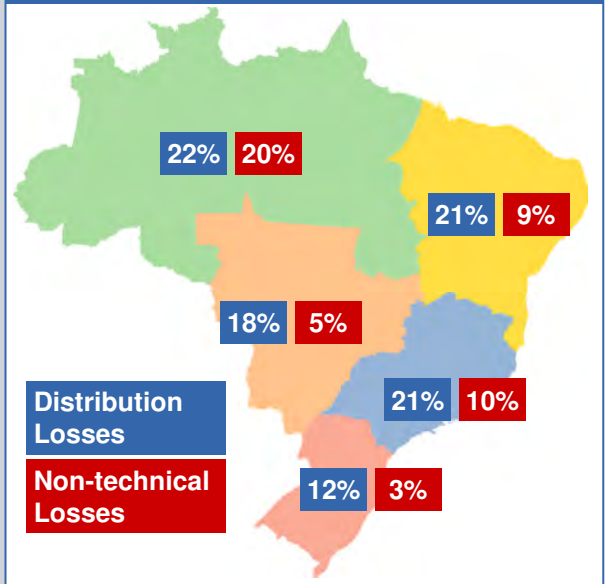
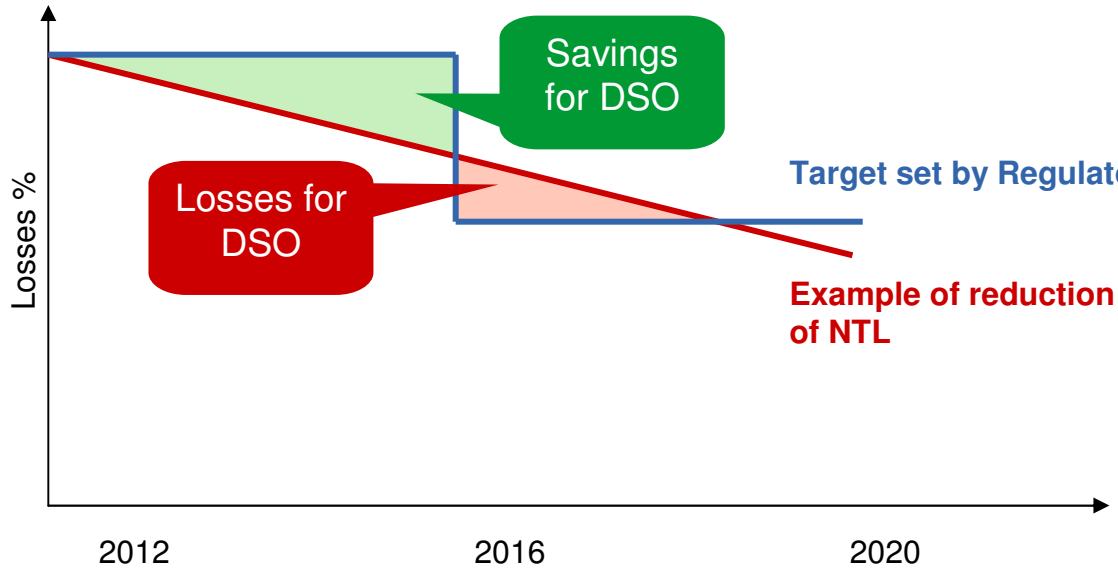
Network losses in % per region



The Non Technical Loss (NTL) business case for DSO is driven by regulation in Brazil



Brazilian Energy distribution network suffers non-technical losses (NTL) of 23 TWh p.a. (5.8 % of total generation)

€ 1'' p.a. lost revenue to the DSOs accrues.

Regulator ANEEL established new regulation on network efficiency and demands 30% NTL reduction every 4 years.

AT&C loss in India at national level reduced from 38.86% in 2001-02 to 27.15% during 2009-10.

Ageing distribution infrastructure is seriously endangering security of supply

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Hurricane Sandy left 7.5 million persons without power

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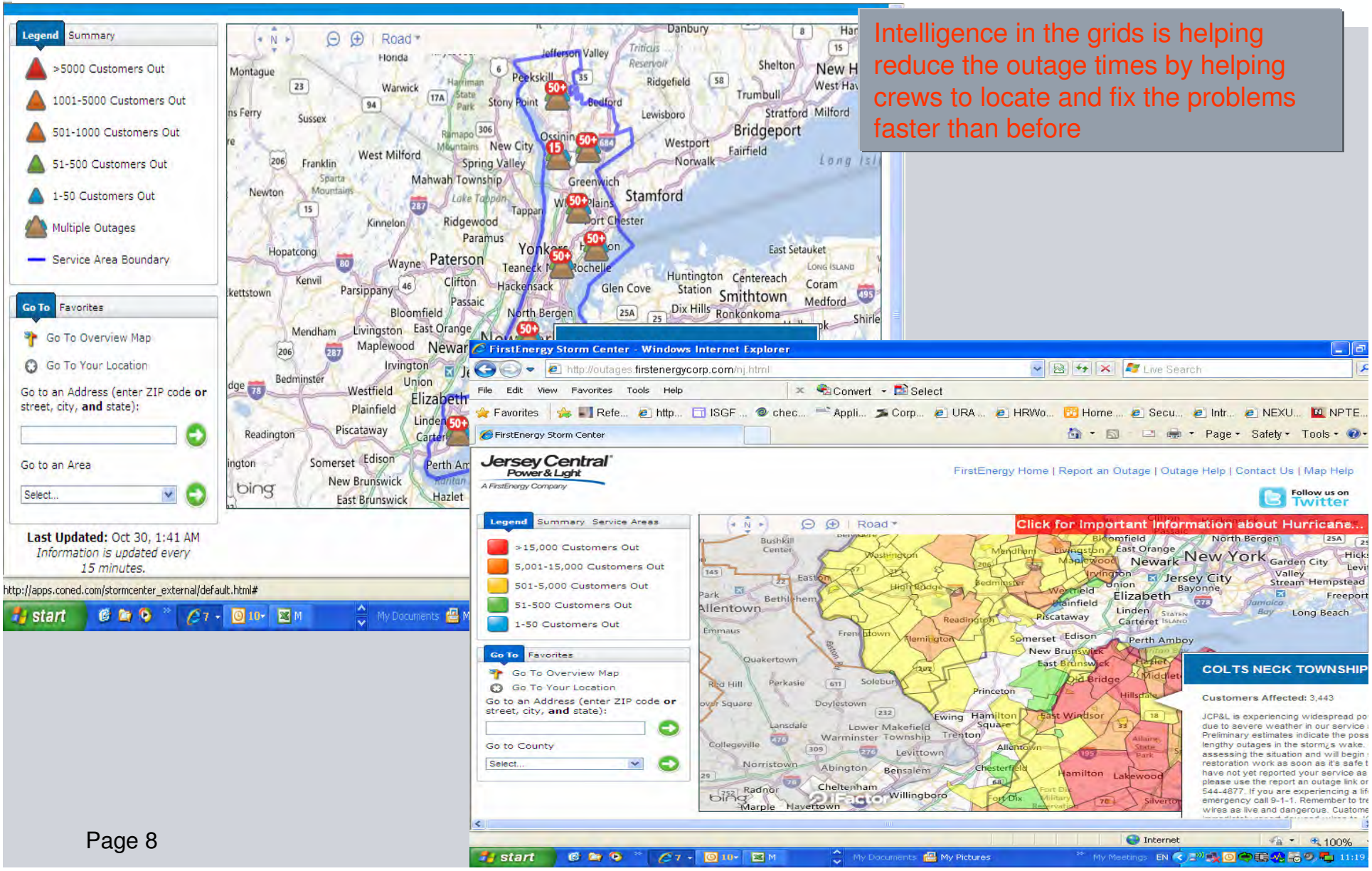
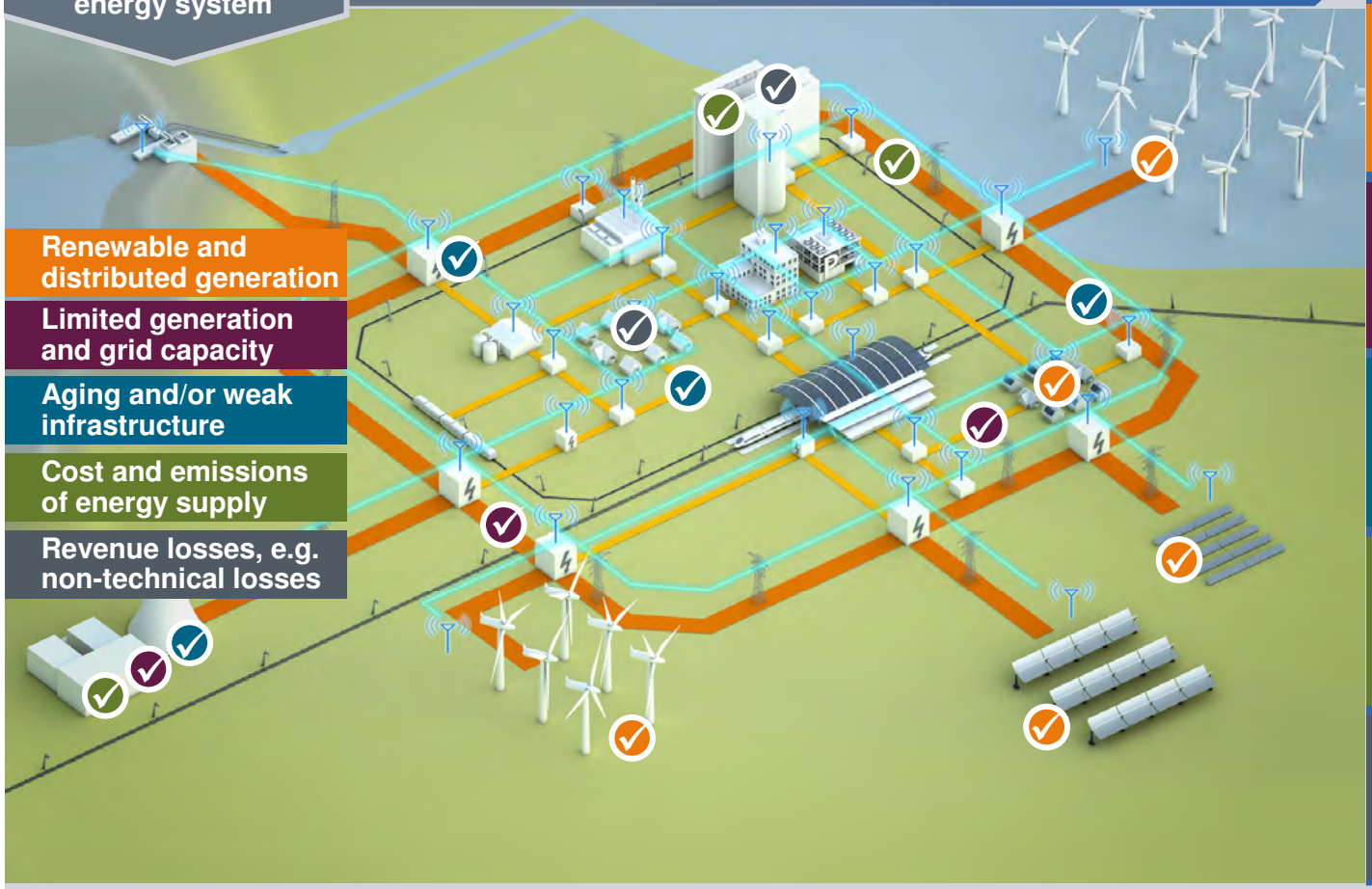


Intelligence in the grids is helping reduce the outage times by helping crews to locate and fix the problems faster than before

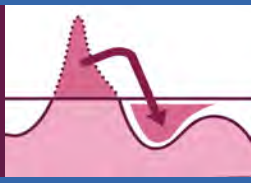
Changing energy system requires new solutions

Challenges in changing energy system



- Renewable and distributed generation
- Limited generation and grid capacity
- Aging and/or weak infrastructure
- Cost and emissions of energy supply
- Revenue losses, e.g. non-technical losses

Smart Grid offers solutions

Balancing generation & demand, new business models	
Load management & peak avoidance	
Reliability through auto-matic outage prevention and restoration	
Efficient generation, transmission, distribution & consumption	
Full transparency on distribution level and automated loss prevention	

There is not one global Smart Grid
Regional drivers are different: some examples

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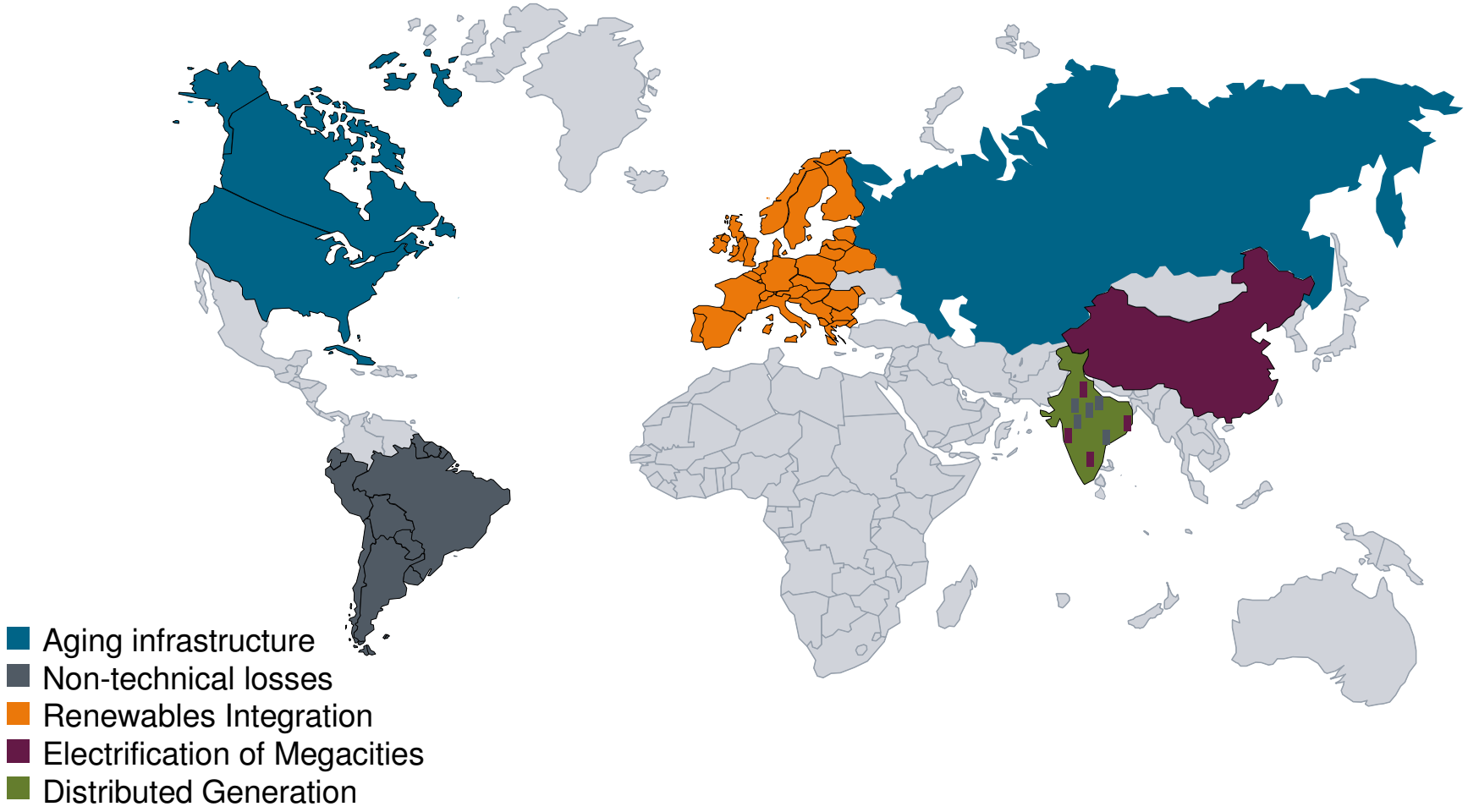
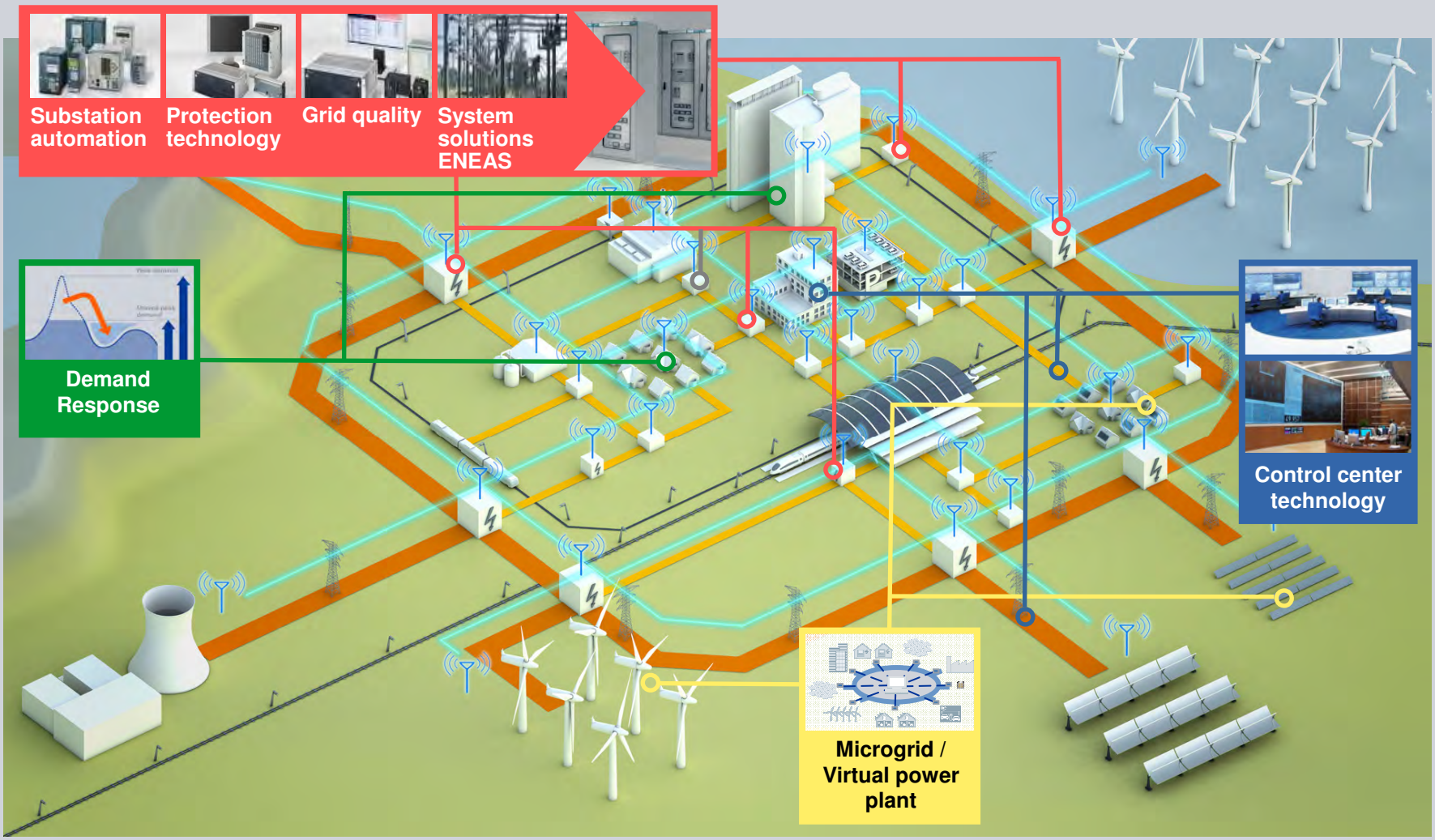


Energy Automation Portfolio



Energy Automation
Our solution portfolio

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Smart Solutions

- ISCM
- EMS
- ILMS
- Demand Response System
- Outage Mangement System
- Renewable energy Integration

Tools

- PowerCC IMM / Graphical Designer
- SICAM PAS UI / Graphical Designer
- TOOLBOX II
- DIGSI

Communications and networking

- PowerLink PLC / DLC
- Modems
- AMIS

Control centers

- PowerCC
- Power 4

Station automation

- SICAM PAS
- SICAM 1703 / SICAM 230

RTU´s

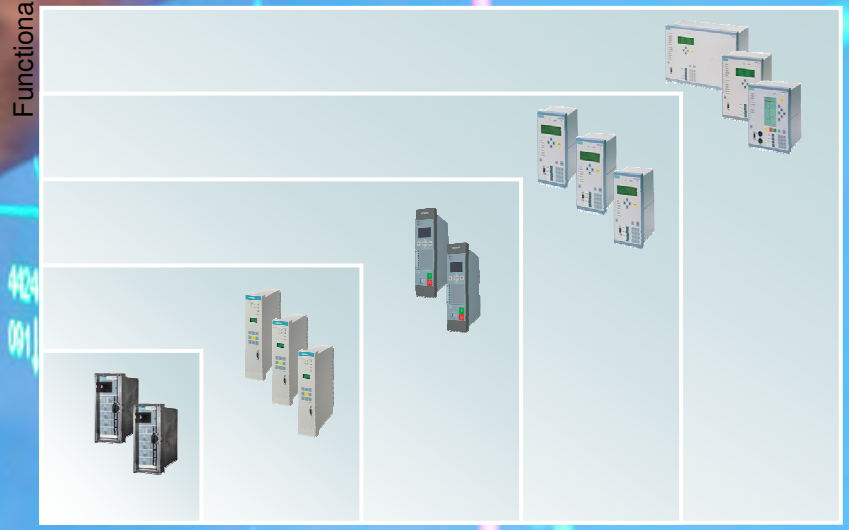
- SICAM 1703
- FRTU 6MD25

Protection / power quality / field control stations

- SIPROTEC
- REYROLLE
- SICAM BC 1703 ACP
- SIMEAS

Absolute security in any situation

Protection technology



Power quality detection with SIMEAS and SENTRON

SIEMENS

T

SENTRON T
Digital transducer for electrical measurands

P

SIMEAS P
Power meter for monitoring electrical measurands

Q

SIMEAS Q80
Power quality recorder for analysis of grid quality in accordance with EN50160

R

SIMEAS R
Fault recorder, power quality recorder, and phasor measurement unit (PMU) in accordance with IEEE C37.118

Benefits of SICAM Family of Sub-station Automation

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Challenge
Cost-efficient and functionally comprehensive remote monitoring and control of all plants as well as integration of all elements of substation automation from field level to the control center

Our solution
Consistent, smart, and scalable substation automation for highest reliability and availability

- Protection of assets and people
- Reduced downtime
- Comprehensive plant and system overview
- Reduced operation and maintenance costs
- Reduced energy cost and optimization of power consumption

Maximum transparency for the efficient management of complex grids – Intelligent Control Centres

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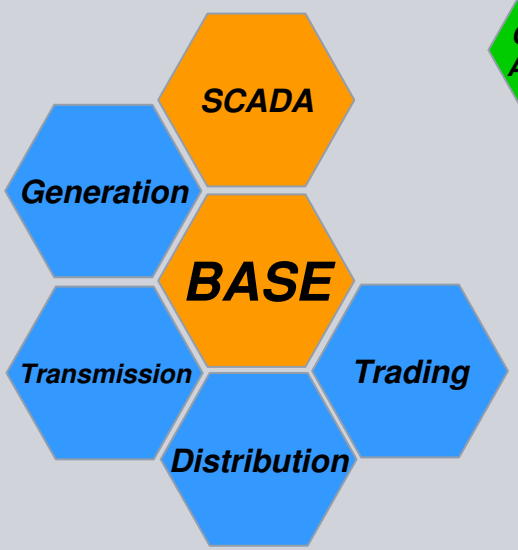
- **Spectrum Power**
  Windows/Linux/ Unix control system for power generation, medium size transmission/distribution networks and industry control centers.



Smart Grid Applications bridges grid intelligence and smart consumption

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IT Systems

- Utility Operational IT
- Utility business systems
- Consumer energy management & monitoring systems

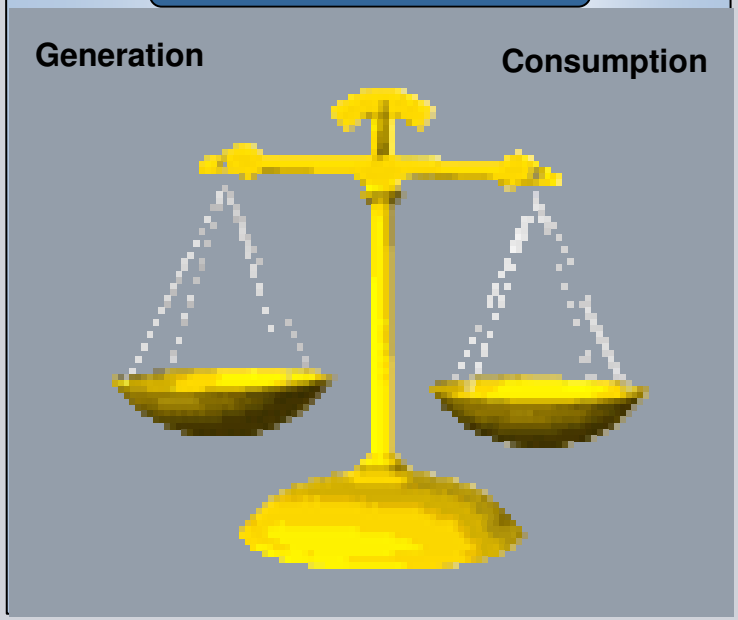
ensure balance between generation and consumption

Utility Infrastructure

Utilities / ISOs

- Generation
- Transmission
- Distribution

Smart Grid Applications



End User Infrastructure

Industrial / Commercial / Residential

- Build. Autom.
- Indust. Autom.
- Smart Home
- Electric Vehicle

Generation follows load

Load follows generation with intelligent grids

Environmental awareness

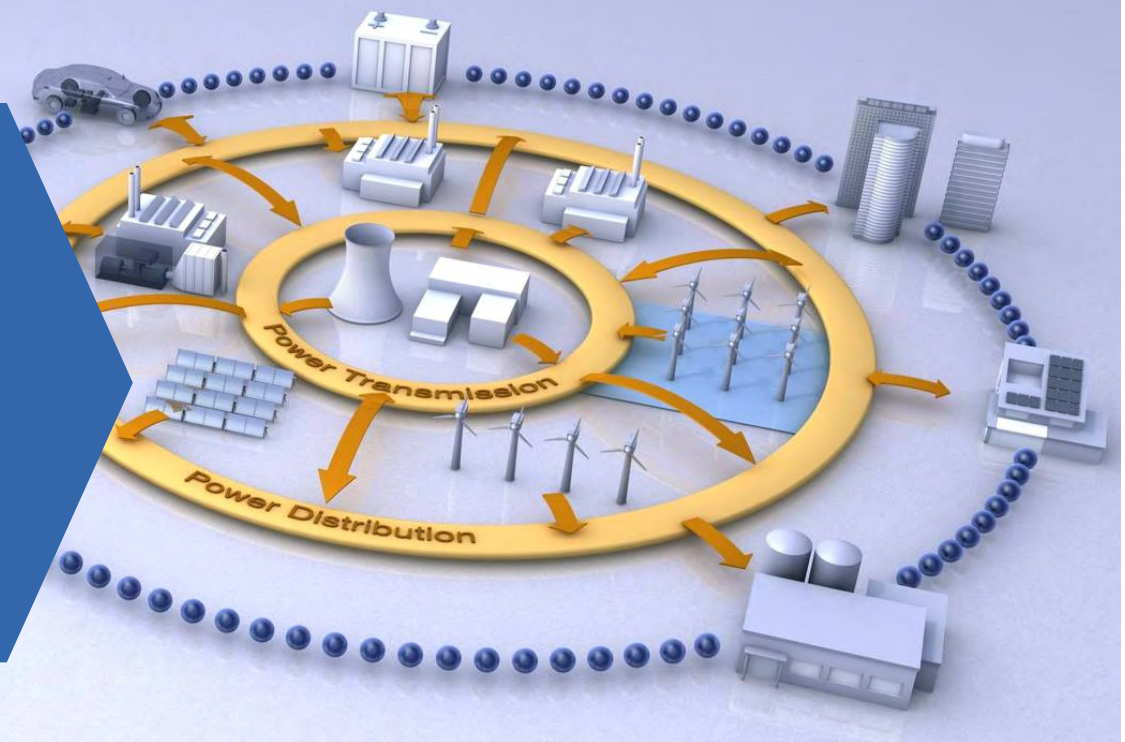
Communications Technology

- Communications consulting & services
- Communications products & solutions

Smart Grid Consulting creates answers

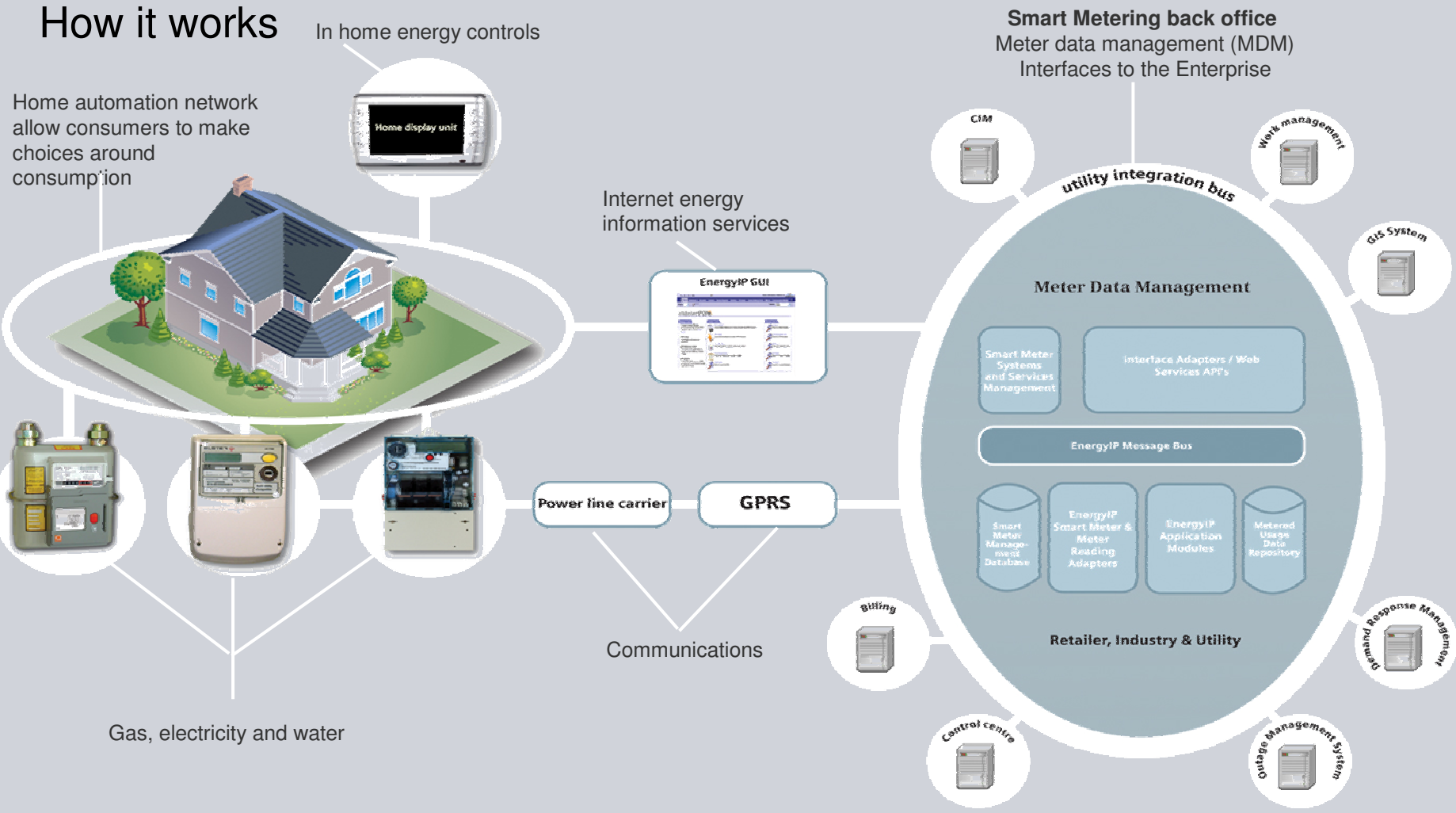
Where to start ?

- **Which strategies?**
- **Where to invest ?**
- **Which are the right steps ?**
- **Which technologies ?**
- **How to measure success?**



The complete smart metering/MDM solution

How it works



Buildings Don‘t Use Less Energy, But They Use It at Different Times

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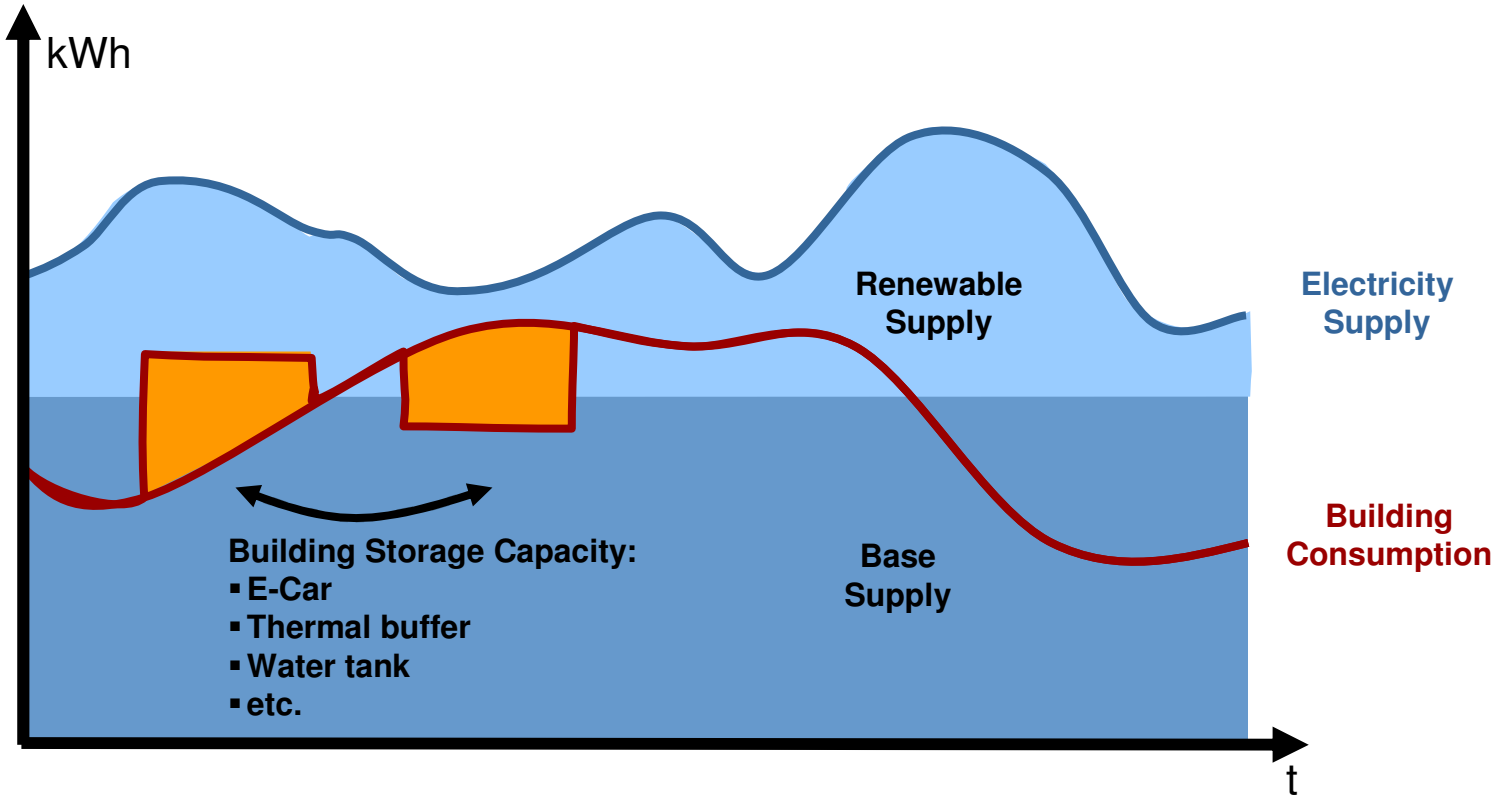

Demand response
Business models in relation to market players

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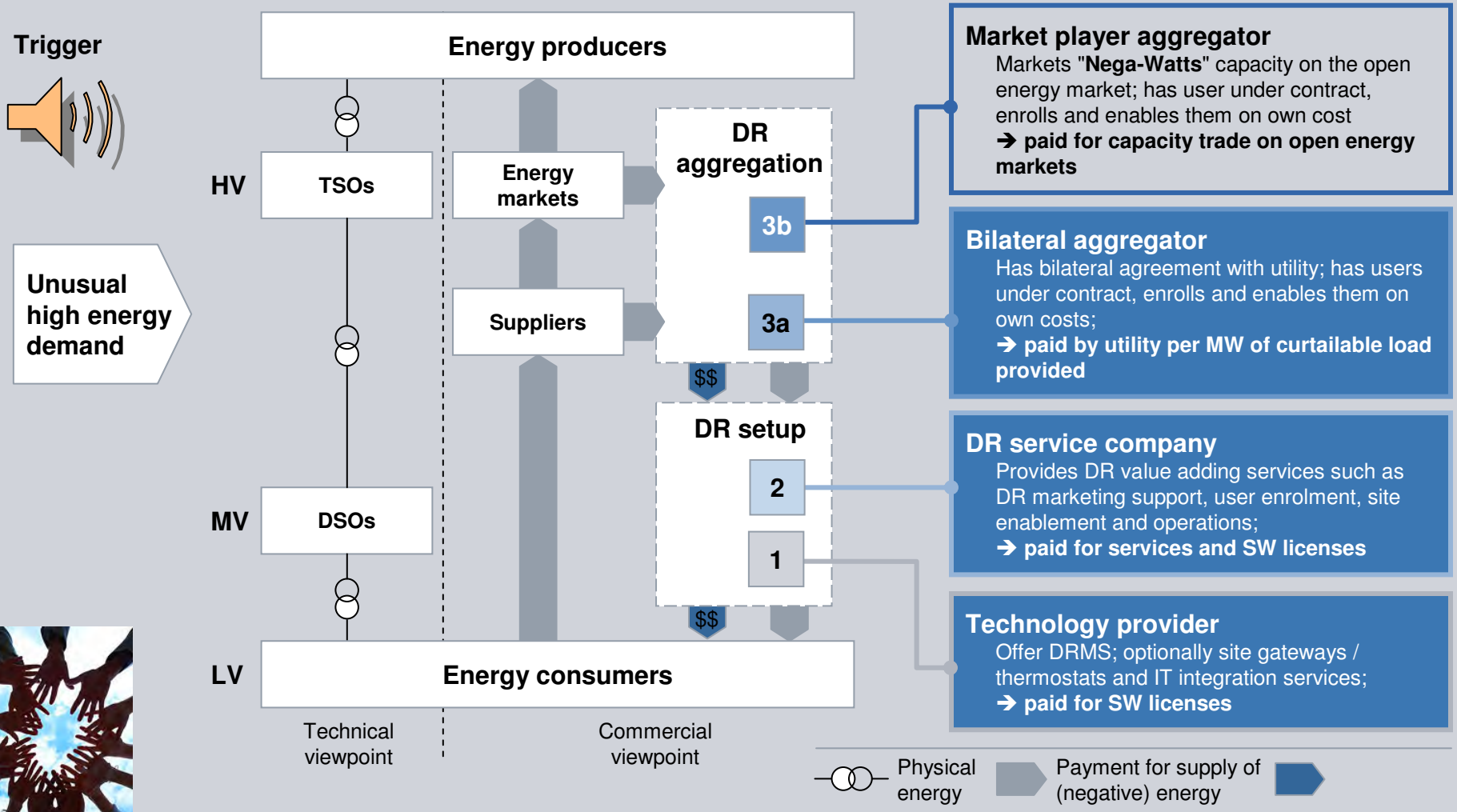

A Look at the Indian Scenario

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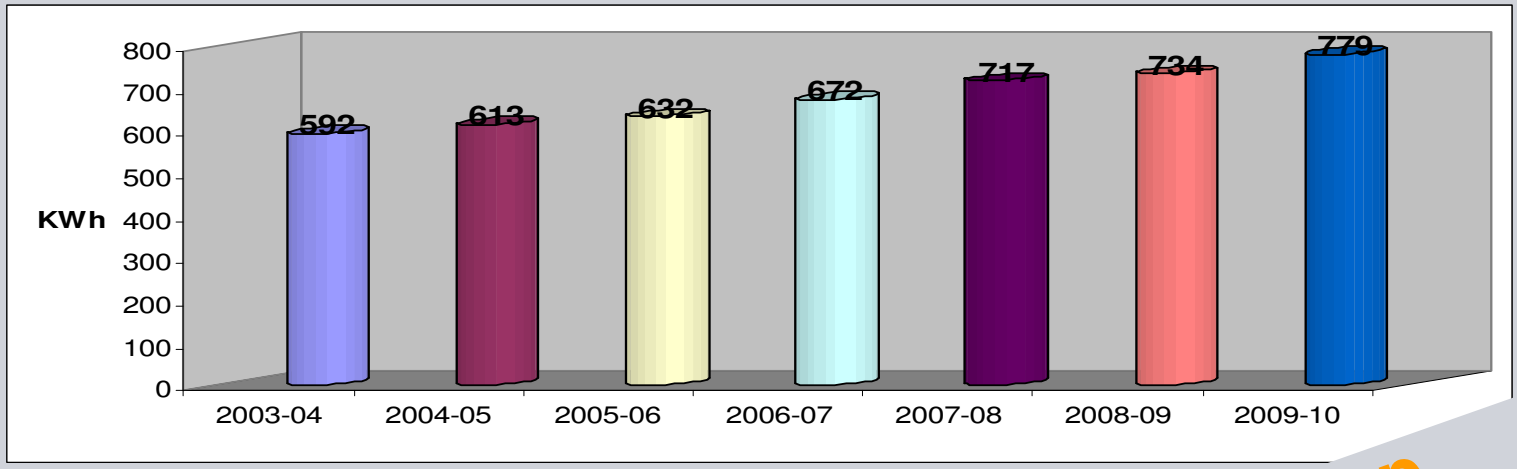
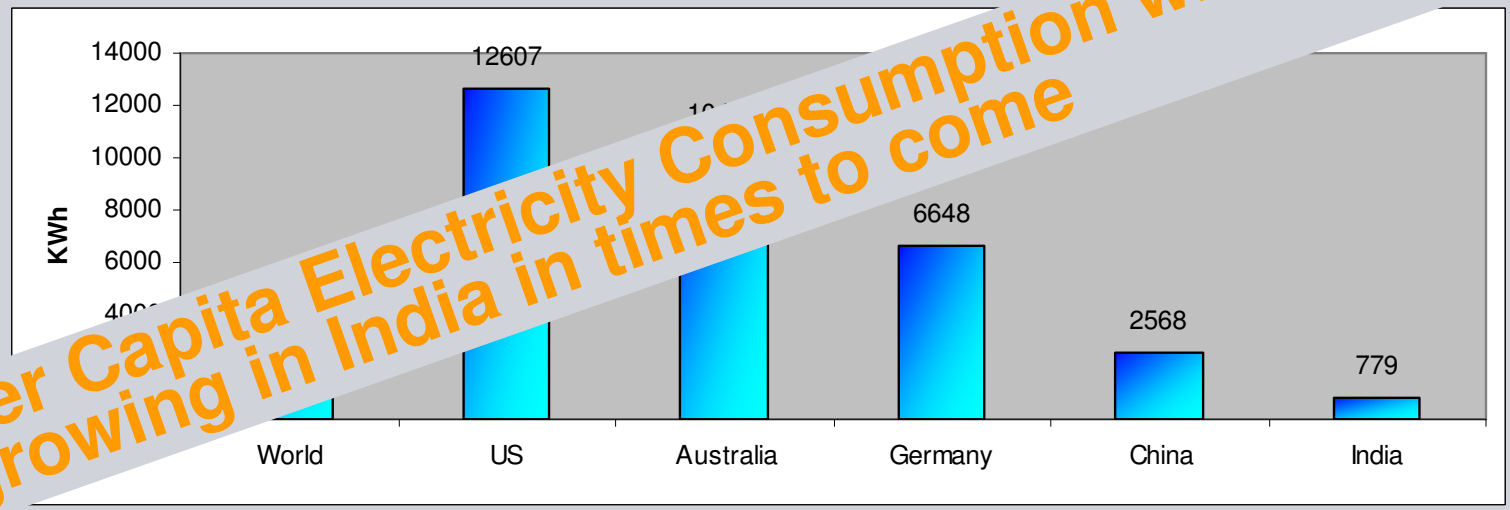
Per Capita Electricity Consumption (KWh) in India



Per Capita Electricity Consumption (KW



Per Capita Electricity Consumption will keep growing in India in times to come

Source : IEA/CEA/CIA World Fact book 2010

A look at the Indian Loads
Flexibility of Energy Use : a key issue

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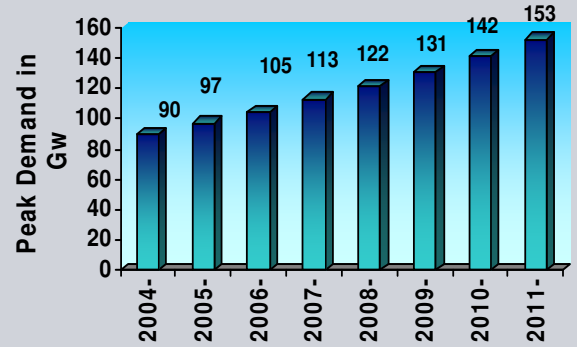
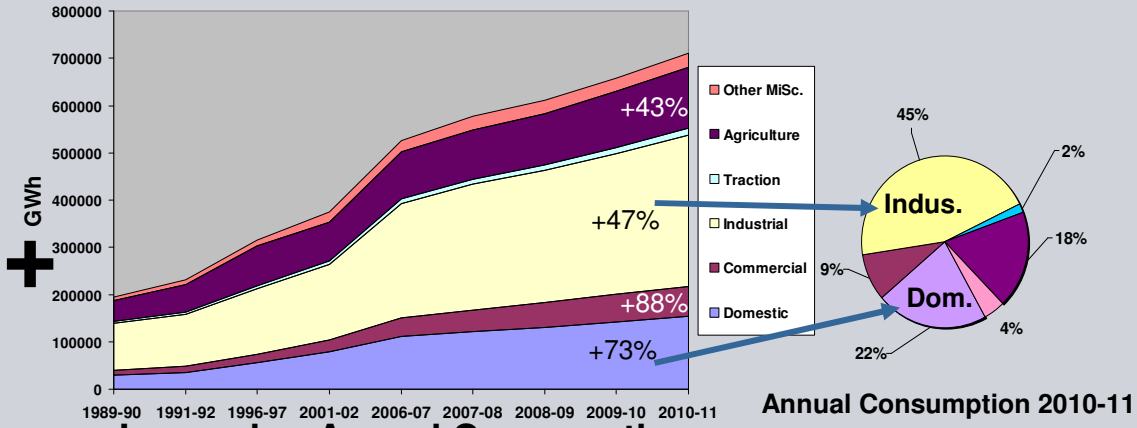


Increasing Consumption Peaks



Increasing Annual Consumption

Annual Consumption 2010-11

+

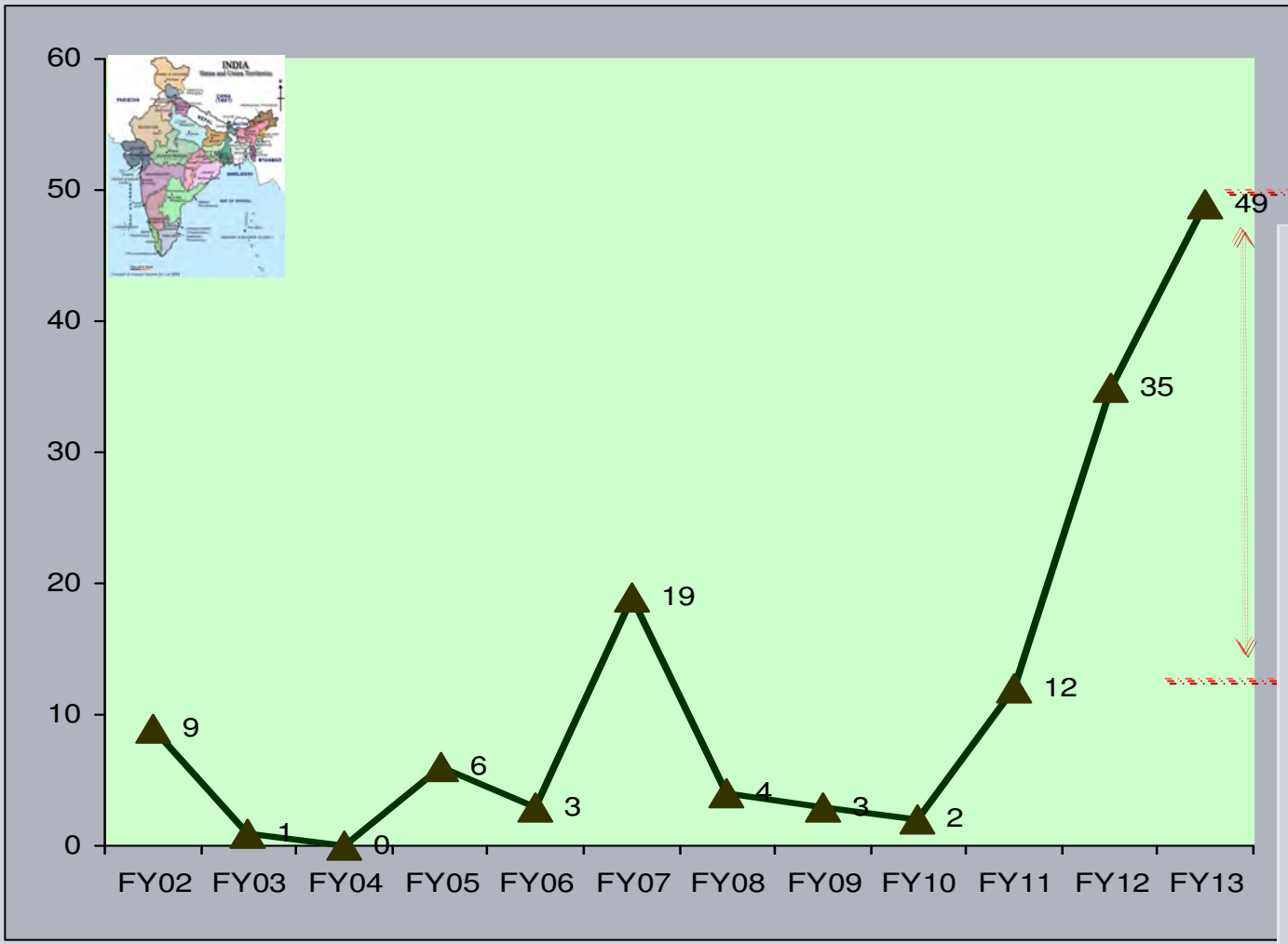
Increasing renewable generation

+

New Consumptions

↘ **Flexibility in generation**
↗ **Constraints in networks** } ↗ **Need for generalized intelligent & flexible consumption**
→ A major goal for Smart grids, smart homes, Smart Appliances, Smart Consumption

Market Trends Scenario – New Control Centers ordered - POWER UTILITIES



Both Opportunities & Challenge for Capacity Building for vendors and also Utilities in order to be successful with minimum risks

Pilot Projects in Distribution

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The following functionalities have been proposed in 14 pilot projects in Distribution

Sr. No.	Functionality	Objective
1	Residential AMI	Demand Response, Reduced AT&C
2	Industrial AMI	Demand Side Management, Reduced AT&C
3	Outage Management	Improving availability and reliability, Proactive maintenance
4	Peak Load Management	Optimal resource utilization, Distribution capacity enhancement, Load curtailment
5	Power Quality Management	Voltage Control, Reduced losses and failures, Decrease in reactive power and harmonics
6	Micro Grid	Improved Power Access in rural areas, Renewable Integration, Reduced carbon emissions
7	Distributed Generation	Improved Power Access in rural areas, Sustainable Growth, New technology implementation
8	Combined Functionality as at 1,2,4,5 above	

Some Suggestions for Indian conditions

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- Develop institutions / think tanks for providing guidance for policy development
- Identify problems of Utilities and look for their solutions
- Practical & workable solutions for Indian conditions
- Modernise the electrical network to make it suitable for remote monitoring and control
- Review the timelines to be more realistic
- Cash flow to be made more balanced for sustenance
- Regulators to be made aware of the benefits and preconditions for Smart Grids e.g ToU tariff,etc
- Capacity building of utilities to enable their motivation & readiness to embrace new technologies

Thank you for your attention

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Siemens is the enabler of the new "age of electricity" – with real solutions today for the Smart Grid and cities of tomorrow

Questions ??

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