The energy dilemma is here to stay

**The facts**

Energy demand  
By 2050  
Electricity by 2030  

Source: IEA 2007

**The need**

\[ \div 2 \]

CO\(_2\) emissions to avoid dramatic climate changes by 2050

Source: IPCC 2007, figure (vs. 1990 level)

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Frequent power outages  
Rising energy prices  
Climate change  
Conflicts for resource access & control

Schneider Electric
The Global Specialist in Energy Management

Energy production & transmission
- Wind energy
- Solar energy
- Hydro
- Biofuels
- Hydrocarbons
- Nuclear

Energy Management
Making energy...
- Safe
- Reliable
- Efficient
- Productive
- Green

Energy Usage
- Appliances
- Climate control
- Security
- Lighting
- Machines
- IT servers

...with 30-70% savings everywhere
**Schneider Electric**
the global specialist in energy management

20
billion € sales in 2010

37%
of sales in new economies

110,000+
people in 100+ countries

4–5%
of sales devoted to R&D

Listed on the Paris Stock Market – CAC40

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**Balanced geographies** – FY 2010 sales

- North America: 24%, 26,000 employees
- Western Europe: 34%, 41,700 employees
- Asia Pacific: 24%, 31,900 employees
- Rest of World: 18%, 19,200 employees

**Year-end 2010 employees**

- North America: 26,000
- Western Europe: 41,700
- Asia Pacific: 31,900
- Rest of World: 19,200

**Diversified end markets** – FY 2010 sales

- Utilities & Infrastructure: 20%
- Industrial & machines: 24%
- Data centres: 17%
- Non-residential buildings: 30%
- Residential: 9%

*Proforma with Areva D integrated on 12-month basis*
Five business organizations developing technology and driving market growth

From products ...  
... to system architectures ...  
... to market solutions

**Energy**
- Medium voltage
- Transformers
- Grid automation
- Flexible distribution
- Substation automation
- Smart grids
- Utilities
- Oil & Gas
- Electro intensive

**Power**
- Low voltage
- Installation systems and control
- Renewable inverters
- Living space management
- Electric vehicle infrastructure
- Renewable grid connection
- Machine control
- Process management
- Industrial automation and control
- Renewable grid connection
- Residential
- Marine
- Oil
- Gas
- Renewable grid connection

**Industry**
- Critical power and cooling
- Installation systems and control
- Integrated security management
- HVAC control
- Lighting control
- BMS
- IT/server room
- UPS systems
- IT
- Bank, Insurance
- IT/server room
- Critical power and cooling
- Renewable inverters
- Renewable grid connection
- Machine control
- Process management
- Living space management
- Electric vehicle infrastructure
- Renewable grid connection

**IT**
- Building automation
- Video surveillance
- Integrated security management
- HVAC control
- Lighting control
- BMS
- Building automation
- Video surveillance
- Integrated security management
- HVAC control
- Lighting control
- BMS
From products to products & solutions

**Products**
- Best-in-class technology
- Strong channel access
- Optimized quality & cost

**Solutions**
- Customized Systems
- Installed base services
- Advanced energy management services

Differentiation through technologies that can be combined and integrated

**Scale & pricing power**

Customer intimacy feeding continuous innovation and differentiation

**Distributors and direct partners**
Provide us the reach to small and medium size customers

**End-users and direct partners**
Extend access to large end-user for our distributors and partners
Best in class products, high value services and complete solutions...

Equipments
- **Primary** Distribution (HV/MV):
  Substations, cubicles, switchgears, circuit breakers, MV ring main units
- **Secondary** Distribution (MV/LV)
- Distribution **Transformers**
- Automation:
  Network Management Systems SCADA, Feeder Automation, Remote control & Digital protection relays

Services
- Asset management: prevention and prediction services
- Maintenance and retrofitting power system assessments & audits
- Consultancy: network planning, distribution installation, demand management
- On-site and off-site monitoring solutions

Solutions
- Engineering
- Equipment systems
- Services

*Energy Business Sales 2010*
Making Distribution flexible thanks to Schneider and Telvent Smart Grid Solutions

Global substation & feeder automation portfolio for Utilities

- Network consulting
  - Network expertise (extension, reinforcement, integration...)
- Substation Automation
  - PACIS
  - Substation Control Systems
- Feeder Automation
  - RTU, bay controller, fault detector
- Protection IEDs
  - Protection relays 61850
  - SEPAM ®  MICOM ®

Real time software suite for global grid management

- Distribution Management
  - Load, Volt/VAR control; Outage management
- Geographic Info Systems
  - Life cycle asset management
- Smart Metering
  - Meter data control, rollout & operations
- Substation Automation
  - Remote Terminal Units (IEC-61850)
- Integration services
  - US, Canada, Europe

Reliability & Efficiency

- Advanced grid management
- Integration of renewables
- Optimize network operations
- Safety & Security

A complete medium and low voltage portfolio and a full set of management software for a more reliable, efficient, and secure grid
Energy Business
Business Overview

Energy Business = 26% of overall SE results

- Medium Voltage #1 worldwide
- € 4.5 sales proforma
- 9% Worldwide market share

Committed to our customers

- 17000 people
- 50+ countries
- 76 Production facilities
- 26 Service Centers

Customer segments

- Oil & Gas
- Utilities

Geographies

- New economies 48%
- Mature Countries 52%

*Excluding Telvent*
Energy efficiency is the key to solving the energy equation

About 50% of CO₂ reduction will come from energy efficiency

Schneider Electric’s 4 steps to Energy Efficiency

- **Measure**
- **Automate**
- **Fix the basics**
- **Monitor**

Energy efficiency

- Cleaner generation
- Fuel mix in buildings & industry
- Biofuels
- CCS**

* Across the cycle
** Carbon Capture & Storage
The new Grid equation - detailed

3 drivers + 3 accelerators

Growing electricity demand:
- new economies: demography, industrialization & urbanization
- mature economies: peak management
- new consumption modes (e.g., electrical vehicles)

Need to reduce CO₂ emissions:
- development of Renewable Energy sources
- focus on energy efficiency

Constraints on existing networks:
- limited generation capacity
- limits on network extension (Not In My BackYard syndrome)
- aging infrastructure and assets
- integration of intermittent & distributed generation

New technology available
- information technology, cyber-security
- energy storage, power electronics...

Active government & regulators:
- deregulation & opening of markets, introduction of price transparency
- need for security of supply & price stability
- increasing economic cost of blackouts
- stimulus packages, investment in EVs...

Active end-users:
- look for competitive prices
- want to contribute to CO₂ emissions reduction
- ready to play active role (control consumption, produce energy, drive electrical cars...)

Making the smart grid happen
Smart Grid is the major focus of Utilities but priorities vary across geographies

Utilities focus in the next 5 years

Global solutions but regional priorities!
From one-way energy-only grid to two-way energy+data Smart Grid

Communication and software at all levels “Smart Grid”

Centralised Generation

Transmission

Distribution

Consumers

Distributed Generation

Active Energy Efficiency:
Energy visibility & Means to act

Renewable Energy Plants

Distributed Generation

Electric Vehicles & Energy Storage

Data Centres

Buildings

Industry

Residential

Infrastructure

Consumers

Consumers

Active
Schneider position: 5 key Smart Grid domains… with a key position to optimize Supply and Demand
SE scope: 5 key domains, all connected...

Centralised Generation

Transmission

Distribution

Flexible Distribution (HV/MV, MV/MV, MV/LV)

Demand Side management

Smart Generation (bulk, distributed & renewable)

Efficient homes (incl. EV charging infrastructure)

Efficient Enterprise (buildings, industries & datacenters + EV charging infrastructure)

Renewable Energy Plants

Distributed Generation

Distributed Generation

Buildings

Industry

Infrastructure
Growth drivers

**Smart Grid**
- More intelligence embedded distribution grid
- Integration of renewables and electric cars
- Demand Response

**New Economies**
- Infrastructure investment
- Increased energy consumption

**Need of retrofit**
- Ageing grid assets in mature countries requiring network and systems upgrades

**Energy reliability and savings**
- End-users with higher expectations in terms of reliability and power quality
- Reduce energy cost

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**Wind installed capacity growth vs. 2009:**
- **US capacity growing by 165% by 2015**
- **China capacity multiplied by 6 by 2020**

Source: Pike research and China Wind Power outlook 2010

**China and India represent 40% of total investment in Distribution Grid (2010-2020)**

Source: World Energy Outlook 2010

**Examples of power outages costs:**
- **Brokerage operations $6.5M per hour**
- **Credit card operations $2.6M per hour**

Source: Arthur D. Little “Reliability and Distributed Generation” White Paper

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**Power interruptions costs in the US**

>$100 bn a year

Source: Perfect Power 2008
Flexible distribution generic architecture

Enterprise integration bus

GIS
EMS
DMS
OMS
Historia
MDM

Real-time integration bus

SCADA
AMM / AMI

Enterprise

Energy market
Planning
Control room
Asset management
CRM Billling
ERP
3rd party

Data integration

Centralised Generation
Transmission
Distribution

Comm infrast

Residential
Efficient Home

Sensors IED's

Substation Solution
Feeder Solution
Smart metering AMM / AMI

Electrical network

Renewable Energy Plants

Renewable
Infrastructure

Efficient Energy Services

Commercial & Industrial
Efficient Enterprise

Distributed Generation

Schneider Electric 18- Energy - Automation – Nov 2011
Six Blockbuster Solutions

**Feeder Solutions**
- Customers: Distribution Utilities
- Needs:
  - Less outages
  - Optimized O&M costs
- Solution bricks:
  - Intelligent switchgear
  - Fault passage indicators
  - SCADA integration
- Differentiation:
  - Strong reference book
  - Customized solutions

**Network Solutions**
- Customers: Distribution Utilities
- Needs: Reliability & Energy efficiency
  - Advanced Grid supervision
  - Integrate renewables
  - Optimize network operations
  - Safety & Security
- Solution bricks:
  - DMS, OMS, MDM, GIS, SCADA
  - Induced sales of: RTU, bay controllers, Fault detectors, Protection relays, substation control systems
  - Advanced Services

**Solar Grid Integration**
- Customers: PV power plants
- Needs:
  - Reliability, connection to the Grid, low cost
- Solution bricks:
  - Eng & consulting, maintenance & operation
- Differentiation:
  - Broad range of complementary offers
  - Turnkey project execution
  - Performance contracts

**Substation Solutions**
- Customers: Distribution Utilities
- Needs: Dependability, cost optimization
  - Engineering tools
  - Cyber security
- Solution bricks:
  - PACS solution with architecture & IEDs
- Differentiation:
  - Strong reference book
  - Customization capabilities
  - On-time delivery

**Wind Integration**
- Customers: Wind Farms developers
- Needs:
  - Execute electric lot with Collection, Connection & Supervision of Wind Farms
  - Complete turnkey execution
- Solution bricks:
  - Relays, Transfo, SMV, PMV
  - Reactive energy compensation, Power Meter, Scada, Video monitoring
- Differentiation:
  - Complete solution & execution capabilities
  - Local presence
  - HV connectivity

**Hydro**
- Customers: Utilities, Private producer, turbine makers, focus on Small HPP
- Needs: flexible, cost optimized, HPP availability, power & control system
- Solution bricks:
  - Plant substation, grid connection (MV, BT, Protection & energy counter)
  - Supervision system, multi plant, hydro resources mgt
  - Turbine, Dam, Plant automation
  - Building mgt & access control (video)
- Differentiation: Global solution provider for SHPP, Open standard, ww

**Blockbuster solutions**
- Address critical Utility customer needs
- Based on existing activities & bricks
- Differentiated approach (offer, delivery, competitiveness)
- Build Country and Regions competence

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**BU Energy content as % of PAM**
Electric Utility Solutions
Flexible distribution offer

Distribution Automation:
- SCADA/ DMS/ OMS/ GIS
- HV/MV Substation Automation
- FA - Distribution Automation
- Underground / Aerial Distribution

Smarter Automation

Advanced services

Renewable Integration
Solutions for Wind and Solar Farms

MV Primary cubicles

MV ring main units MV Pole Mounted Reclosers

Prefabricated MV/LV cubicles for secondary substation
Smart Grid-enabling products and solution offering

**Flexible Distribution**
- HV/MV – MV/MV – MV/LV
- Active networks solutions reactive power & active filters
- Network automation (FA, Substation Automation)
- Instrumentation (Protection, Metering…)
- Smart MV/LV Substation (*)
- DMS, GIS, OMS, MDM, AMI, Full IT Integration
- Micro-grid system

**Demand Response**
- Charging spots
- Residential energy management
- Circuit Protection
- IS&C
- & EV charging spots
- Web Portal & Management Software

**Efficient Home**
- Power Management
- IT Management & Secure Power
- Building & Security Management
- Process & Machine Management
- EcoStruxure integrated architectures
- Performance Contracting
- Turnkey projects
- EV charging spots
- EcostruXure Solutions

**Efficient Enterprise**
- Renewable farms (Trans or Dis)
- Pro-sumer Renewable installations

**Smart Generation**
- In-plant MV, LV, SCADA* & Automation Services & Retrofit
- Power plants automation and control retrofit
- Full Electrical Distribution (MV/LV/ Smart Meter) & Automation integration
- Dynamic VAR compensation and system stability for Renewable Energy integration
- Renewable Energy Monitoring & Management Software

* with full capability of communication and data concentration with AMR, LV circuit monitoring, load balance, loss reduction and metering identification
Network Solutions - Smarter Grid

SCADA and RTU provide open, secure operational control for critical grid elements

GIS optimizes asset management, saving money and resources

DMS analyzes, optimizes and automates the grid

OMS improves system reliability and reduces the ‘real cost’ of service

AMI and MDM enable utilities and customers to work together to save energy

Weather provides situational awareness and drives operational planning and analysis

The Power of the Integration: the best way to success harnessing the flood of information generated and turning it into real-time business intelligence
Smart Operations

Integration of GIS, AMI, OMS, DMS and SCADA

- Leverage GIS data (ArcFM) to build the DMS model (normal state of the network)
  - Savings:
    - Labor.
    - Quality/Data Integrity.
- Seamlessly synchronize the current state of the network model between AMI, OMS, DMS and SCADA through the Real Time Integration Bus.
# Feeder Solutions

## MV Feeder Automation
- Reduce Outage Time
- Reduce cost of curative actions
- Reduce Installation, operation & maintenance costs

## LV management integration
- Monitor LV power supply quality
- Reduce technical losses of the transformer
- Monitor the load & control the peak load
- Reduce the transformer fault

## Smart Metering integration
- Reduce tech. and non technical losses on LV network
- Ease LV network maintenance & evolution
- Reduce outage time on LV network
- Keep LV network stable with DG proliferation
Feeder Solutions - Self Healing

Overload and DG easy to manage from the DMS data base

Overload management to be shared between DMS and FRTU

Load management more difficult to manage

Simple to very complex network schemes

Simple to complex network schemes

>5 min < 0.5 s < 1 min

The FRTU react automatically to reconfigure the network and inform eventually the DMS

Both FRTU and DMS are involved into the decision.

• The DMS manages the decision and send restoration control orders to the FRTU.
• The FRTU are passive

Centralised Semi decentralised decentralised
Substation Solutions

**MV/LV SS** (1 Tranfo + 6-16 MV feeders)
- OI – PLS Citect
- Engineering tools: Use of simplified configurator for C264
- Delivery model: Execution center =SE= Integrators

**MV/MV SS (1-2 Tranfos + 6-16 MV feeders)**
- OI – SUI, IEC61850 imposed
- Engineering tools: SCE + modèles tranches et IEDs
- Delivery model: RSAC or Execution center =SE= Integrators

**HV/MV SS (>2 Tranfos + >16 MV feeders)**
- OI – SUI, IEC61850 imposed
- Engineering tools: IEC61850 & legacy IEDs + fast distributed Automation IEC1131 + local HMI with SCADA

Market prices (SAS function)
- 1 000 000 €
- 750 000 €
- 500 000 €
- 250 000 €
- 100 000 €

**I/Os Nb**
- 100 -> 500 IOs
- 500 -> 5 000 IOs
- >= 5 000 IOs

- IEC61850 & legacy IEDs + “slow” Automation IEC1131 + local HMI with SCADA
- Multi-ring+ Redundancy + IEC61850 & legacy IEDs + fast distributed Automation IEC1131 + local HMI

Schneider Electric/ Energy Business/LoB Automation- September 14th, 2011

Company confidential - for discussion purposes only
Multi-sites substation automation

Solution offer: IEC 61850

Key benefits

- Provides scalable solution from single RTU to large industrial sites
- Allows for single or redundant searches all over the architecture
- Smooth Integration and testing, with custom engineering tools
- Communication backbone open to 3rd party components
Feeder automation

- High cost x benefit proposal
- Easy to install, configure and maintain
- Flexible and modular approach

Overhead network

- Solutions
  1. U27/N38/RL27 - ADVC-2
  2. Easergy T200P
  3. Flite

Underground network

- Control Unit
  4. Easergy T200P Fault passage Indicator
  5. Flair Digital Protection Relay
  6. Sepam Power quality monitoring
  7. Ion / PM
Wind Power Solutions

1. Turbine Control & protection
   - 100 M€ Power
   - 30 M€ IND
   - 7 M€ UPS

2. LV/MV Transformers
   - 110 M€

3. Production site & test Equipments

4. Primary / Secondary Equipments
   - 180 M€

5. EPC business
   - 150 M€

6. Services
   - 30 M€

OEM business (270 M€)
Wind Farm Project business (360 M€)
Renewable Energies: Wind

Wind turbine solutions
1 – Main turbine power circuit to collect the wind energy
2 – Optimized Turbine control with PLCs
3 – Control of auxiliary circuits with contactors and LV boards

Wind farm solution offer
4 – MV Collection: compact wind-specific MV RMU
5 – Connection to the Grid complying with utility requirements
6 – Supervision: remote operation for accurate energy metering

Customer Benefits
● Reduced capital and operation costs:
  ● Faster ROI.
  ● Maximize power generated with a small investment.
  ● Quick intervention on-site.
  ● Maintenance cost reduction.
  ● Lower cost/kWh produced.
● Enhanced quality of service and network reliability:
  ● Reduced outage time.
  ● Increased revenue.
  ● Global warranty for global solution.

Main references
● Scottish Power – Whitelee Windfarm, UK (320MW) - 2007
  ● Protection relays, MV primary and secondary cubicles, Services
● SINAЕ - Parque Eólica Altos del Voltoya, SPAIN (41MW )
  ● MV primary and secondary cubicles and services
● Cegelec – Cap Kaliakra wind farm, Bulgaria (36MW) - 2008
  ● LV/MV substations and services
Renewable Energies: Small Hydro

Main applications
● Electrical distribution and grid connection
● Plant Automation
● Supervision and remote control
● Access control and video monitoring
● Services: Engineering, Development, Commissioning, Retrofit

Customer Benefits
● Easy to integrate, implement, and operate.
● Cost effective and reliable
● Global solution: electrical distribution and control.

Main references
● Chamalière-sur-Loire, France (400kW) – 2004
  ● Electrical distribution and control
● Santa Catarina, Brazil (20MW, 4 plants) – 2010
  ● Electrical distribution, control, Scada and services
● Rucar, Romania (33 MW) – 2004
  ● HV, MV, LV, control, Scada and services
● Rizzanese – Corsica, France (54MW) – 2010
  ● Electrical distribution, control, Scada and services
Renewable Energies: Solar

Turnkey Solution offer:
● Solar panel movement control: M340 PLC, Lexium drives
● DC low voltage: Range of array boxes
● Power conversion substation
  ● Xantrex inverter range
  ● LV AC protection, LV/MV Oil and Cast resin transformers
  ● MV Cubicles (RM6, SM6)
● Grid connection substation
  ● Power quality and revenue metering (ION software and hardware)
  ● MV cubicles (AIS and GIS) Monitoring and supervision
  ● Power meters PM800, W325 gateway and Kerwin Scada
● Video CCTV and access control: Pelco and TAC ranges
● Services: Design, commissioning and retrofit

Customer Benefits
● Complete and coherent solutions
● Long term maintenance services (20 years).
● Efficiency and reliability: supervision and monitoring
● Extensive range of inverters

Main references
● 10MW Rooftop Solar Farm - Veolia (SPAIN) - 2008
  ● Electrical distribution
● 12MW Solaire Direct plant in Les Mées (FRANCE) - 2010
  ● Electrical distribution, inverter and remote control
● 76MW EDF Solar Farm in Le Gabardan (FRANCE) - 2009
  ● Panel control, electrical distribution, inverter and supervision
● 1MW Teydi plant (SPAIN) - 2008
  ● Project automation and electrical design
Generation: Thermal and nuclear plants

Main applications
- Electrical distribution and control for auxiliaries
  - Turbine auxiliaries: motors, pumps, protections
  - UPS and Building power supply
- Balance of plant process control
  - Water treatment and desalinization.
  - Combustible supply and waste processing.
- Plant building automation
  - HVAC and Access control.

Customer Benefits
- Solutions qualified for nuclear
  - Electrical distribution and UPS
- Global service offer
- Reduced Maintenance cost

Main references (Nuclear plants)
- Mochovce - Slovakia – 2010
  - MV, LV switchboards, UPS (Gutor), MCC
- Ling Ao2 – China – 2006
  - MV, LV, Transformers
  - MV and transformers
Flexible Distribution: References

**SCADA DMS in La Havana (Cuba)**
Complete integration of La Havana dispatching center controlling MV network

Energy Efficiency: ★★★★★
 Availability: ★★★★★
 Productivity ★★★★★

MV Distribution Management System controlling La Havana network. It allows quick adaptation to network changes, reduce outages time, and increase safety and power availability

Global supervision
> Scada DMS integration (Partner)

Power management
- Seefox Scada M8000 remote control system: switchgear monitoring, circuit-breaker controls, alarm and event management
- T2000 Remote Terminal Units installed in substations
- DMS function (dynamic network coloring, network management support)

Services
- Training to configure, operate and upgrade systems
- Commissioning support
- Customer follow-up during the operation phase

**MV Feeder automation (S. Arabia)**
Monitoring and control of 650 MV/LV utility substations

Energy Efficiency: ★★★
 Availability: ★★★★★
 Productivity ★★★

MV feeder automation system that enables fast fault restoration, remote monitoring of asset condition, network loading and power quality in strategic points in the network

Global supervision
> Vijeo Citect

Power management
- MV current and voltage sensors
- Easergy T200 remote terminal unit
- ION 6200 meter
- RM6 motorized MV switchgear
- Easergy Flite fault indicators
- GPRS communication system

Services
- System design
- Project management
- System installation
- Software configuration
- Testing & Commissioning
- Training

**HV/MV substation control (Germany)**
Digital control system for utility 110kV /20 kV primary substations

Energy Efficiency: ★
 Availability: ★★★★★
 Productivity ★★★★★

Distributed Protection & Control System fully compliant with IEC 61850 standard providing high level of availability and energy efficiency using full remote operation & supervision within turnkey project

Global supervision
> PACiS and Network Control Center

Power management
- Protection & Control of 110/20 kV s/s
- Digital circuit breaker failure protection and interlocking system
- High availability remote control via redundant SCADA links
- Cyber Security Gateway

Services
- Project management
- Design & engineering
- Setting & configuration
- Installation, Tests & Commissioning
- Training
- Remote maintenance service contract
**Smart Generation: References**

**Northern Ireland Windfarm (UK)**

A turnkey contract for a complete windfarm system grid connection

- **Energy Efficiency:** ★★★★
- **Availability:** ★★★★
- **Integration of renewables:** ★★★★

The 30 MW Thanet Offshore windfarm saves 2,800 tons of CO₂. The Pacis solution provides up to 30% more generation export to the grid.

- **Global supervision:** > PACIS OI
- **Power management:**
  - Metering
  - Local MV & HV protection & control
  - Renewables energy management
  - Micom relay with Dynamic Line Rating functionality
- **Services:**
  - System design
  - Project management
  - Software configuration
  - System installation
  - Tests & Commissioning
  - Training

**Solaire Direct (FRANCE)**

A turnkey contract for a complete system including conversion & distribution of photovoltaic electricity

- **Efficient:** ★★★★★

The Vinon array will produce enough electricity to supply 2,000 homes, i.e. nearly 4,600 inhabitants. An array of this type can save 2,900 tons of CO₂ from being produced per year.

- **Global supervision:** > Kerwin Power SCADA
- **Power management:**
  - High density metering
  - Local LV/MV protection & control
  - Renewables energy conversion
- **Security management:**
  - Video security
  - Intrusion detection
- **Services:**
  - Electrical network studies
  - Installation and Commissioning
  - 97.5% availability for 20 years with maintenance contract
  - Remote monitoring

**4 hydro plants on Rio Engano (Brazil)**

Full integration of a multi site hydro plant electrical system including grid connection, control, supervision and substation automation

- **Productive:** ★★★★★
- **Availability:** ★★★★★
- **Integration of renewables:** ★★★★★

This hydro system provides up to 15MW power capacity of 100% renewable energy saving 1,500 tons of CO₂. Vijeo Citect allows full remote operation of the plant.

- **Global supervision:** > Vijeo Citect Scada
- **Power management:**
  - ION Metering
  - Sepam S80 protection relay
  - SM6 MV for generator protection
  - HV / MV substation automation
  - LV switchboard
- **Process control:**
  - Magelis HMI for local control
  - Vijeo Scada integration
  - Partner PLC and RTU integration
- **Services:**
  - System design
  - Project management
  - System installation and commissioning
# Smart Grids Influence – Key bodies

<table>
<thead>
<tr>
<th>Actor</th>
<th>Influence…</th>
</tr>
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</table>
| **Business/Industry associations** | • Gimelec, ZVEI, NEMA, Capiel, T&D, Orgalime  
• EU & US messages may slightly differ |
| **Standardization bodies** | • Power syst.ctrl & com. & security  
• Devices description & integration  
• Meters  
• Smart grid task forces  
• Wireless communication  
• Home & Buildings electronic syst  
• Renewable  
• Electrical Vehicle | • IEC TC 57 & ISA SP99  
• IEC 65 & ISO 184  
• IEC 13  
• IEC SMB, IEEE  
• Zigbee & IEC  
• 205, KNX, LON…  
• IEC TC 82  
• Fr/Ge task force |
| **Consortia, think tanks, academia & others** | • ETP SmartGrid  
• T&D Europe  
• European Smart Meter Industry Group  
• EuropElectro Homes  
• Smart Grid coalition  
• Eurelectric & Smart appliance | • Green Grid  
• Smart house  
• Gridwise |
| **Governments** | • EC, Energy forum, DOE, EPA,  
• Member states and other countries  
• Ministries (Env, Energy, Industry..)  
• National Energy agencies |
Standardisation strategic guidelines

- **Focus on international standardization at IEC first (and ISO)**
  - Help and Ensure IEC co-ordination, especially in handling cross-cutting issues
  - Encourage the maximum alignment of CEN/CENELEC/ETSI and IEC works
  - Encourage the maximum alignment of China and IEC works

- **Promote harmonized data model, handled by electrical specialists**
  - Harmonized: Ensure a single data model management within IEC
    - Break the silos between domains
  - Promote:
    - Promote unified data model (IEC 61850 - CIM)
    - Extend the use of IEC 61850 data model -> DER, Storage, Electrical Vehicle, ancillary services, feeder automation

- **Ensure Cyber-secured and state-of-the-art communication solution**
  - IP based
  - Web-services based

Principles are shared by T&D Europe, Eurelectric
Schneider Electric: from standardisation strategy to actions

Presence and active contribution in the main Smart Grid standardisation bodies

- **At IEC level**
  - IEC SG3 – Corporate – roadmap
    - Schneider Electric has 2 active members in this committee
    - Pushing for IEC change in handling system aspects
  - At IEC TC57, very active in groups dealing with SG standards
    - Schneider Electric has 7 members in this committee
    - Substation and feeder automation
    - Distributed Energy resources and Electrical Vehicle
    - IEC 61850 editors and UML modelling TF leader

- **At European level**
  - Smart Grid standard expert for the European Commission
  - Drafted the M490 mandate of EC to Cen-Cenelec-Etsi
  - CEN/CENELEC/ETSI Smart Grid Working group
    - Lead of 2 main sections of the roadmap:
      - System aspect (Demand-Response, System management, Data modelling)
      - Generation (including Distributed Energy Resources (DER))
  - CEN/CENELEC/ETSI SGCG board
    - Lead the definition of the set of standards (main M490 delivery)
Pilot Projects Smart Grid
We are also investing in research within IDEA consortium

IDEA partnership description

IDEA, a partnership to “invent the future of the distribution networks”

3 partners: 2 industrial players and a specialized university

3 focus for the years to come:
  - Innovative network architectures
  - “Observability" of the distribution network for an efficient network & asset management
  - Connection of renewable energies to the grid

Examples of DG-related research topics

- Voltage management in active networks
- Optimized management of energy systems in Buildings with multiple sources
- Contribution of mixed wind farms to Ancillary services: applications in off-grid mode (islands)
- Smart voltage management on the LV network with PV production
- Leakage current of PV systems and innovative solutions to avoid accidental disconnection
- PV converters behaviors during voltage dip events in electrical networks
- Laboratory demonstration of fast reconfiguration with local intelligence
- Decentralized control architecture and configurable protections
- Observability and state estimation of future distribution networks
- Load management forecast in the AMM context
GreenLys demonstrator: testing full Smart Grid solutions

- Business model & technical experimentation project in France, supported by ADEME
- Project: Consortium with leader ERDF, **total budget: 40 M€**
  - **SE Contribution: 8 M€**, project duration: 4 years
- Project description:
- **SE objectives**
  - **Test full smart grid solutions & services at a regional scale** (Rhône Alpes),
  - **Understand value to be created by SE** for different actors, identify business model which maximize value for SE
  - **Increase SE awareness** in a highly visible project

**Lyon:** LV grid & AMM demonstration, ERDF leader (15 RTU/Concentrator, 500 Home box, Building + REN + EV + CHP)

**Grenoble:** Global demonstrator, GEG & GDF SUEZ leaders (15 RTU/Concentrator + 1 self healing MV loop reconfiguration, 500 Home Box (EH step 0, EH step 1), 3 SE “Smart Grid” plans (EV, REN, Building Management)
GreenLys demonstration stakes

- Test **full smart grid solutions & services** at a **regional scale**: both for **DNO QoS and grid management** (LV & MV) and **for retailer** (customer automation for Energy efficiency and peak shedding)
  - Reduce **SAIDI** to less than 1mn, reduce **DNO operation costs** and reduce peak by 10% from customer side, get arguments for regulation evolution
  - **Leverage AMM for grid management** (incl. feeder automation)
  - Full demonstration **including services and business models**.
  - Consortium include **all relevant players** (from regulator to customer)

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**Schneider Electric – Utilities – Oswaldo Kaschny – Jul/11**
MILLENER: installation and management of Distributed Generation in islands

- Project: Consortium with leader EDF, total budget: ~30 M€
  SE Contribution: # 4.6 M€, project duration: 4 years

- Project description
  - Deploy a full-scale solution with storage and energy management in 2 islands fed by distributed energy (PV), to test aggregator services and business models during 18 months.
MILLENER demonstration stakes

- Increase significantly the level of renewable energies on the grid. Test in a limited size islander grid to have realistic conditions to address key issues.
  - Reduce peak demand and global energy consumption in island grids
  - Reduce CO₂ emission (less fossil electricity)
  - “Micro-grid approach” with global solution combining storage, EnR, load management, aggregation services.
  - More than 30% EnR (clearing today’s limitation), contribute to power reserve of 4 MW, 50% peak reduction with 4 kWh pro-sumers local production load management and each.
  - A self sustained Business model (notably use for reserve)
ENERPOOL: balancing renewable production thanks to Industrial Demand Response

- **Project**: Consortium lead by Energy Pool, **total budget**: ~2,2 M€
  - **SE Contribution**: #0,8 M€, project duration: 3 years

- **Project description**
  - **Objective**: test consumers capacity to absorb peaks/dips in RES production
  - **Industrial mass peak shedding** via load management by Aggregator
  - **Local balance** between **Distributed Energy Sources** and **demand** to relieve the network

- Industrial peak shedding > 100MW with large flexible plants (site power >0.5MW)
- Trying to balance a large PV production (~100MW) with flexible industrial consumption
- Objective: test consumers capacity to absorb peaks/dips in RES production.
Project Objectives

Project: 5.6M€ total cost, 3.4 M€ funding
SEI: 0.9M€ cost (0.4M€ in 2011), 0.5M€ funding

- The aim of the INTElligent GRId Sensor Project is to define a novel ICT System enabling implementation of Smart Grid New Functions in the Distribution Field.

- Technologically, the project focuses on:
  - The development of a WSN (Wireless Sensor Network) inside the MV/LV substations
  - The use of Broad Band PLC over the MV Loop.
  - The distribution of intelligence between Distribution Management System and substations.
  - The implementation of SOA (Service Oriented Architecture) between DMS and RTUs.
  - The opportunity to use the new AMM smart meters as LV WSN.
Thanks for your attention!