

International Congress & Exhibition on Energy Efficiency & Renewable Energy Sources

Sofia, 7 April 2009



Doing Business with Energy Efficiency –

BUSINESS OPPORTUNITIES IN POWER GENERATION, TRANSPORT AND DISTRIBUTION OF ELECTRICITY

Giuliano Monizza



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G. Monizza – Electra: Doing Business with Energy Efficiency – Power Gen, Transmission & Distribution

Sofia, 6-7 April 2009

Electra: Doing Business with Energy Efficiency in Power Gen, Transmission & Distribution
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About T&D Europe : The association

- **T&D EUROPE** is the European association of the electricity transmission and distribution equipment and services industry.
- **Our scope** includes the complete range of products and services necessary to transport and distribute electricity in high and medium voltage, between the producers and the end users.
- **The companies represented** by T&D Europe account for a production worth over €25 billion, and employ over 200,000 people in Europe



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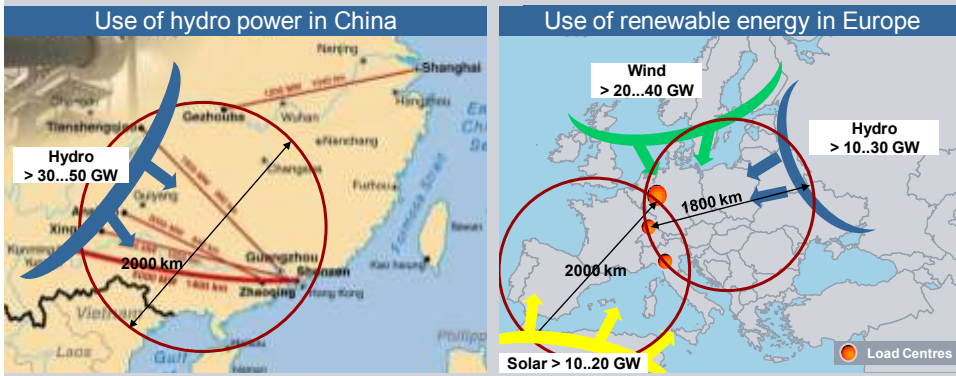
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About T&D Europe : The Members

- **Members of T&D EUROPE are all relevant European national associations.**



Grid access for large scale renewables



T&D Products and Solutions

- Worldwide most powerful wind energy plant mass-produced
- Complete solutions for on-shore and off-shore wind power
- Highly-efficient turbines for solarthermal power generation
- Integration of renewable energies via HVDC
- Energy lines with UHVAC and UHVDC
- Gas-insulated lines (GIL)



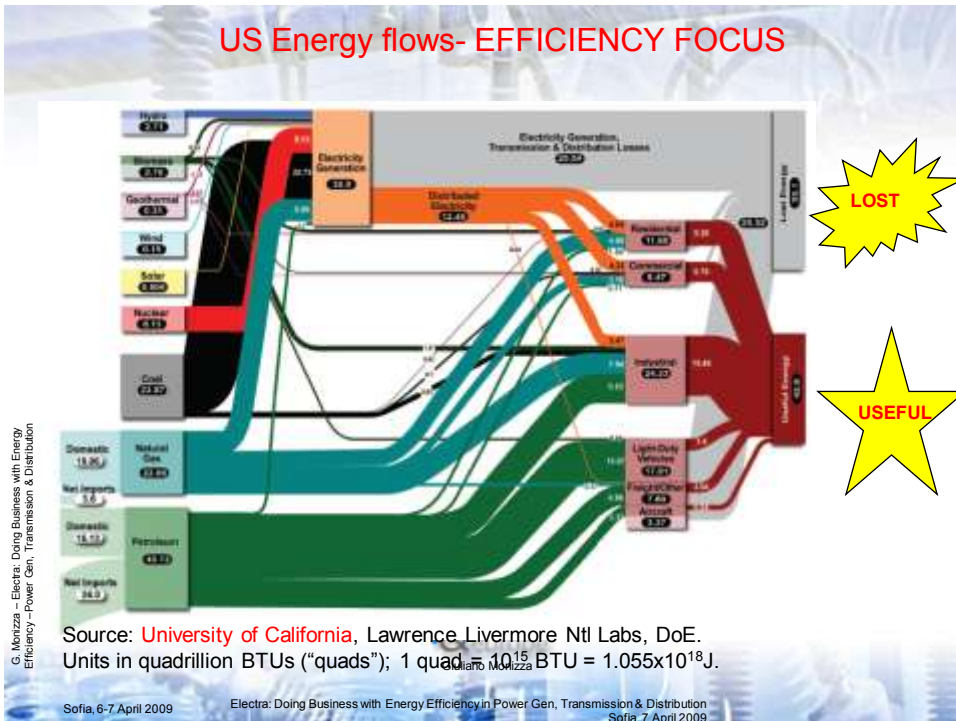
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US Energy flows- EFFICIENCY FOCUS



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Source: **University of California**, Lawrence Livermore Ntl Labs, DoE.
Units in quadrillion BTUs ("quads"); 1 quad = 10^{15} BTU = 1.055×10^{18} J.

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Power Generation

- The **total world generation** of electricity :19'000 TWh in 2006
EU25 accounted for 3'300 TWh.
- **Renewable sources: EU target= 20%**
globally provide some 7% of the electricity generated.
- **Fossil fuels** cover 70% of worldwide electricity while in Europe the figure is 60%.
- A drastic change in the portfolio of power generation in Europe is required
- Public opinion does not accept a substantial increase in nuclear energy in some countries
- The availability of extra **hydro power** is limited.
- **Renewable energy sources**, such as **wind, solar energy, biomasses**, are expected to increase up to 10-15% of the energy supply in the short and medium term and are not yet, in most cases, economically competitive.

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Power Generation, Transmission & Distribution

Today's conversion systems from primary energy to useful forms of energy are highly inefficient in many countries

Average power generation efficiency = 33%
but could be higher than 50% with existing technologies.

In the EU, approximately 7% of the generated electricity is lost in the power transmission and distribution.

Key technologies trends:

- Power plants with higher efficiency and controllability
- CCS (Carbon Capture Storage) & CHP (Combined Heat & Power): **Eff > 80%**
- Transmission and distribution grids (HVDC, Facts) , “Supergrids”,

Transmission: T-Smartgrids

- Grid flexibility and reliability, Bulk Power Transmission, Fast change load profile, Bi- directional, ready-to-collect decentralized renewable sources

Distribution: D-Smartgrids

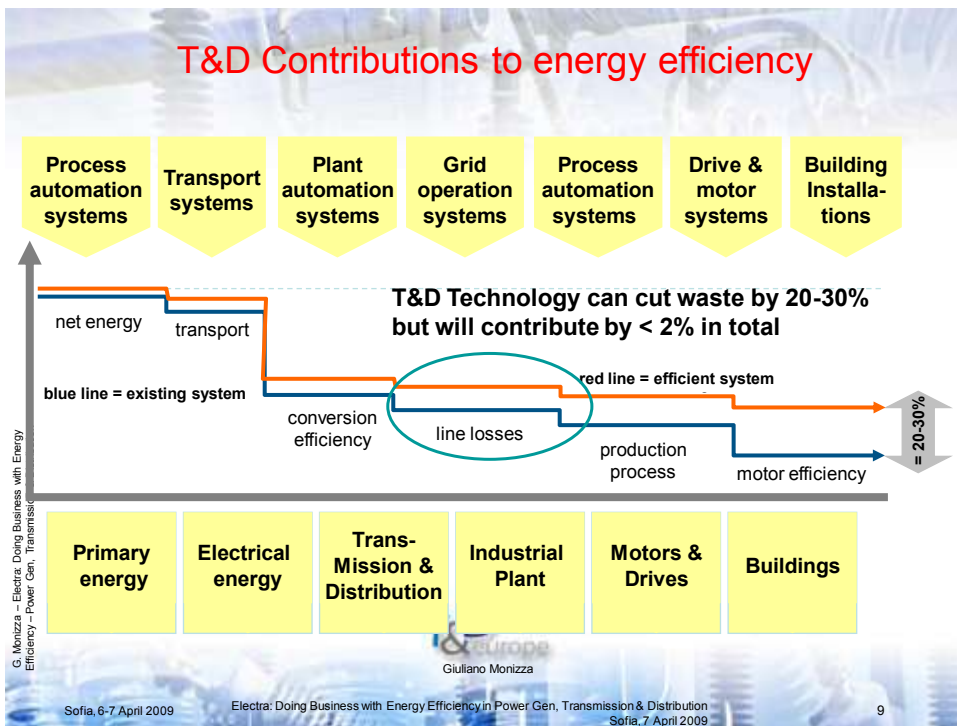
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25% ... 30% saving potential in end-user sectors

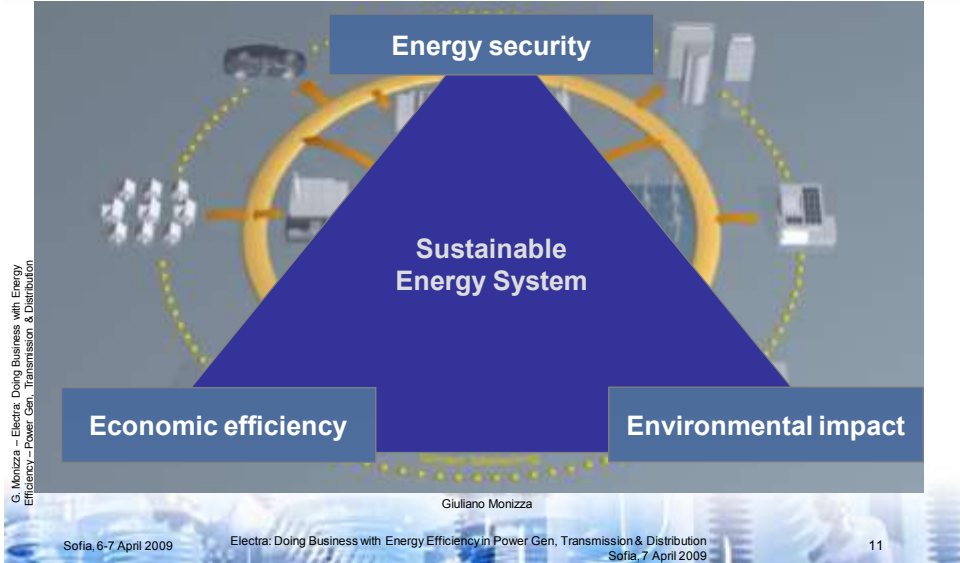
Findings from ELECTRA report

Sector	Energy consumption (Mtoe) 2005	Energy Consumption (Mtoe) 2020 (Business as usual)	Energy Saving Potential 2020 (Mtoe)	Full Energy Saving Potential 2020 (%)
Households (residential)	280	338	91	27%
Commercial buildings (Tertiary)	157	211	63	30%
Transport	332	405	105	26%
Manufacturing Industry	297	382	95	25%

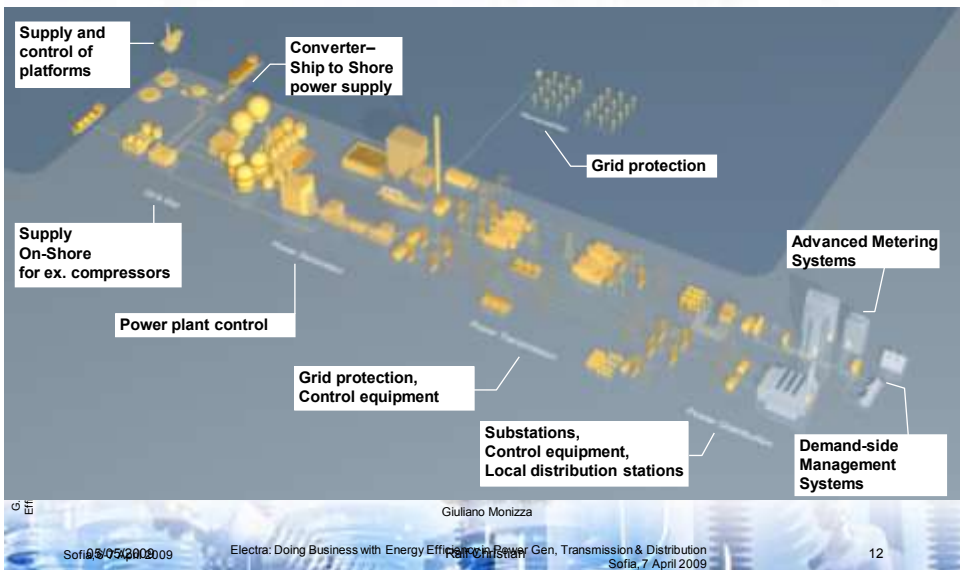
Estimates for full energy saving potential in end-use sectors

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The 3 pillars of a sustainable energy system




Grid automation is an important enabler along the entire energy chain



Smart Grids - why and what -

From traditional to smart grids


traditional grid




- Centralized power generation
- One-directional power flow
- Generation follows load
- Top-down operations planning
- Operation based on historical experience

- Centralized and distributed power generation
- Multi-directional power flow
- Consumption integrated in system operation
- Operation based on real-time data

smart grids





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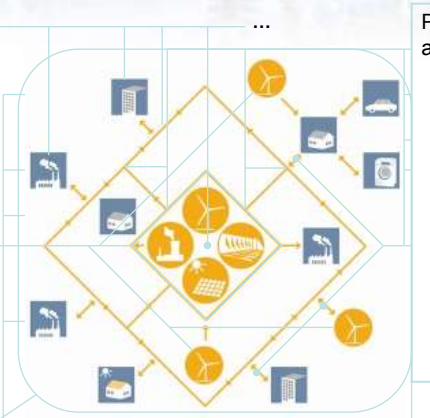
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Smart Grids offering

The portfolio – all over the system!

System operation:
Network Manager

- [SCADA](#)
- [SCADA/EMS](#) (incl. [WAMS](#))
- [BMS](#)



Power transmission and distribution:

- [solutions for load flow control and power quality improvement](#)
- [substation automation](#)
- [Network Manager SCADA/DMS](#)
- [distribution and feeder automation](#)
- [distribution communication](#)

Power generation:

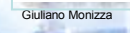
- [Network Mgr. SCADA/GMS](#)
- System for
 - thermal
 - hydro
 - solar

Power system communication

- [optical communication](#)
- [radio communication](#)

Demand response

- smart metering
- advanced home appliances



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Smart Grids drivers

Improving Grid Energy Efficiency

Tap Changers S sensor M meter

- Goal: Loss reduction in distribution grids by controlling field devices
- How: Reduction of line current, thus resistive losses
- Financial drivers
 - Reduction of fuel burn (and emissions)
 - Reduction of generation capacity
- Solution areas
 - Improved coordination and integration
 - [integrated communication infrastructure](#)
 - [distributed generation, energy storage and demand response](#)
 - Outage support → [improved substation power factor](#)

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Smart Grids drivers

Improving Grid Reliability

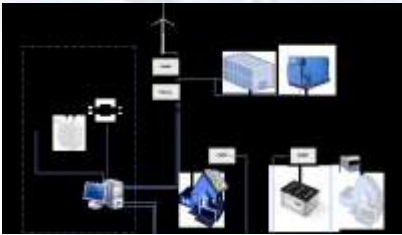
Tap Changers S sensor M meter

- **Goal:** Automatic isolation and location of faults, very fast service restoration to customers
- **How:** Using information from IEDs, sensors and meters to control switchgear and to pinpoint fault location
- **Financial drivers**
 - Improved customer satisfaction
 - Avoided penalties
 - Reduction of operational expenses (e.g. crew costs, tree trimming)
- **Solution areas**
 - [Improved coordination and integration](#)
 - [Utilization of advanced metering infrastructure](#)
 - [Outage support](#)

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Smart Grids drivers

Renewable and Distributed Generation



Goal: Ensuring reliable grid operation in systems with high share of generation based on volatile renewable energy (e.g. wind and solar) and maybe economic storage

- **How (examples):**
 - Wind and PV specific protection and control systems
 - Wind and PV specific substations and power electronics
 - HVDC to connect remote wind and solar thermal plants
- **Financial drivers**
 - Emission reduction
 - Maintaining security of supply despite volatile generation
- **Solution areas**
 - Improved coordination and integration
 - integrated communication infrastructure
 - distributed generation, energy storage and demand response
 - Outage support
 - restoration switching alternatives
 - peak load shifting to defer generation investments

} *supporting Smart Grids*

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Transmission & Distribution

Key technologies trends

T&D losses reduction:


- Actual average total: 6-7.5% (Transmission up to 3.5%; Dist up to 4.5%)

Loss reduction by:

- Voltage increase
- Reduction of reactive power transmitted
- Increase transformer efficiency
- Replace old transformers

Substations:

- Smaller footprint (GIS)
- Replacement of old installed base (T-Smart & D-Smart)




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The need for more Transmission investment

Development of a Pan-European transmission grid requires investments!



Drivers

- Rising electricity demand
- Integration and accommodation of renewable energies
- More cross-border energy trade
- High regional electricity prices
- Energy security concerns
- Stability Improvement

The UCTE countries **need** to invest ***17 Bil. EUR** on their Transmission Network between 2008 -2013

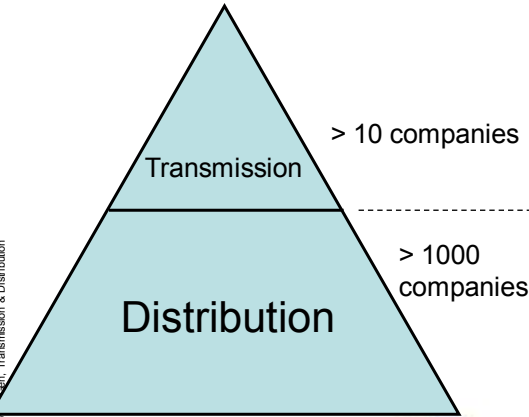
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Structure of the current EU recovery program regarding Electricity and Wind

T&D Industry



Effect of EU recovery program

- 750 M€ for Transmission
- A small portion of 500 M€ from Wind

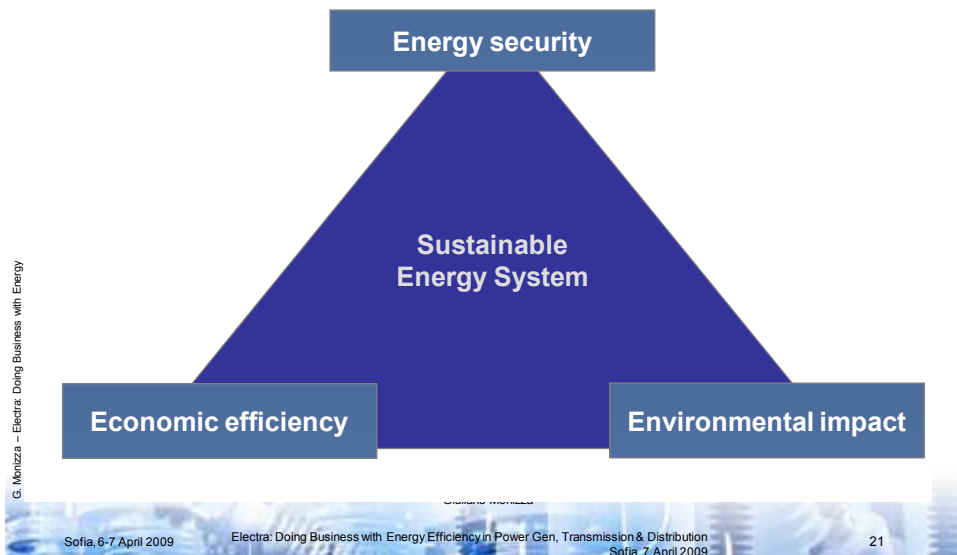
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The 3 pillars of a sustainable energy system



3 forces are needed to enable the future sustainable energy system

Climate-compatible energy technologies
Efficiency increase, CO₂ sequestration, wind, solar thermal ...



Only through joint forces of politics, power sector and industry sustainable energy systems can become reality.



T&D EUROPE

the voice that drives consensus

on Transmission & Distribution Technologies

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