Anie – GIFI – 18 Giugno 2010

EU 20 20 20:
Tecnologie e Sistemi per le Reti Intelligenti
"Smart Grids"

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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

About T&D Europe : The Members

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

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FEI FACHVERBAND DER ELEKTRO- UND ELEKTRONIKINDUSTRIE

ANIMEE

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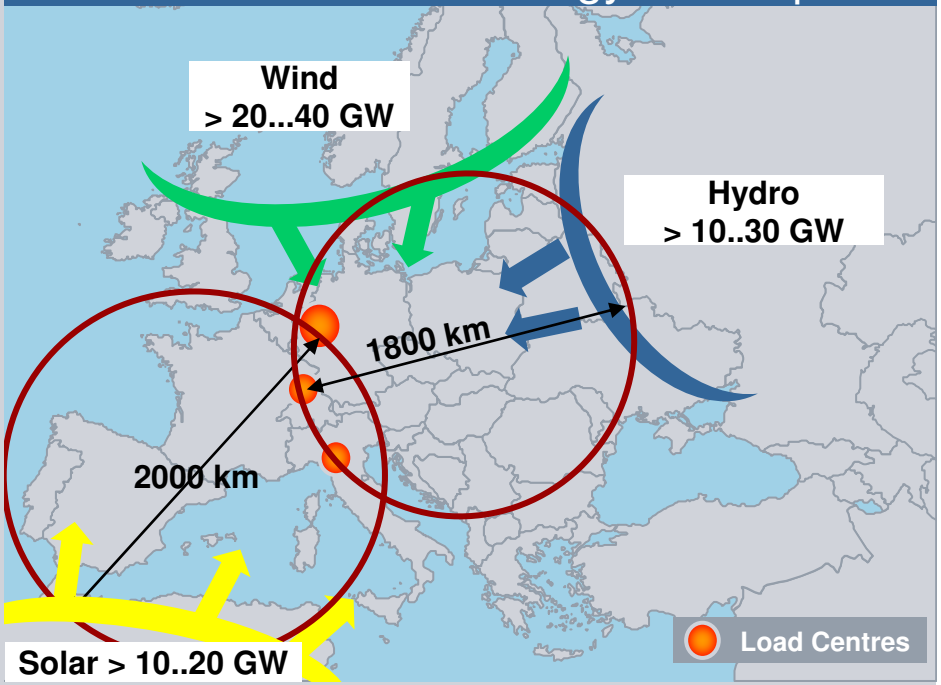
The world in power T&D

Grid access for large scale renewables

Use of hydro power in China

Use of renewable energy in Europe



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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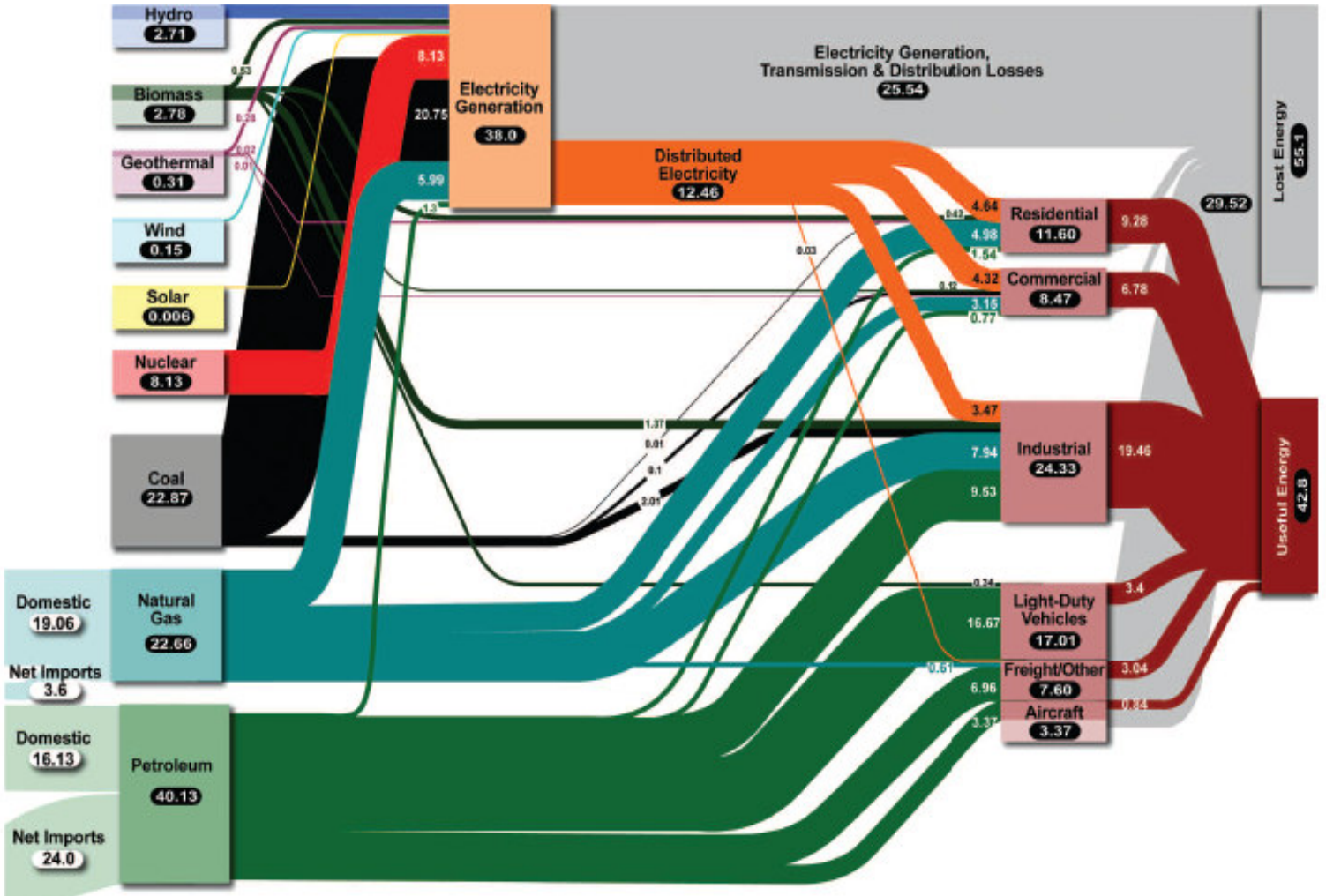
US Energy flows- EFFICIENCY FOCUS



LOST

USEFUL

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

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.

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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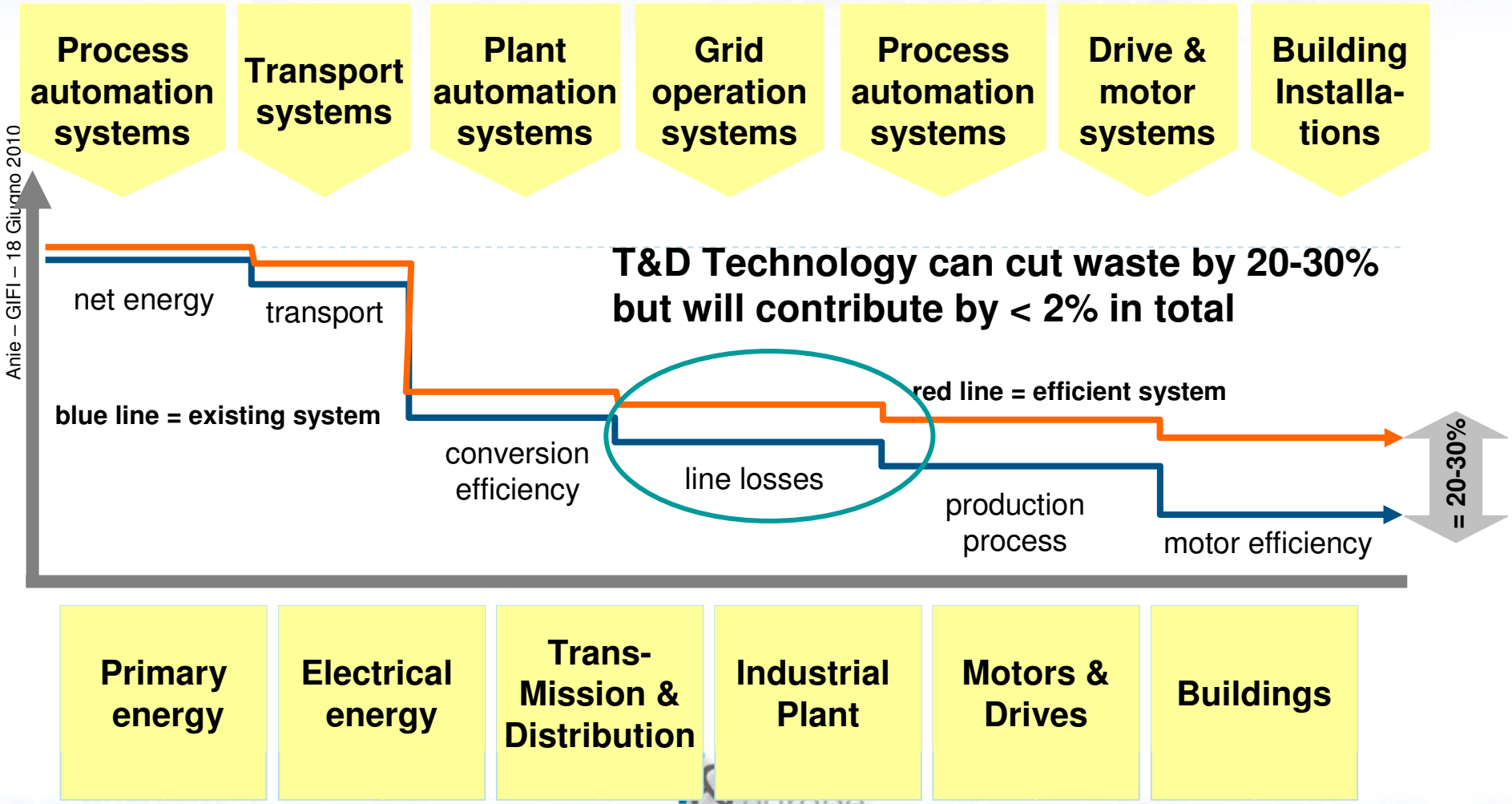
T&D Contributions to energy efficiency



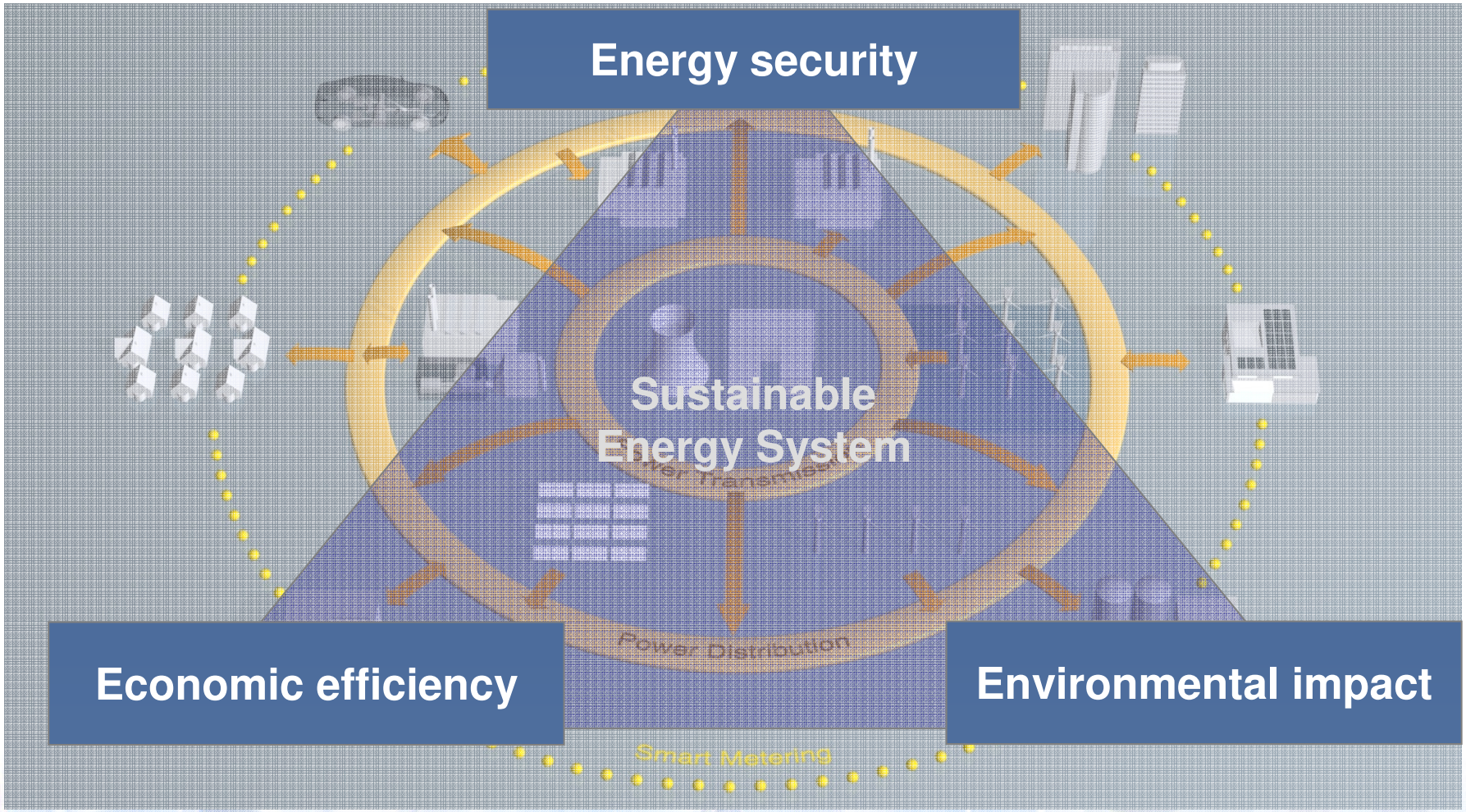
25% … 30% saving potential in end-user sectors

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%

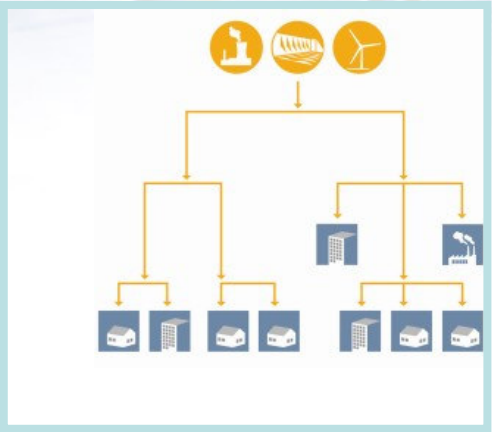
Estimates for full energy saving potential in end-use sectors

The 3 pillars of a sustainable energy system



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

smart grids

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

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Smart Grids offering

The portfolio – all over the system!

System operation:
Network Manager
- SCADA
- SCADA/EMS (incl. WAMS)
- BMS

Power generation:
- Network Mgr. SCADA/GMS
- System for
  - thermal
  - hydro
  - solar

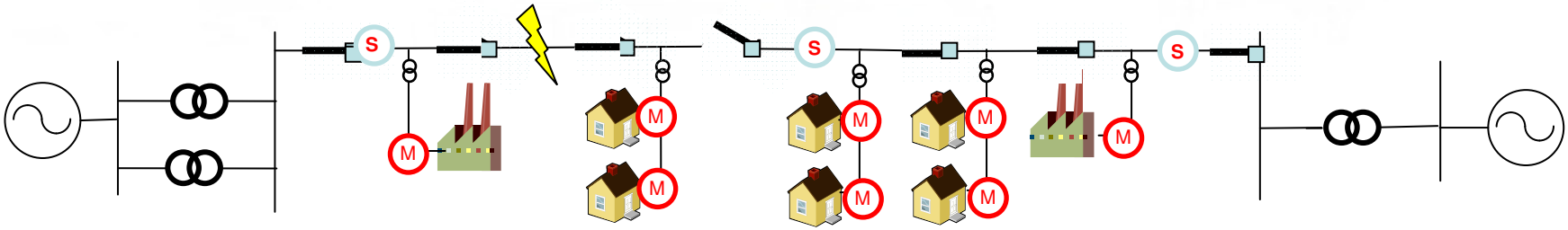
...

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 system communication
- optical communication
- radio communication

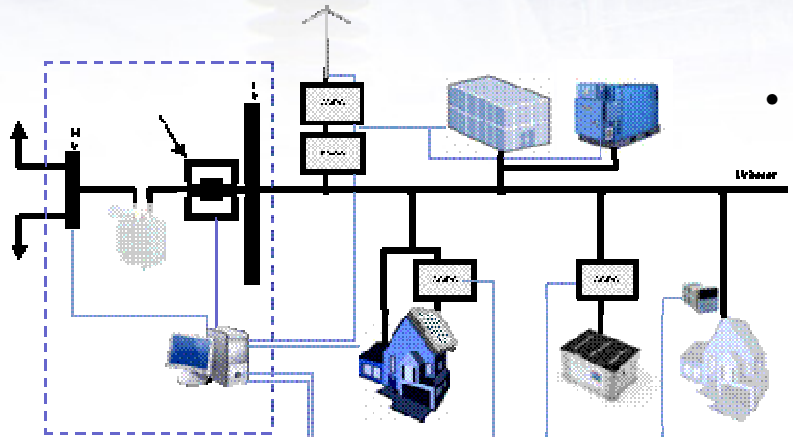
Demand response
- smart metering
- advanced home appliances

Improving Grid Reliability



- **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

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

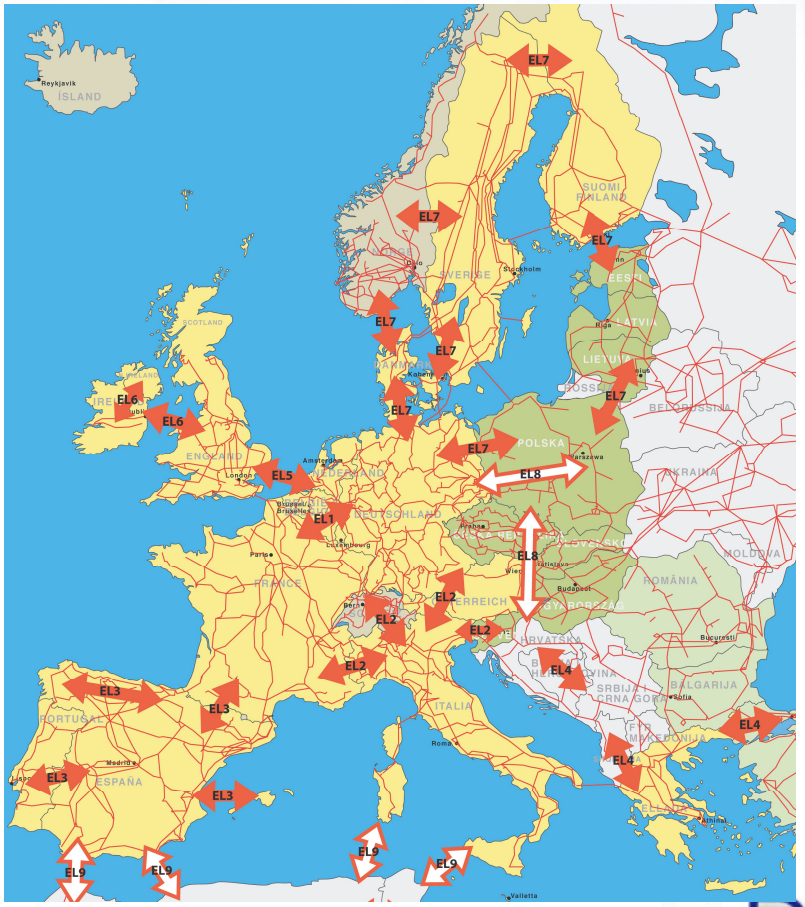
- **How** (examples):
  - Wind and PV specific protection and control systems
  - Wind and PV specific substations and power electronics
  - HVDC to connect remote wind and solar thermal plants

} *supporting Smart Grids*

- **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**

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 ENTSO-e countries **need** to invest **22** to **24** **Bil. EUR** on their Transmission Network between 2010 -2014

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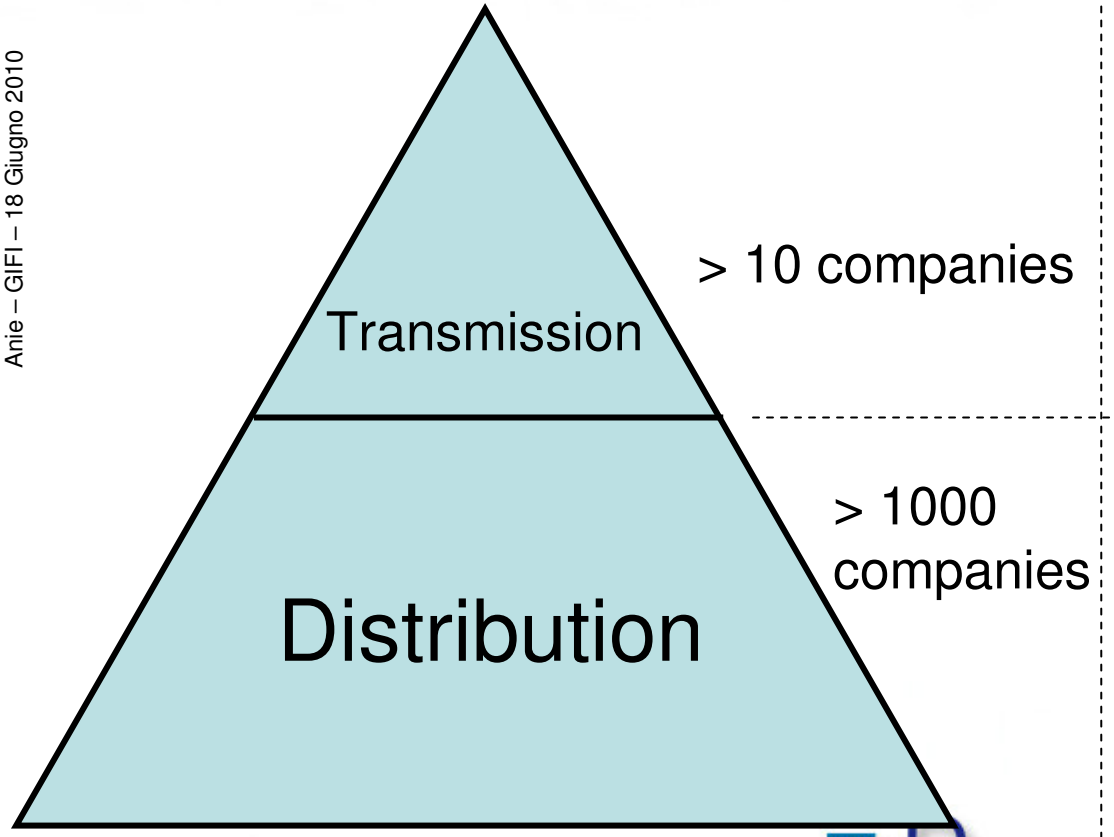
Structure of the current EU recovery program regarding Electricity and Wind

T&D Industry



> 10 companies

> 1000 companies

Effect of EU recovery program

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

0 €

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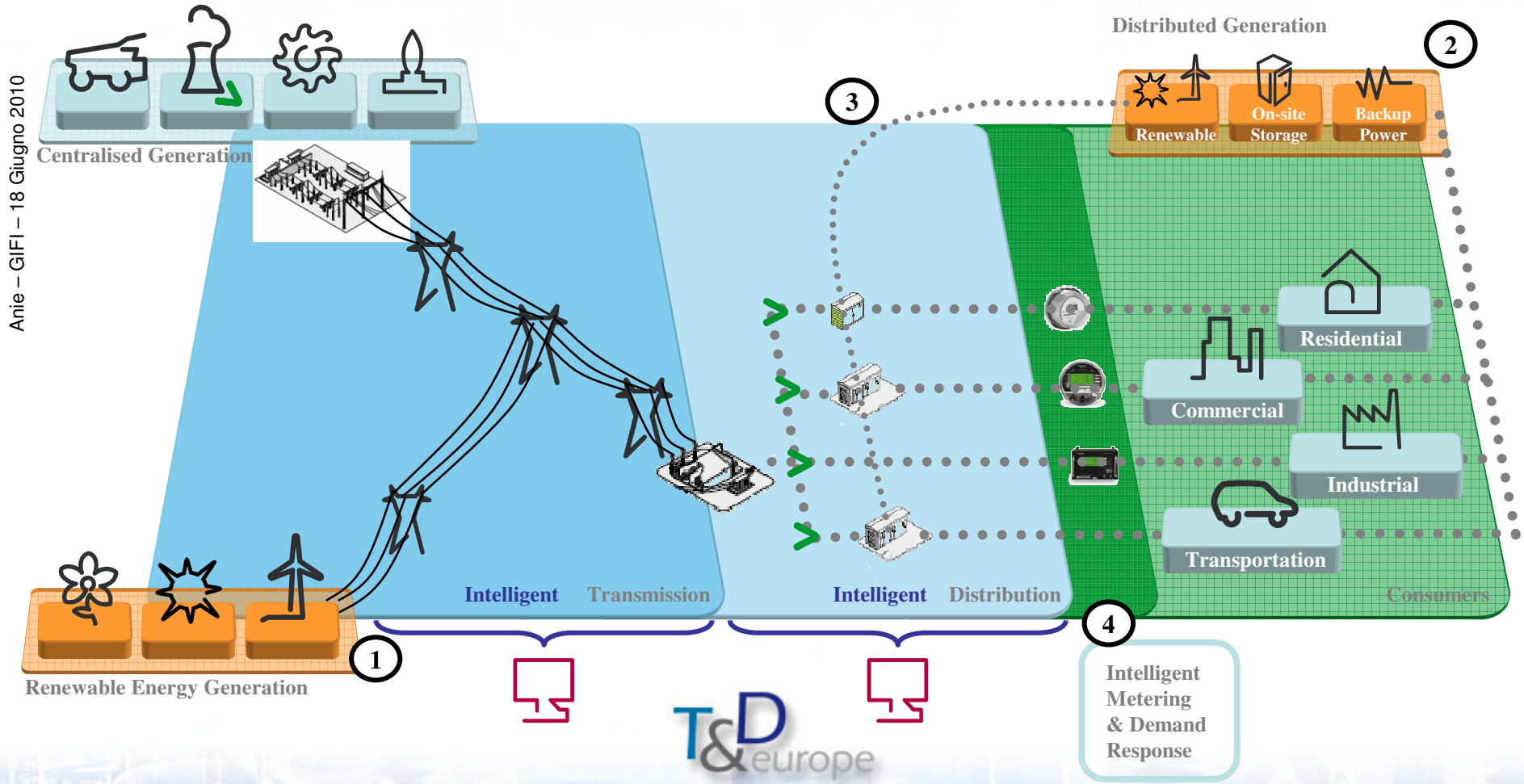
Structure of the Smart Grids



3 forces are needed to enable the future sustainable energy system

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

1 Technology push

- R&D funding for key technologies
- Funding for full-scale demo projects
- Fair risk sharing between suppliers, operators and the public

2 Market pull

- Reliable long-term investment incentives
- Global perspectives for equipment suppliers
- Grow public acceptance & awareness

3 Legal basis and acceptance

- EU and national legislation for geological storage
- Public relations in an open dialogue
- Cooperation of politics, industry, NGOs

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

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the voice that drives consensus

on Transmission & Distribution Technologies