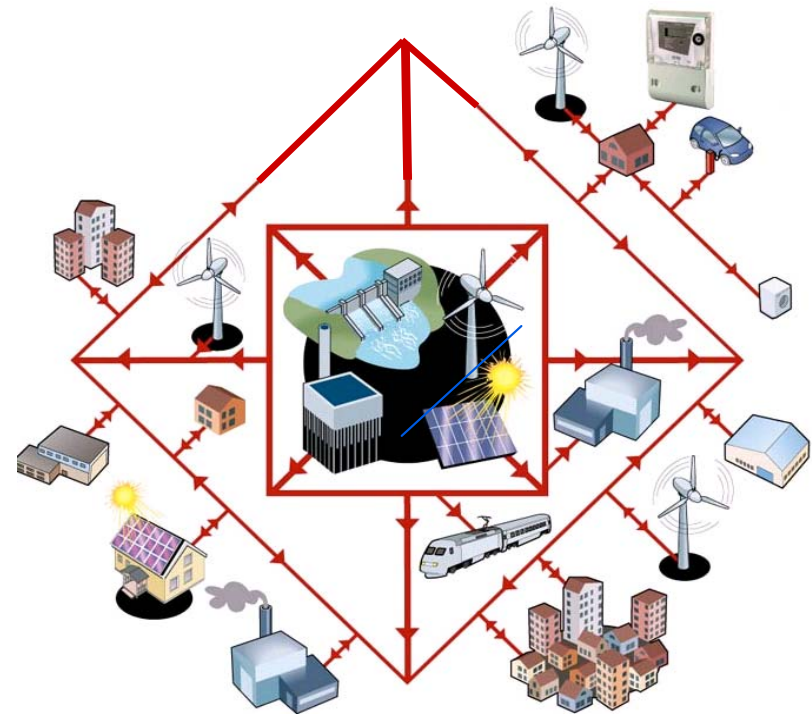
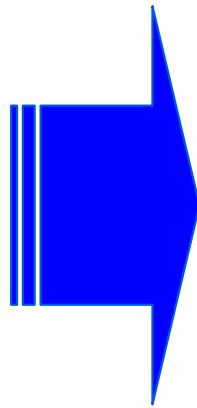
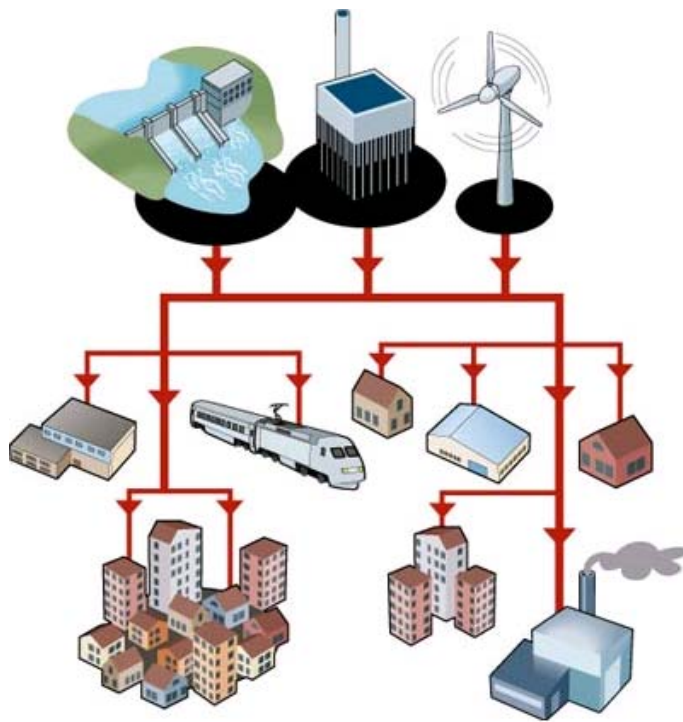




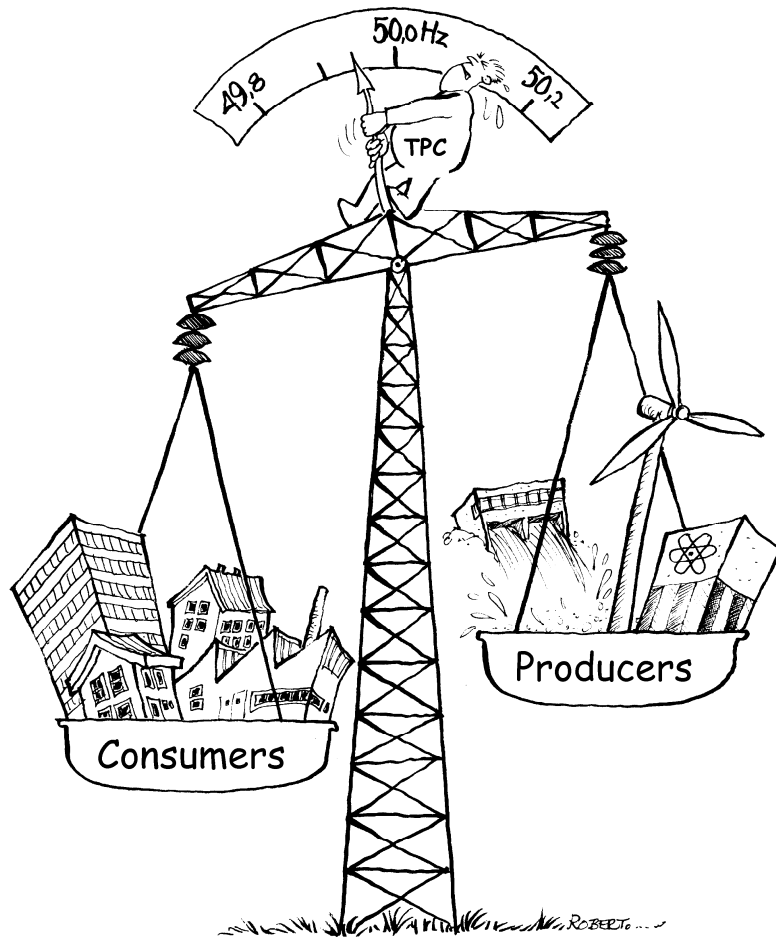
Håkan Johansson, ABB FACTS / SMART GRID - TAIWAN, 2009-04-08

# What do an evolution into a Smart Grid require?

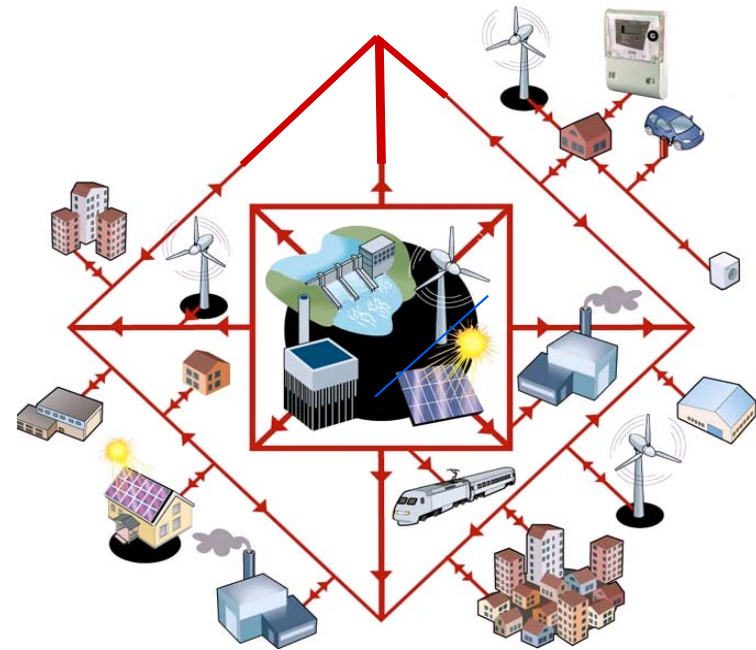
# A system in transition. How will this evolution affect our business?



# What are today's tasks for a grid company?



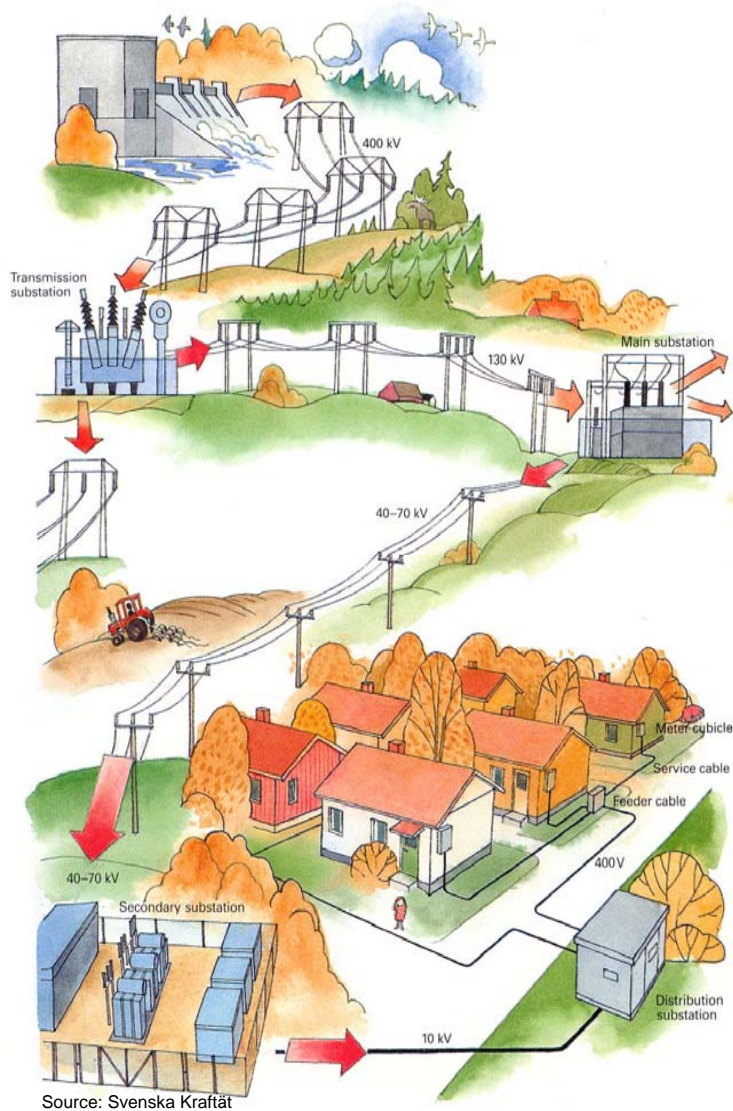
## And tomorrows?



Laws of physics still apply.

Production always equal to consumption

# How and where do we now have to regulate?

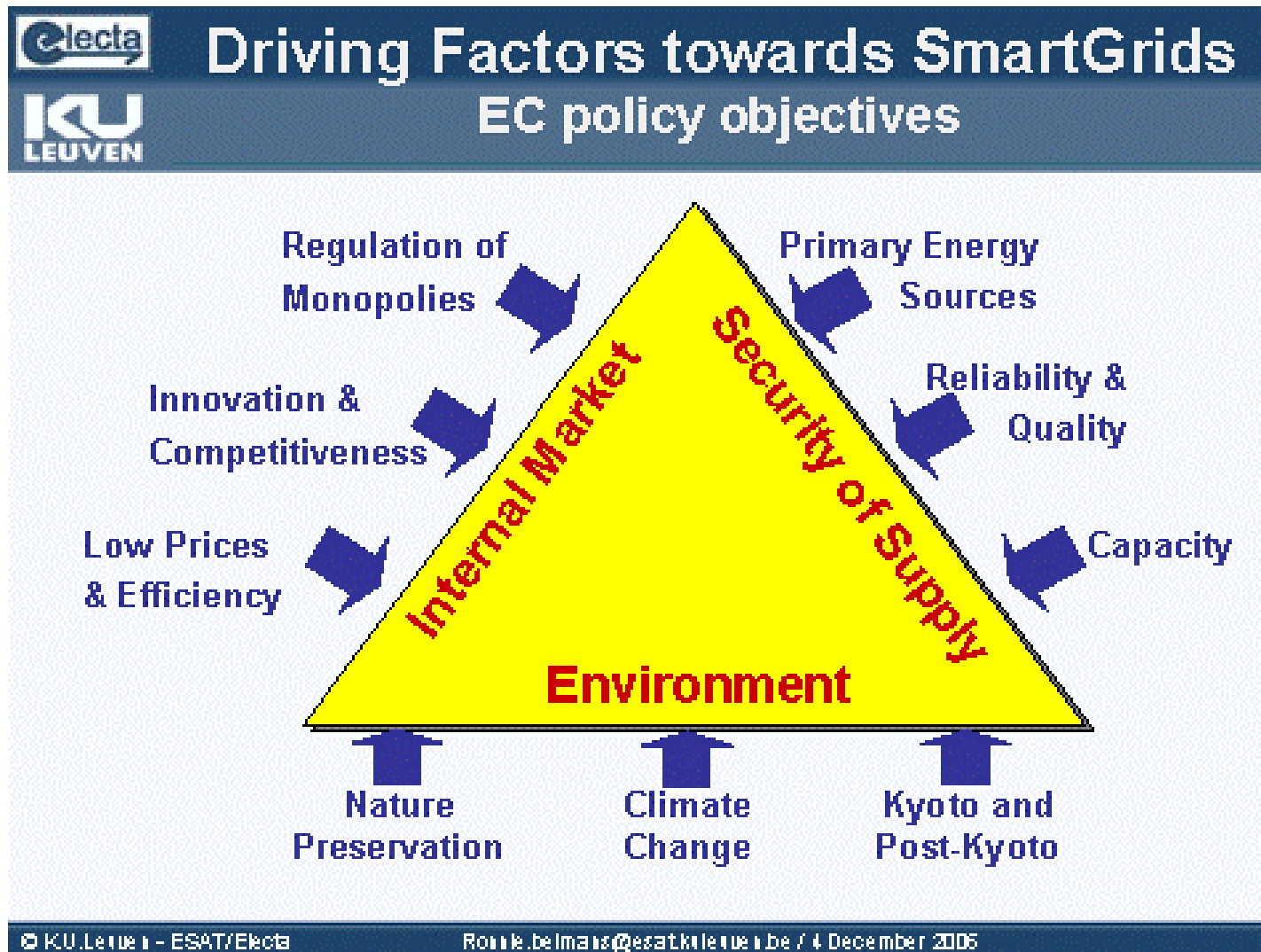


Power regulation in generation

.....or

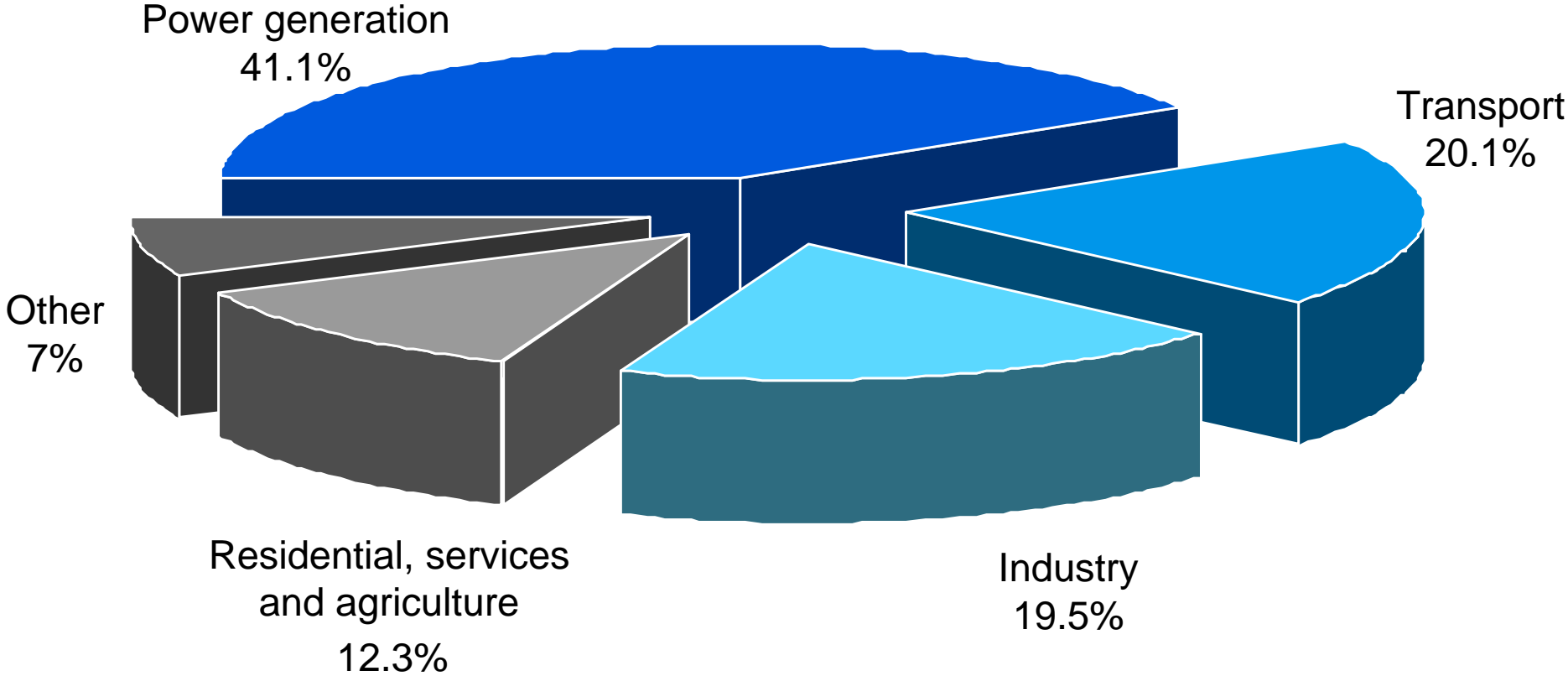
in consumption.

# WW focus never before been so strong and in accord?



# World energy-related CO<sub>2</sub> emissions by sector

Total 2005 emissions: 26.6 million tonnes of CO<sub>2</sub>



Source: International Energy Agency, World Energy Outlook 2007



## The opening of the electricity markets...

- Has increased the complexity of the operation of power systems:
  - New players have appeared: (Regulators, TSOs, IPPs, PXs, traders, Balance responsible...)
  - New services are provided: (Balancing mechanism, ancillary services,...)
- Has induced higher expectations towards the power system: (Transmission capacity on tie lines, more flexibility on system operation...)

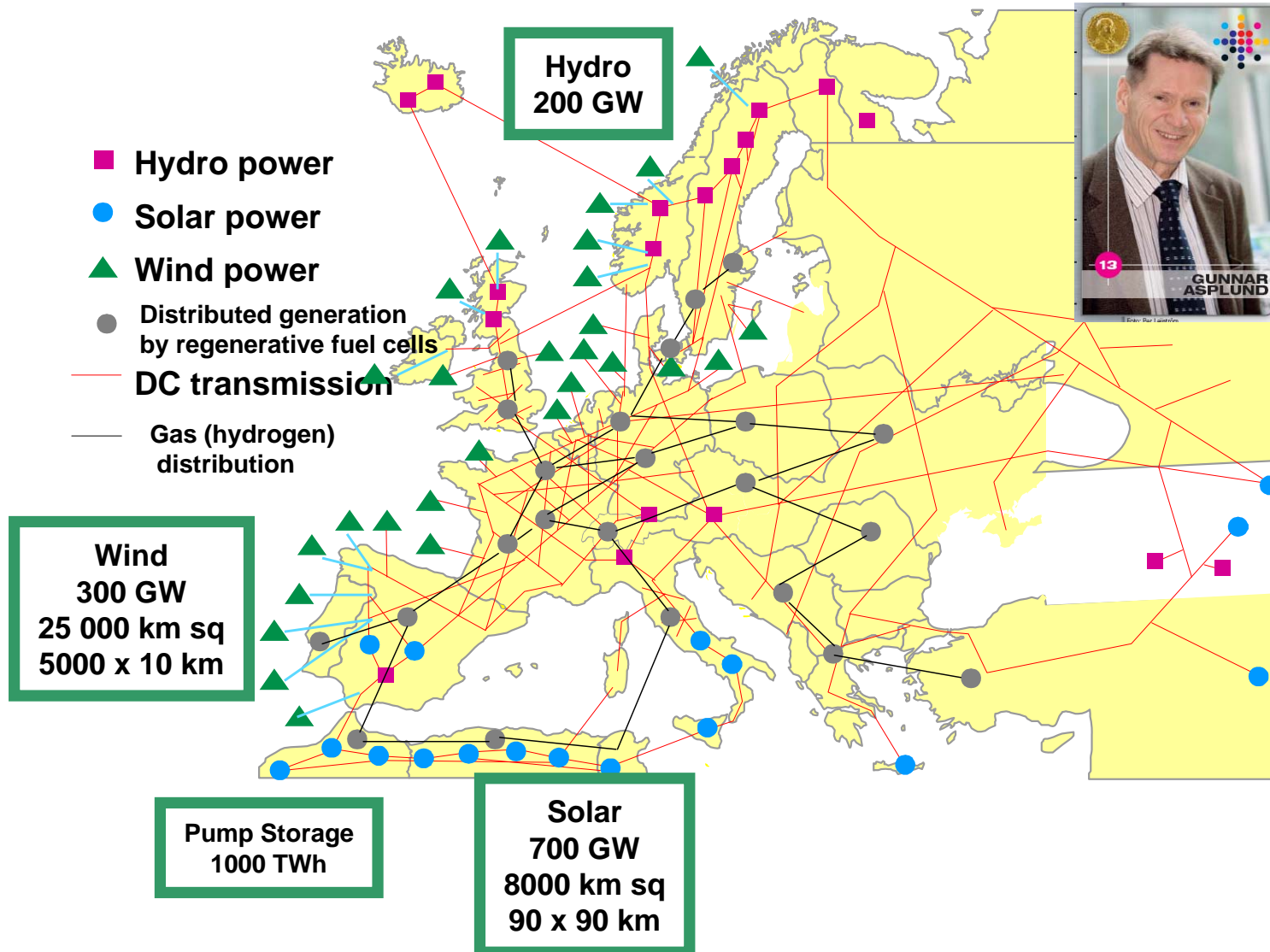
## Other elements have increased the complexity

- Higher public and environmental constraints for the construction of new transmission infrastructures
- The fast growing development of renewable energy sources like wind power
- The market is now at the size of the European interconnected system
- The development of the synchronous system towards new systems

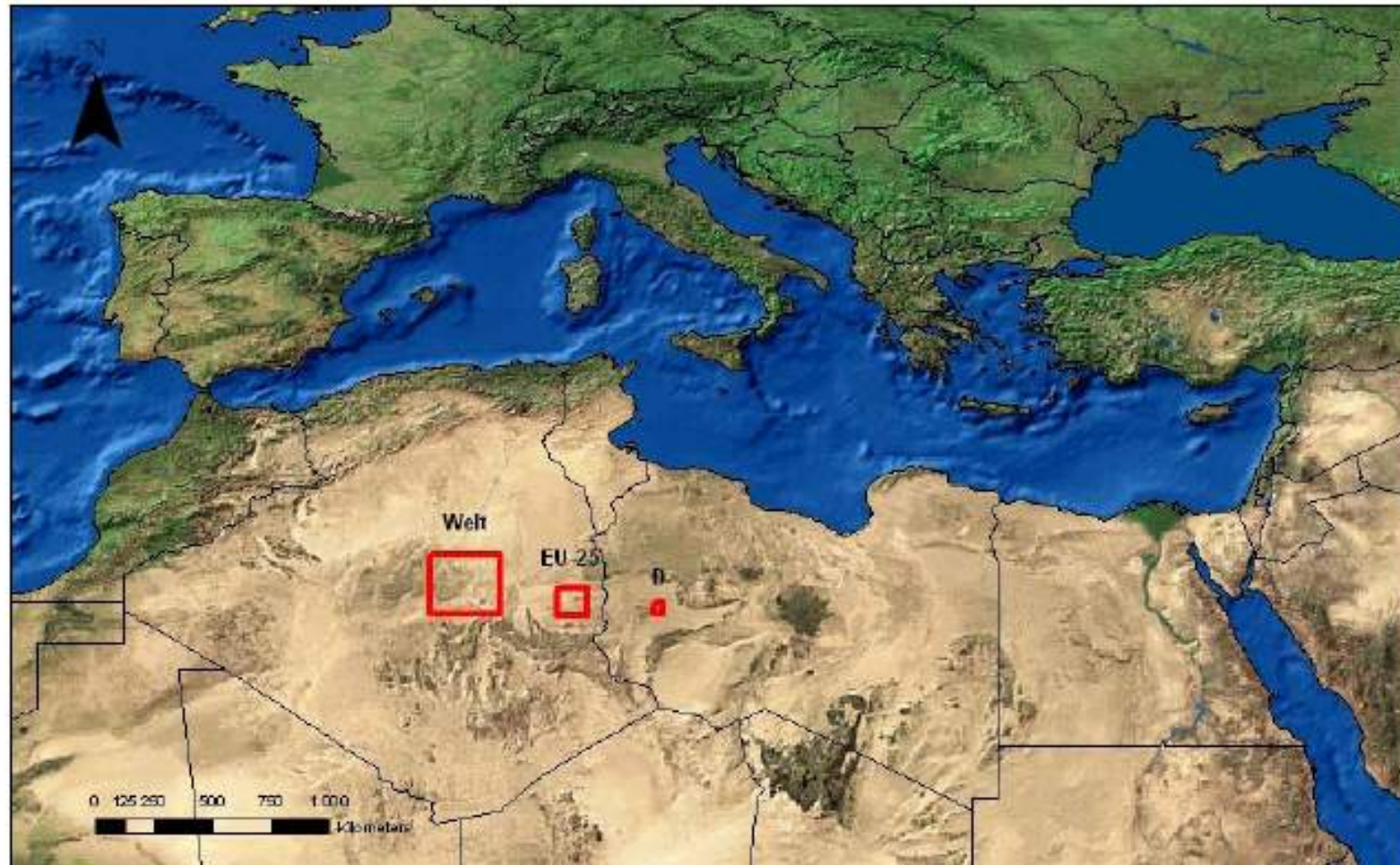
# Europe 20XX Scenario

## Increased need of controllability

99LFC0825



Or, put it like this



**Fig. 12: Theoretical space requirement to meet the electricity demand of the world, Europe (EU-25) and Germany (Data from DLR, 2005).**

# Smart Power Products is needed.



## Key deliverables

- Power technology products for ultra-high, high and medium-voltage applications
  - Transformers: power, distribution, traction, others
  - UHV, HV and MV products, including switchgear
  - Range of power capacitors
  - Distribution automation products, eg, electronic relays
- Power products services
  - Transformer repair, refurbishment, spare parts, maintenance

## Markets served

- Utilities, industries, OEMs, EPCs, distributors

# Power Systems solutions



## Key deliverables

- Electrical, automation, control and instrumentation for power generation
- AC and DC power transmission grid systems for traditional and renewable energy integration (HVDC, FACTS, Cables)
- Turnkey substations (incl. substation automation)
- Network management and market systems
- Power systems services
  - Consulting and system studies
  - Repair, retrofit, refurbishment
  - Software and hardware upgrades
  - Asset management and diagnostics

## Markets served

- Utilities, industry, OEMs, EPCs, channel partners

# Conclusion

- A Smart Grid is an evolution and requires smart systems and components to interact with consumers and markets. Most of them are here already.
- Strong pressure from society on reduced stress on the environment, e.g. emissions. Main driver?
- The opening of the electricity market increases complexity of operation of the power system. At the same time reliability, efficiency and security have to improve.
- Higher constrains for construction of new transmission infrastructure.
- Increased need for controllability.
- Fast growing development of renewable energy sources like wind power.

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for a better world™**

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