

CT-AT Winter School
8 February 2010, Graz

Energy in the European Union

Different structures and joint targets

Stefan P. Schleicher

Wegener Center for Climate and
Global Change at the
University of Graz



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Agenda

- Why our energy systems need a fundamental re-design
- What is the EU strategy for 2020?
- How are the current energy systems of the EU member states?
- How could the energy systems of tomorrow look like?

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Potential milestones of the energy system of the future

A subjective selection

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Innovative mobility

A new generation of electric cars



USA
Tesla Roadster

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The next generation of cars: Multifunctional cars

Aptera Type-1

- 2(+1) Persons
 - **386 kg** (90% Composite)
 - > 190 km
 - < 0,9 l/100 km
- www.aptera.com



Multifunctional
Plug-in operation

The service is sold, not the product
Individual service plans

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Innovative buildings A new generation of buildings



Passive house
standard



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The next generation of buildings: power plants

Plus energy standard

Gutau



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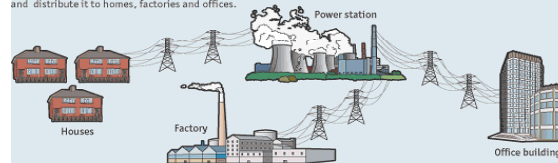
Innovative grid structures Smart Grids und Distributed Generation

Internet structures for heat and electricity

The shape of grids to come?

Conventional electrical grid

Centralised power stations generate electricity and distribute it to homes, factories and offices.

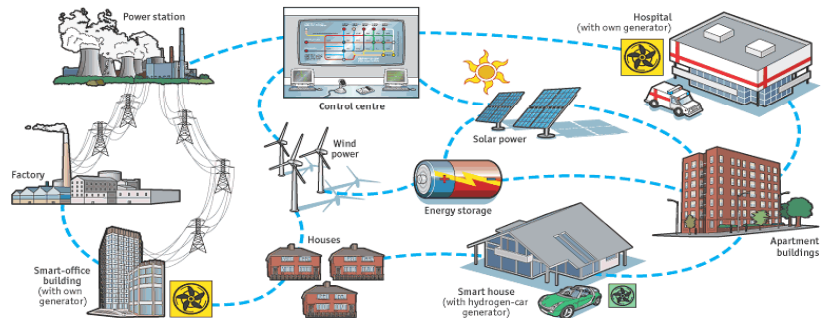


Energy internet

Many small generating facilities, including those based on alternative energy sources such as wind and solar power, are orchestrated using real-time monitoring and control systems.

Offices or hospitals generate their own power and sell the excess back to the grid. Hydrogen-powered cars can act as generators when not in use. Energy-storage technologies smooth out fluctuations in supply from wind and solar power.

Distributing power generation in this way reduces transmission losses, operating costs and the environmental impact of overhead power lines.



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Sources: The Economist; ABB

What motivates this re-design?

The energy crisis and the climate crises

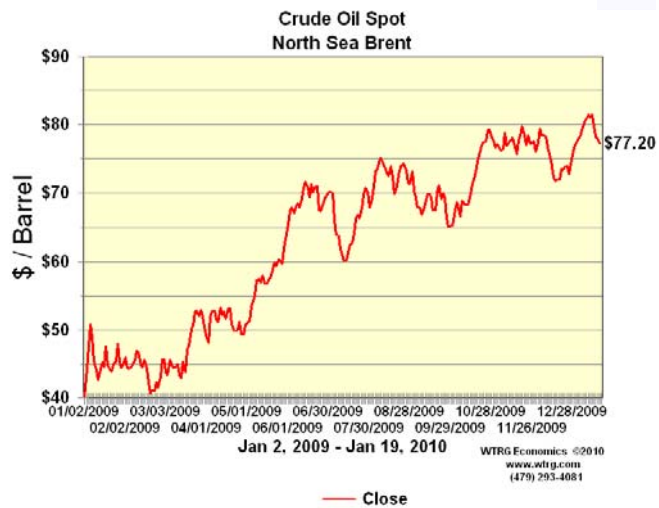
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Problems with oil

- Peak oil
- Volatile but rising prices



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Problems with other fossils

- **Clean coal**
CCS:
Carbon Capture and Storage
- **The fight for gas**
New pipelines
LNG: Liquefied Natural Gas



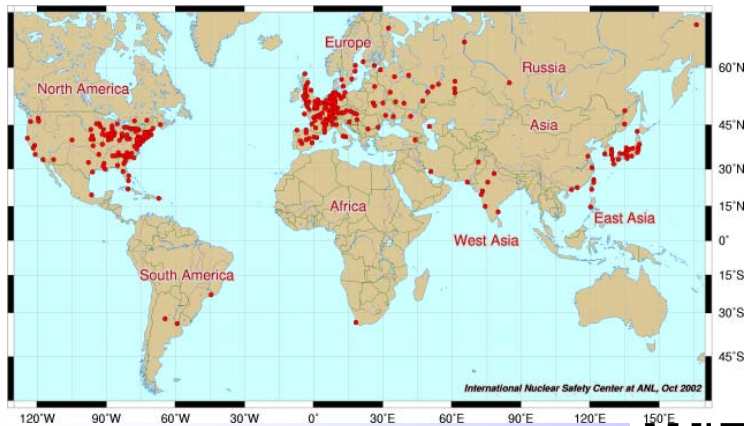
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Problems with nuclear

About 370 installations provide 4 % of global energy demand
This number is declining because of decommissioning

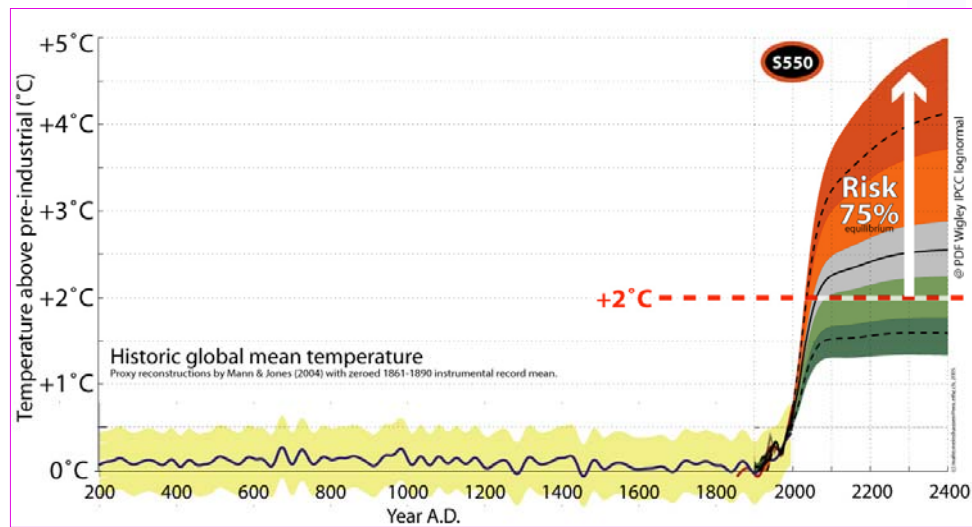


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Problems with climate change Stern Review: The biggest market failure



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The big challenge of the EU

„A new industrial revolution“

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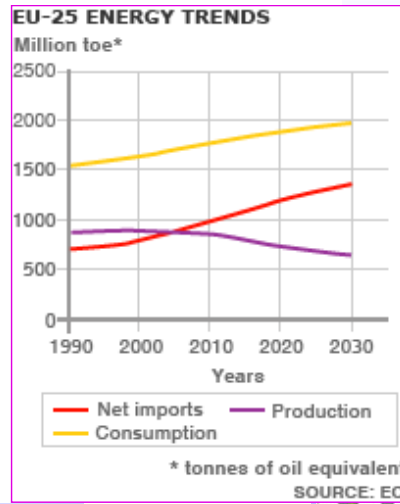
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20 + 20 in 2020

The big bang of EU energy and climate policy

The ambitious targets for 2020

- 20 % less CO₂e over 1990 or 30 % with USA, China, ...
- 20 % Renewables in final energy consumption



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The (new) energy strategies (of the EU)

The vision of a Post-Carbon Society


- **Low energy**
 - Energy autonomous buildings
 - Deci litre cars
- **Low carbon**
 - Fuel switch to renewables
- **Low distance**
 - Local availability



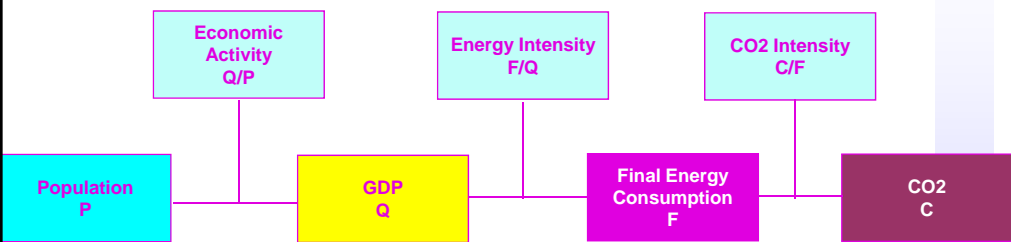
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The current energy systems
Structural differences of EU Memberstates


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Structural model of the energy sector (1)
Demand side



$$F = (F/Q) * (Q/P) * P$$

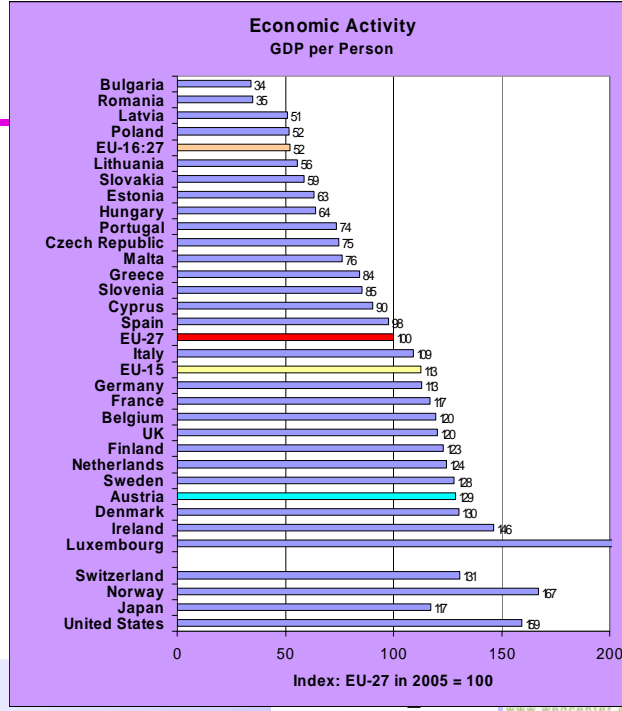
$$C = (C/F) * F$$

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Structural Indicator Economic Activity

GDP per Person

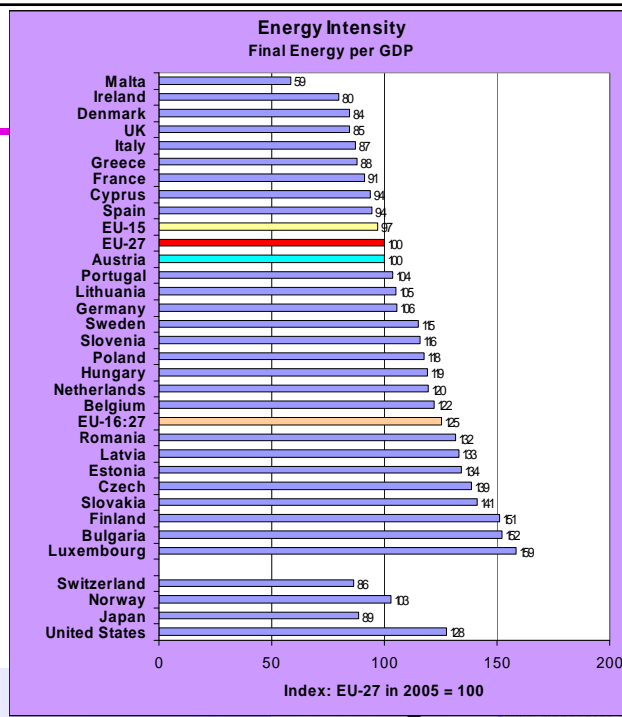
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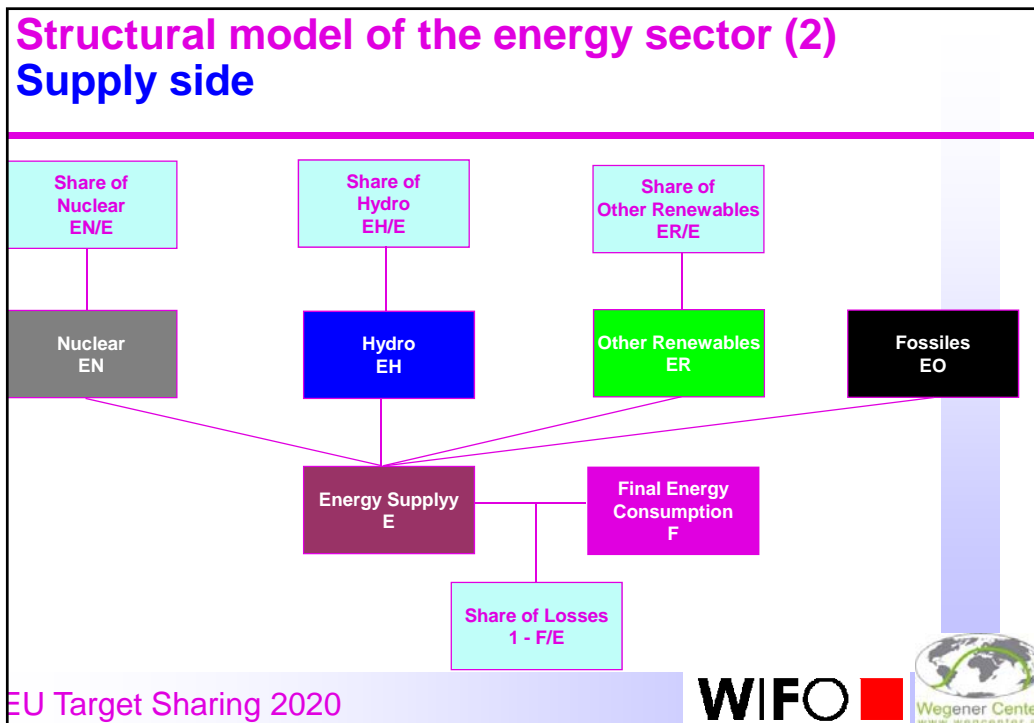
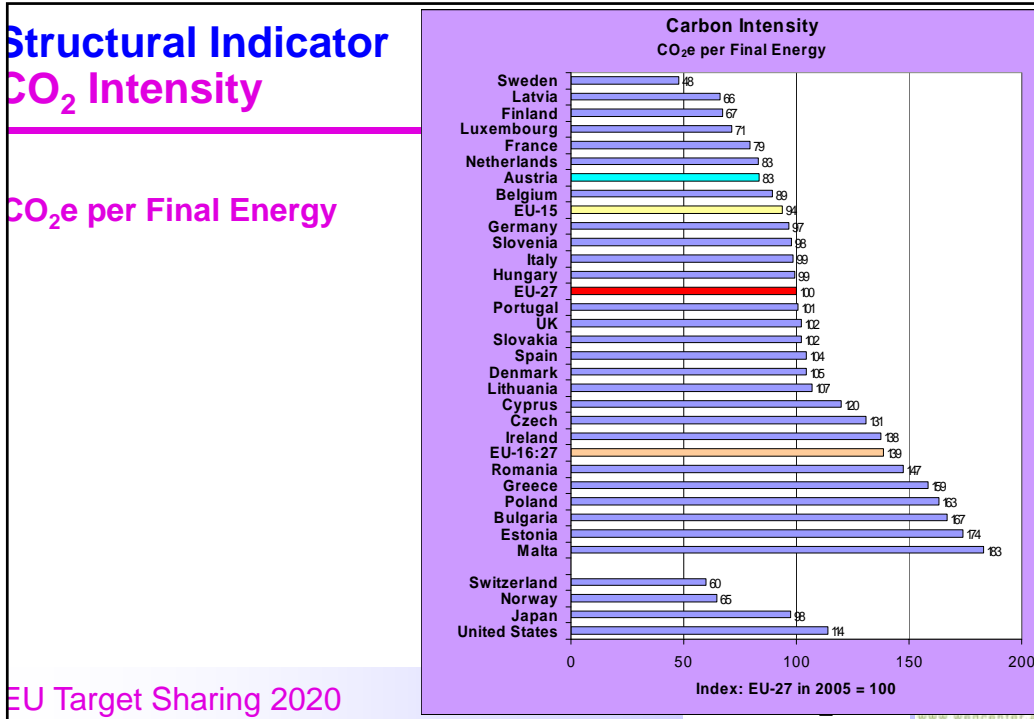


Structural Indicator Energy Intensity

Final Energy per GDP

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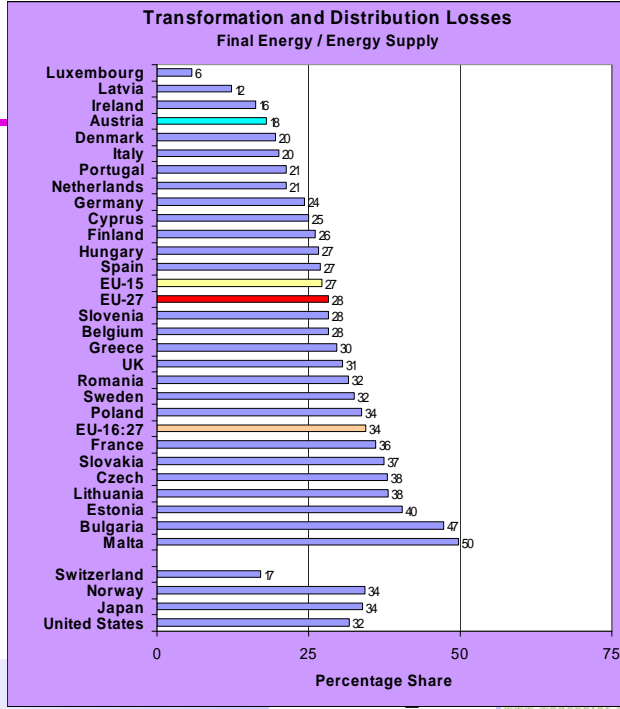




Structural Indicator Share Losses

100 –
(Final Energy) /
(Energy Supply)
100

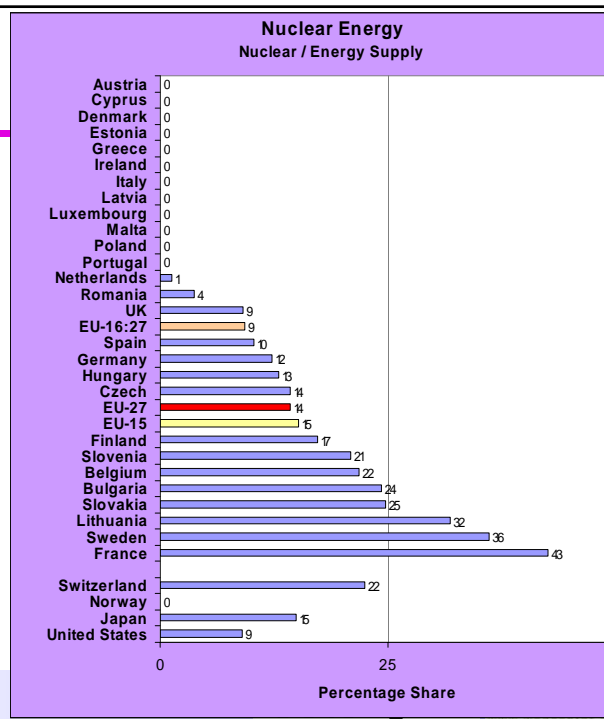
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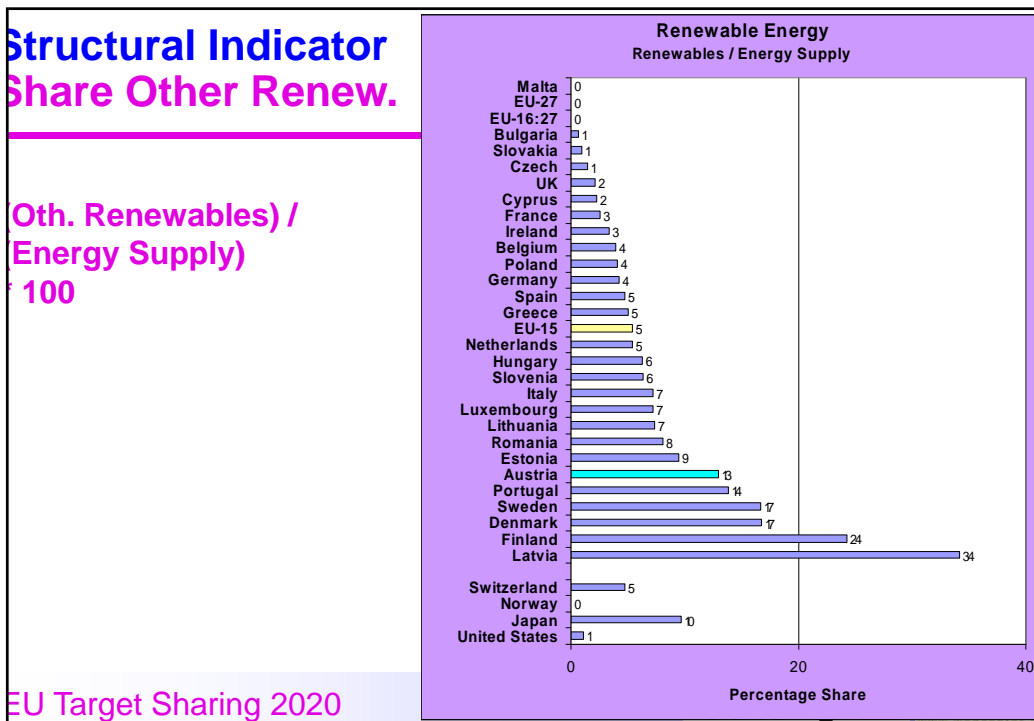
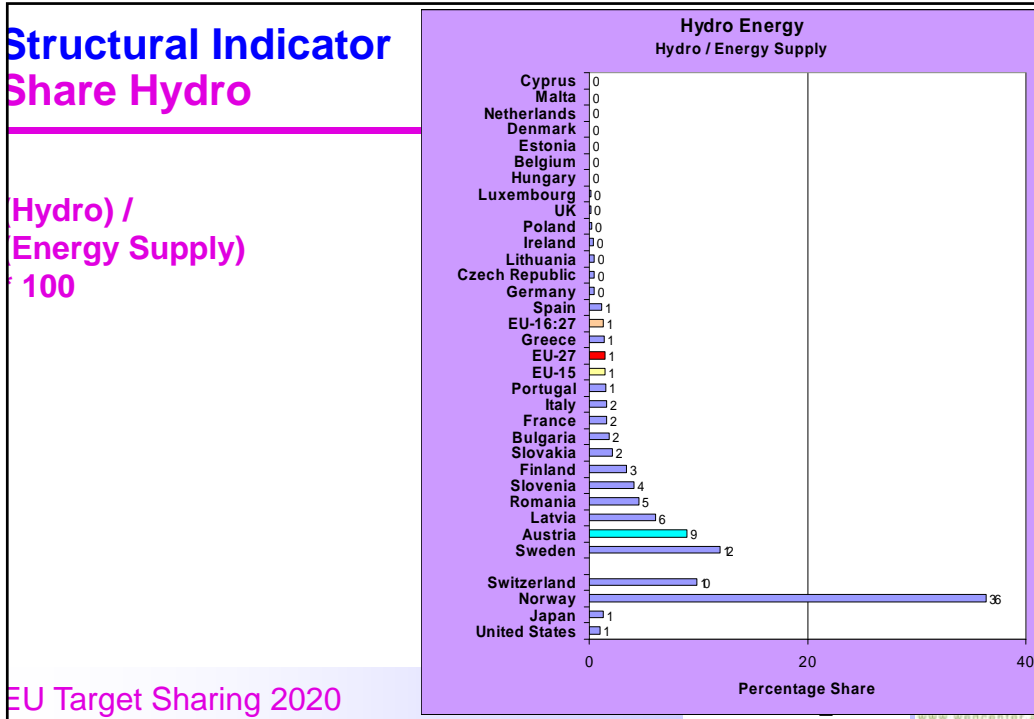


Structural Indicator Share Nuclear

(Nuclear) /
(Energy Supply)
100

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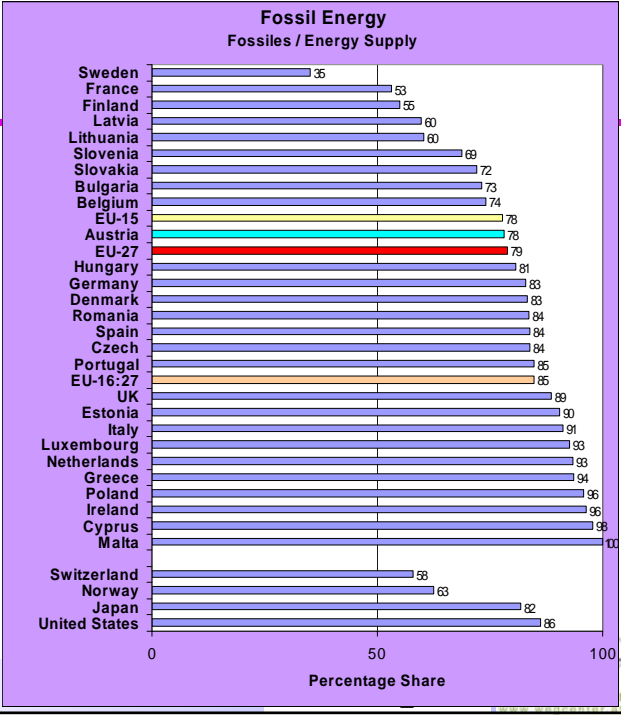




Structural Indicator
Share Fossile

Fossils) /
Energy Supply)
100

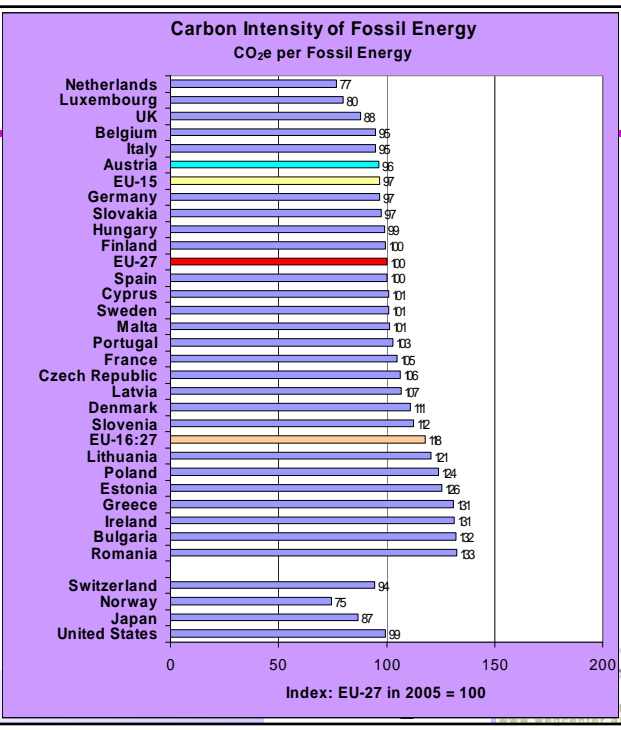
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Structural Indicator
CO₂ Intensity Fossils

CO₂) / (Fossils)

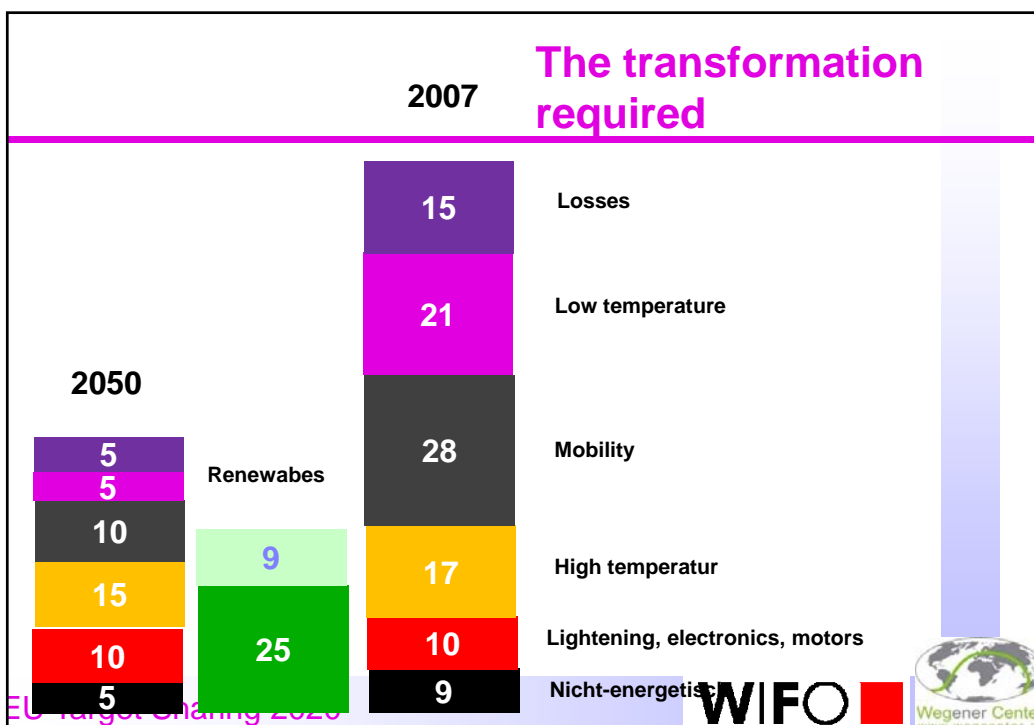
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The next steps
Implementation of the re-design

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Strategy 1: Buildings

- **Renovation program for existing buildings**
 - **Factor 4 technologies: Low energy standard**
- **Quantum leap for new buildings**
 - **Factor 10 technologies: Passive house standards**
- **Looking ahead**
 - **Plus-energy buildings**



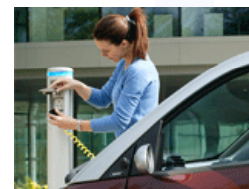
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Strategy 2: Mobility

- **Integration of all modes of mobility**
 - **Better zoning regulations**
 - **Better links between all modes**
- **Switching to full electric cars**
 - **The example of London**



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Strategy 3: Energy supply

■ High-efficient cogeneration

- Small scales

■ Solar strategies

- Solar heat
- Solar electricity
- Wind and hydro

■ Biomass strategies

- Wood and agricultural sources
- Waste
- Gasification technologies



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Thank You.



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