Energy in Denmark
- from 99% imports of fossil fuels to 100% Renewable Energy

Lars Georg Jensen
Chief Adviser, International Affairs,
Danish Energy Agency, Ministry of Climate, Energy & Building
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Denmark 39 Years ago

- 1973-74 oil crisis: 2 countries were 99% dependent of imported energy: Japan + Denmark
- Severe economic crisis, unemployment - and no driving on Sundays...

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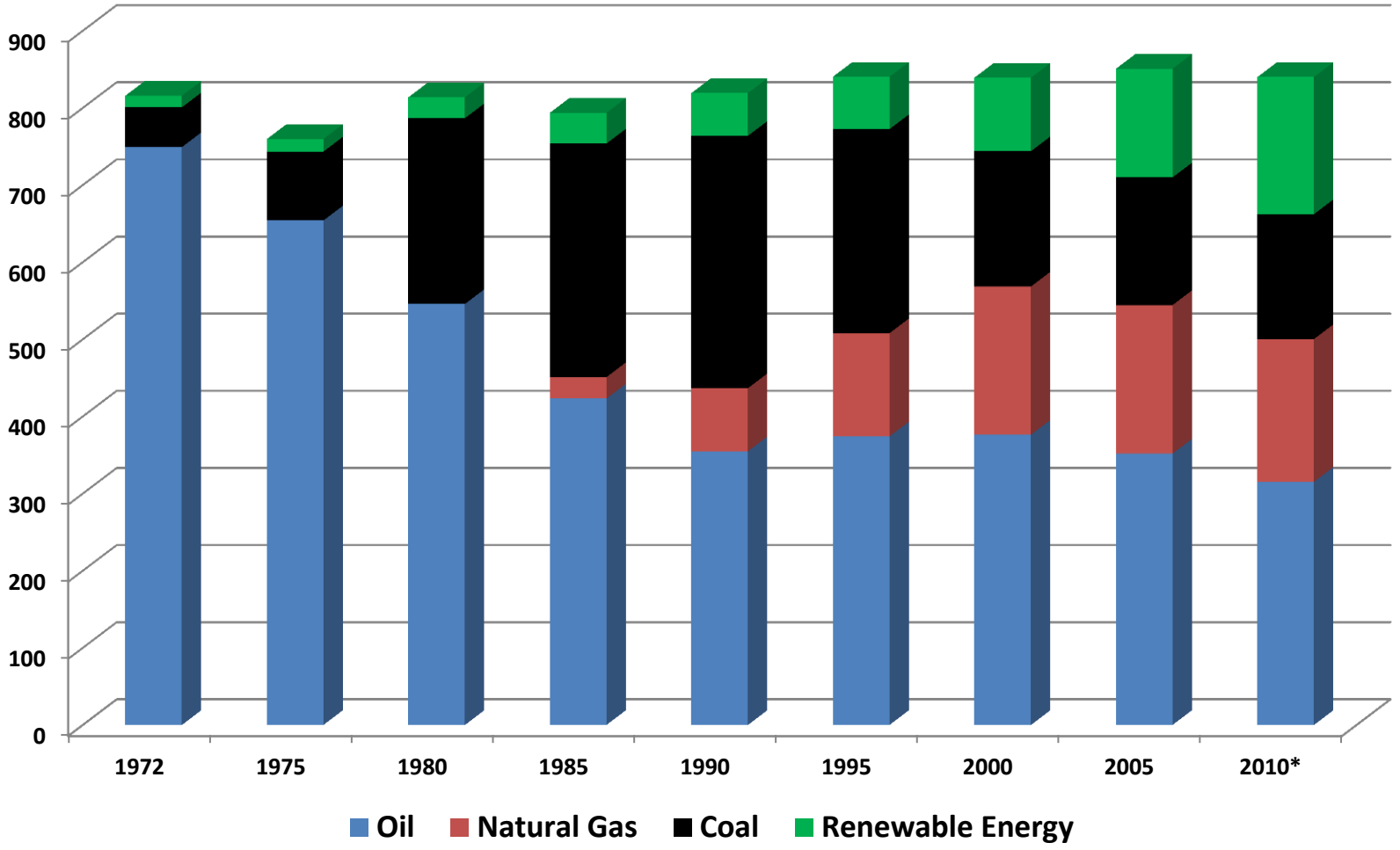
Since then - responding to the crisis in 1973, Denmark today has:

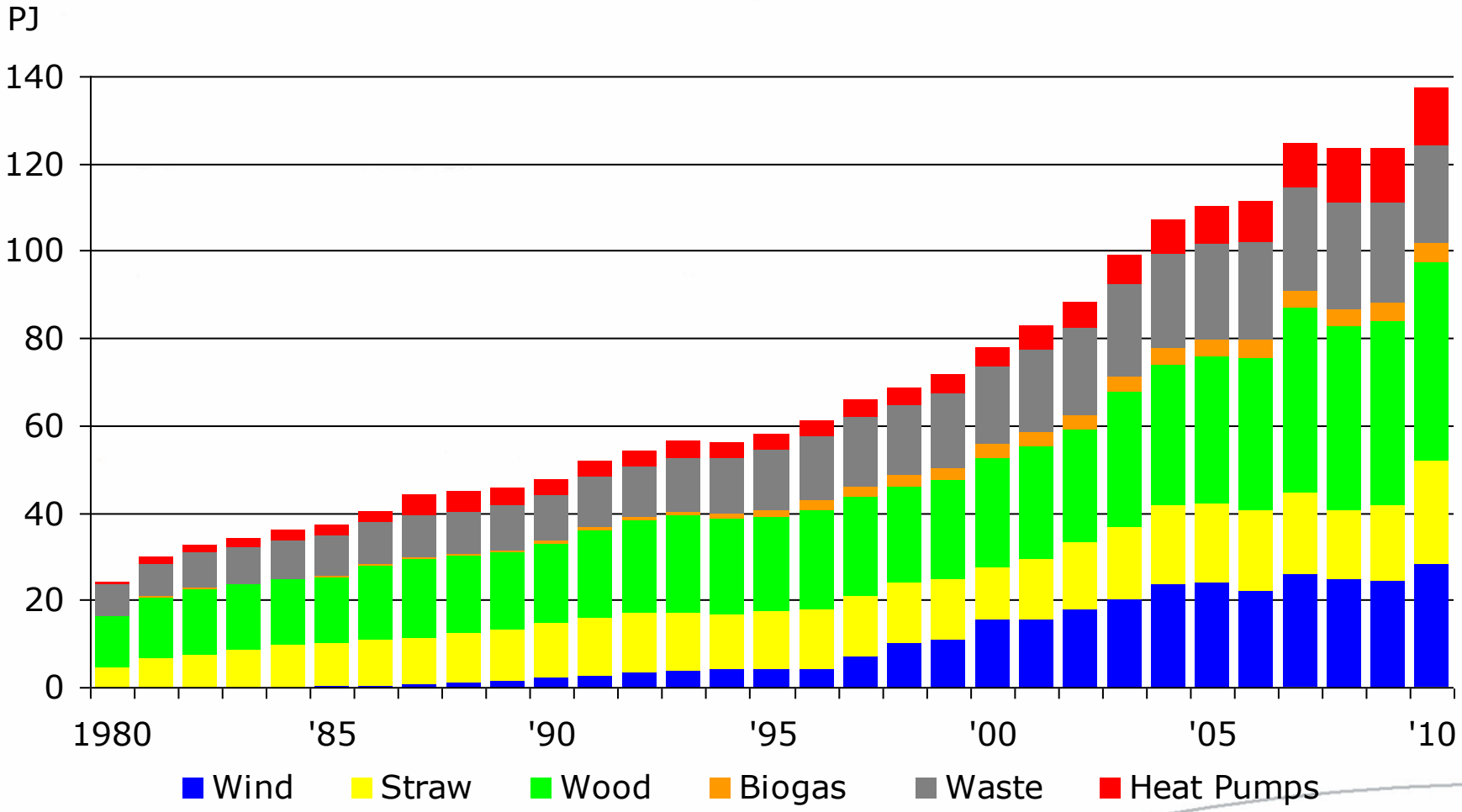
- Lowest energy consumption per GDP-unit in EU
- Highest contribution to electricity from new renewables (non-hydro RE) in the world (33%)
- Most efficient clean coal technology world wide (CHP)
- Highest export rate of energy technology in OECD – wind, energy efficiency (Vestas, Danfoss, Grundfos, Rockwool, etc.).

Gross Energy Consumption in Denmark 1972-2010 – from oil to a mix of fuels



Production of Renewable Energy

1980-2010 – a mix of sources



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Why? Four key drivers of global – and Danish - energy policy

- **Energy *security***: people & societies getting the *amount* of energy they need *when* they need it;
- **Economic development**: energy provided at a *price* which enables economic growth & welfare (and elimination of energy poverty).
- **Environmental priorities**: tackling climate change and local pollution.
- **Energy *safety***: providing energy in a manner consistent with safety for people and societies.

Some global energy trends and uncertainties driving us

- The era of cheap oil is over;
- Are we facing a golden age of Natural Gas? Many uncertainties about price, delivery, environmental impacts, etc.
- Will coal still be abundant and cheap? China's *incremental* demand in two years equals the size of TOTAL EU coal use. And climate change?
- Uncertainty about nuclear power – safety - and what about the price?
- Demand for energy is rising fast in emerging economies – and are still high in OECD.

Four good reasons why some countries are taking steps to move beyond fossil fuels:

- The economy. Renewable energy is not cheap, but nor is continuing with fossil fuels and nuclear. Huge investments are required in any case – we can decide what to invest in!
- Predictability! Creating predictable prices for businesses and consumers.
- Political independence (>$100/barrel is ”the largest transfer of wealth in human history”.)
- The environment – we are heading for 3.5 – 6 degrees C global temperature increase…

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The Danish Governments vision for the future energy mix in Denmark

- **100% Renewable Energy by 2050**

- **100% of RE in electricity and heating by 2035.**

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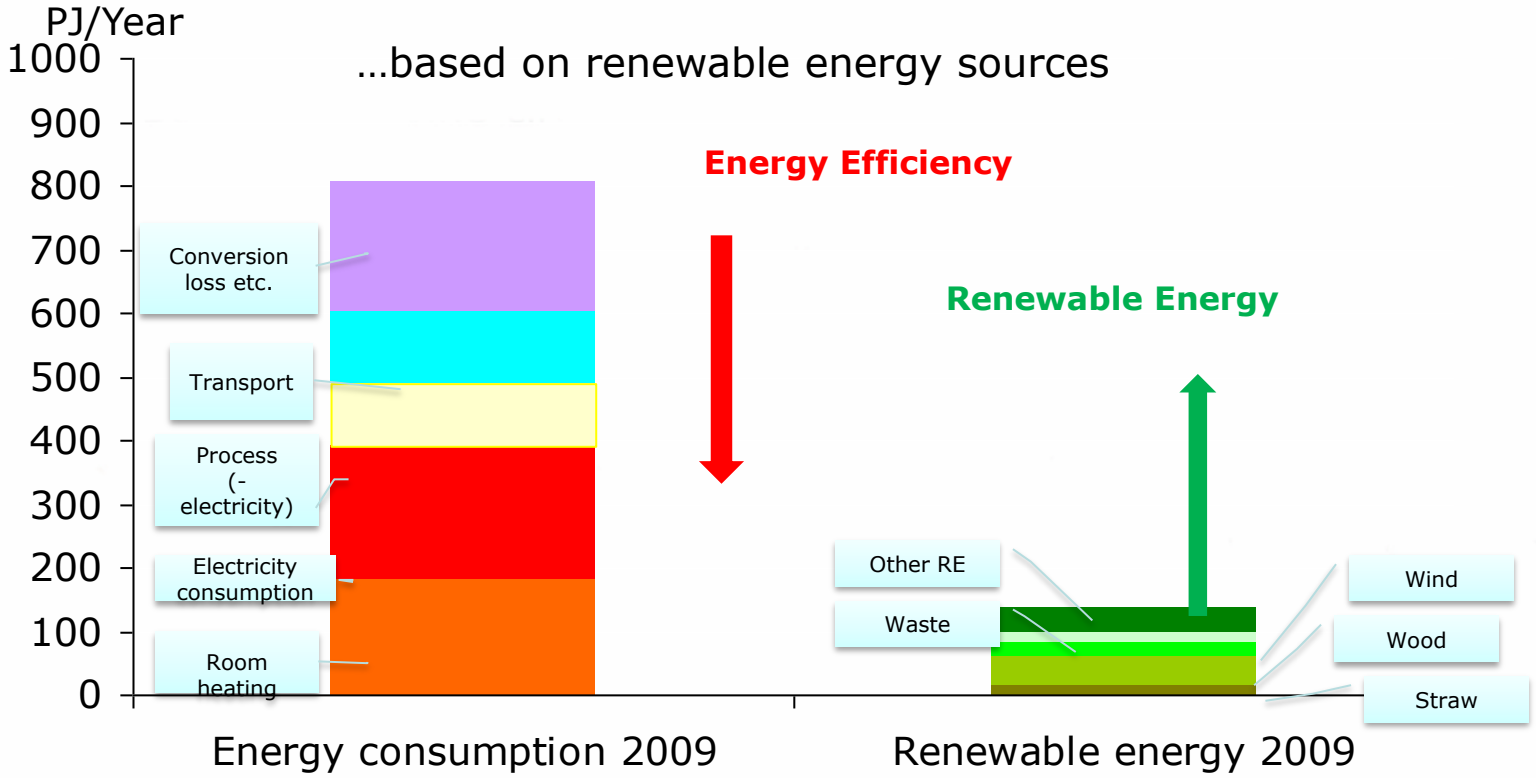
What's the trick: 100% RE in 2050

…by improving energy efficiency

…in order for more energy services to be satisfied with less energy

…based on renewable energy sources



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Key elements for a 100% Renewable Energy society in Denmark

- Electricity as main energy carrier.
- Wind and biomass are main sources.
- Strong interconnections to neighbours – domestically and abroad (Germany, Sweden, Norway)
- High share of Combined Heat and Power and district heating systems.
- System, system, system.

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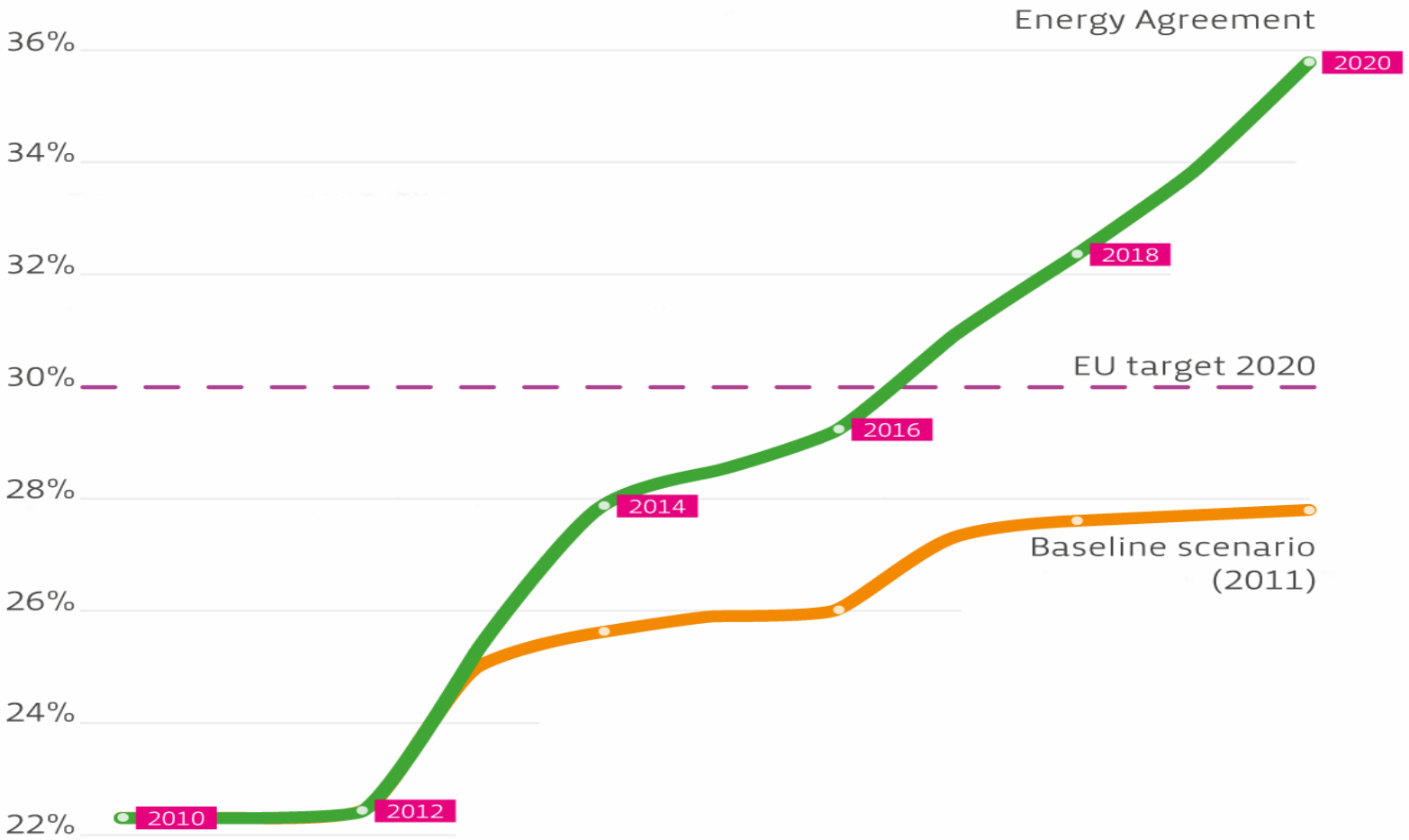
Policy Target for Renewable Energy for 2020



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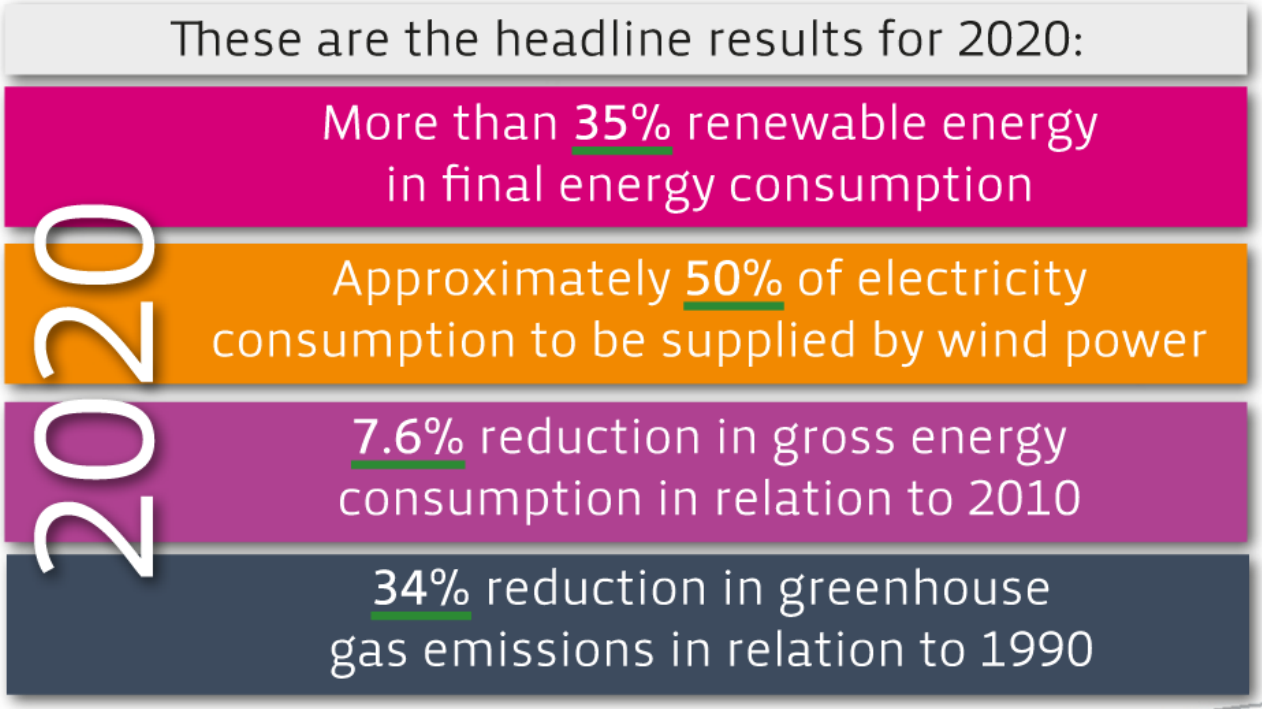
New Policy Targets and Costs

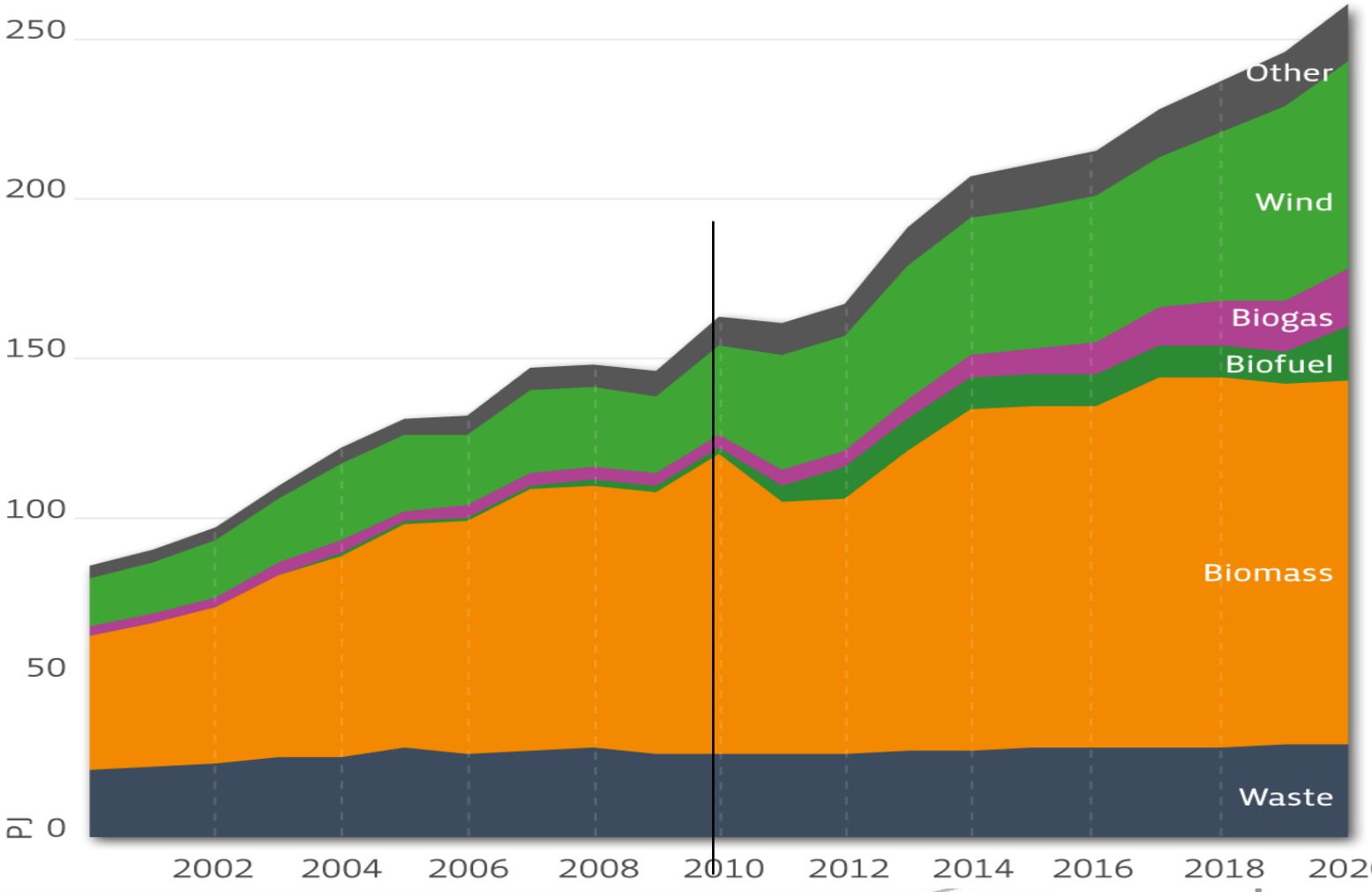
Additional costs are borne by consumers, not state subsidies:

- an average household: 175 € in 2020
- private companies: Average 32 € per employee in 2020



Energy Agreement of March 2012

New Energy Strategy (March 2012): Renewable Energy's contribution to Gross Energy Consumption



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Key Policy Strategy in Denmark

- **Long term strategy** and based on broad political agreement in the Parliament.
- **Cost-effective subsidy schemes** with evaluation on a regular basis, avoiding over-subsidising
- **Energy taxes on fossil fuels** makes RE and business more efficient & competitive.
- A suitable legislative and **planning framework** creating predictability.
- A combination of a strong **state and the market**!

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Conclusions :
- The transition to independence of fossil fuels is:

- Challenging
  - Amounts to no less than a structural shift in the economy
  - The necessary investments are considerable.
  - There are several roads to take, but also ”safe bets”

- Affordable.
  - For the economy as a whole the transition is expected to have limited negative impact, if any
  - For individual companies the transition will create winners as well as losers

- Technically feasible
  - Alternatives to fossil fuels are available and can deliver on a large scale
  - Alternatives to fossil fuels need supportive policy frameworks to be competitive in the short run

And presents new business opportunities

- politically created demand for wind power, biomass and bio fuels, building components,
- incentives for profitable energy renovations in industry and other business sectors
- first mover advantages for cleantech companies

What is a Wind Turbine?

Horns Rev Offshore Wind Park (2002)

80 x 2 MW turbines at water depths 5 – 15 meters. Production 600 GWh/year equals the electricity consumption of 150.000 households.

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Thank you!

More information:

http://www.ens.dk

http://www.kebmin.dk

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