



# Denmark's Low Carbon Energy Solution to Climate Change: Policies, Means and Costs

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# Denmark 35 Years Ago – and Today

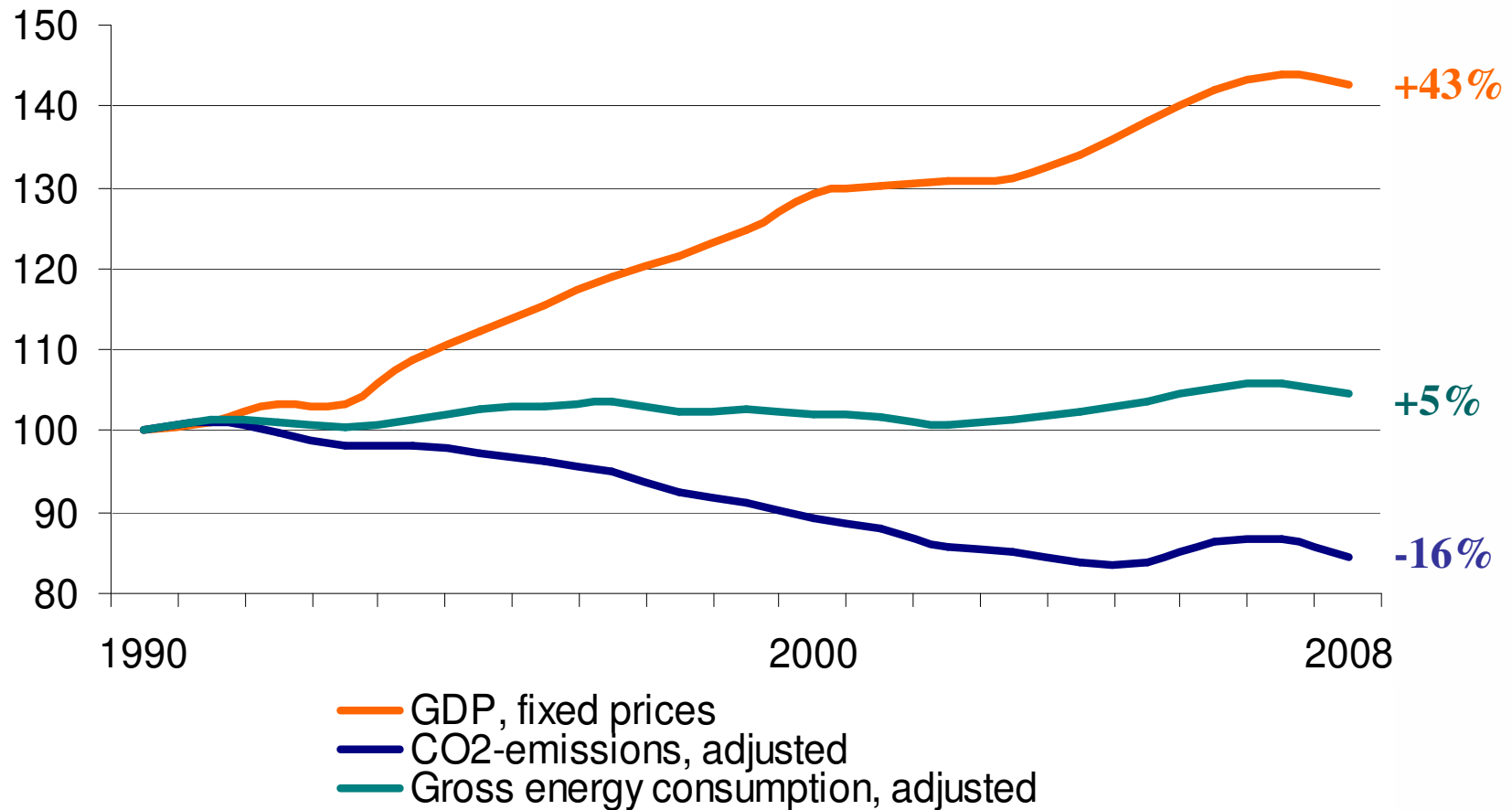
- 1973-74 oil crisis: 2 countries were 99% dependent on imported energy: Japan + Denmark
- Severe economic crisis and unemployment.



- Lowest energy consumption per GDP-unit in EU
- Highest contribution to electricity from new renewables (non-hydro RE) in the world
- Most efficient clean coal technology world wide
- Highest export rate of energy technology in OECD

Danish Kyoto Obligation: CO<sub>2</sub> reduced by 21 pct. from 1990 to 2008-12 = Worlds most ambitious target for CO<sub>2</sub> reduction

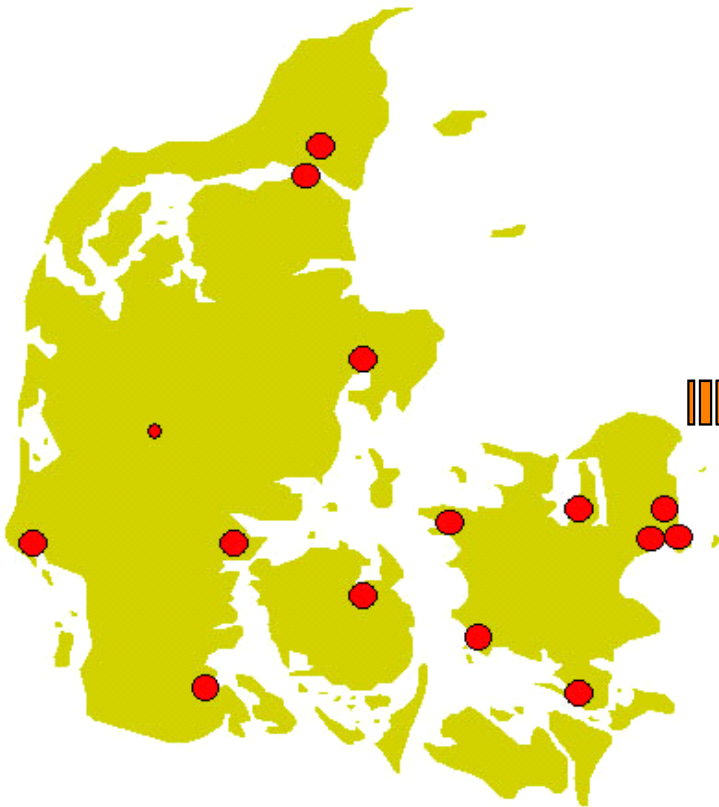
# De-linking Economic Growth and Energy Consumption: 1990-2008



3 reasons: 1) CHP/DH, 2) Renewable Energy, 3) Energy Savings

# From Centralized to Decentralized CHP

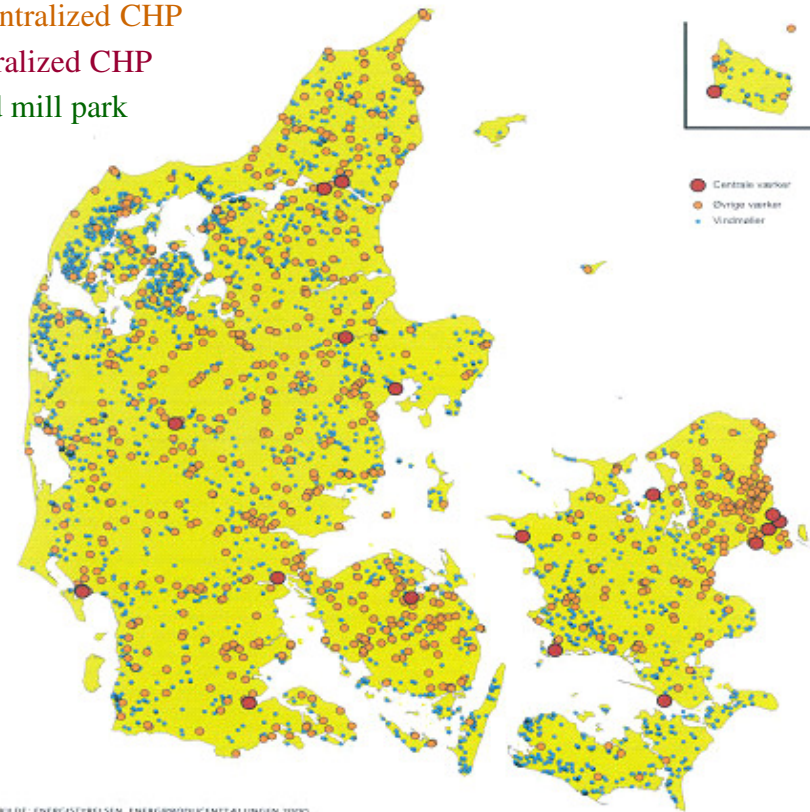
Centralized production in the mid 80's



Decentralized production of today

Legend:

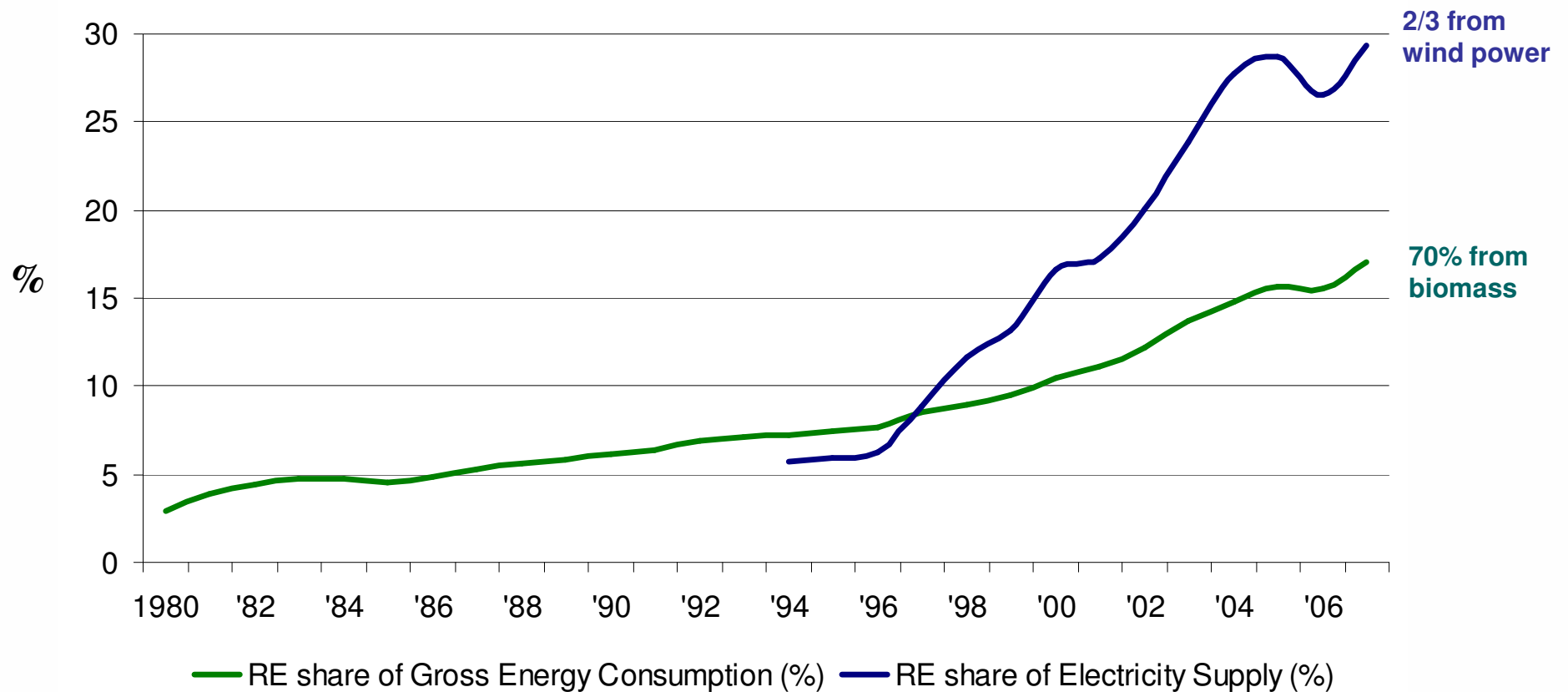
- Decentralized CHP
- Centralized CHP
- Wind mill park



KILDE: ENERGISTYRELSEN, ENERGIPRODUKTANTALLINGEN 2000, VINDMØLLEKØRDKVATER, KORT 4. MATRIKELSTYRELSEN 2001

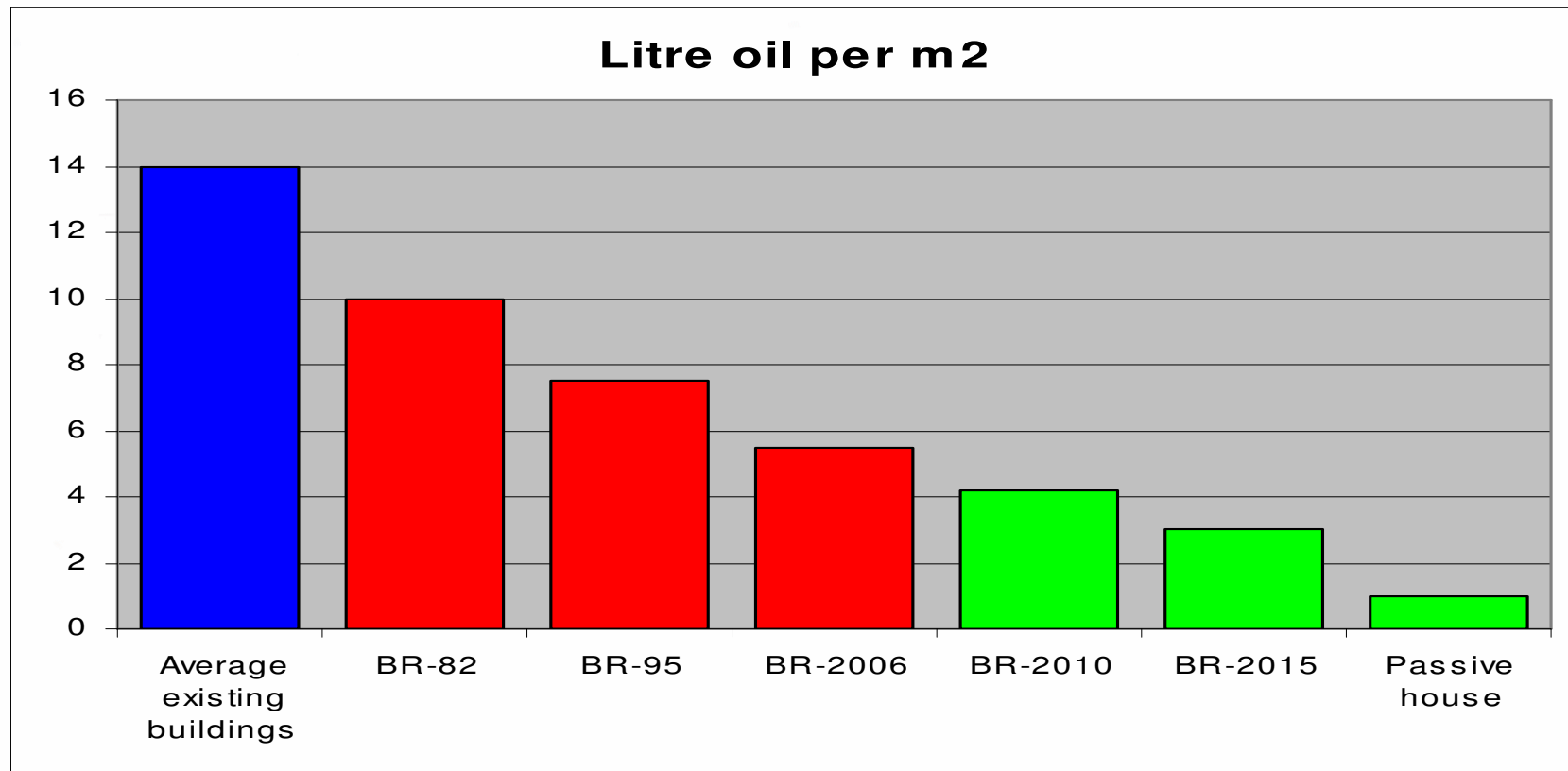
District heating and CHP have reduced Denmark's CO<sub>2</sub>-emission by 1/5.

# Renewable Energy in Denmark



- Highest contribution to electricity from **new** renewables in the World
- Total costs for el-consumers in 2007: +1.2 US-cent/kWh (excl. VAT)

# Energy Savings: Building Codes

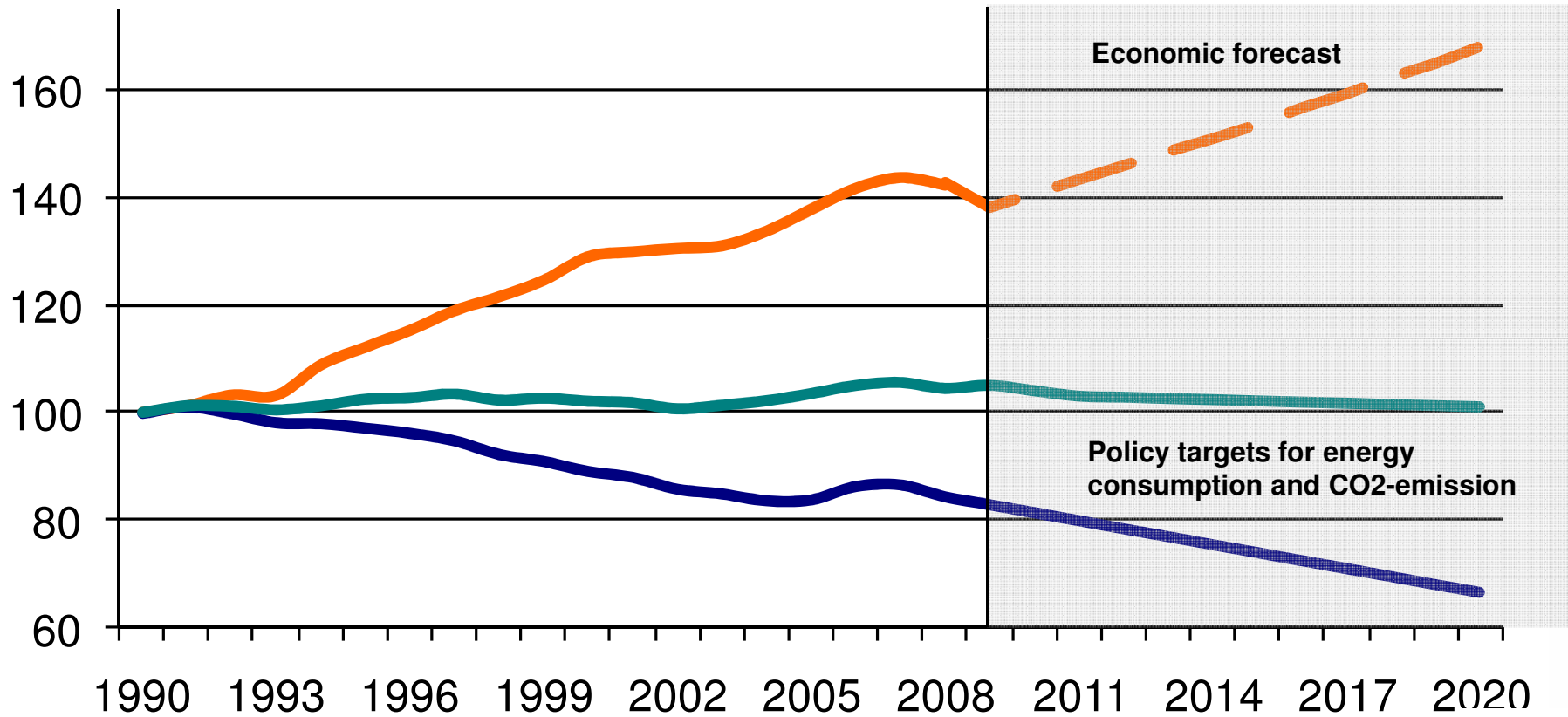


- Reduce energy demand with 25-30 % from 2000.
- The codes will be tighten again in 2010 and 2015.

# Key Policy Strategy in Denmark

- **Long term strategy** and stable energy policies based on broad political alliances in the Parliament.
- **Cost-effective support schemes** from the start ensures sound development. Evaluate subsidy schemes on a regular basis, avoid over-subsidiation.
- **Energy taxes on fossil fuels** makes RE more competitive and provides finance for RE subsidies.
- A suitable legislative and **planning framework** - supporting the local initiative by local shareholding, master plan for selection of off-shore sites, cost sharing of grid extension = **Confidence building measures**.
- A pro-active and **efficient state** is a precondition!

# De-linking Economic Growth and Energy Consumption: 1990-2020



— GDP, fixed prices — CO2-emissions, adjusted — Gross energy consumption, adjusted

# Costs of CO<sub>2</sub>/GHG Reduction (2005-20)

## Three targets for Denmark

1. RE-share of final energy consumption increased from 17 pct. to 30 pct.
2. CO<sub>2</sub> in quota sectors reduced by 21 pct. (ETS)
3. GHG in non-quota sectors reduced by 20 pct.



TOTAL COSTS per year when fully implemented  
= 220 to 400 US\$ per Dane (at today's prices)  
= Less than 1/2 pct. of Denmark's GDP  
(real figure lower due to saved fossil fuel costs)

# WWW.ENS.DK

## Facts and figures

- Find the data you need

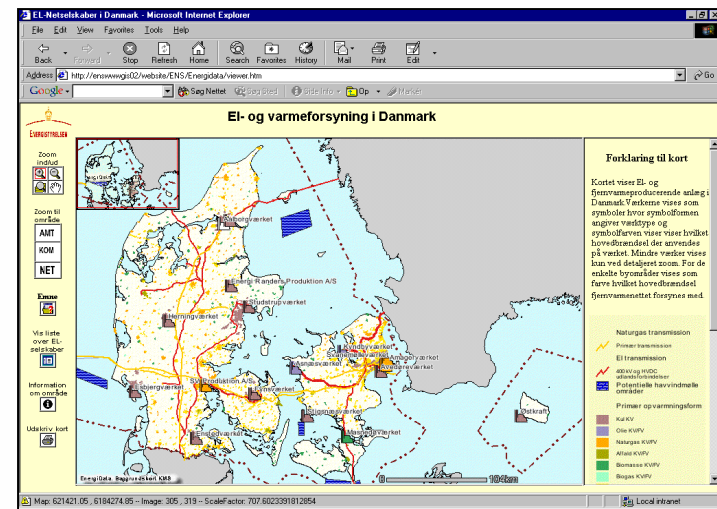
## Energy Statistic

- download data

Energibalancen 2000									
	El	Rådte og hale energi	Gas energi	Udvalgte andre energier	Udvalgte andre energier	Udvalgte andre energier	Udvalgte andre energier	Udvalgte andre energier	Udvalgte andre energier
<b>Energiforsyning i TWh</b>	<b>813,438</b>	<b>356,335</b>	<b>11,552</b>	<b>186,511</b>	<b>165,921</b>	<b>90,580</b>	<b>2,394</b>	<b>144</b>	-
Produktionsproduktion	1,163,880	764,126	-	310,251	-	89,900	-	-	-
Produktion	609,943	171,638	344,836	-	161,484	1,520	30,300	144	-
Import	922,452	576,732	192,981	120,676	3,054	-	27,906	-	-
Export	56,038	-	56,038	-	-	-	-	-	-
Omring	647	-	647	-	-	-	-	-	-
Lagerændring	18,970	2,971	16,119	3,106	8,428	-	-	-	-
Statistisk afvigelse	92	240	1,000	-	977	-	-	-	-
<b>Kraftindustri i TWh</b>	<b>43,343</b>	<b>356,335</b>	<b>339,285</b>	<b>25,026</b>	-	-	<b>968</b>	<b>299</b>	-
Produktion	354,181	-	334,181	-	-	-	-	-	-
Forsyning ved produktion	397,514	356,335	14,095	27,026	-	-	968	299	-
Omring	109,333	-	43,717	92,616	153,642	62,216	123,814	117,775	679
Udvalgte energier	11,189	-	38,082	29,052	152,131	8	121,600	55,402	-
Udvalgte energier	8,636	-	152	48,222	1,004	30,343	27,687	32,003	-
Fjernvarme udvalgte energier	2,439	-	2,354	2,442	40	9,312	390	12,481	-
Andre producenter	18,933	-	3,119	12,964	460	22,333	18,073	17,876	-
Produktion	184	-	-	400	-	-	144	-	-

## Energy Data

- print theme maps



## Themes

- Heat supply
- RE and Offshore Wind
- Links to background reports