

Energy in the Netherlands

Cees Volkers

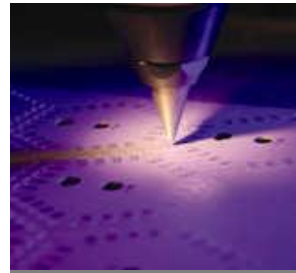
Amsterdam
24 February 2016

Program

- ECN
- Netherlands energy use
- Fossil energy
 - Gas
 - Oil
 - Coal
- Electricity and heat
- Nuclear energy
- Renewable energy
 - Biomass
 - Wind
 - Water
 - Other
- Energy policy



**Policy
Studies**



**Energy
Engineering**



Environment



**Energy
Efficiency**

Process & Energy Industry



Solar Energy



Wind Energy



Biomass

Policy Studies

- Netherlands

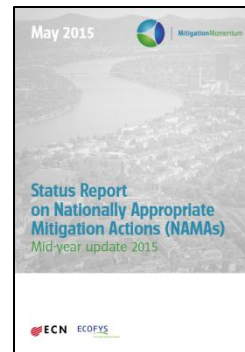
- Dutch ministries: Economic affairs, Infrastructure and the Environment, Interior and Kingdom Relations
- PBL Netherlands Environmental Assessment Agency
- RVO.nl Netherlands Enterprise Agency
- Provinces
- Regionale uitvoeringsdiensten
- Network companies (Tennet, Gasunie, etc.)
- Industry associations



- EU

- World

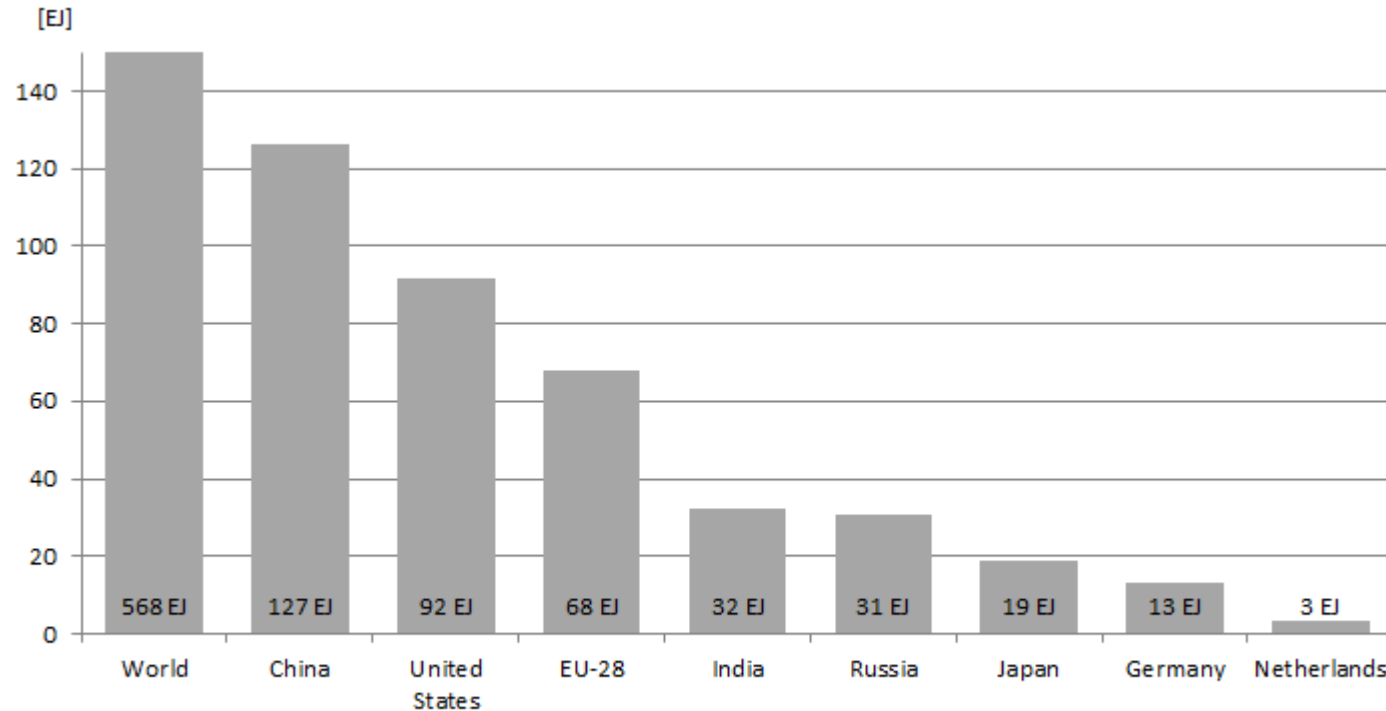
- Indonesia
- Kenia
- Pakistan
- Middle East



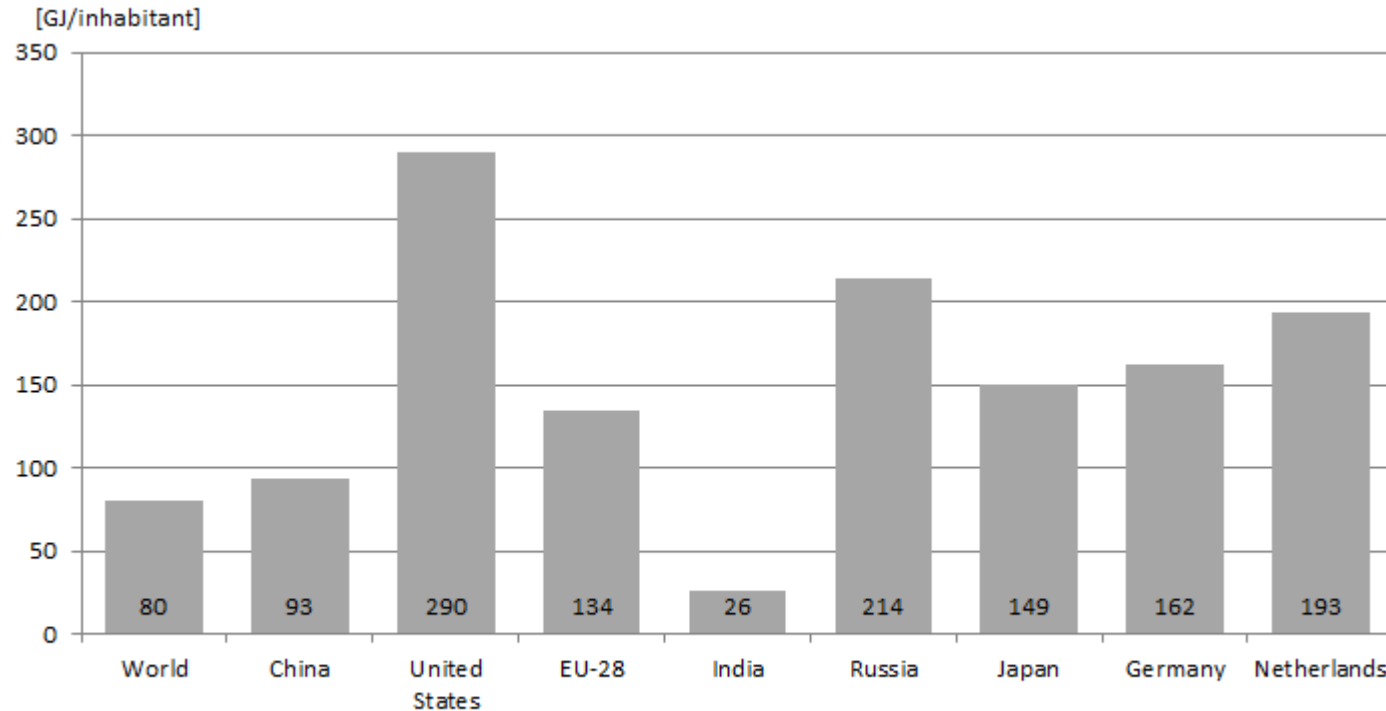
Units

- Exa (10^{18})
- Peta (10^{15})
- Tera (10^{12})
- Giga (10^9)
- Mega (10^6)
- kilo (10^3)
- 1 kWh (kilowatt per hour) = 3.6 MJ (megajoule)
- 1 toe (ton of oil equivalent) = 41.868 GJ (gigajoule)
- 1 m³ natural gas = 31.65 MJ (megajoule)
- Average electricity use: 3050 kWh per household (= 11 GJ)
- Average gas use: 1200 m³ per household (= 38 GJ)

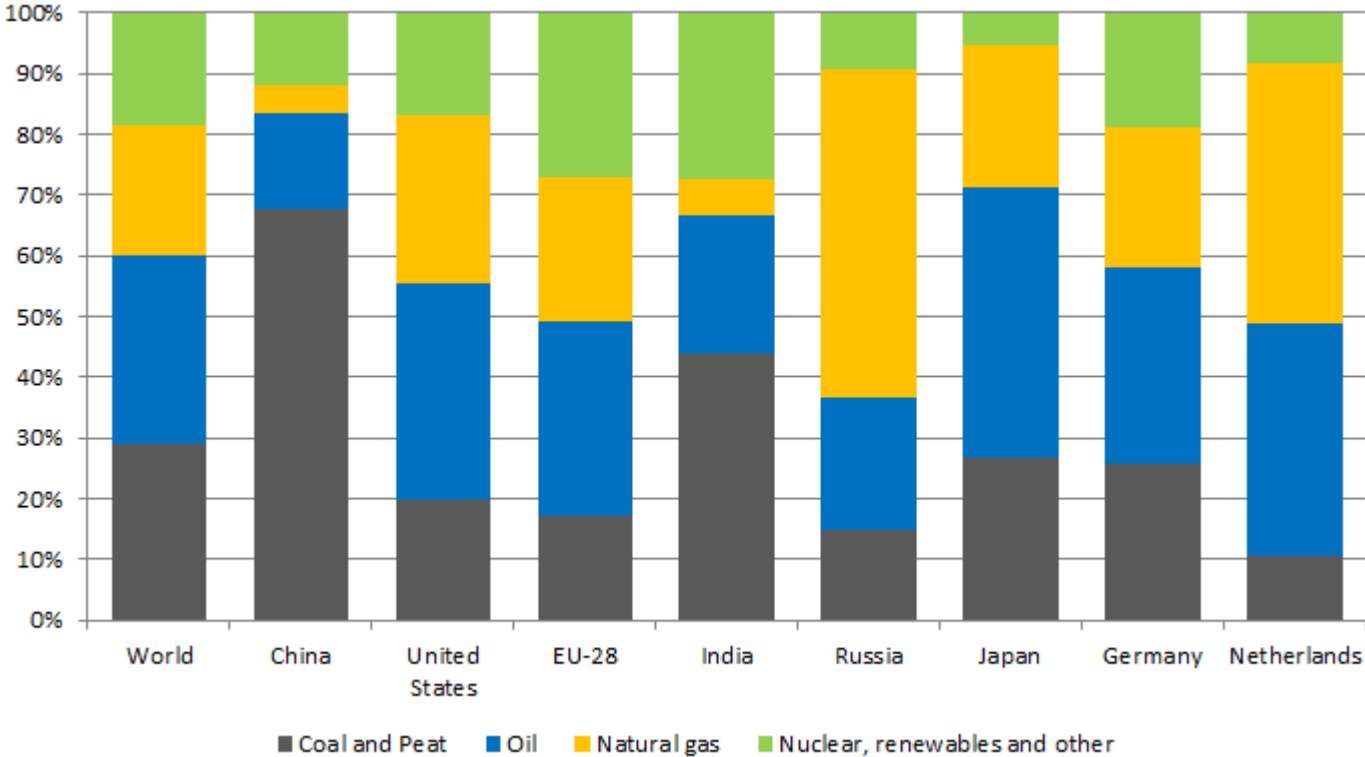
Energy use compared to other countries (2013)



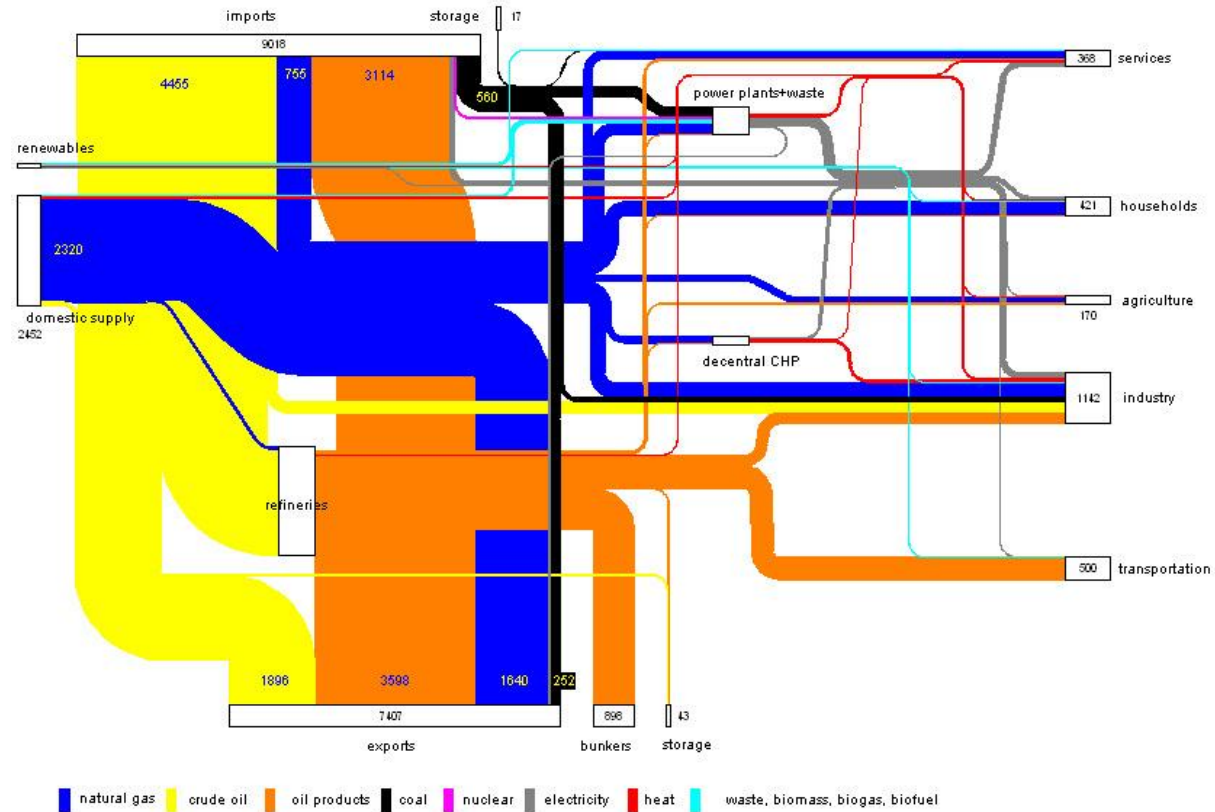
Energy use compared to other countries (2013)



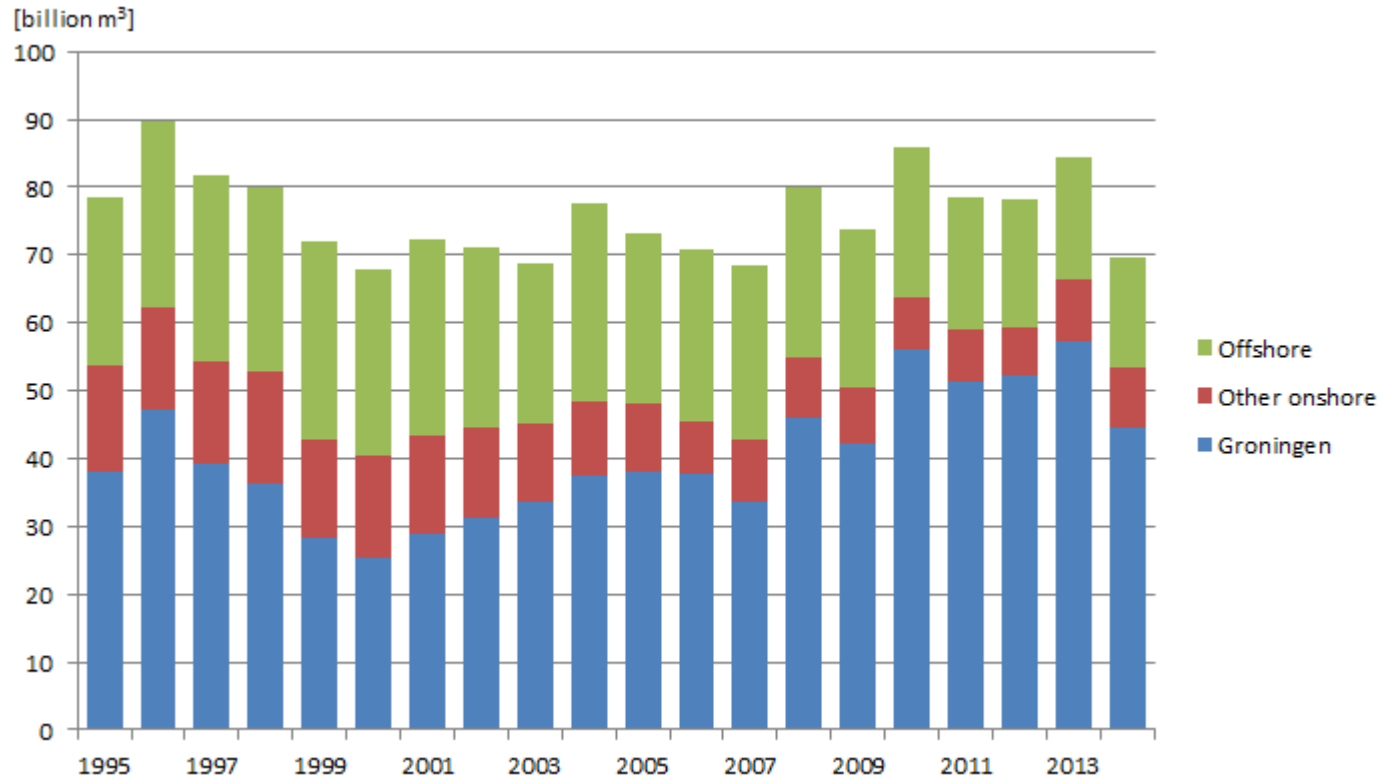
Energy use compared to other countries (2013)



Energy flows [PJ] (2006)

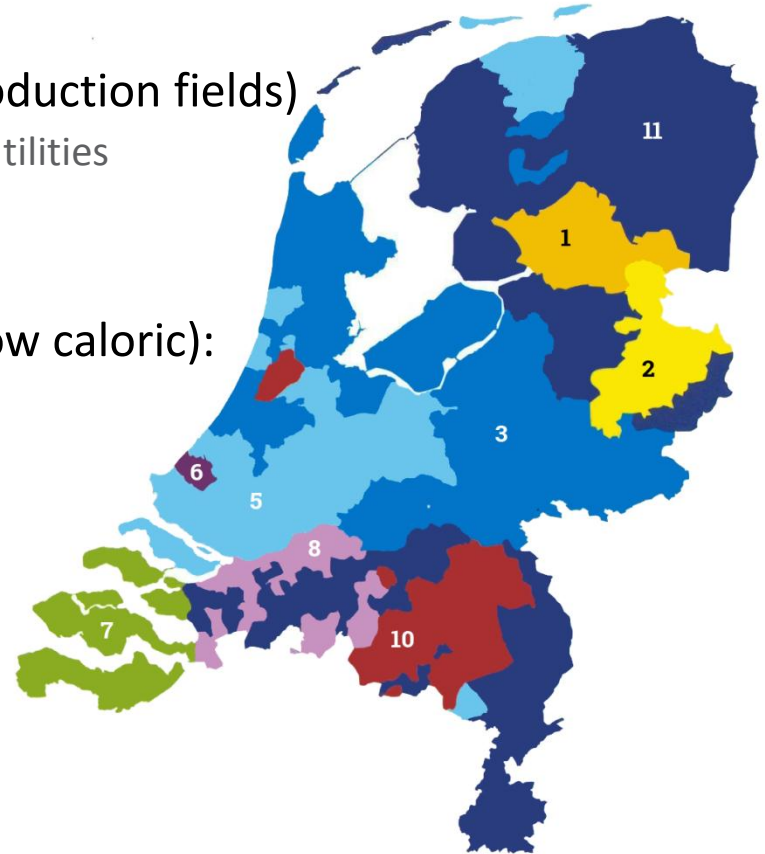


Natural gas production



Natural gas distribution

- 2 networks: low caloric (Groningen) and high caloric (import and other production fields)
 - Low caloric gas for households and small utilities
- National main transmission network (both low and high caloric): Gasunie
- Regional network operators (mainly low caloric):
 1. RENDO
 2. Cogas
 3. Liander
 5. Stedin (Eneco)
 6. Westland Infra
 7. Enduris (Delta)
 8. Enexis
 10. Endinet
 11. Enexis



Oil

- Production at Schoonebeek (26%), Rijswijk & Botlek (11%), Offshore (63%)
- Conversion
 - Refineries
- Consumption
 - Chemical industry
 - Transport

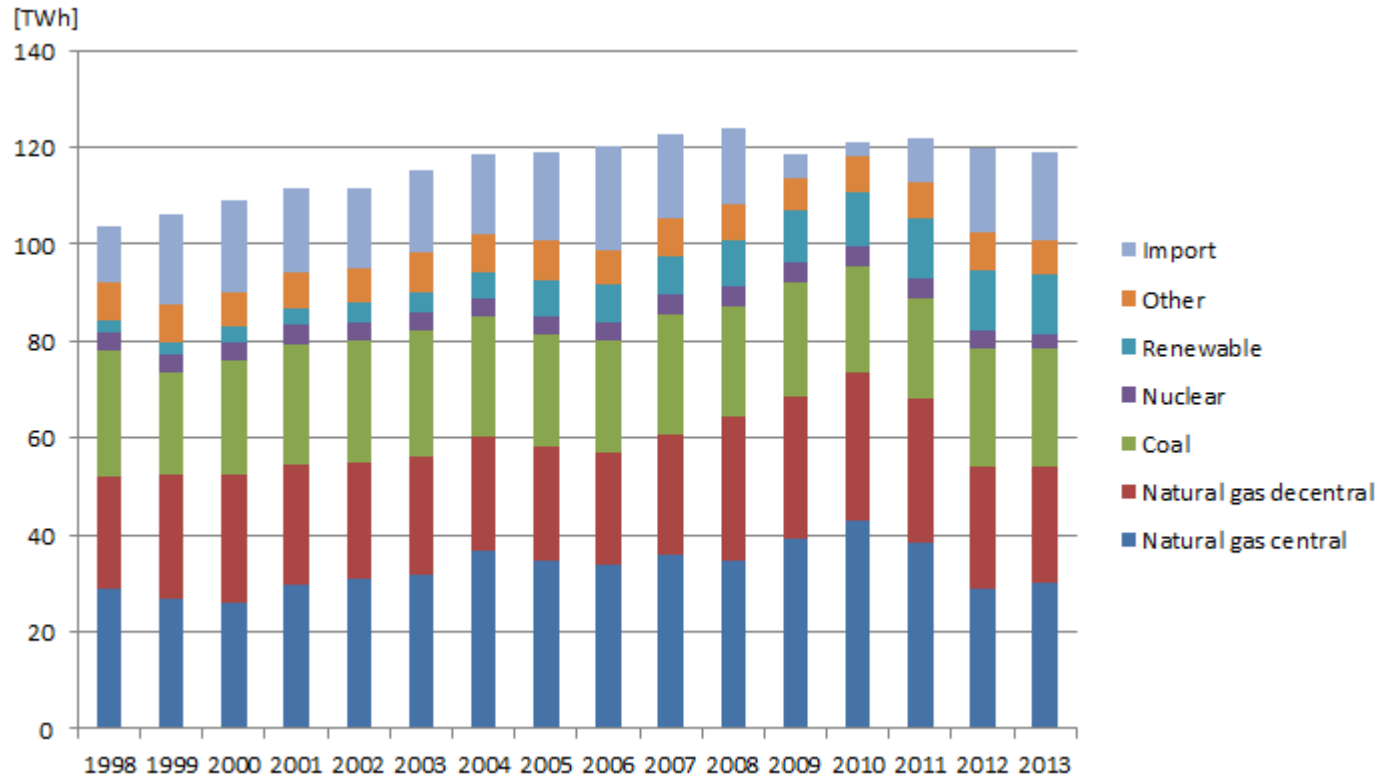


Coal

- No production but still major reserves in Gelderland and Limburg
- Consumption
 - Power plants
 - Maasvlakte
 - Geertruidenberg
 - Eemshaven
 - Amsterdam
 - Nijmegen
 - Borssele (closed)
 - Tata Steel IJmuiden

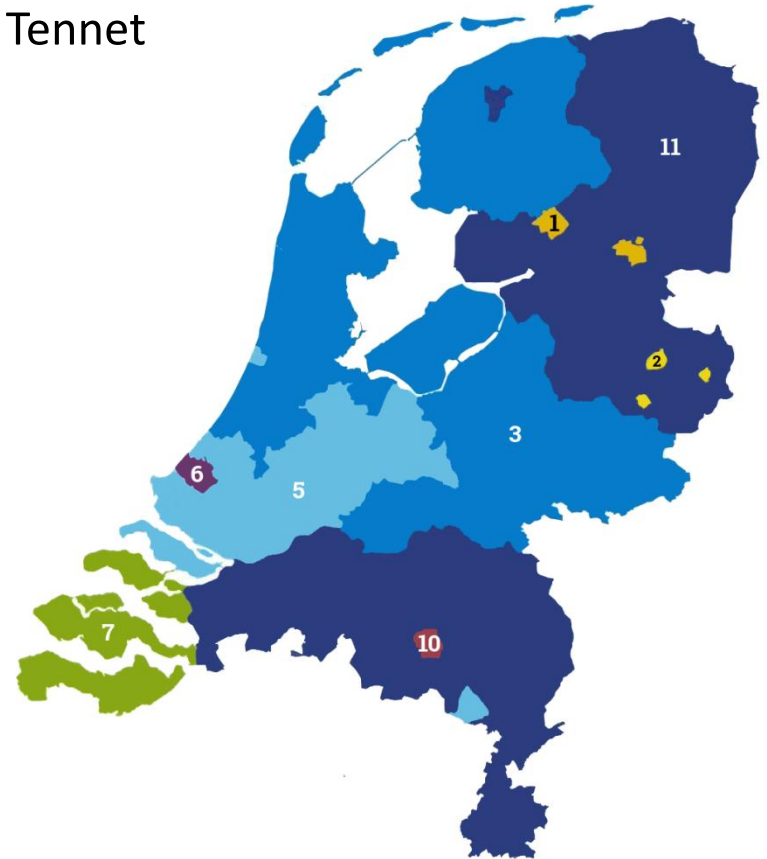


Electricity production



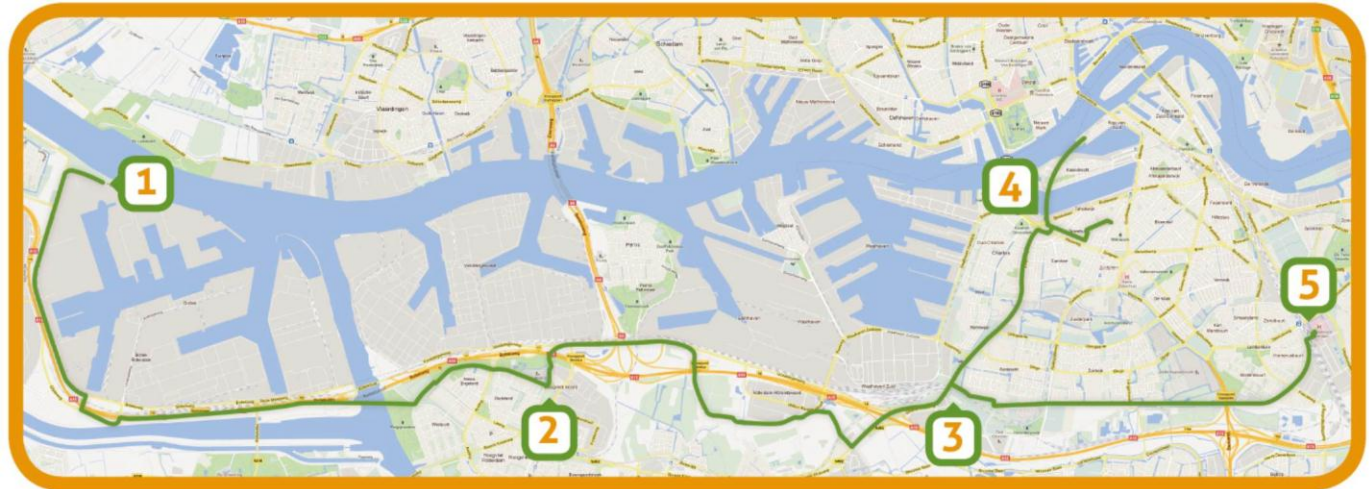
Electricity distribution

- National main transmission network: Tennet
- Regional network operators:
 1. RENDO
 2. Cogas
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 5. Stedin (Eneco)
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Heat

- 4.8% of households connected to district heating
- Rotterdam heat network: from AVR Rozenburg to Maasstad Hospital and district heating in center Rotterdam

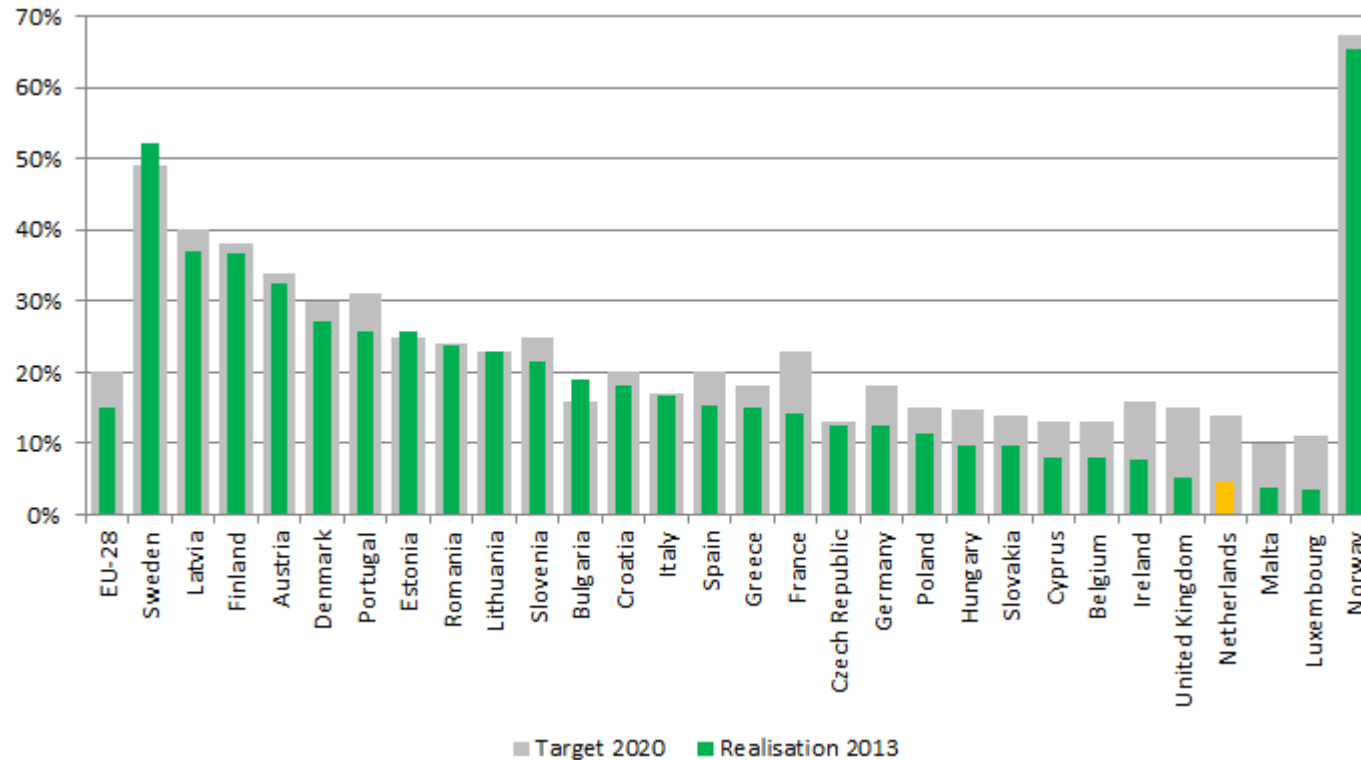


Nuclear energy

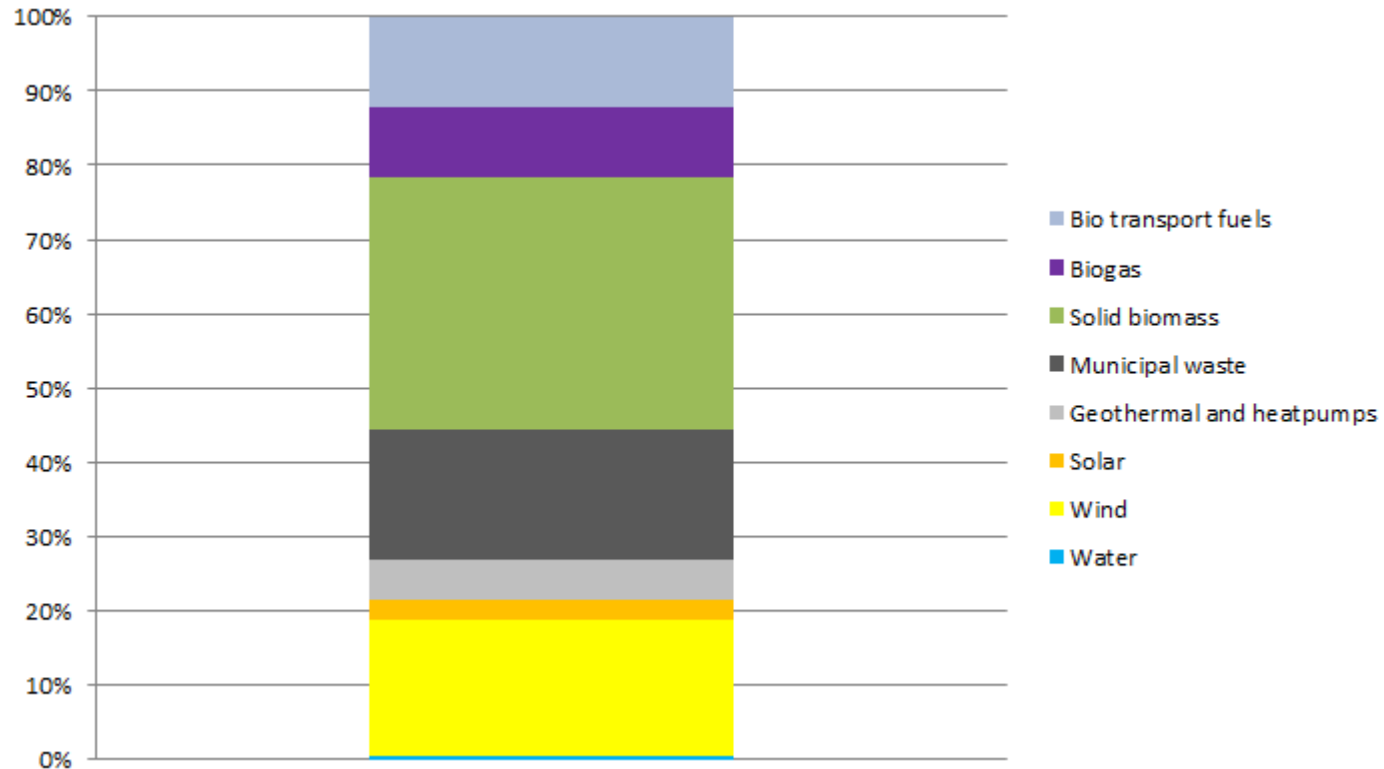
- Borssele 1973-???? (482 MW)
- Doodewaard 1968-1997 (55 MW)



Renewable energy share (2013)



Renewable energy (2013)



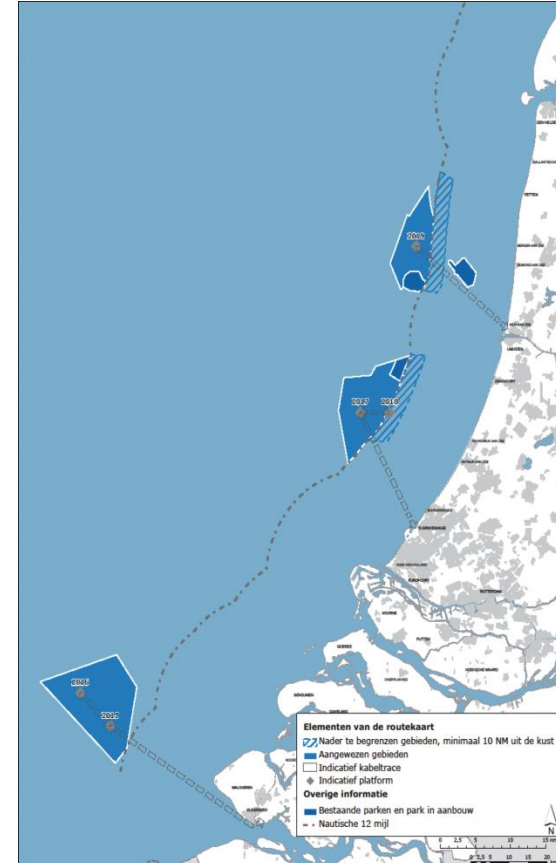
Biomass

- Cofiring in coal plants
- Wood stoves households
- Boilers on wood at companies
- Electricity production with biomass
- Municipal waste
- Biogas
- Bio transport fuels



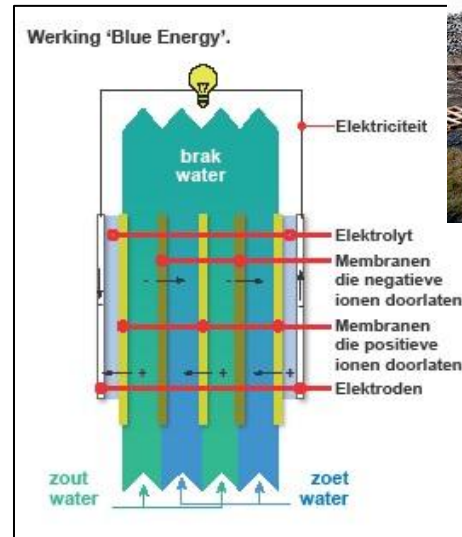
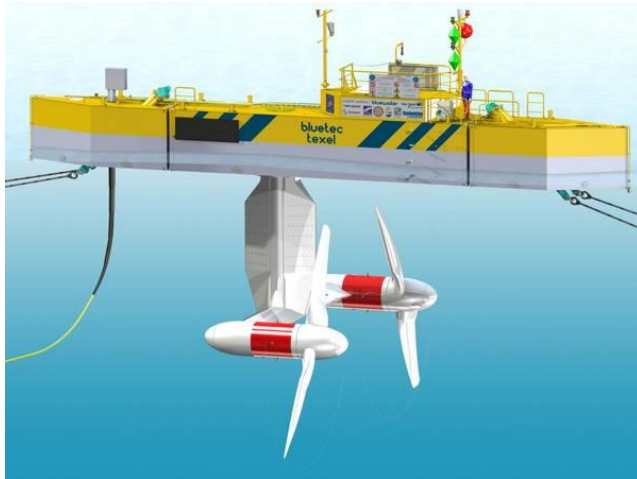
Wind

- Onshore: every province has a specific target
- Offshore: designated areas
 - Borssele (totaal 1400 MW)
 - Zuid-Hollandse kust (Luchterduinen, 129 MW; totaal 1400 MW)
 - Noord-Hollandse kust (Egmond aan Zee, 108 MW; Prinses Amalia, 120 MW; totaal 700 MW)
 - Groningen (Gemini, 600 MW)



Water

- Hydro power: Alphen/Lith (Maas), Linne (Maas), Maurik (Nederrijn), Hagestein (Lek)
- Blue energy: Breezanddijk (Afsluitdijk)
 - salt concentration between fresh and salt water
- Tidal energy: Marsdiep (between Texel and Den Helder)



Other renewable energy

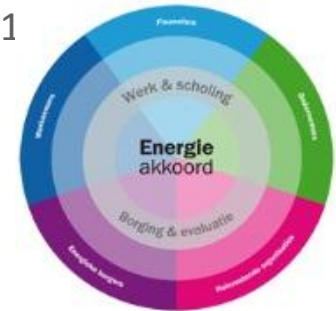
- Solar
- Geothermal (± 15 projects, mainly for greenhouses)
- Heatpumps



Energy policy targets Netherlands

- EU-target Renewable Energy: 14% in 2020
- EU-target Energy Efficiency Directive: cumulative minimum 482 PJ in 2020
- EU-target Greenhouse gasses: cumulative maximum 920 Mton for period 2013-2020

- Energy agreement
 - Agreement between government, employers, trade unions, environmental organisations, social organisations and financial institutions in 2011
 - Closure off 5 oldest coal based power plants
 - Various measures which lead to
 - 100 PJ energy savings in 2020
 - 16% renewable energy share in 2023



Thank you for your attention

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