ECN
Your energy. Our passion.

Energy in the Netherlands

Cees Volkers

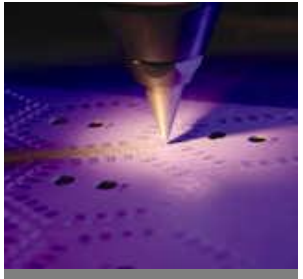
Amsterdam
24 February 2016

Program

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

ECN

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

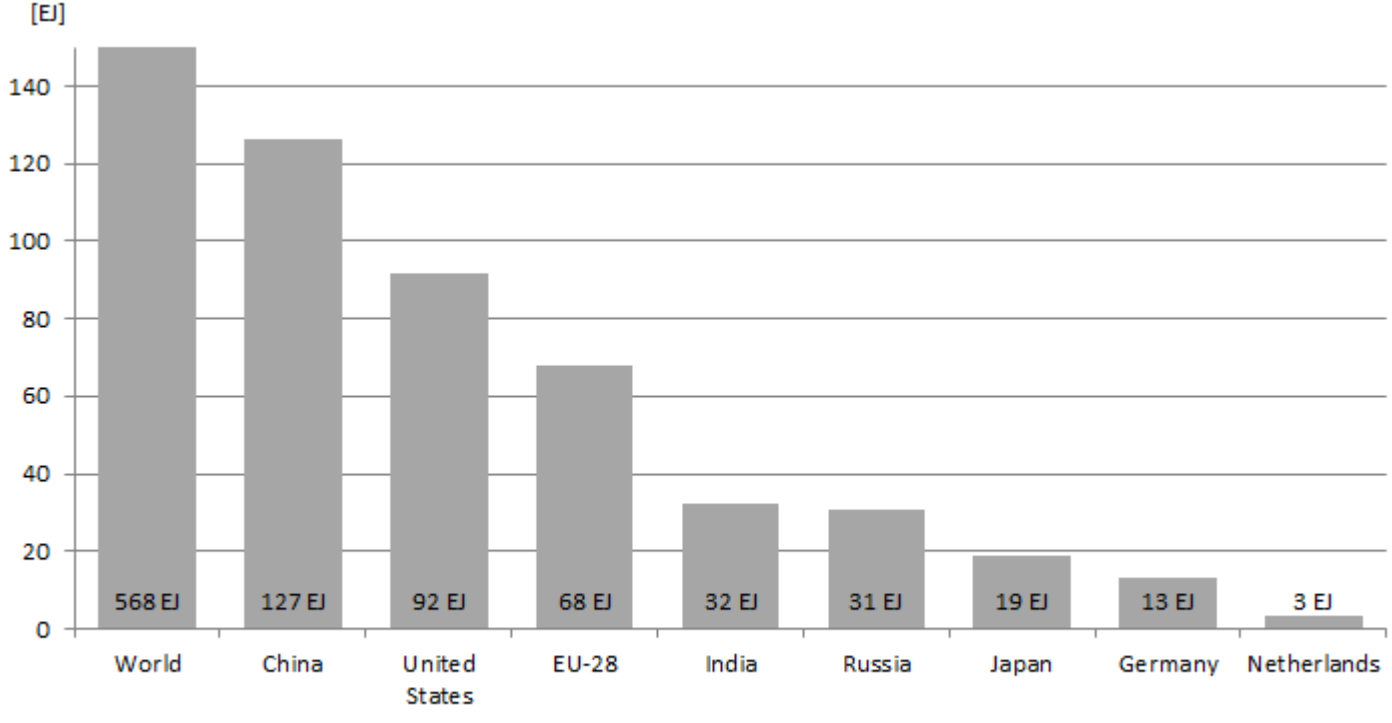
Units

- Exa (10^{18})
- Peta (10^{15})
- Tera (10^{12})
- Giga (10^{9})
- Mega (10^{6})
- kilo (10^{3})

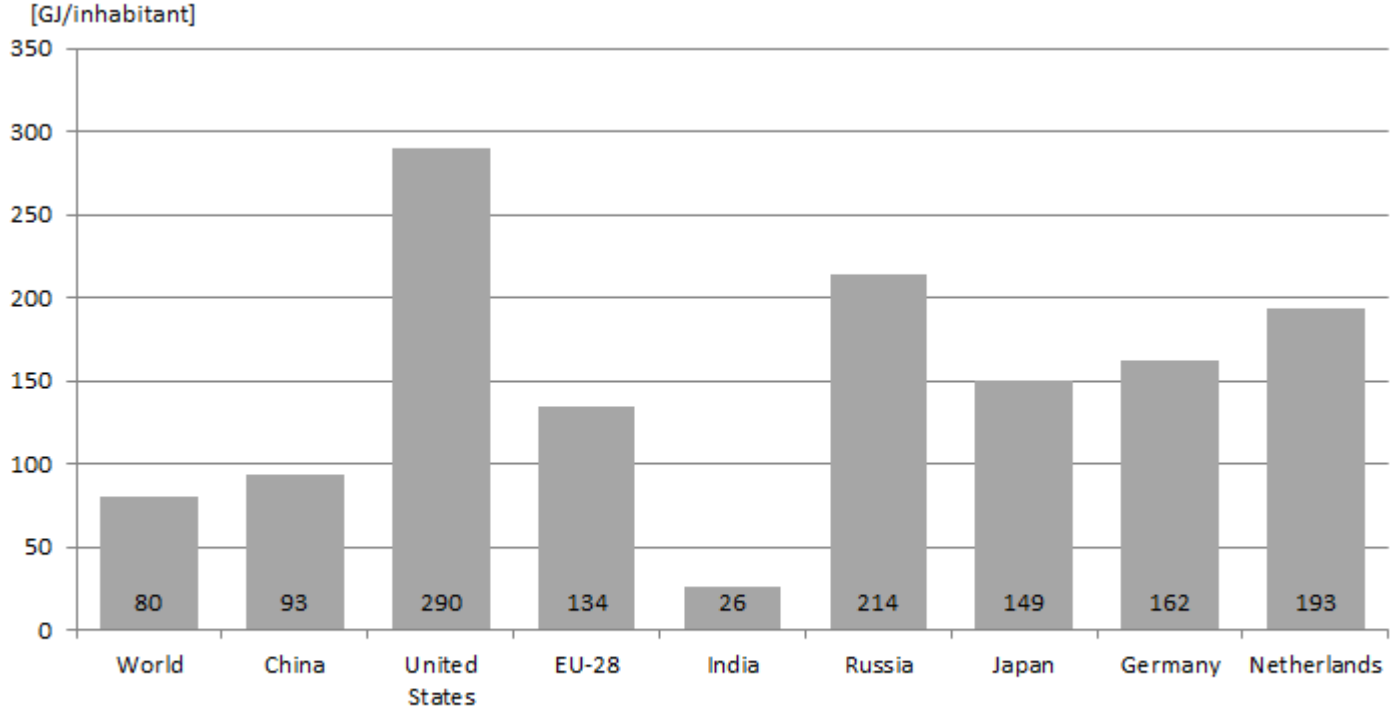
- 1 kWh (kilowatt per hour)= 3.6 MJ (megajoule)
- 1 toe (ton of oil equivalent) = 41.868 GJ (gigajoule)
- 1 m^3 natural gas = 31.65 MJ (megajoule)

- Average electricity use: 3050 kWh per household (= 11 GJ)
- Average gas use: 1200 m^3 per household (= 38 GJ)

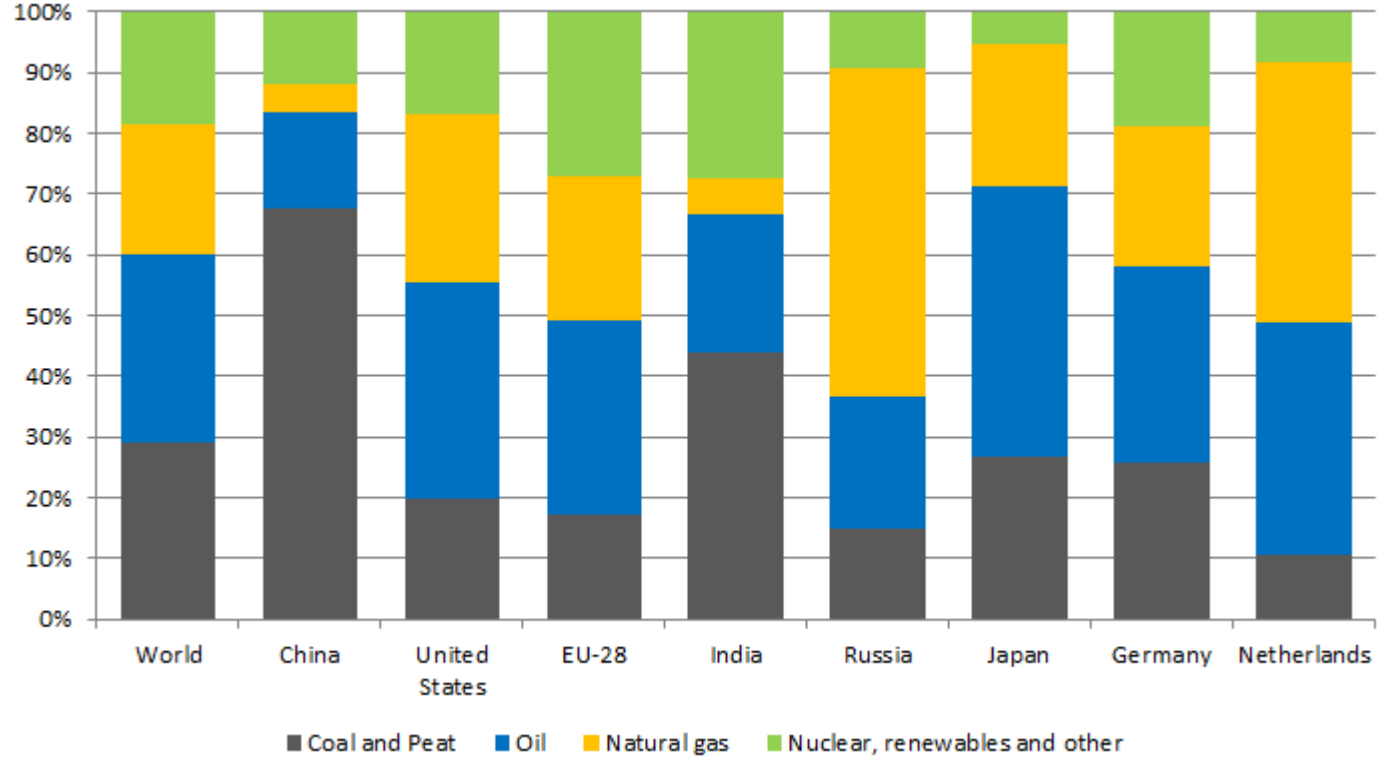
Energy use compared to other countries (2013)



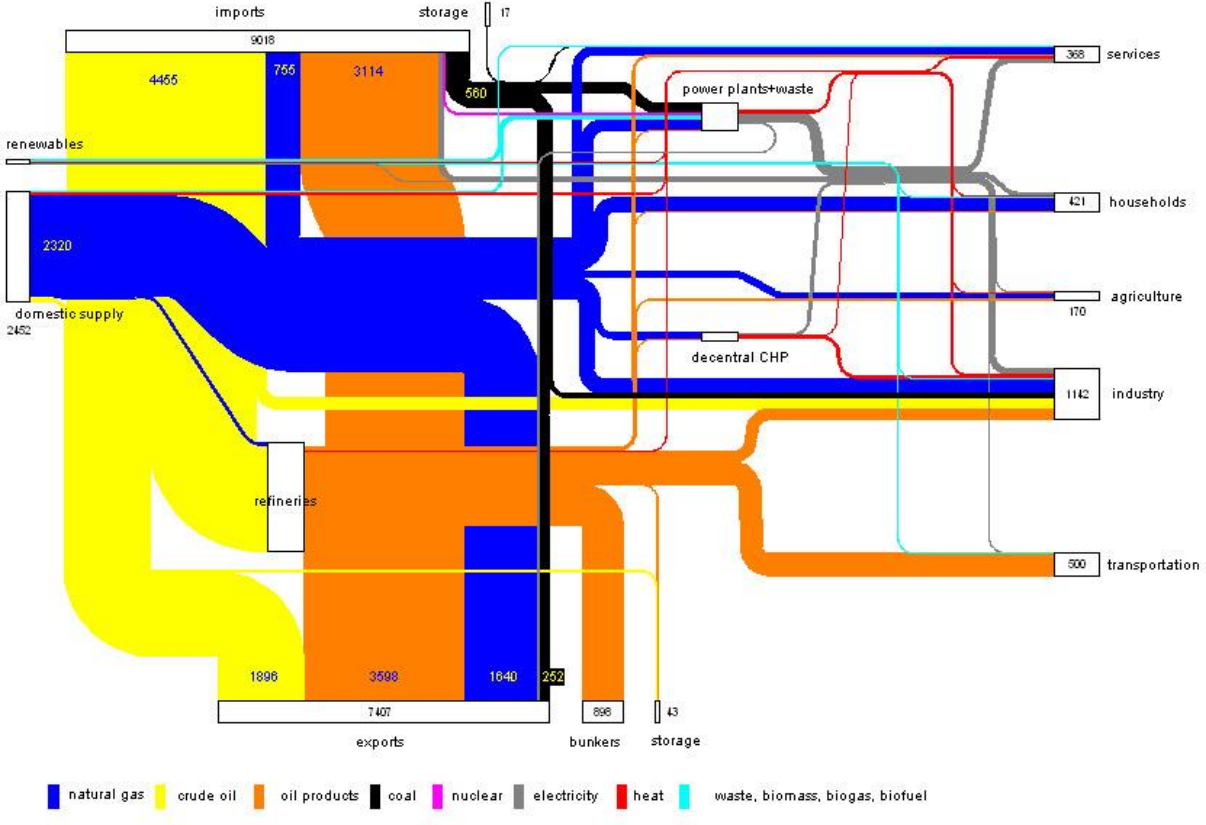
Energy use compared to other countries (2013)



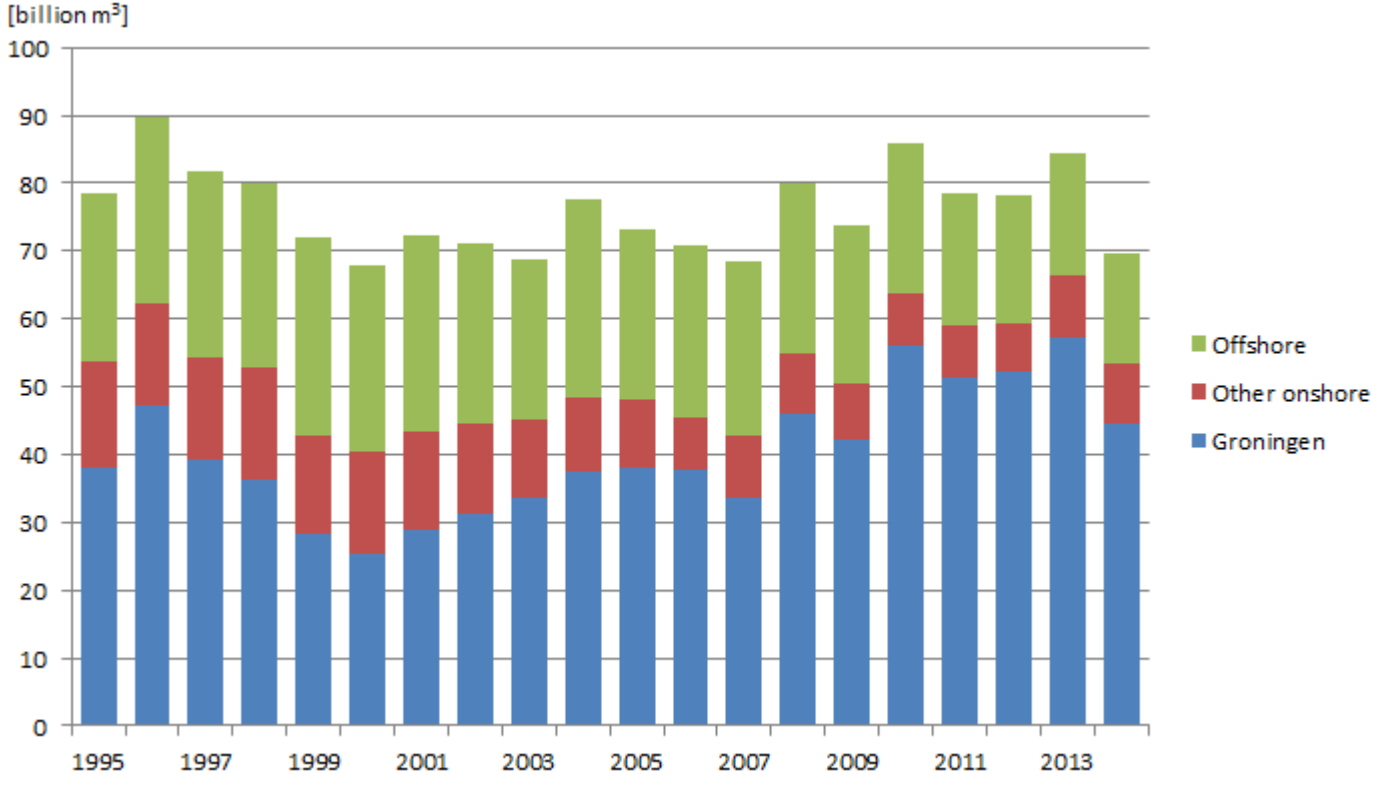
Energy use compared to other countries (2013)



Energy flows [PJ] (2006)

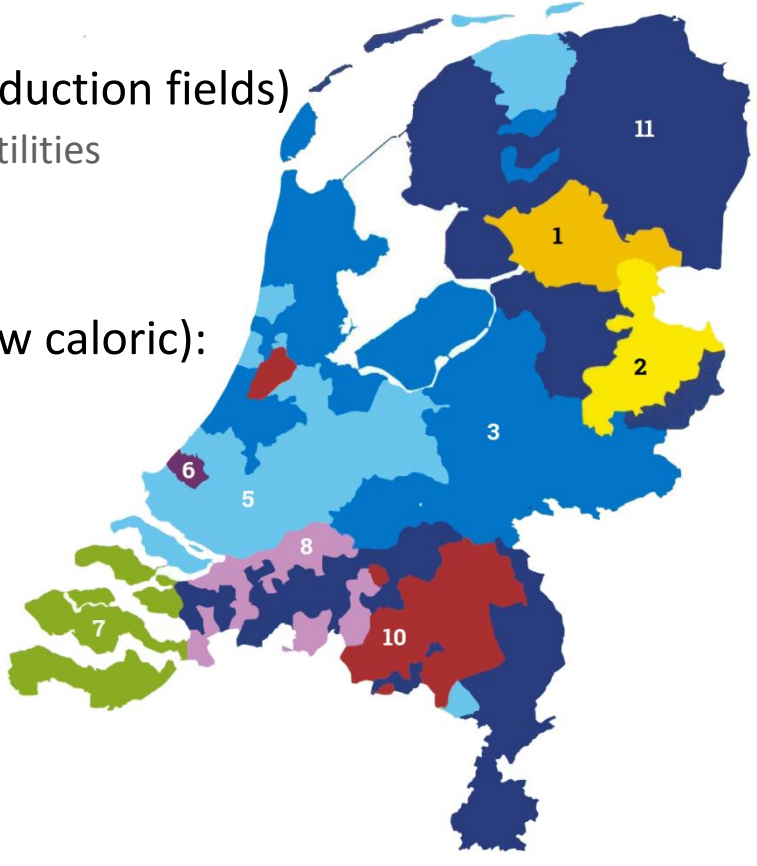


Natural gas production



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%)

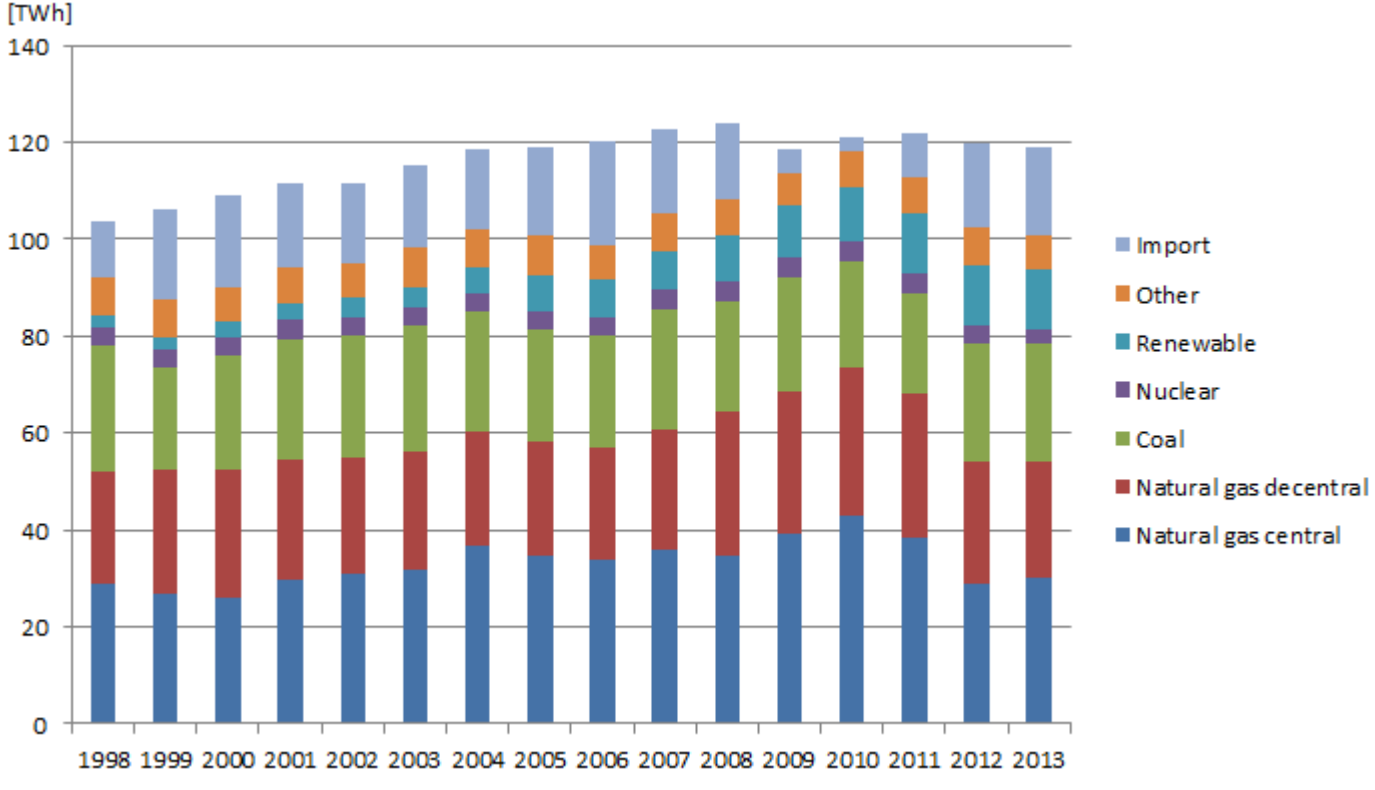
- Conversion
  - Refineries
- Consumption
  - Chemical industry
  - Transport

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

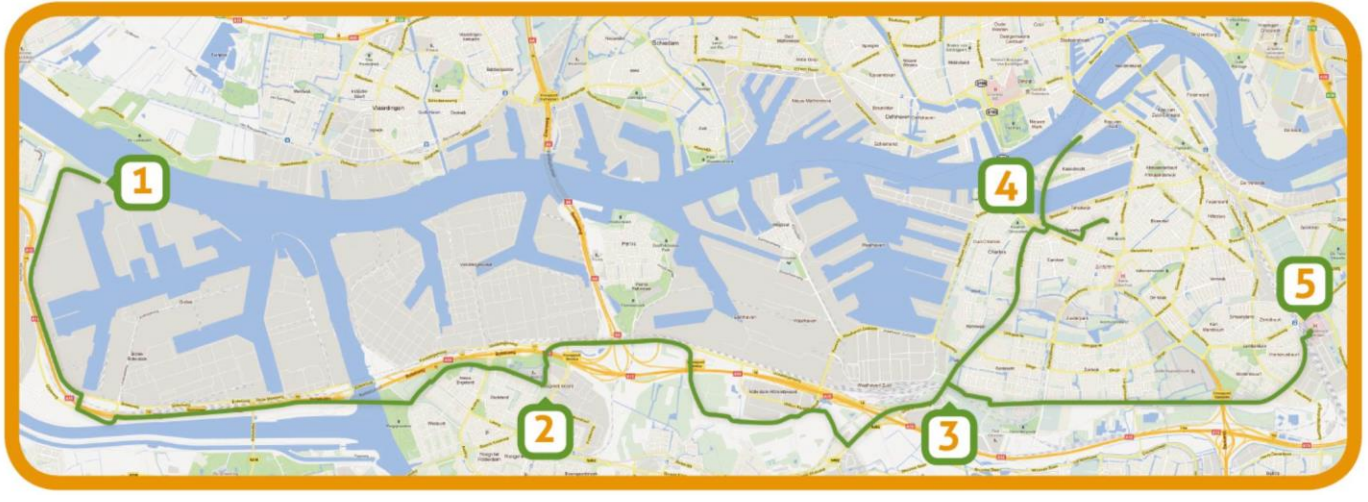


Electricity distribution

- National main transmission network: Tennet
- Regional network operators:
  1. RENDO
  2. Cogas
  3. Liander
  5. Stedin (Eneco)
  6. Westland Infra
  7. Enduris (Delta)
  10. Endinet
  11. Enexis

Heat

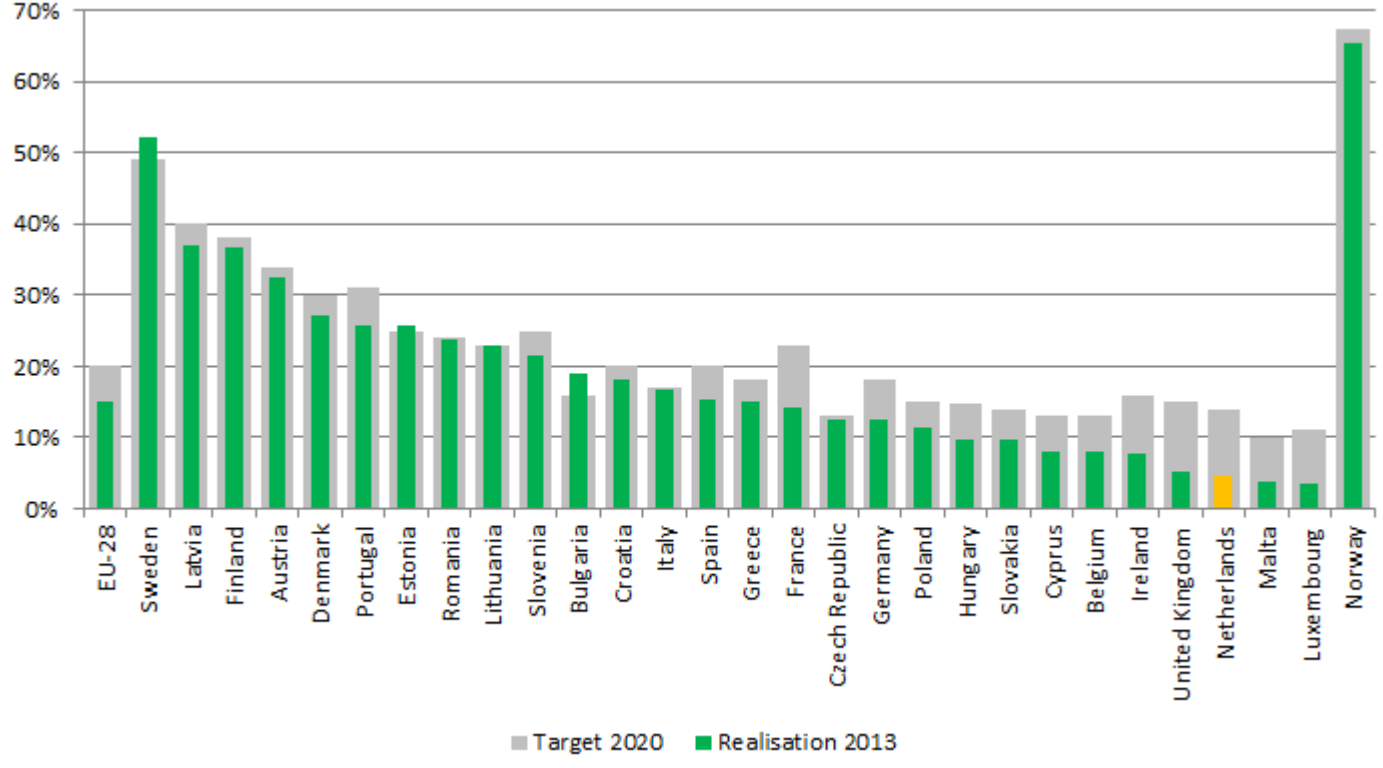
- 4.8% of households connected to district heating
- Rotterdam heat network: from AVR Rozenburg to Maasstad Hospital and district heating in center Rotterdam



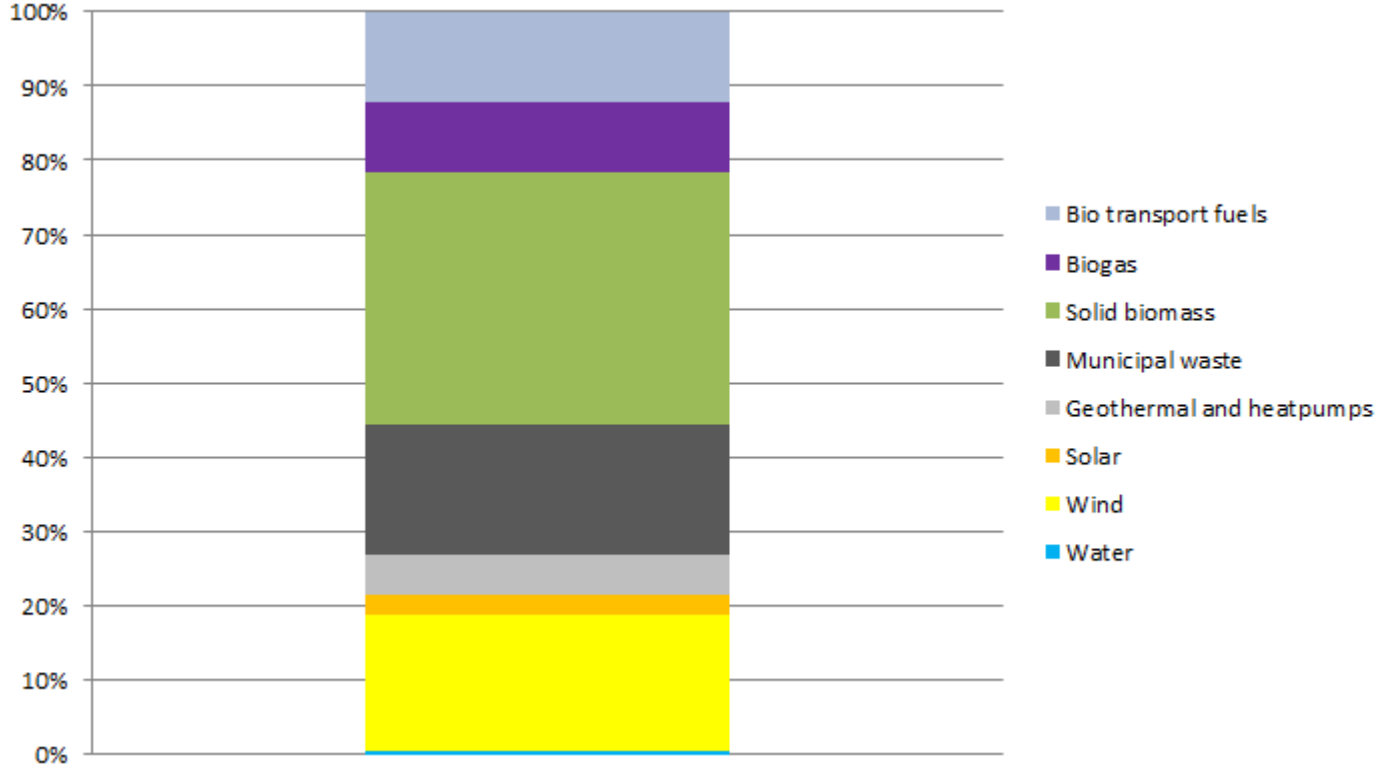
Nuclear energy

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

Renewable energy share (2013)



Renewable energy (2013)

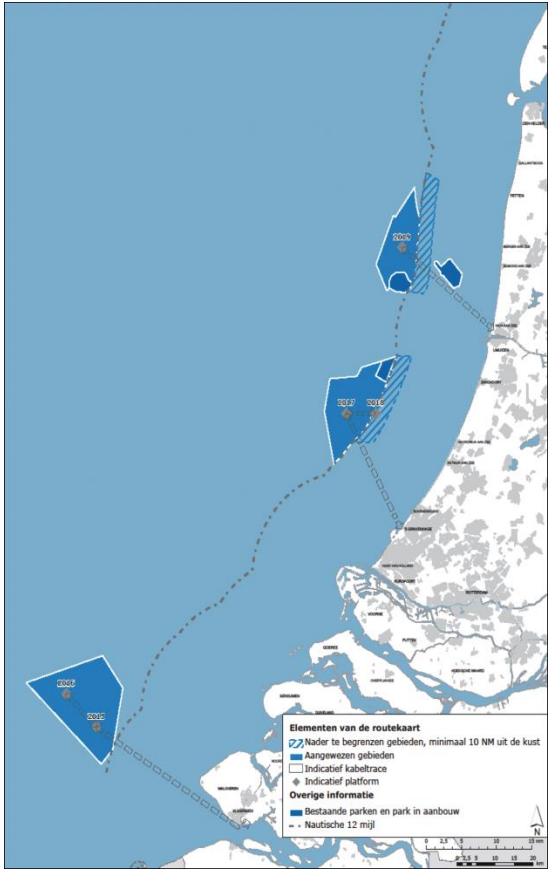


Biomass

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

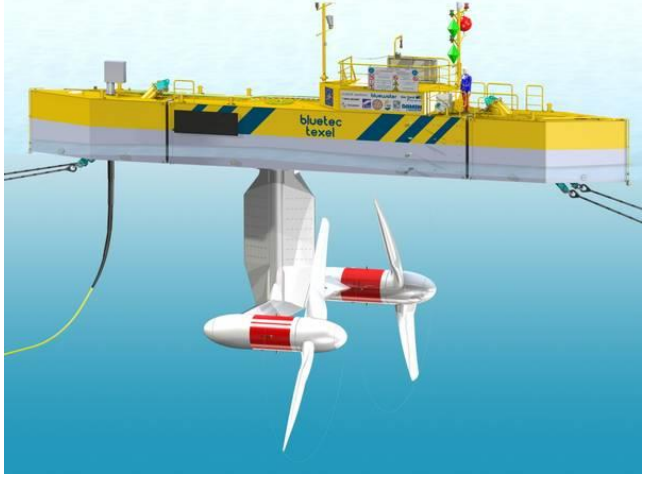
Wind

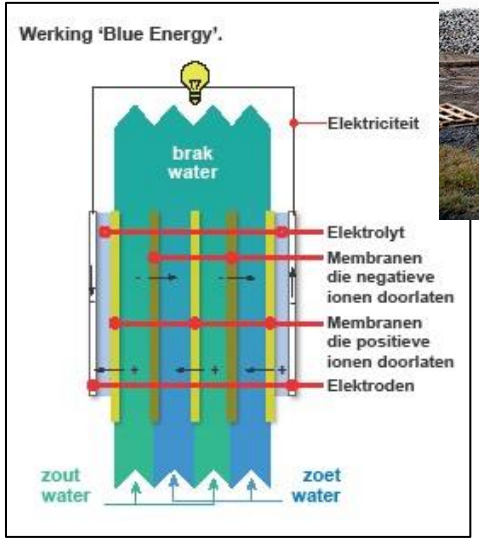
- Onshore: every province has a specific target
- Offshore: designated areas
  - Borssele (totaal 1400 MW)
  - Zuid-Hollandse kust (Luchterduinen, 129 MW; totaal 1400 MW)
  - Noord-Hollandse kust (Egmond aan Zee, 108 MW; Prinses Amalia, 120 MW; totaal 700 MW)
  - Groningen (Gemini, 600 MW)



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





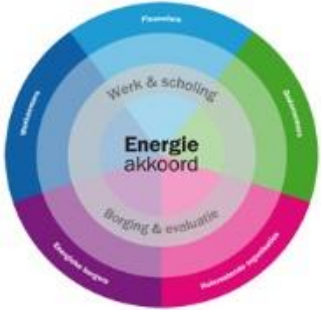
Other renewable energy

- 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 201
  - 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

ECN

Westerduinweg 3
1755 LE Petten
The Netherlands

P.O. Box 1
1755 ZG Petten
The Netherlands

T +31 88 515 49 49
F +31 88 515 44 80

info@ecn.nl
www.ecn.nl