National energy outlook of the Netherlands 2014

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Energy research centre of the Netherlands

- Strategic & Technological studies
  *Creating insights in energy technology and policy*

- Problem solving
  *Using knowledge, technology, and facilities to solve our clients’ issues*

- Technology development
  *Developing technology into prototypes and industrial application*

- Not for profit organisation
  *Tier-1-supplier for Dutch government on energy policy*
The Dutch energy context

- Fossil fuels dominant, gas exporting
- Energy ports and refineries
- Energy intensive industries & refineries make up 12.4% of GDP
- Densely populated; modest available area for renewable energy
- Small share renewable energy (2.3% in 2005, to 4.5% in 2013)
- Significant installed wind power capacity
Main principles of Dutch energy policy

- Clean, reliable and affordable energy supply
- Balanced mix of energy sources
- In the longer term: a sustainable energy supply
- Framed in the European Energy policy context
- EU 2030: 40% reduction GHG and 27% RES
- GHG emission reduction in 2050: 80 - 95%

2013 Energy Agreement
- 14% RES in 2020 and 16% in 2023
- 100 PJ additional final energy efficiency
- 15,000 Full time jobs
- In 2030 a top-10 position in global Clean Tech Ranking
National Energy Outlook (NEO)

• Goal
  – Providing a factual, complete, integrally consistent, quantitative overview of the current state of affairs of and future expectations for the Dutch energy system, embedded in the developments in the surrounding world

• Use
  – Data for reporting obligations
  – Observed distances to targets mark areas for increased policy attention
  – Reference baseline for policy assessments
  – Set of up-to-date energy models available for additional analyses
Methodology

PAST developments
• National energy balance (detailed sector level energy statistics)

FUTURE developments
• National energy outlook modeling system (detailed sector level projections)

• Other statistics, other developments, analyses,
• interpretation, description
Methodology

- External developments
  - Energy prices
  - Economic development
  - Development and policy in neighbouring countries

- Two variants of policy and measures
  - Existing policies and measures
  - Intended policies and measures

- Uncertainties: margins
Data and cooperation

• Statistics Netherlands (CBS)
  – Detailed energy statistics, economic statistics

• Netherlands Enterprise agency (RVO.nl)
  – Interface of private sector activities and policy

• Netherlands environmental assessment agency (PBL)
  – Strategic policy analysis, interpretation, modeling

• Energy research Centre of the Netherlands (ECN)
  – Strategic policy analysis, interpretation, modeling, NEOMS
NEO modeling system

- Integrated modeling system with balanced supply and demand throughout the economy

- Long standing history, first component since 1982
  - In integrated form since mid 1990’s
  - ‘Living’ model – continuously evolving

- Set of ~15 interconnected models for sectoral developments
  - Each model simulates developments in part of the energy system
  - Interconnections lead to internally consistent energy balance

- Consistent set of economic driving forces
  - (demography, economic growth, resource prices)
NEO modeling system

- **Demand**
  - Households
  - Services
  - Transport
  - Agriculture
  - Industry
  - Refineries

- **Integration module**
  - Consistent set of economic drivers (growth, resource prices, taxes)

- **Supply**
  - Power market
  - Gas extraction
  - Renewable energy supply

- **Database**
- **EVA, investments, employment**
- **Postprocessing**

Activities, policy, developments

Import / export

Prices

Consistent set of economic drivers (growth, resource prices, taxes)
NEO modeling system
NEO modeling system

Demand -> Integration module <- Supply

Households  Services  Transport  Agriculture  Industry  Refineries
NEO modeling system

Demand
- Households
- Services
- Transport
- Agriculture
- Industry
- Refineries

Integration module

Supply
- Power market
- Gas extraction
- Renewable energy supply
NEO modeling system

Consistent set of economic drivers (growth, resource prices, taxes)

Demand module

Households
Services
Transport
Agriculture
Industry
Refineries

Supply module

Power market
Gas extraction
Renewable energy supply
NEO modeling system

Activities, policy, developments

Households
Services
Transport
Agriculture
Industry
Refineries

Consistent set of economic drivers (growth, resource prices, taxes)

Demand → Integration module → Supply

Power market
Gas extraction
Renewable energy supply
NEO modeling system

- Demand
  - Households
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  - Industry
  - Refineries

- Supply
  - Power market
  - Gas extraction
  - Renewable energy supply

Integration module

Consistent set of economic drivers (growth, resource prices, taxes)
NEO modeling system

Demand module

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- Services
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Supply module

- Power market
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Prices

Consistent set of economic drivers (growth, resource prices, taxes)
NEO modeling system

Integration module

Demand → Integration module → Supply

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Services
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Refineries

Power market
Gas extraction
Renewable energy supply

Prices

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Activities, policy, developments

Consistent set of economic drivers (growth, resource prices, taxes)
NEO modeling system

Consistent set of economic drivers (growth, resource prices, taxes)

Activities, policy, developments

Import / export

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Submodels: simulating investment decisions

• Submodels are also used stand alone for sectoral policy assessments

E.g. Energy use in Households
• ‘Micro data’ on dwelling types, energy bills, household types and historic investments
• Allows modeling investment decisions for future investments
  – Existing dwellings: replacement decisions for boilers, windows, etc. following costs and observed investment behaviour
  – New dwellings: building code mandates energy efficiency measures – package dependent on investment costs

• Similar detail for other sectors
Submodels: simulating power market

E.g. Power market model
• Covers entire NW-European power market
• Data on technical and economic performance of individual plants
• CHP in industry and agriculture
• Renewable energy production from various sources

• Hourly match of demand and supply

• Resulting power mix and hourly commodity trading price
Results:

Energy transition in NL becomes visible
Energy use, CO$_2$-emissions and economy show ´decoupling´
Regulations work!

Average electricity use of households declines

Electricity use (kWh)
Energy efficiency: Not all goals within reach (yet)

- **Energy savings pace 2010-2020**
  - Existing policy 1,0% p.a (0,7 – 1,2%)
  - Intented policy 1.2% p.a. (1,0 – 1,4%)
  - After 2020 drop to 0,7% p.a.

- **EU Energy efficiency directive**
  - Existing policy: probably uncompliant
  - Intented policy: probably compliant

- **Energy agreement 100 PJ additional**
  - Out of reach yet
Substantial growth of renewable energy, big uncertainties

![Graph showing share in final energy use (percent) from 2000 to 2030. The graph compares statistics, short term projection, existing policy and measures, and intended policy and measures. The data indicates a steady increase in renewable energy share over the years, with the intended policy and measures showing the highest growth.]
Electricity production

Capacity (GW)

Production (TWh)
Greenhouse gas emissions declining

GHG emissions (Mt CO$_2$-eq)
The Netherlands becomes gas importing country

Gas production and consumption (bln m³ Geq)

Continental shelf
Other territorial
Groningen

Historic consumption
Existing policy
Intended policy
Investments generate substantial employment

Employment (x1000 fte)

- Conventional + infra, inv & trickle down
- Renewables and energy saving, inv & trickle down
- Renewables exploitation
- Infrastructure exploitation
- Conventional exploitation
Conclusion

- Energy transition in the Netherlands becomes visible
  - Decoupling economic growth – energy use – greenhouse gas emission
  - Greenhouse gas target within easy reach
  - Renewable energy: substantial growth, big uncertainties
  - Energy savings: point of attention
  - Concept of ‘the Netherlands gasland’ under pressure
  - Growth energy related employment through investments
Inspirations, suggestions, questions?
Thank you for your attention

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