National energy outlook of the Netherlands 2014

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Abu Dhabi
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- Goal and approach
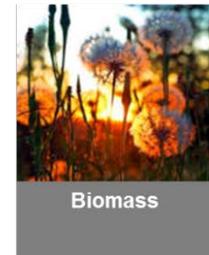- National Energy Outlook Modeling System
- Results
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Energy research centre of the Netherlands

- **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

Policy Studies

Energy Engineering

Environment

Energy Efficiency

Process & Energy Industry

Solar Energy

Wind Energy

Biomass

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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

Photo Rik Schuiling

Photo Ad Meskens

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
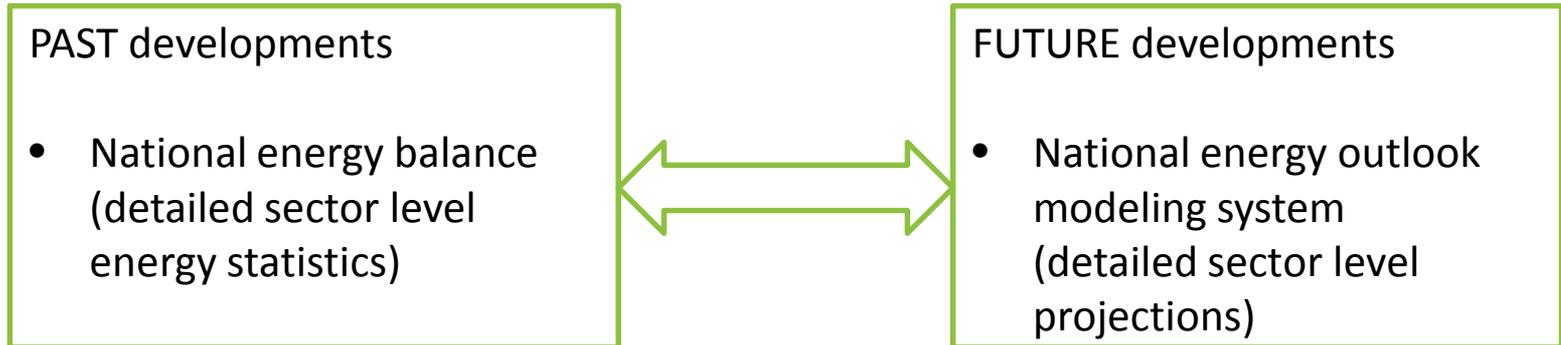 - In 2030 a top-10 position in global Clean Tech Ranking

Clean

Affordable   Secure
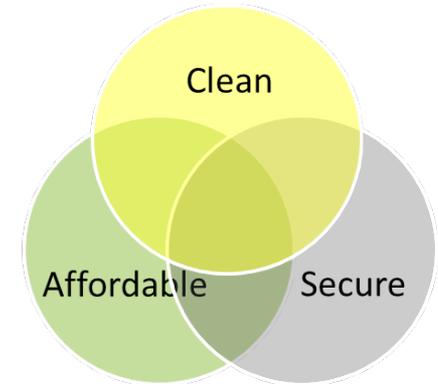
National Energy Outlook (NEO)

- **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		FUTURE developments
• National energy balance (detailed sector level energy statistics)	⟷	• 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
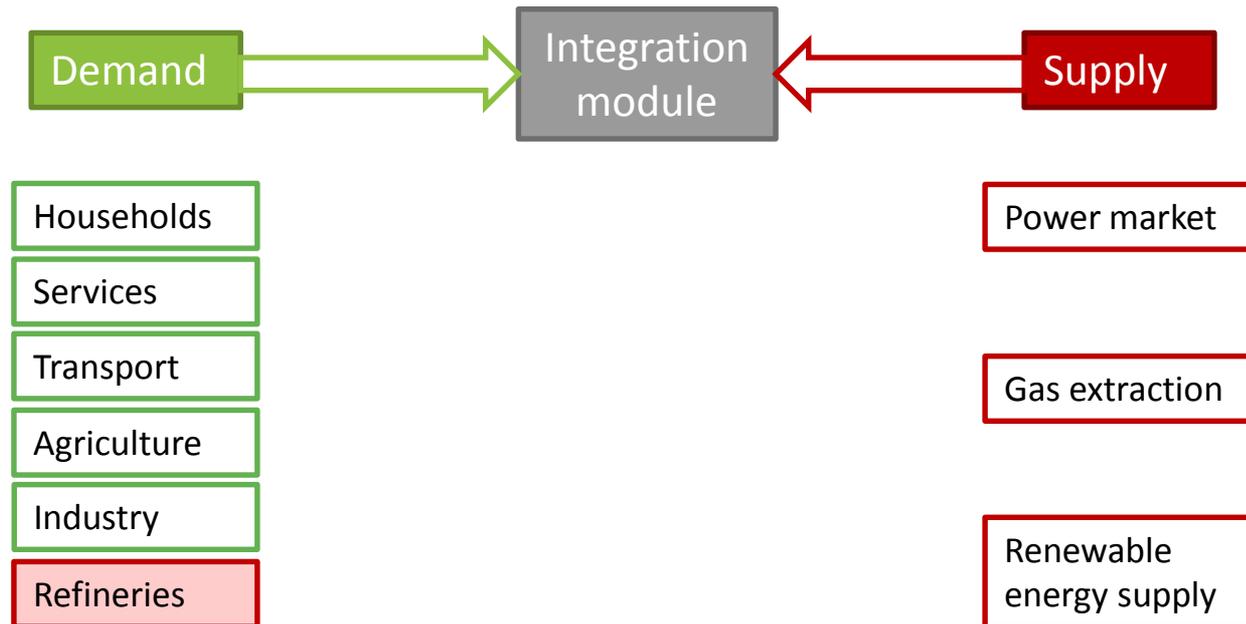 - (demography, economic growth, resource prices)
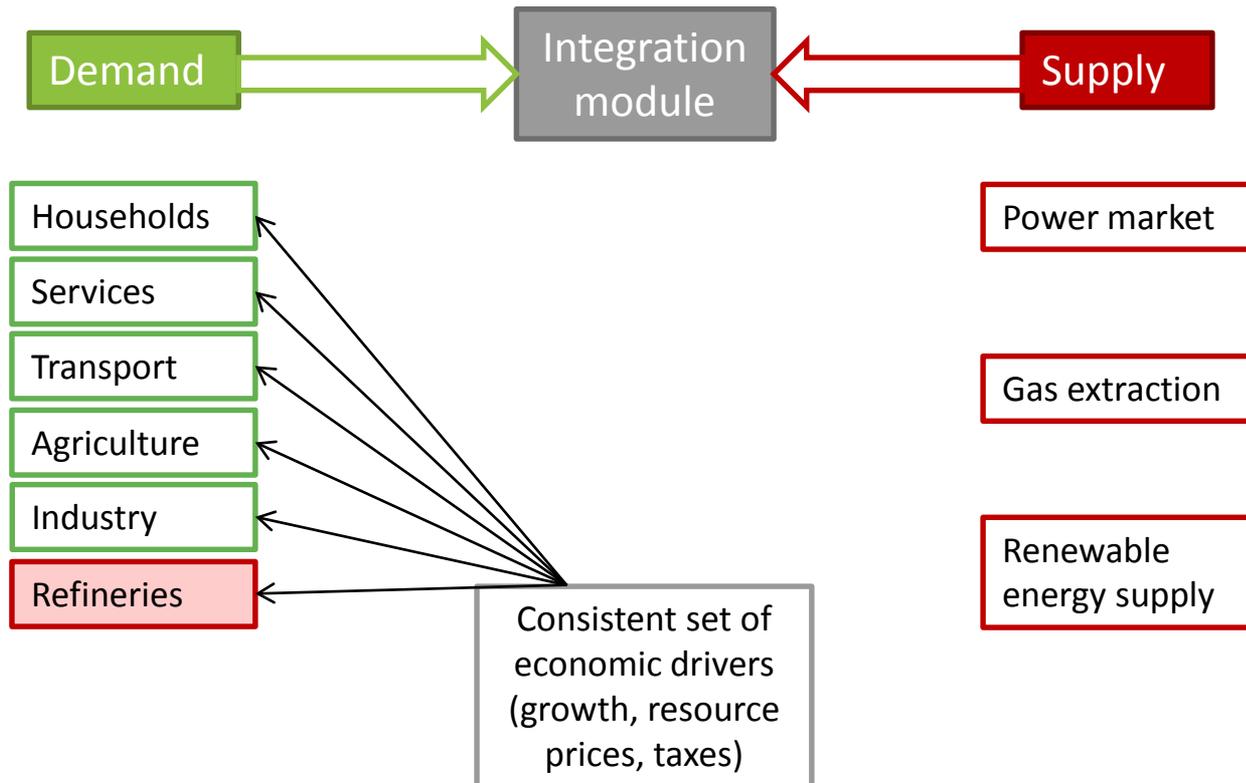
NEO modeling system
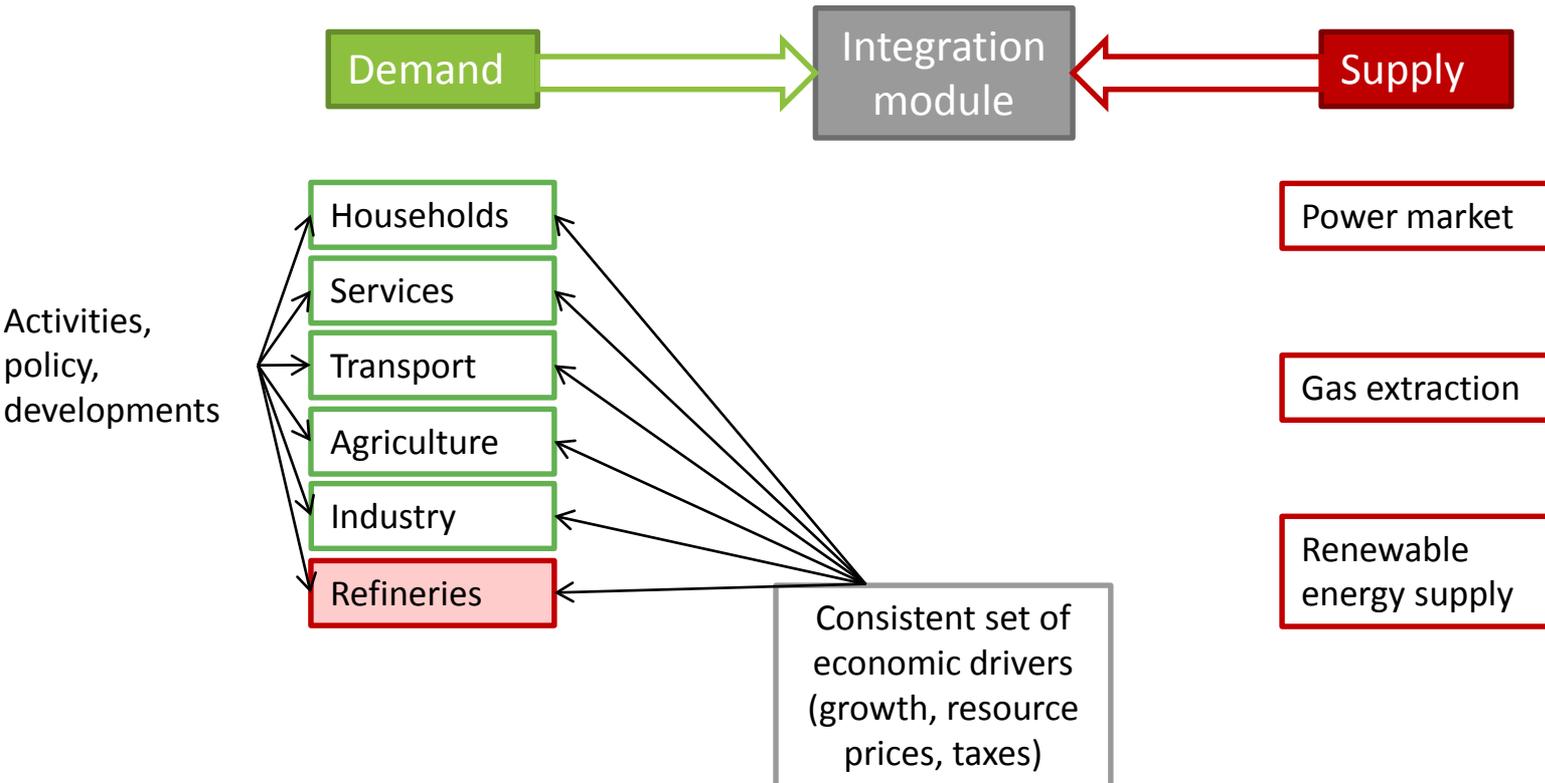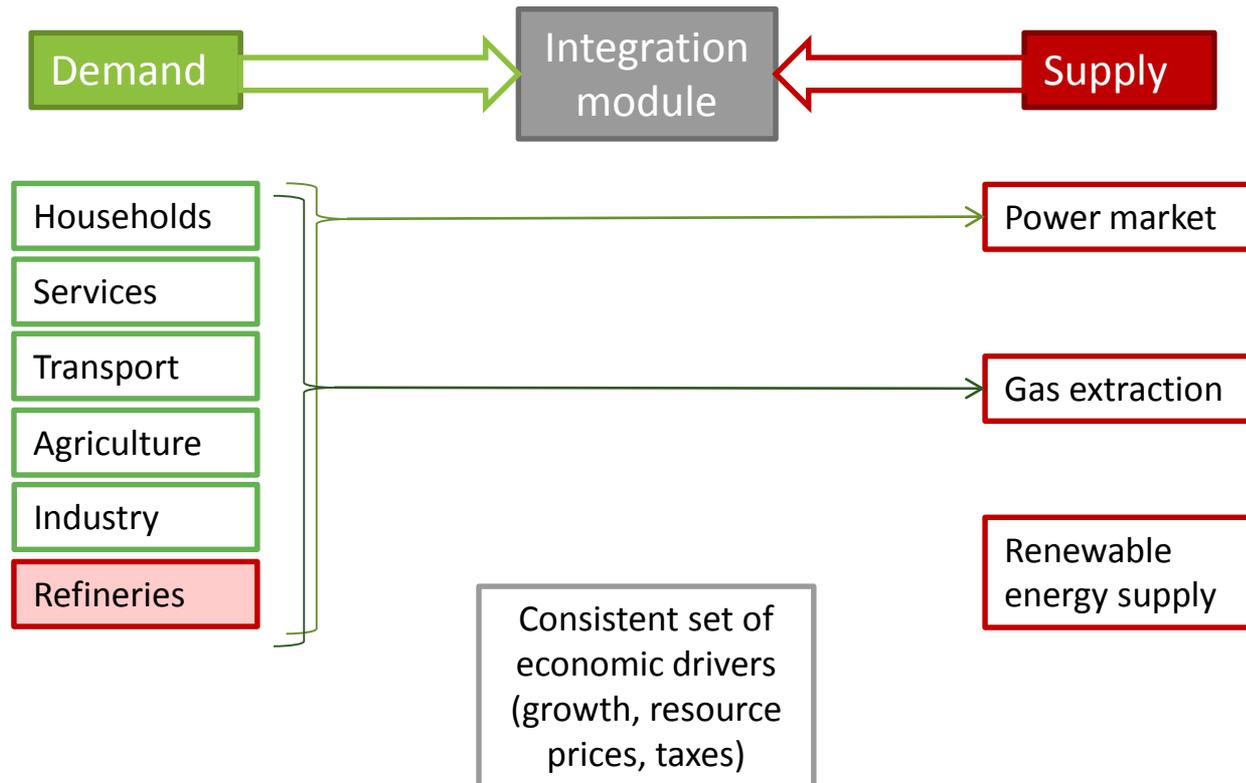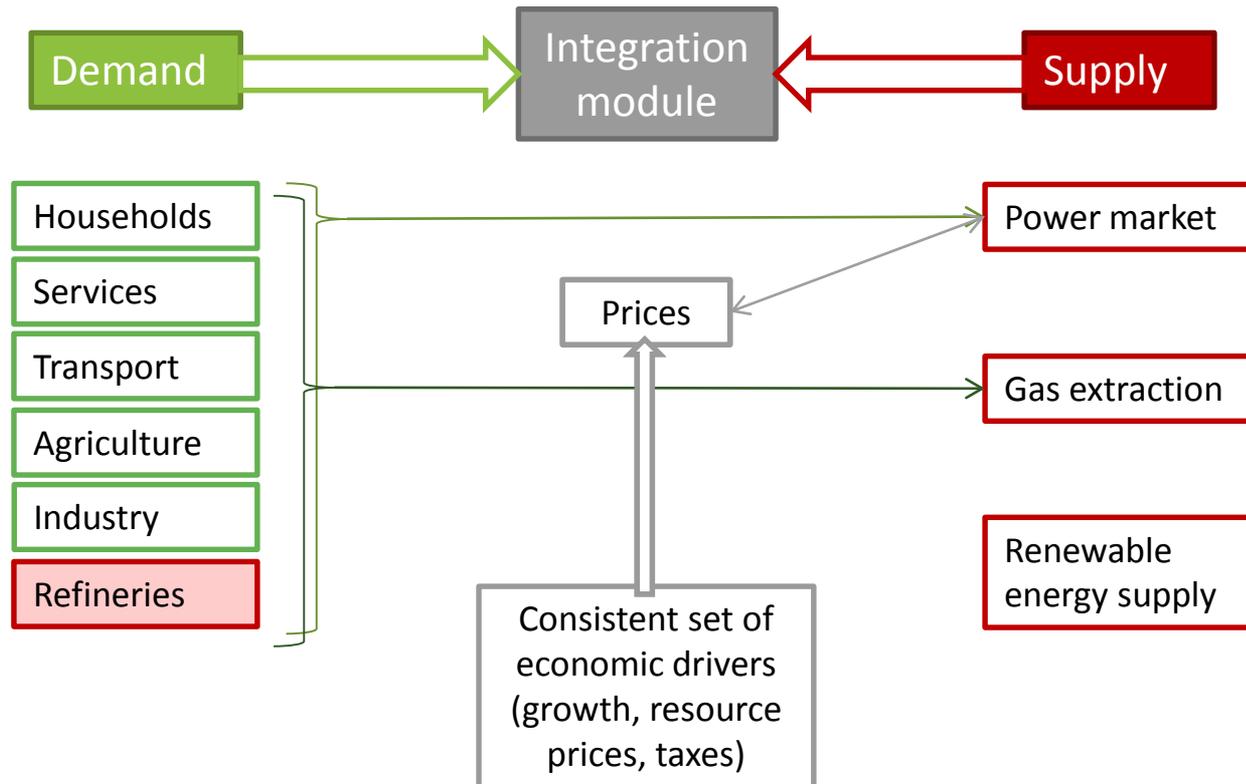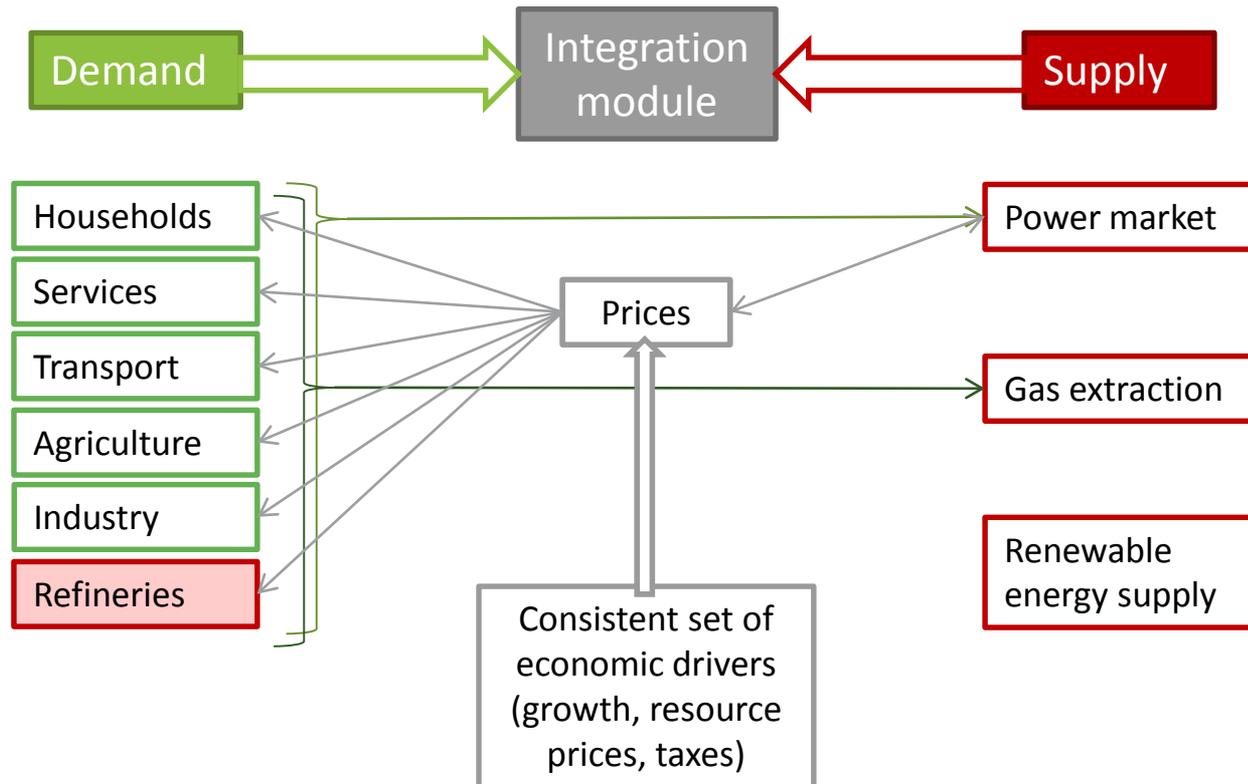
NEO modeling system

NEO modeling system

NEO modeling system

NEO modeling system

NEO modeling system

ECN

Demand → Integration module ← Supply

Activities, policy, developments

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

Power market

Gas extraction

Renewable energy supply

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

NEO modeling system

Demand → Integration module ← Supply

Households
Services
Transport
Agriculture
Industry
Refineries

Power market

Gas extraction

Renewable energy supply

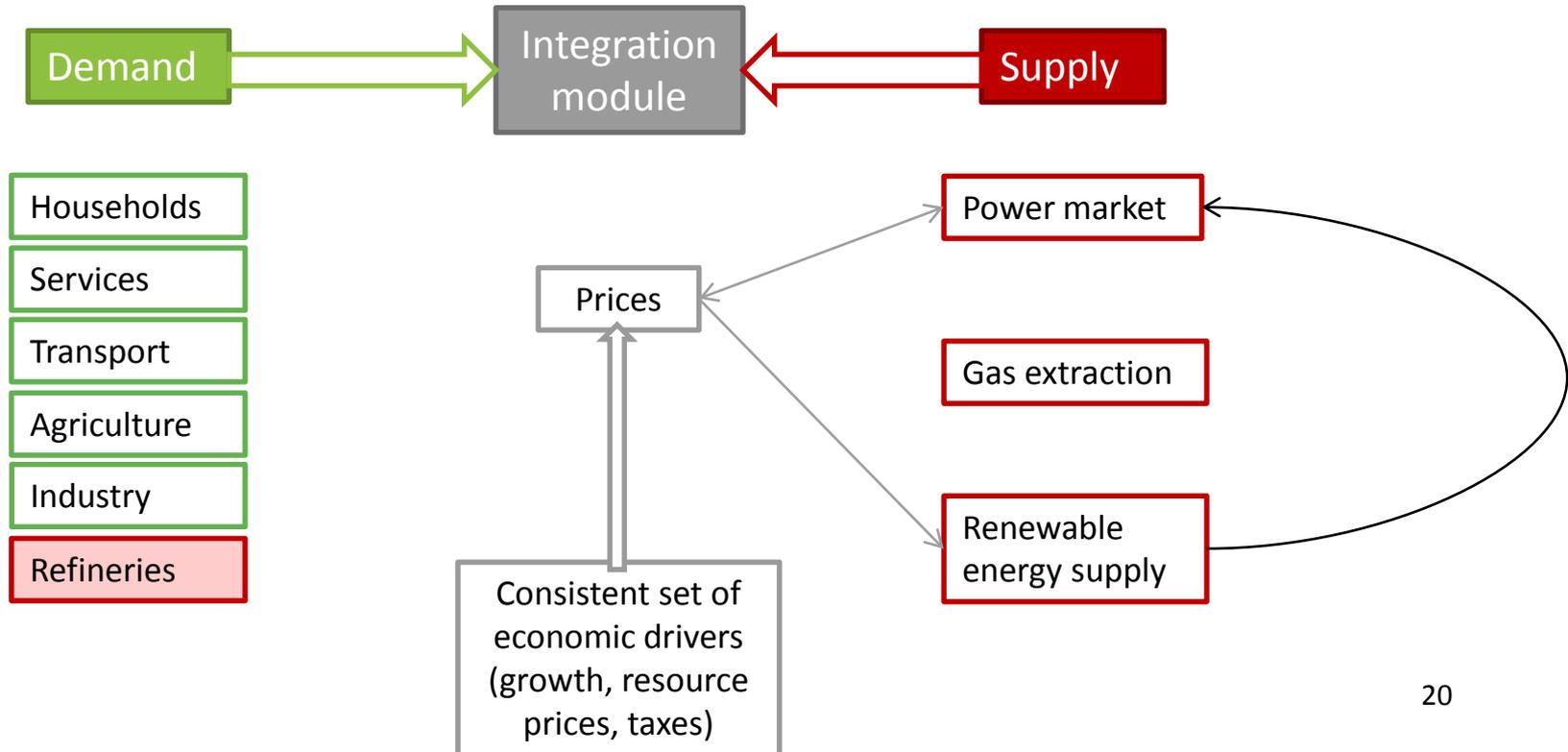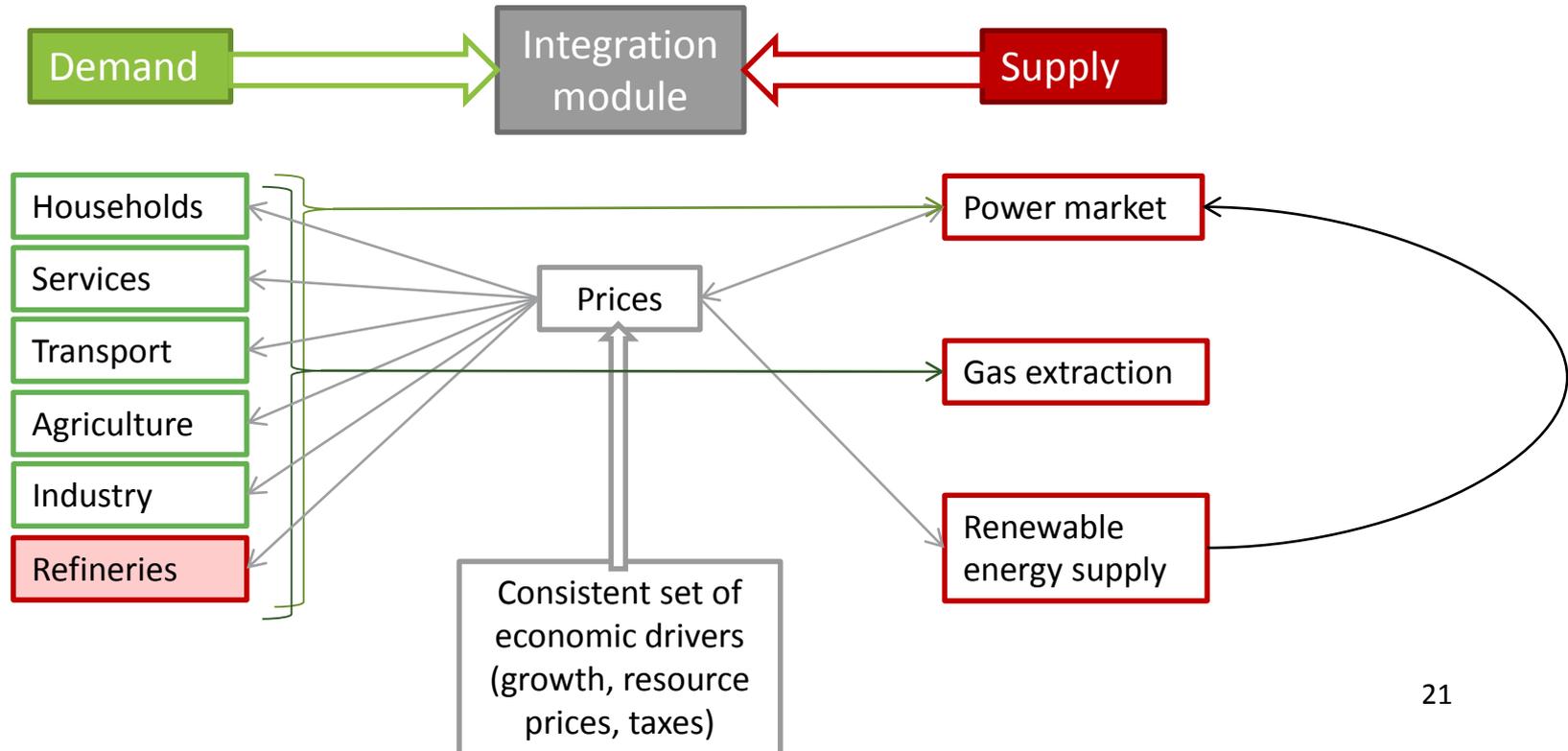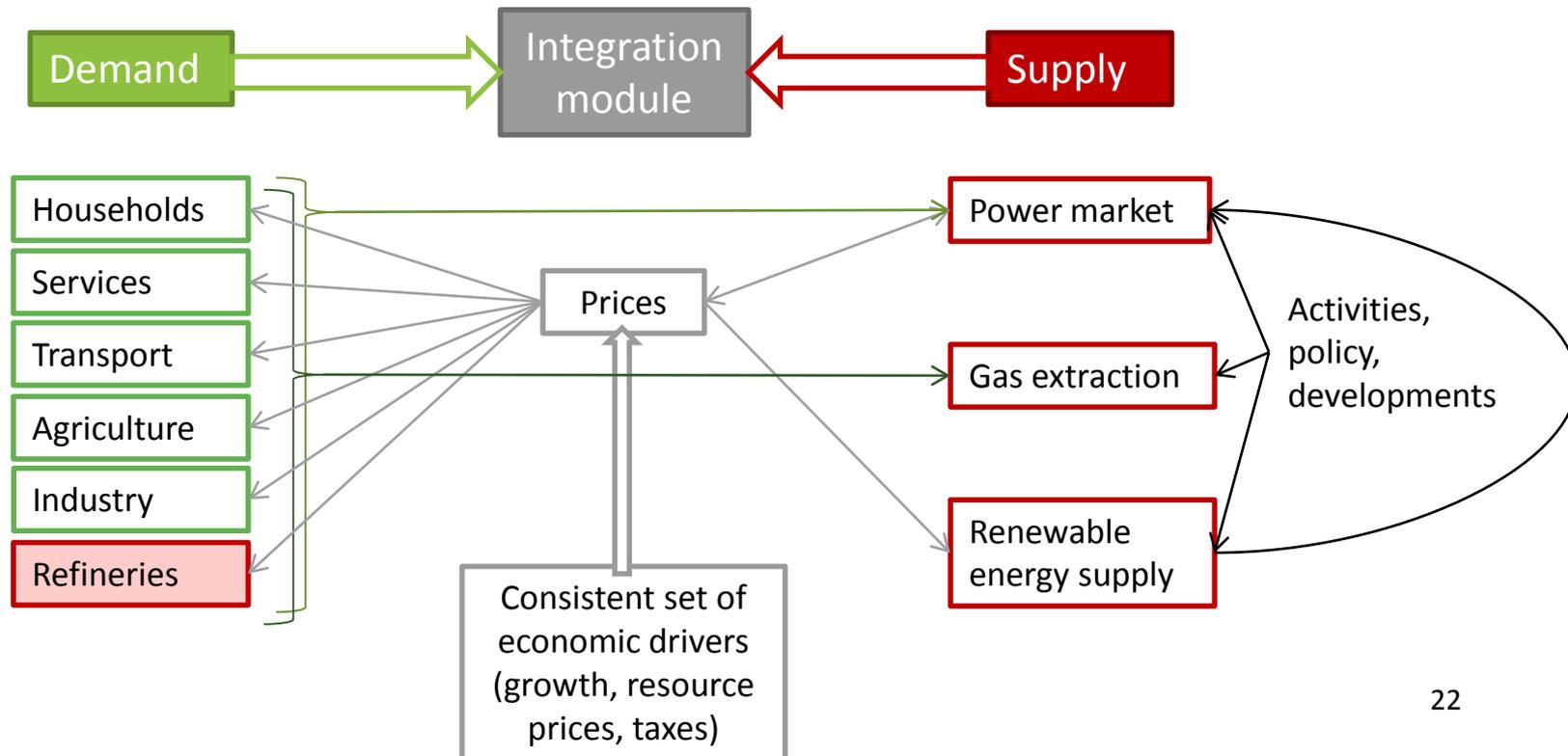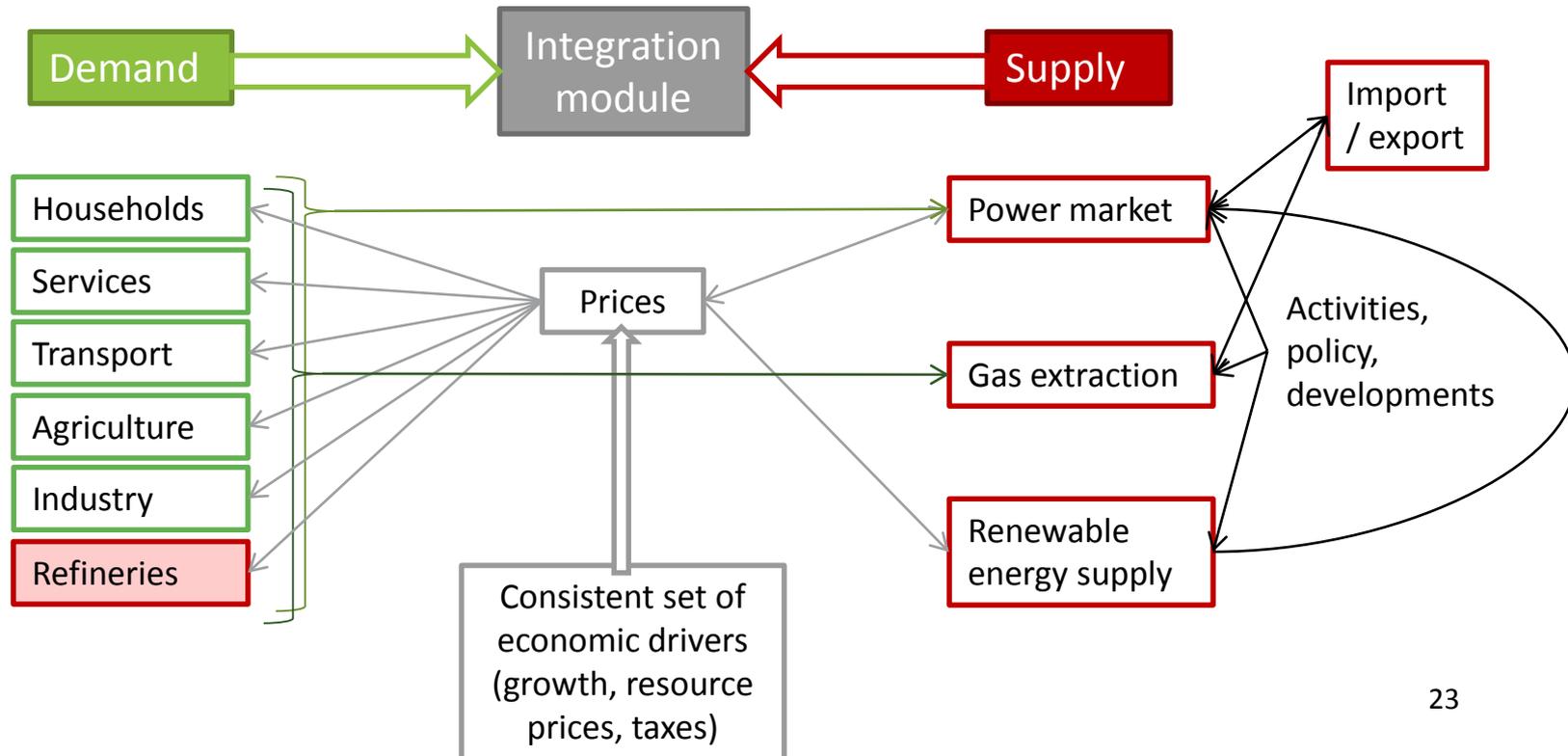Consistent set of economic drivers (growth, resource prices, taxes)

NEO modeling system

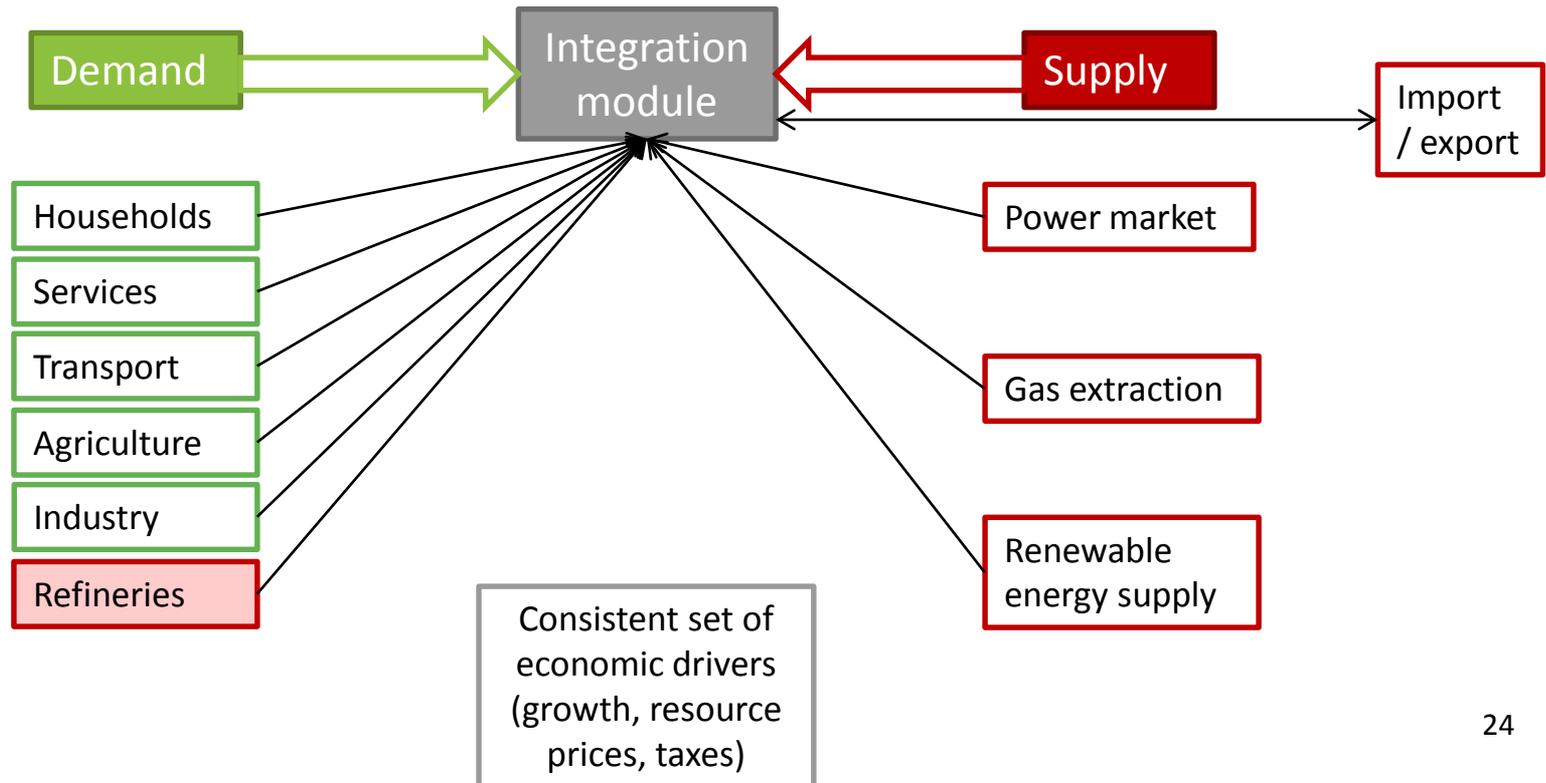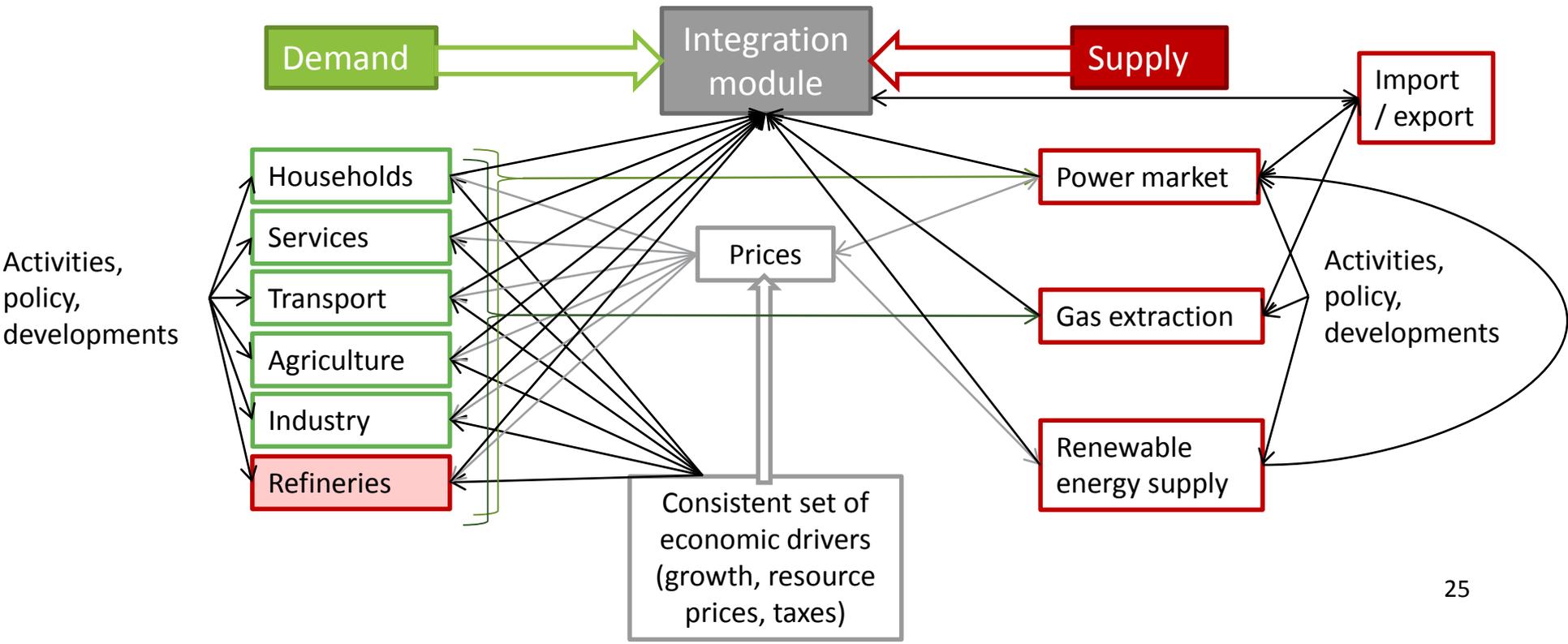# NEO modeling system

NEO modeling system

NEO modeling system

NEO modeling system

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NEO modeling system

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NEO modeling system

NEO modeling system

ECN

Demand → Integration module ← Supply → Import / export

Households
Services
Transport
Agriculture
Industry
Refineries

Prices

Power market
Gas extraction
Renewable energy supply

Activities, policy, developments

Activities, policy, developments

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

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NEO modeling system

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
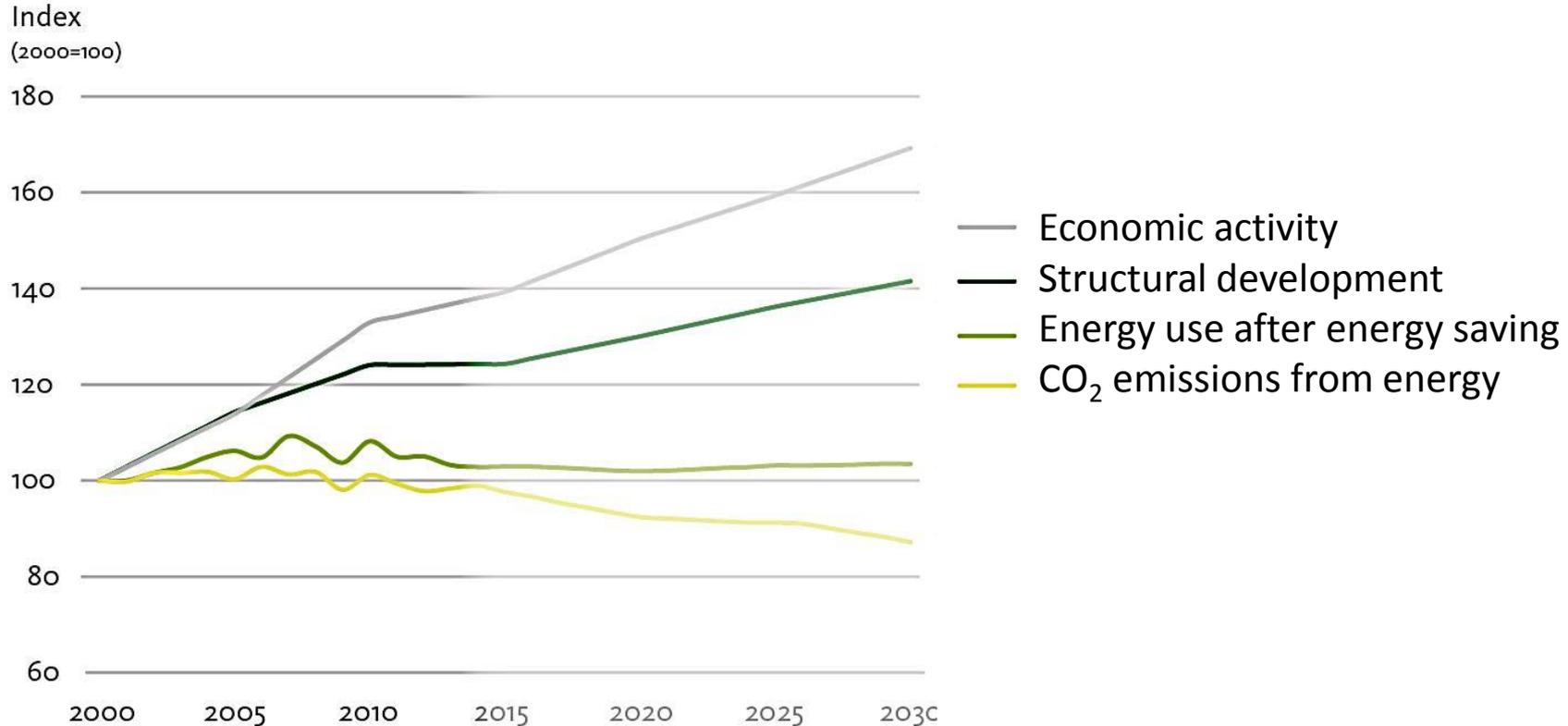- Renewable energy production from various sources

- Hourly match of demand and supply

- Resulting power mix and hourly commodity trading price

Results:

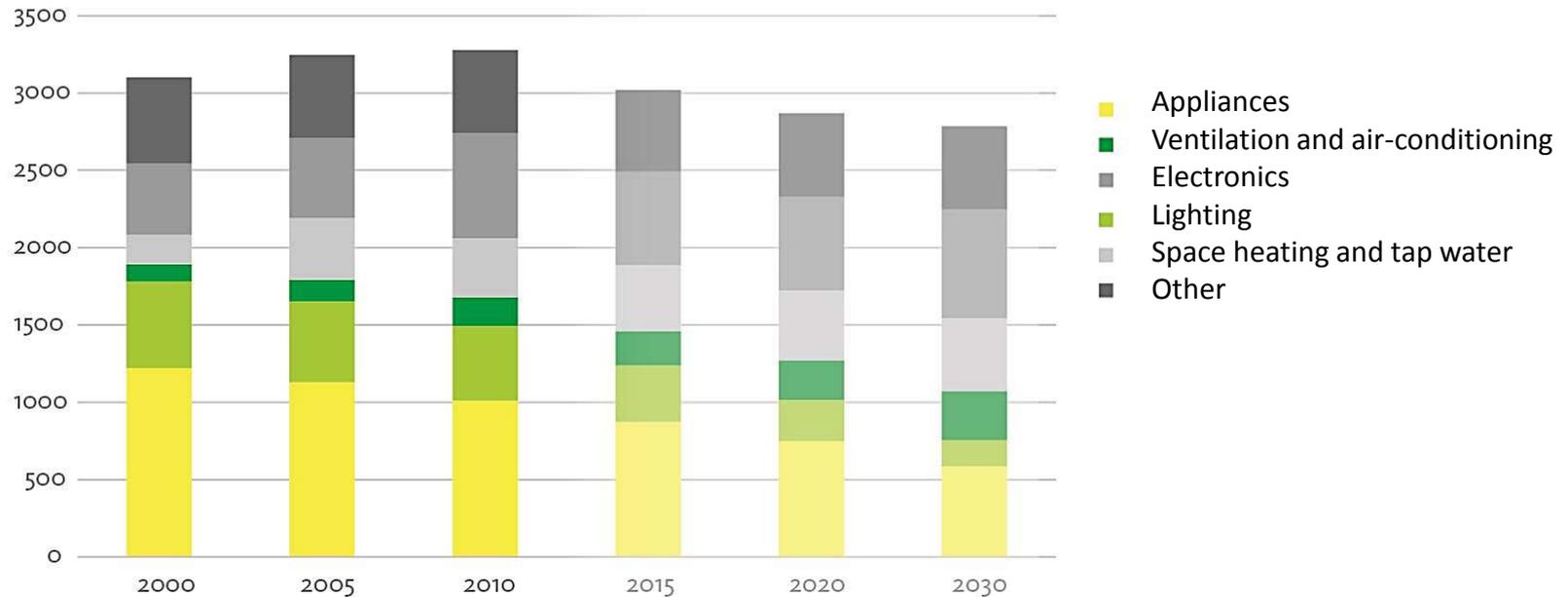Energy transition in NL becomes visible

Energy use, CO_2-emissions and economy show ´decoupling´

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Index
(2000=100)

- Economic activity
- Structural development
- Energy use after energy saving
- CO_2 emissions from energy

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Regulations work!

Average electricity use of households declines
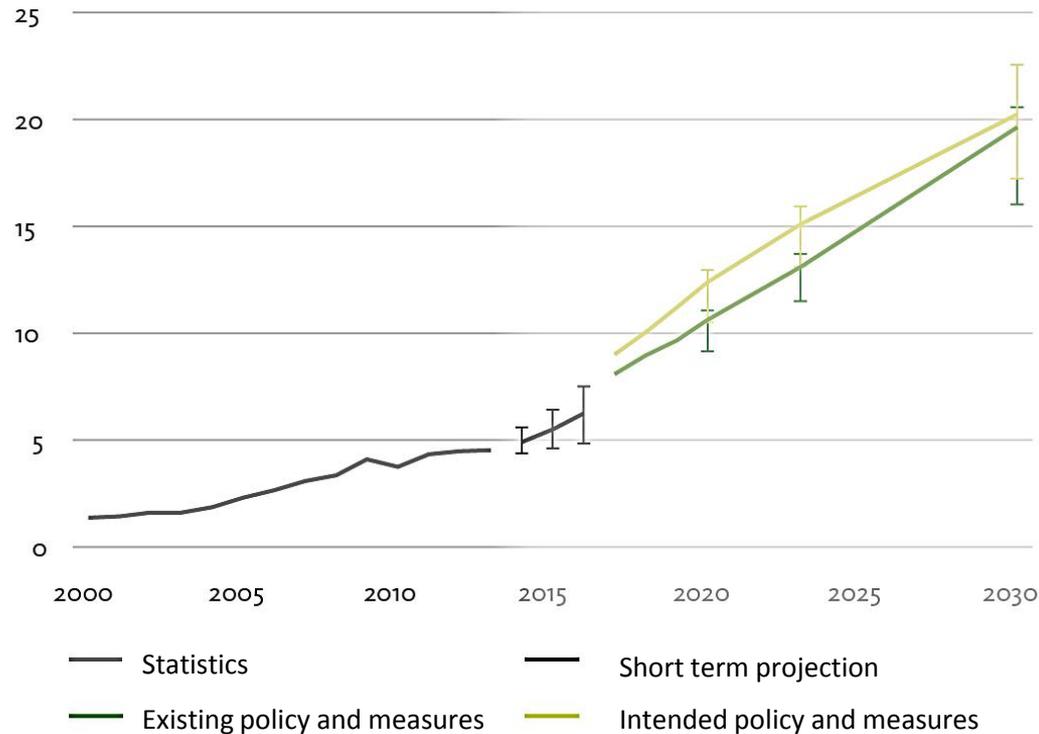
Electricity use (kWh)

Energy efficiency:
Not all goals within reach (yet)

- **Energy savings pace 2010-2020**
  - Existing policy 1,0% p.a (0,7 – 1,2%)
  - Intented policiy 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**
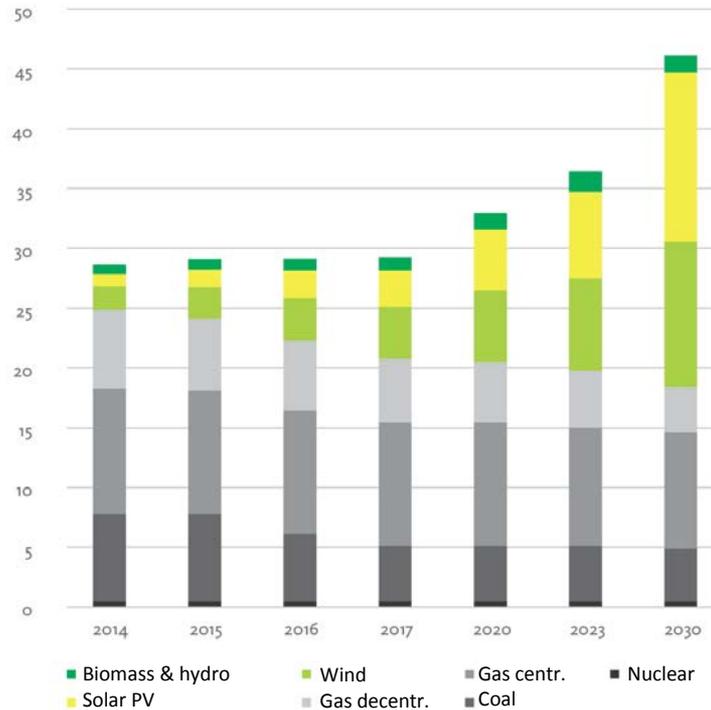 - Out of reach yet

Substantial growth of renewable energy, big uncertainties
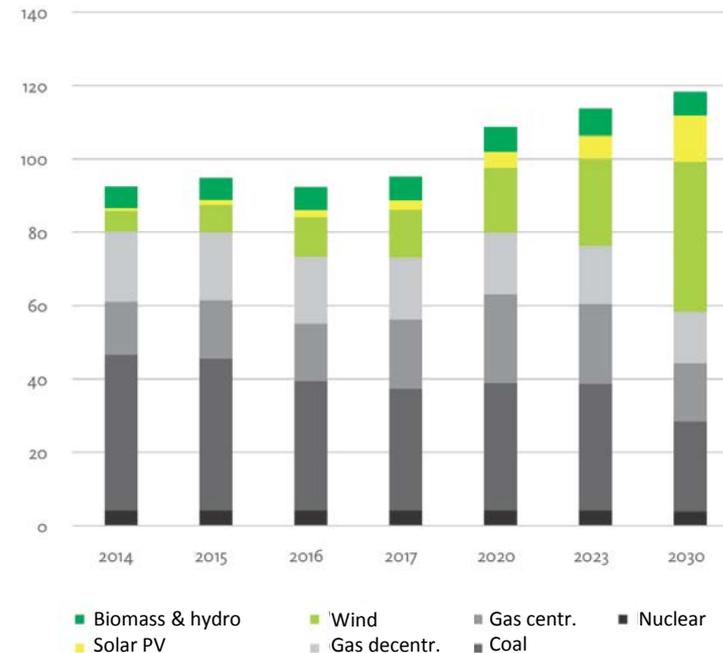
ECN

Share in final energy use (percent)

Legend:
- Statistics
- Short term projection
- Existing policy and measures
- Intended policy and measures

Electricity production

Capacity (GW)

Production (TWh)

Legend: Biomass & hydro, Wind, Gas centr., Nuclear, Solar PV, Gas decentr., Coal

Greenhouse gas emissions declining

GHG emissions (Mt CO_2-eq)
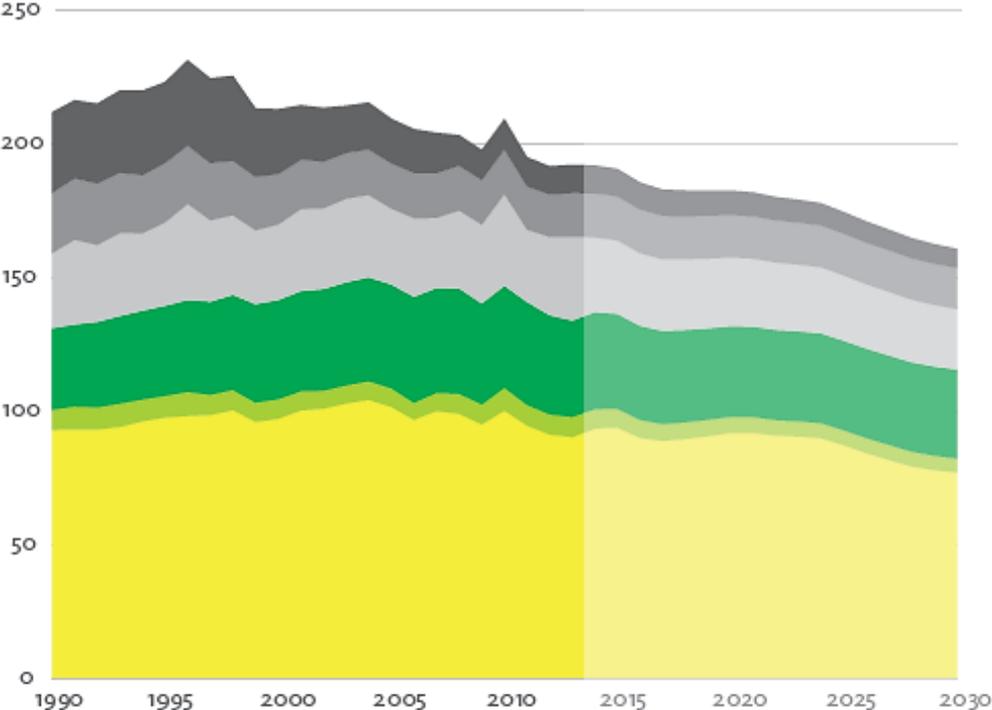
Legend:
- Industry CO_2
- Agriculture CO_2
- Transport CO_2
- Built environment CO_2
- Other GHG agriculture
- Other GHG remaining

The Netherlands becomes gas importing country

Gas production and consumption (bln m^3 Geq)

Legend:
- Continental shelf
- Other territorial
- Groningen
- Historic consumption
- Existing policy
- Intended policy
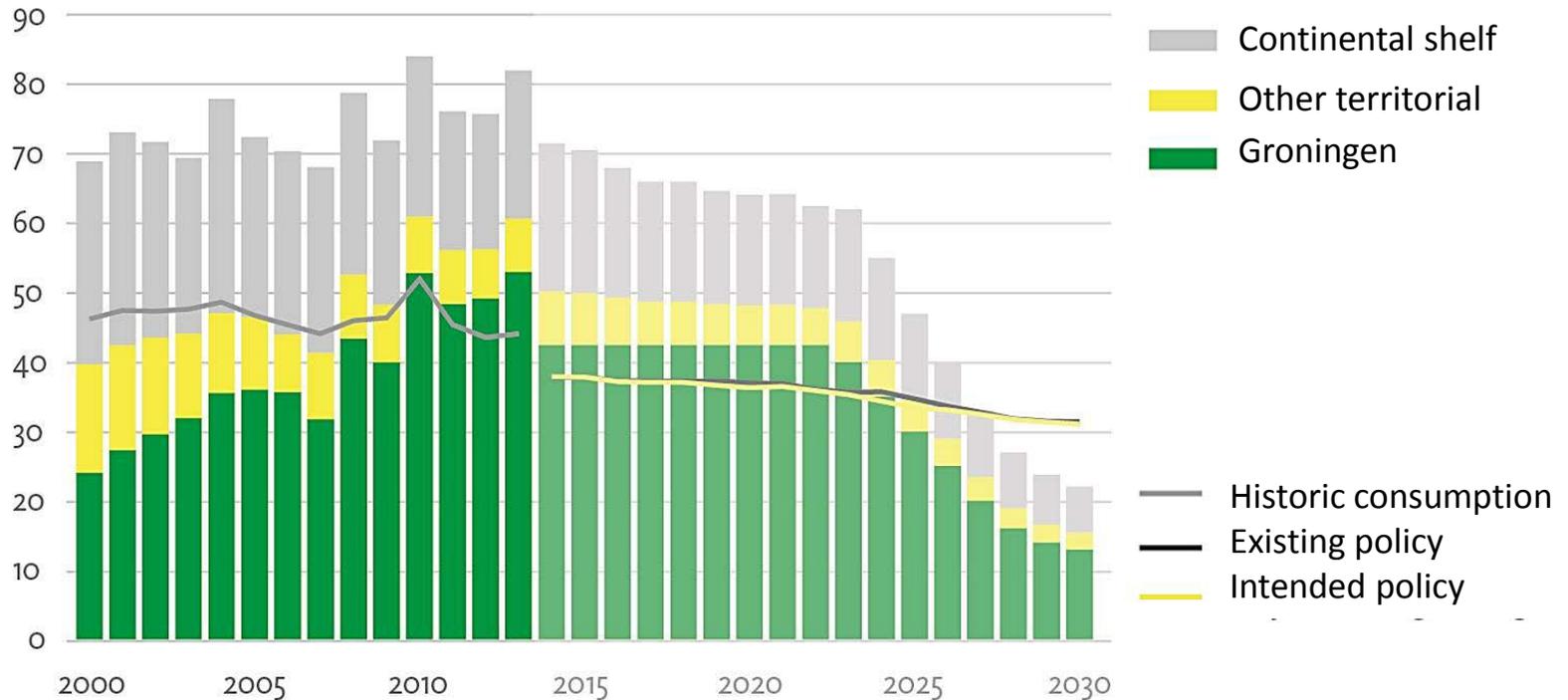
Investments generate substantial employment

Employment (x1000 fte)

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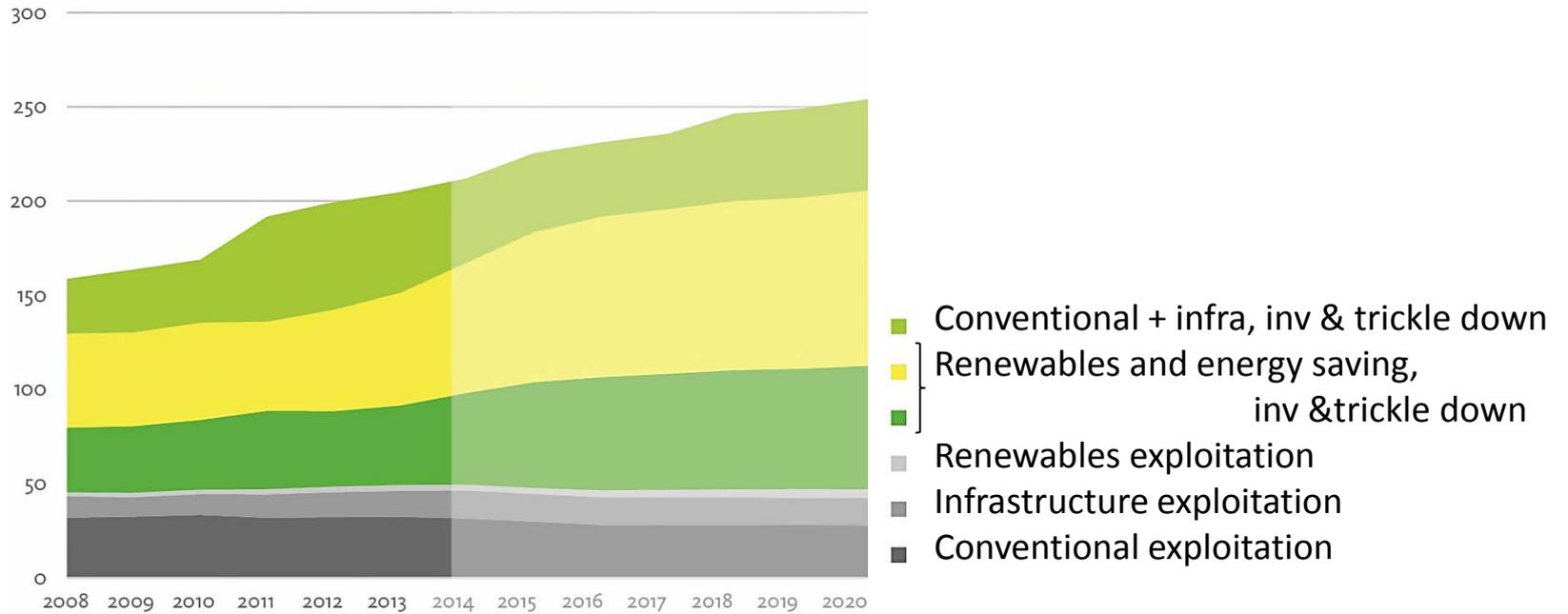
Conclusion

- 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
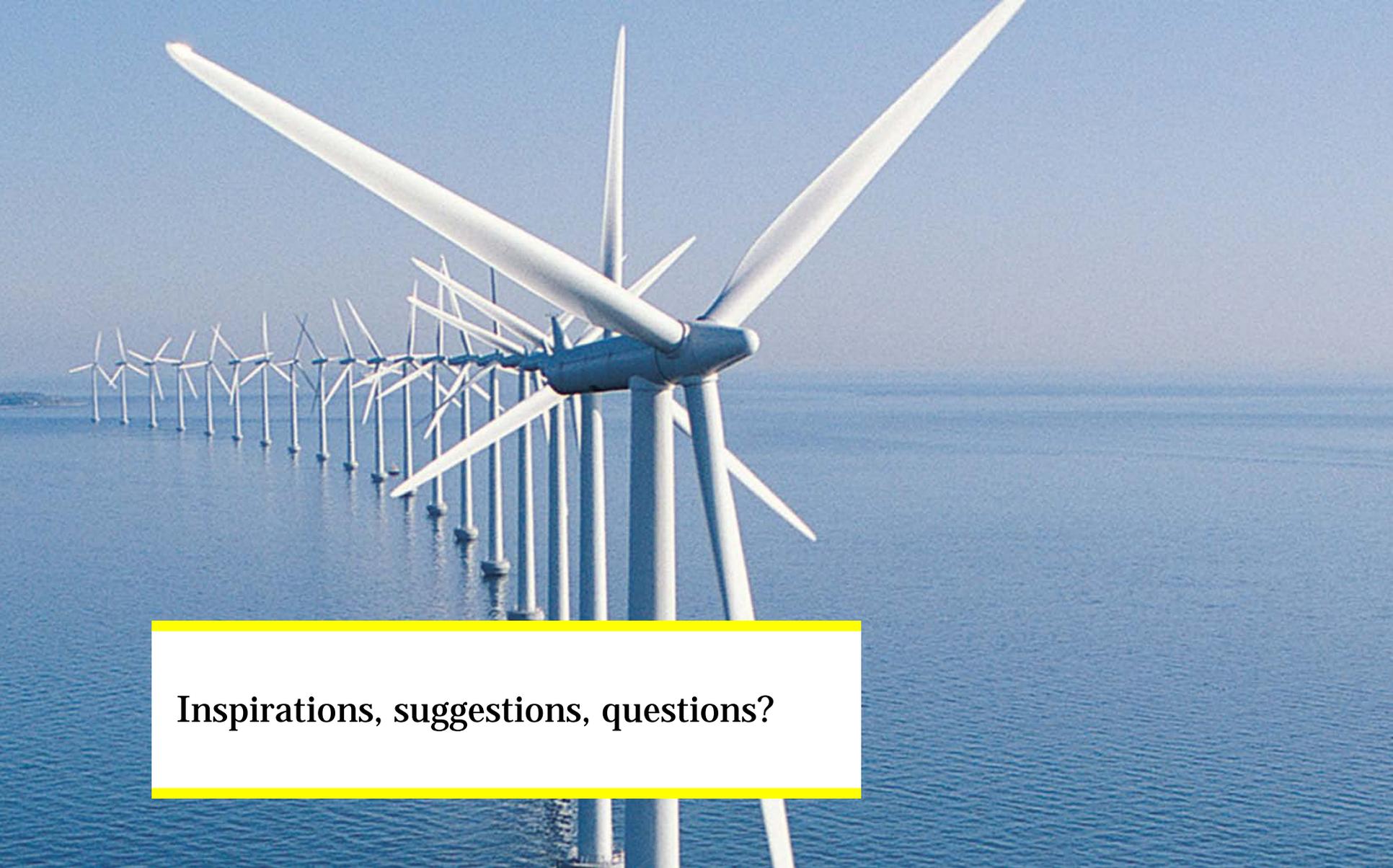
Inspirations, suggestions, questions?

Thank you for your attention

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