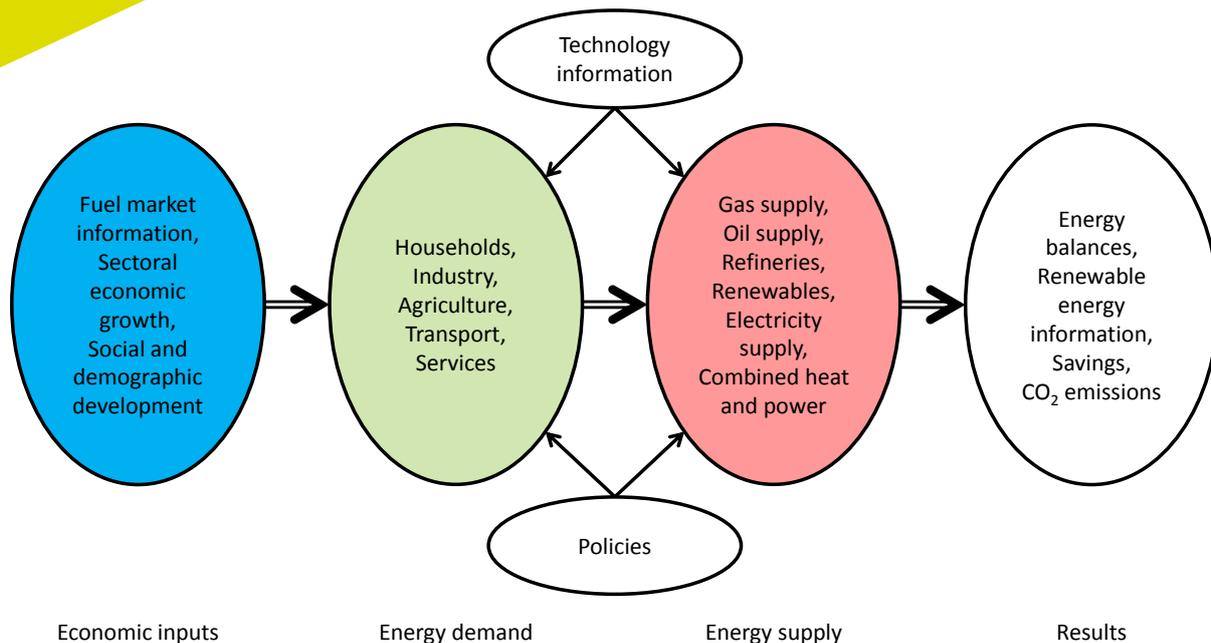




## National Energy Outlook Modelling System

For over 20 years, ECN has been developing the National Energy Outlook Modelling System (NEOMS) for Energy projections and policy evaluations. NEOMS enables 12 energy models of ECN to exchange data and produce consistent and detailed results.



NEOMS enables ECN to calculate the energy use and the corresponding emissions for the Dutch energy system and for individual sectors. Detailed results include energy demand, supply, emissions, technology uptake, investments, costs, prices, policy impacts. The total system includes about 22 sub-sectors with all relevant technologies and fuels per sub-sector. Their CO<sub>2</sub> emissions are also calculated.

The NEOMS models currently cover the following sectors and their corresponding models:

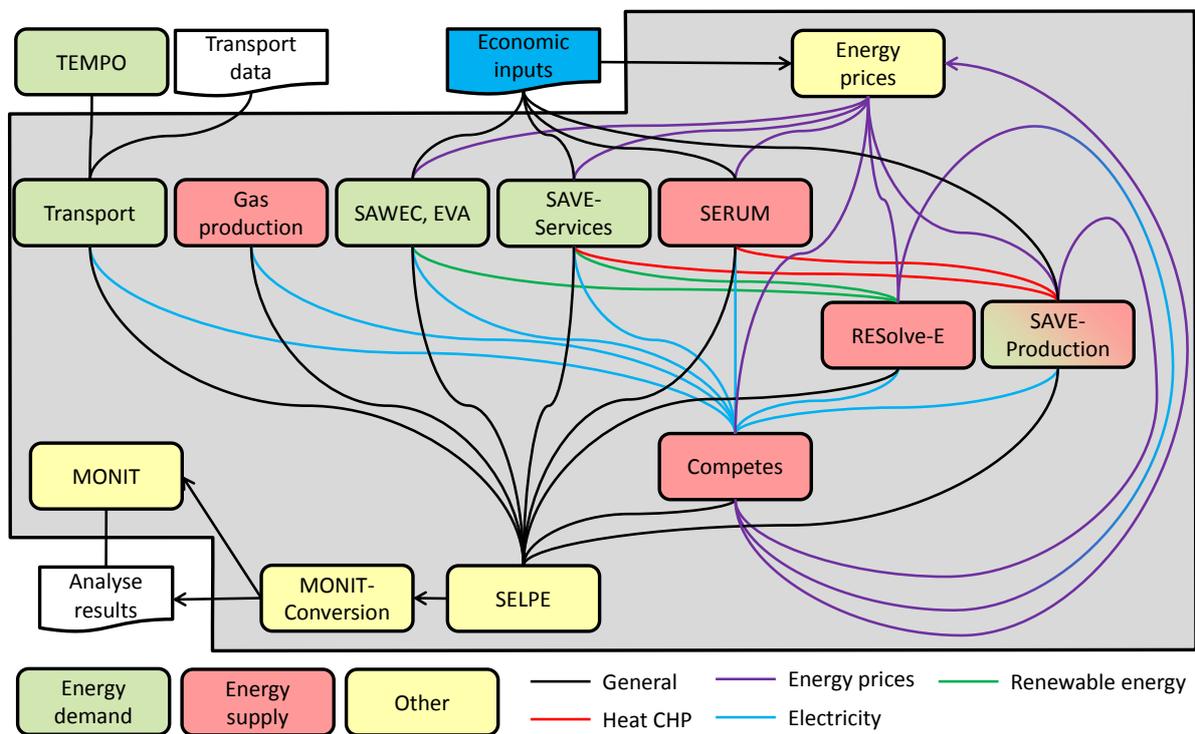
- **Energy demand**

- Industry and agriculture (SAVE-Production),
- Service sector (SAVE-Services),
- Households (SAWEC and EVA),
- Transport (TEMPO and/or external inputs).

- **Energy supply**

- Combined heat and power (SAVE-Production),
- Electricity supply (Competes),
- Refineries and oil supply (SERUM),
- Renewables (RESolve-E),
- Gas supply (Gas production).

The outputs of all the separate models are combined in a model of the total energy sector (SELPE) in which the validity and consistency of the energy system as a whole is verified. Ultimately, all the results feed into MONIT-Conversion, a tool which calculates the energy savings per sector and produces aggregated results for all kinds of analyses, for example for the presentation tool MONIT.



## Energy demand



### SAVE-Production (industry, agriculture and CHP)

SAVE-Production is a simulation model that calculates the

energy demand of industry and agricultural sectors and the sectoral implementation of combined heat and power generation. The future energy demand is calculated based on the economic growth per subsector and measures taken.



### SAVE-Services (service sector)

SAVE-Services is a simulation model for the services sector. Based on the economic growth per subsector and

the measures taken, the model calculates the future gas and electricity demand.



### **SAWEC (households)**

SAWEC is a simulation model for households that calculates the building-related energy use of

houses, for example natural gas, electricity, district heating and oil products. Based on a stock database, SAWEC calculates the effects of all kinds of measures. The model can accurately simulate historic energy-related trends dating back to 1985 and uses the same algorithm to project future developments towards 2040.



### **EVA (households)**

EVA uses a detailed stock database to calculate the national electricity use of household appliances, yielding

prognoses up to 2020. EVA offers a detailed view on the impact of changes in the penetration of appliances and autonomous or policy driven changes in energy consumption.



### **Transport**

The transport model is a tool to incorporate the results of the ECN model TEMPO and externally provided data into the

databases of NEOMS. This enables the other models to use these data for their calculations.

## **Energy Supply**



### **Competes (electricity supply)**

Competes is used to calculate the centralised electricity production.

Based on the Dutch sectoral electricity demand, hourly electricity production from intermittent renewables and sectoral implementation of combined heat and power, the remaining demand is covered by Competes, taking into account the merit order of the supply curve of centralised electricity generators and electricity trade with the neighbouring countries. Competes also provides the commodity prices for electricity.



### **SERUM (refineries and oil supply)**

SERUM is an optimization model for the Dutch oil refining sector. Based on

expectations about the demand for oil products, environmental measures and crude properties, SERUM calculates the required crude intake, the required refining configuration and the energy use for the whole process. Based on energy use and energy carriers, emission developments are calculated.

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### RESolve-E (renewables)

The aim of the RESolve-E model is to provide data about the total renewable energy

production (excluding biofuels). For the renewable energy production that is eligible to receive a subsidy via the SDE subsidy scheme, the SDE budget constitutes a ceiling for the total production. Because renewable energy can contribute to realising the energy performance coefficient standards for new buildings, the renewable energy production of SAWEC and SAVE-Services serve as input for RESolve-E.



### Gas production (gas supply)

In this model, the supply of natural gas is calculated based on the availability of natural gas in the 'Groningen' gas

field, and the other onshore as well as the offshore fields. Exogenous assumptions are made about the volume for gas storage and export. If demand exceeds this production, natural gas will be imported. The model calculates the amount of energy needed for production, storage and transport as well as losses in the grid.

### Other models and tools in NEOMS

#### Energy prices

The energy prices tool provides electricity and gas prices for the different sectors as defined in NEOMS. These data can be used by the NEOMS models.

### SELPE (validity and consistency check)

SELPE is an optimisation model that is used to model the entire Dutch energy sector. Most of the constraints are set by the above-mentioned models. The aim of this model is to check the feasibility and consistency of the outcomes of the other models, for example verifying that the total electricity demand does not exceed the electricity supply.

### MONIT-Conversion (aggregation tool)

The output of the SELPE model is very detailed. MONIT-Conversion can aggregate its results into any format needed by the user. The output is made available to MONIT, and can also be made available to external parties. Another function of this tool is to calculate the energy efficiency indicators.

### MONIT (presentation tool)

This tool is used to present the combined results of the models in such a way that they can be used in all kinds of reports, together with historic data. Some of the results are also available on the Internet (<http://monitweb.energie.nl/>).

