



PBL Netherlands Environmental  
Assessment Agency

# Modelling industry in the Climate and Energy Outlook (KEV) 2021

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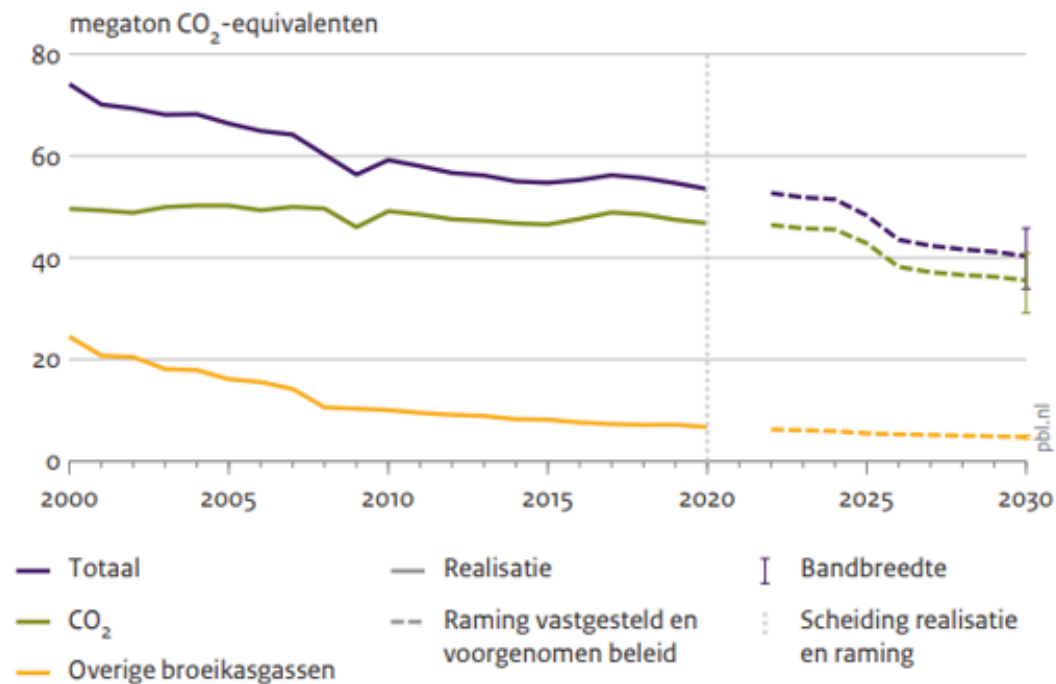
30-11-2021



# KEV2021: main insights industry

- > 2030 industry emissions: 40,3 (34-46) megaton CO<sub>2</sub>-eq. (scope 1)
- > 2030 emission reduction (scope CO<sub>2</sub> levy, incl. Velsen units):
  - 5-11 megaton carbon capture & storage
  - 2-4 megaton electrification
  - 1-2 megaton energy savings
  - approx. 1 megaton other GHG-projects
- > Main policy impulses:
  - NL CO<sub>2</sub> levy
  - SDE++ subsidies
- > The uncertainties are significant

Emissie broeikasgassen door industrie



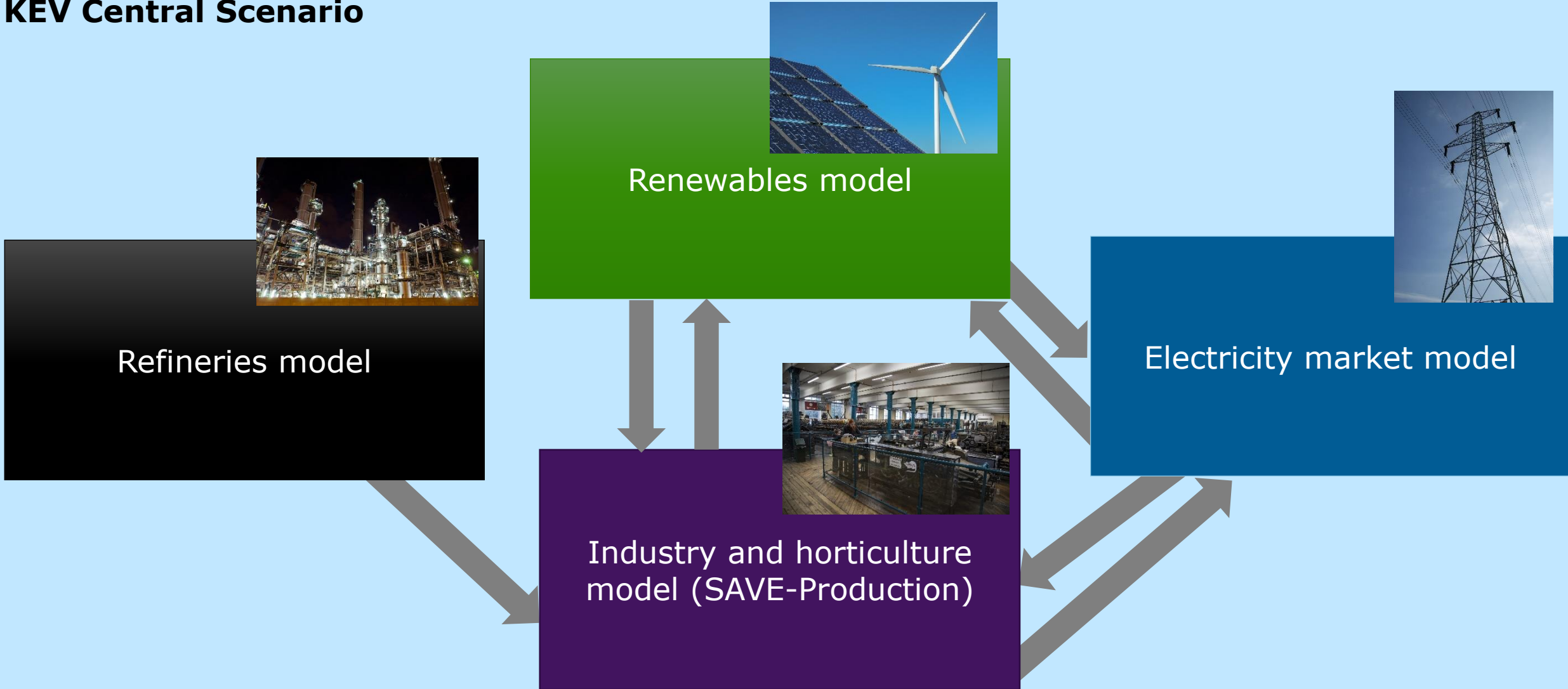
# KEV modelling system

Part relevant to modelling industry



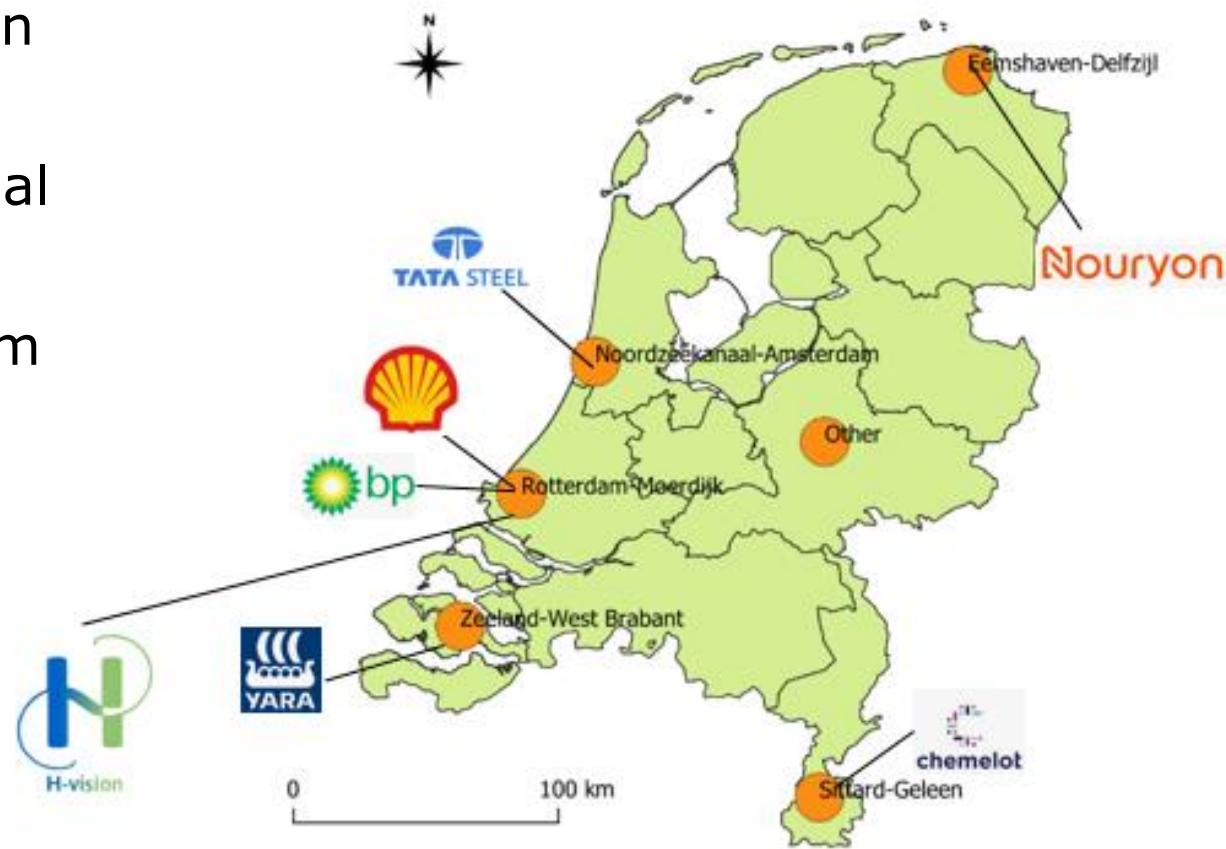
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## KEV Central Scenario



# SAVE-Production model - scope

- > Model to assess energy use and emissions in NL industrial and agricultural sectors
- > Scope: 52 subsectors attributed to 5 regional clusters, and 6<sup>th</sup> 'cluster'
- > Used for assessing shorter and medium term
- > Wide range of technologies/options, e.g.:
  - Combined Heat & Power (CHP)
  - Boilers: natural gas, H<sub>2</sub>, biomass, electric
  - Carbon Capture & Storage/Utilization (+ infrastructure)
  - H<sub>2</sub> production facilities
  - Various unique projects: e.g. H-Vision



Examples of the allocation of options and companies to clusters

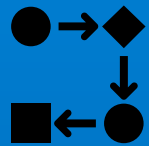
# Main model input



Physical growth scenarios



Price data (e.g. fuel prices)



Technology and process data



Policy input

Main data sources:



# Model objective

$$\text{MINIMIZE } \sum_{s,y} \frac{1}{(1 + r_{s,y})^{y - \text{BaseYr}}} \times (\text{Net OPEX}_{s,y} + \text{CurtailCost}_{s,y} + \text{FixedCost}_{s,y} - \text{Subsidy}_{s,y})$$

Subject to, i.a.:

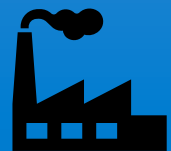
- Flow balances (e.g. thermal)
- Capacity
- Infrastructure links
- Policy constraints: e.g. 550 million SDE expenditure constraint, NL CO2 levy



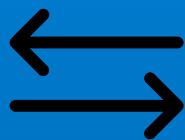
# Main model output



Investments, CO<sub>2</sub> levy payments (if any), subsidy claim industry, operating expenditures, etc.



Emissions



Input/output flows per option (of which energy use)



## Final remarks

- > SAVE Production valuable tool to support NL industry policy design
  - Significant level of detail
  - Tool to assess 'what-if' questions, not meant for forecasting
- > Model continuously updated:
  - Model code improvements
  - Changes in policy design and restrictions
  - Changes in initiatives for unique CO<sub>2</sub> reduction projects
  - Further implementation of insights and data MIDDEN





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# Thank you for your attention!



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