

THE PROSPECTS OF NATURAL GAS IN A FUTURE ENERGY SYSTEM: A PROBABILISTIC APPROACH

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Overview

- National context
- Overview of energy outlooks on the role of natural gas in the future energy system
- Probabilistic modelling of the developments in natural gas markets

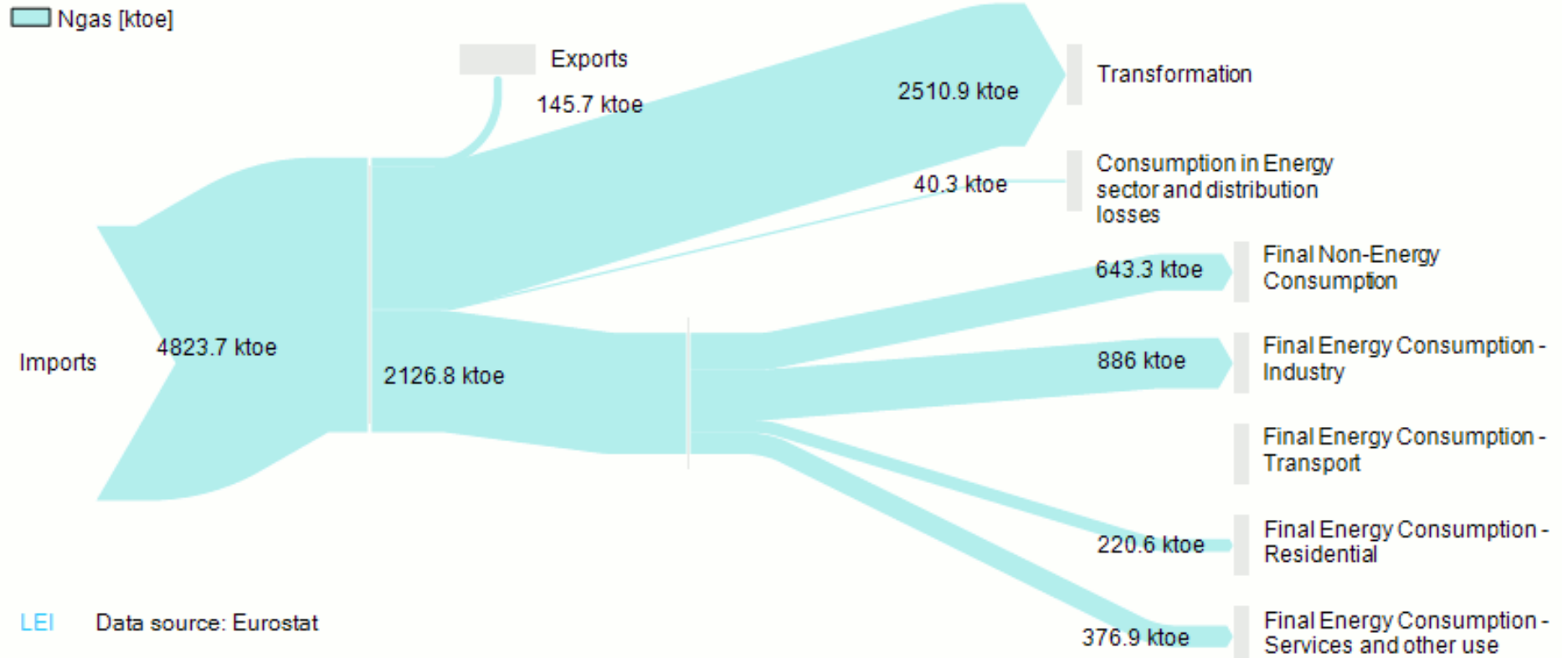


Local context in Lithuania

- INDEPENDENCE, a floating LNG storage and regasification unit to be used as an LNG import terminal started operating in the autumn of 2014.
- It can store 170,000 m³ (6,000,000 cu ft) of natural gas and is able to satisfy all the natural gas demands in Lithuania.
- Currently the FSRU is leased from Norwegian company Hoegh LNG. However, there are plans to purchase the terminal after 2024.



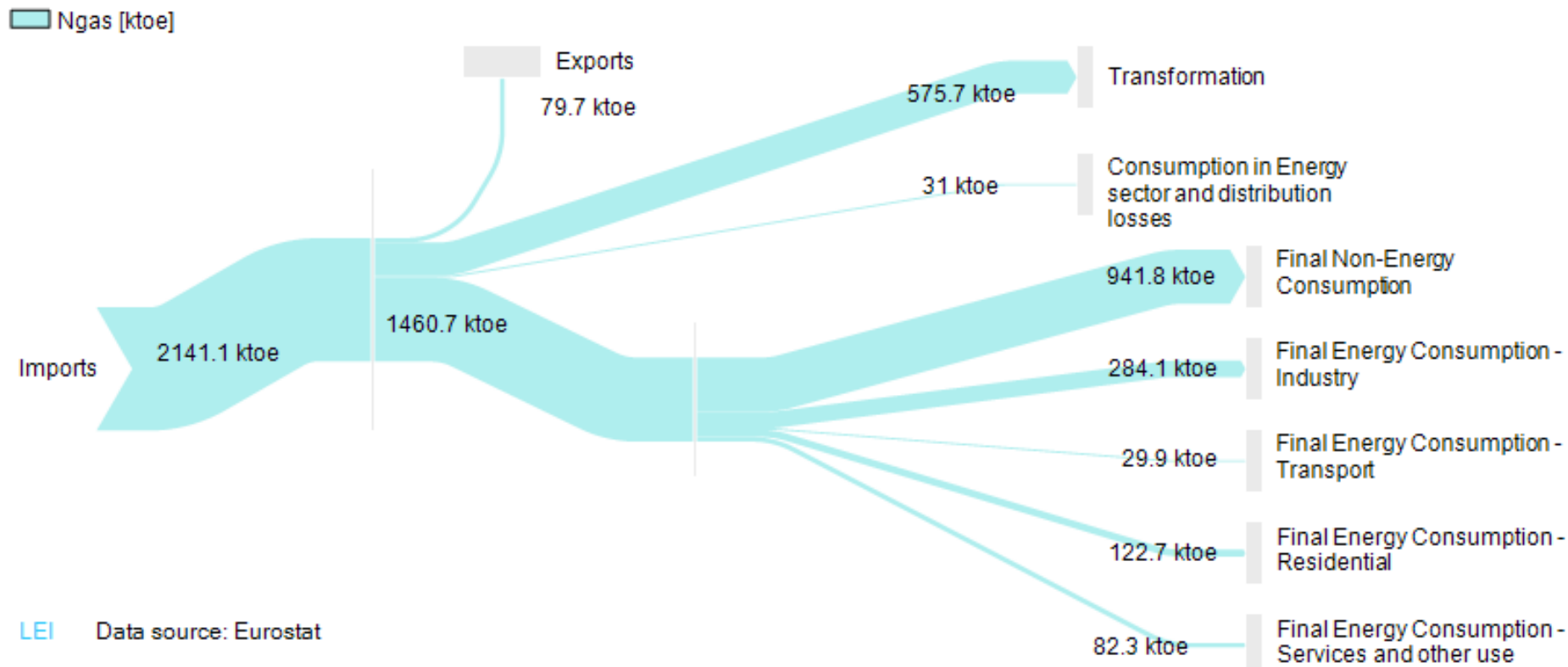
Natural gas consumption in Lithuania in 1990



* 1 ktoe = 1,25 million m³



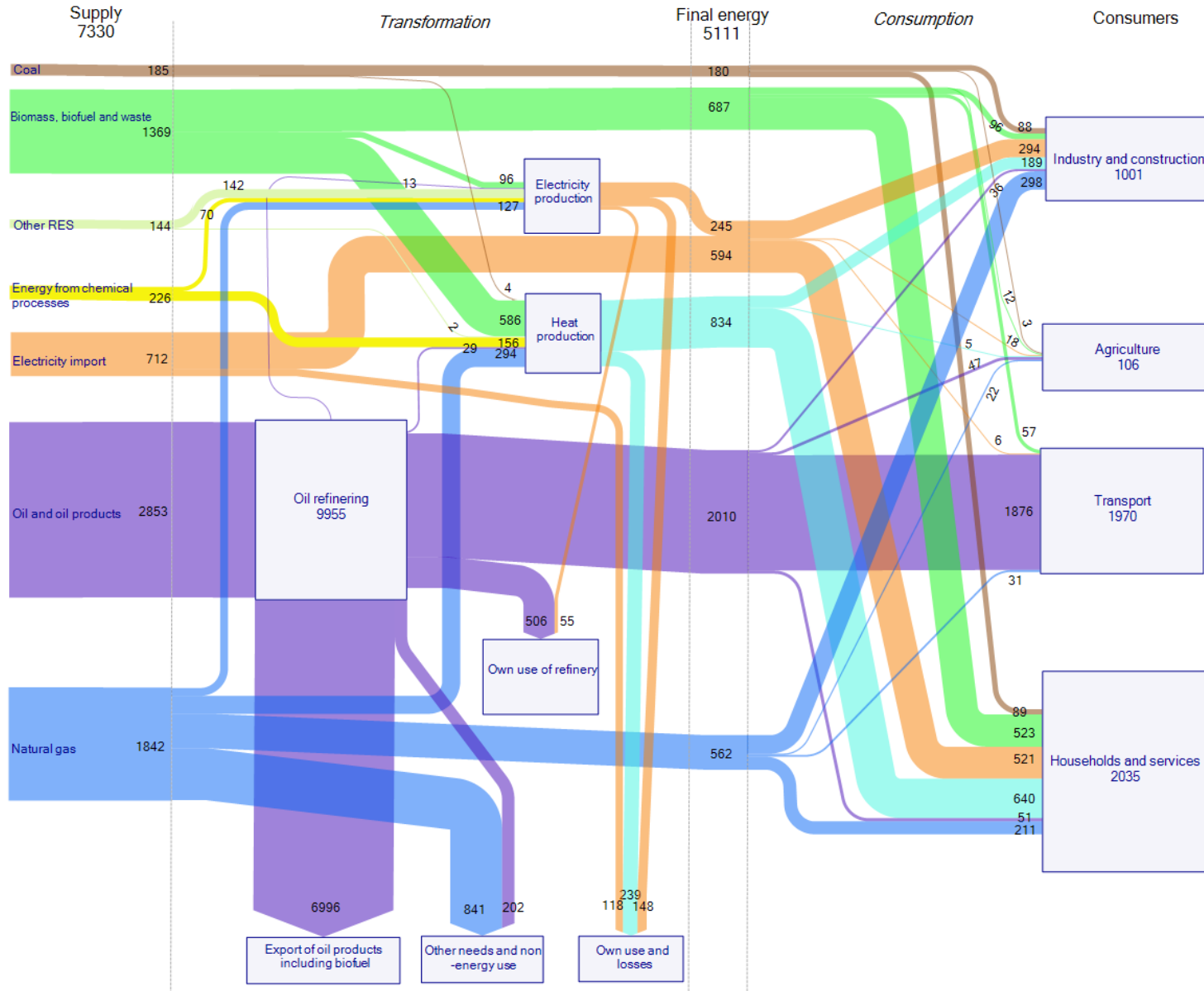
Natural gas consumption in Lithuania in 2015



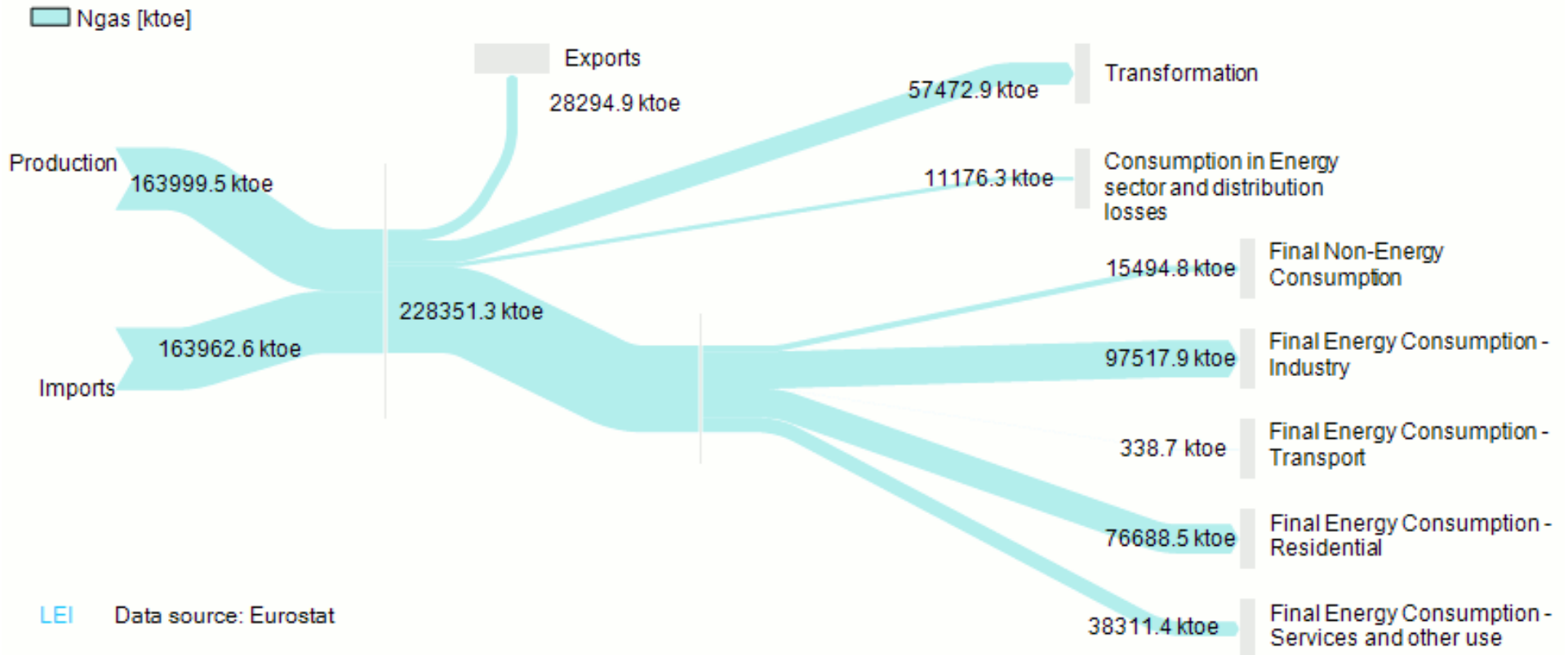
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The role of natural gas in Lithuania in 2016



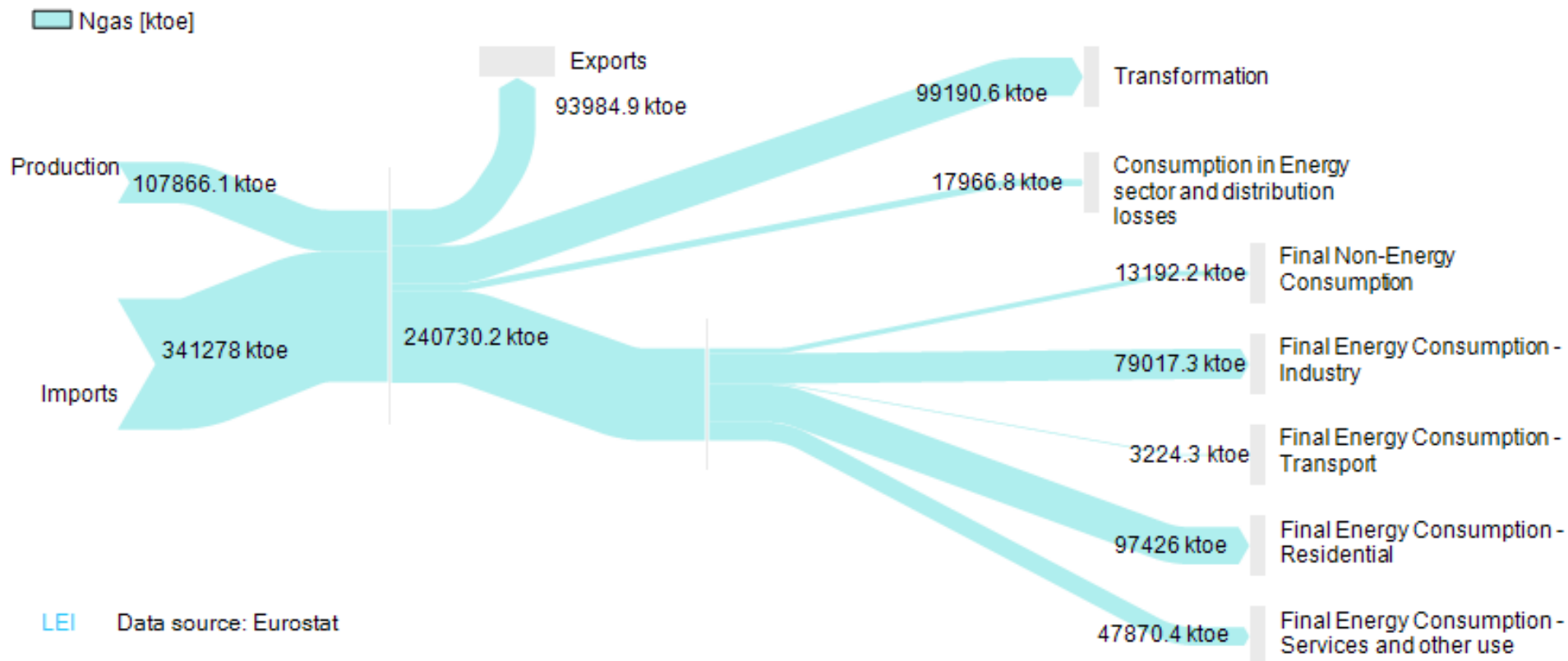
Natural gas consumption in the EU in 1990



* 1 ktoe = 1,25 million m³



Natural gas consumption in the EU in 2015



* 1 ktoe = 1,25 million m³



Motivation

- The organizations that publish long-term outlooks usually use complex models and carefully ground their assumptions.
- However, there are considerable differences in the scenarios and projections.



The prospects of natural gas (1)

- “Natural gas grows strongly, supported by broad-based demand and the continuing expansion of liquefied natural gas (LNG) increasing the availability of gas globally”. *BP Energy Outlook 2018 Edition*
- “Natural gas production [in the US] increases in every case, supporting higher levels of domestic consumption and natural gas exports. However, these projections are sensitive to resource and technology assumptions”. *Annual Energy Outlook 2018*



The prospects of natural gas (2)

- “Natural gas, the fuel focus in WEO-2017, grows to account for a quarter of global energy demand in the New Policies Scenario by 2040, becoming the second-largest fuel in the global mix after oil” – *World Energy Outlook 2017*
- “Gas will continue to play a key role alongside Renewables in helping to meet future, lowercarbon, energy requirements” – *Energy Transition Outlook 2018: Oil and Gas*



The prospects of natural gas (3)

- *“Gas role as ‘transitional fuel’ appears overstated outside the US” – New Energy Outlook 2016 by Bloomberg New Energy Finance*
- *“Gas is a transition fuel, but not in the way most people think” – New Energy Outlook 2017 by Bloomberg New Energy Finance*
- *“Gas consumption for power generation increases only modestly out to 2050” – New Energy Outlook 2018 by Bloomberg New Energy Finance*



The prospects of natural gas (4)

- “Global gas consumption will increase by 53% between 2017 and 2040” – *GECF Global Gas Outlook 2017*
- “By 2050 in the REmap Case, fossil fuel use for energy would fall to one-third of today’s levels. Oil and coal would decline most, 70% and 85% respectively. Natural gas use would peak around 2027, and would be the largest source of fossil fuel by 2050, however with production declining 30% from the present level” – *Global Energy Transformation. A roadmap to 2050 (IRENA)*



The prospects of natural gas (5)

- “the role of natural gas is likely to continue to expand, and its relative importance is likely to increase even further when greenhouse gas emissions are constrained” – *The Future of Natural Gas – An Interdisciplinary MIT Study*
- “Clean energy portfolios” represent a promising alternative to new gas-fired power plants – *RMI report The economics of Clean Energy Portfolios*
- “Dramatically expanding the use of natural gas to generate electricity creates numerous and complex risks for our economy, our health, and our climate” – *The Natural Gas Gamble ()*



Methodology

- Meta-study design of stochastic optimisation model.
- Probability distributions are obtained from the projections published in outlooks
- To express different significance of each information source (independent study vs study of lobbying organisation vs study prepared by a distinguished international organization; policy scenario vs reference case), expert opinions or sensitivity analyses might be involved
- Additional calculations are performed to ensure fit of the data (different geographical coverage, units, etc.)
- Major policy decisions can be introduced additional variables/constraints to the model

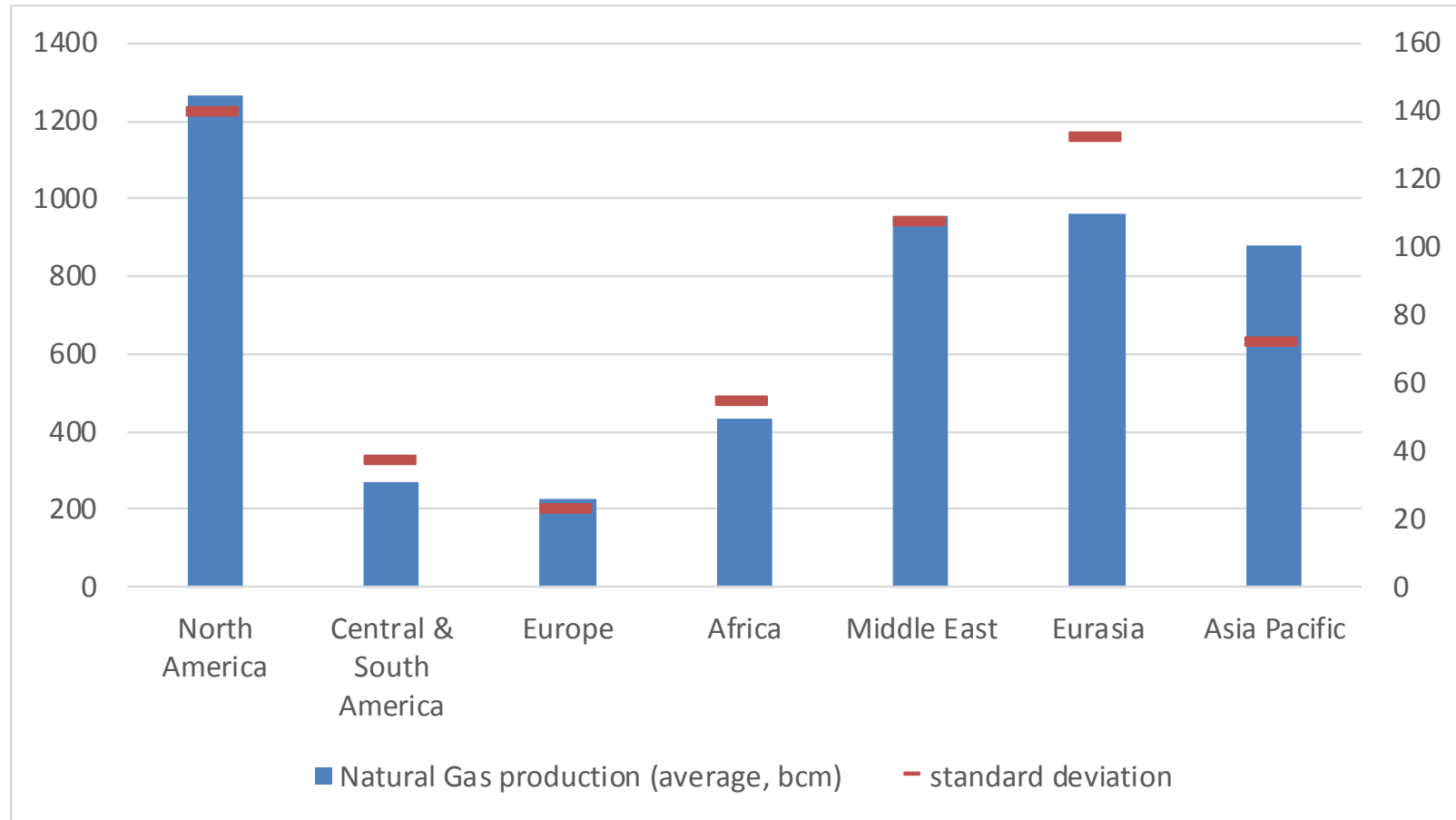


Illustrative case study

- Various data sources to express possible price variations
- IEA World Energy Outlook scenarios (New Policies, Current Policies, Sustainable development) are used as the basis for the assumptions about natural gas supply and demand
- Different weights for each scenario

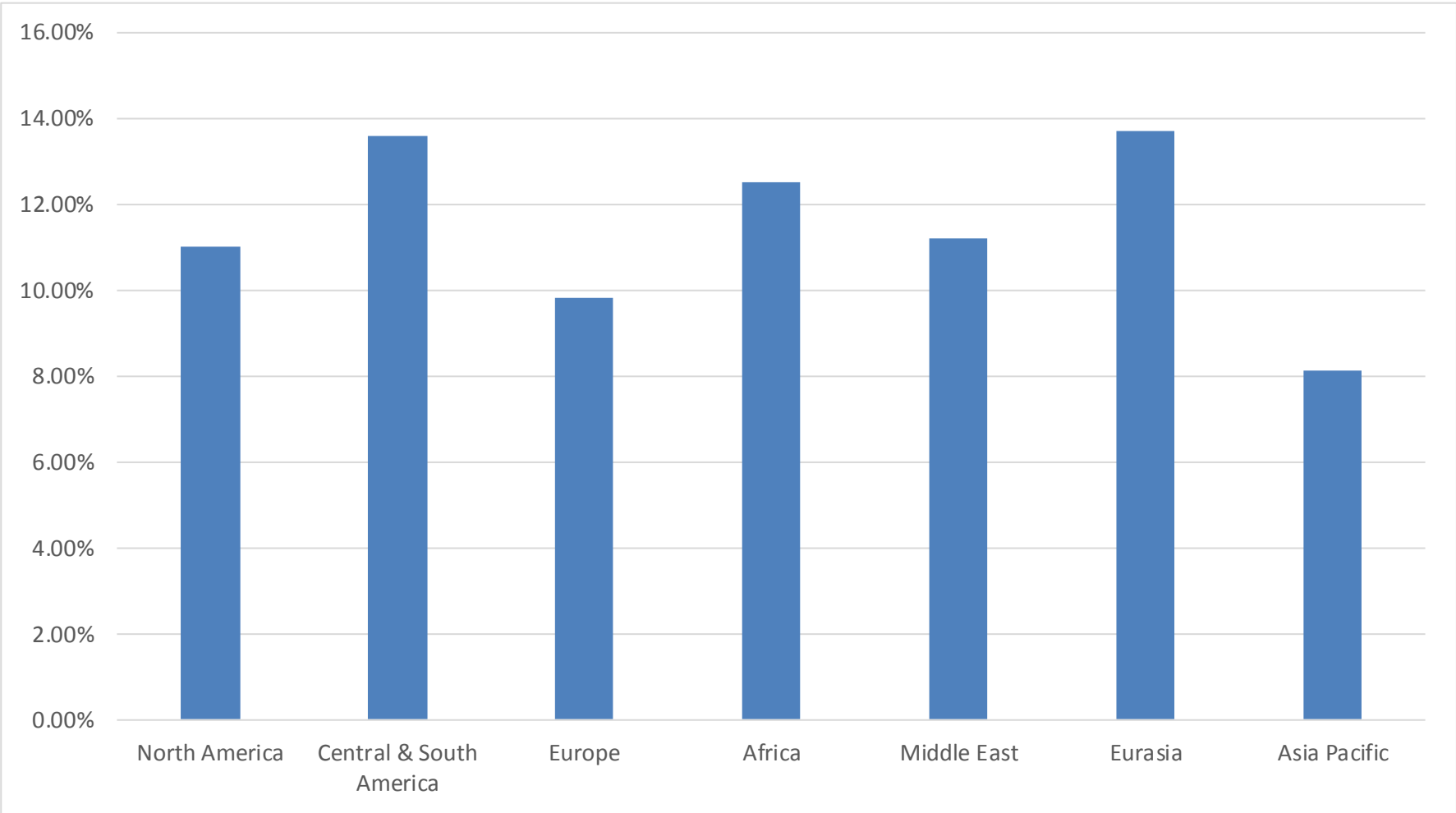


Global natural gas production





Coefficient of variation as an uncertainty measurement





Conclusions

- Energy outlooks suggest consensus that natural gas should remain an important fuel. Thus, investment to LNG facilities are still reasonable.
- Possible uncertainties related with different models and assumptions can be resolved by using stochastic multistudy approach.
- However, multi-study will still depend on initial data. Sometimes, things just happen despite the low probability.



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