

Interdependencies between the UK power and gas industries' long-term investment decisions

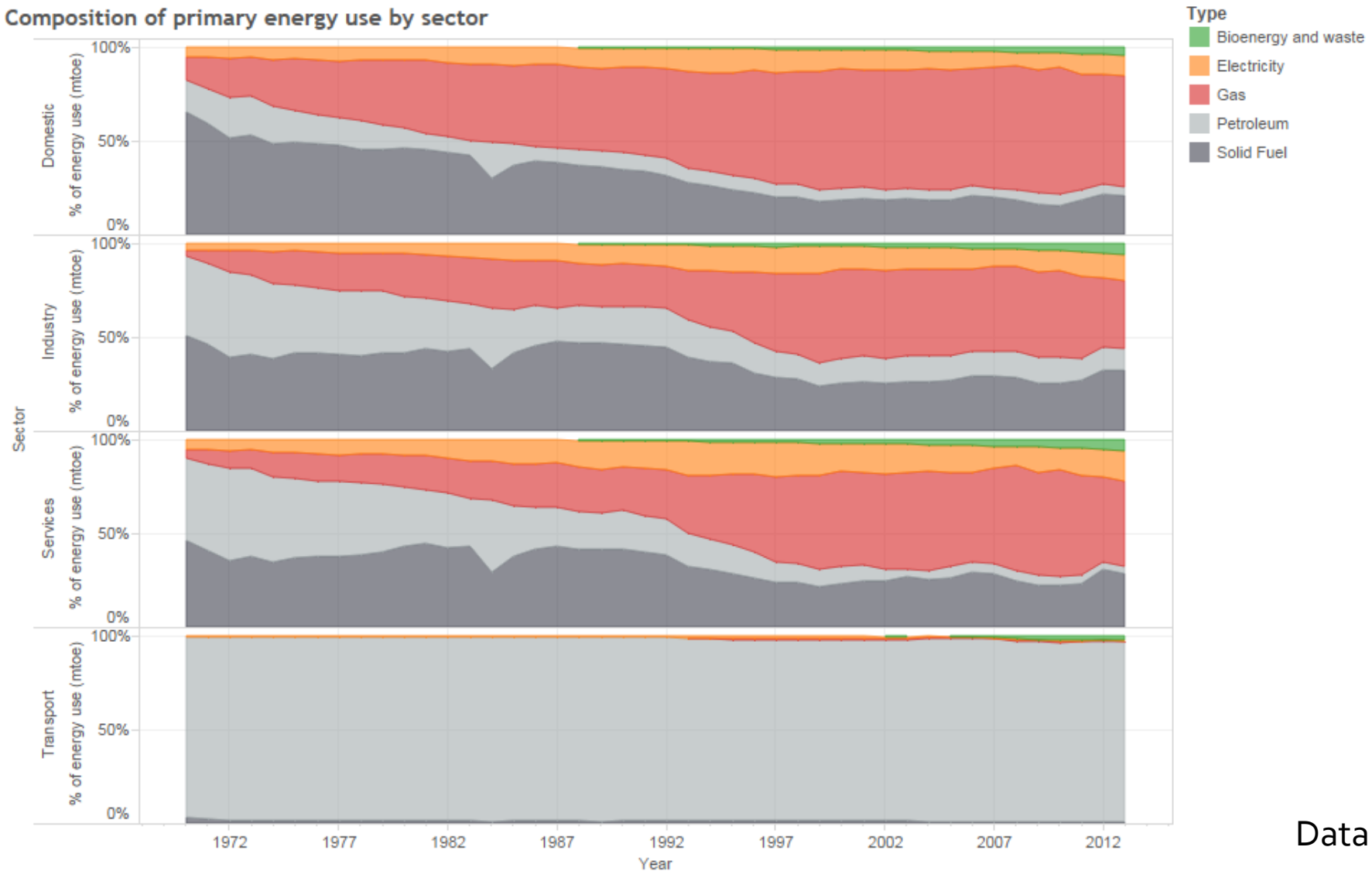
Donna Peng

Erasmus Mundus Masters in
Economics and Management of Network Industries



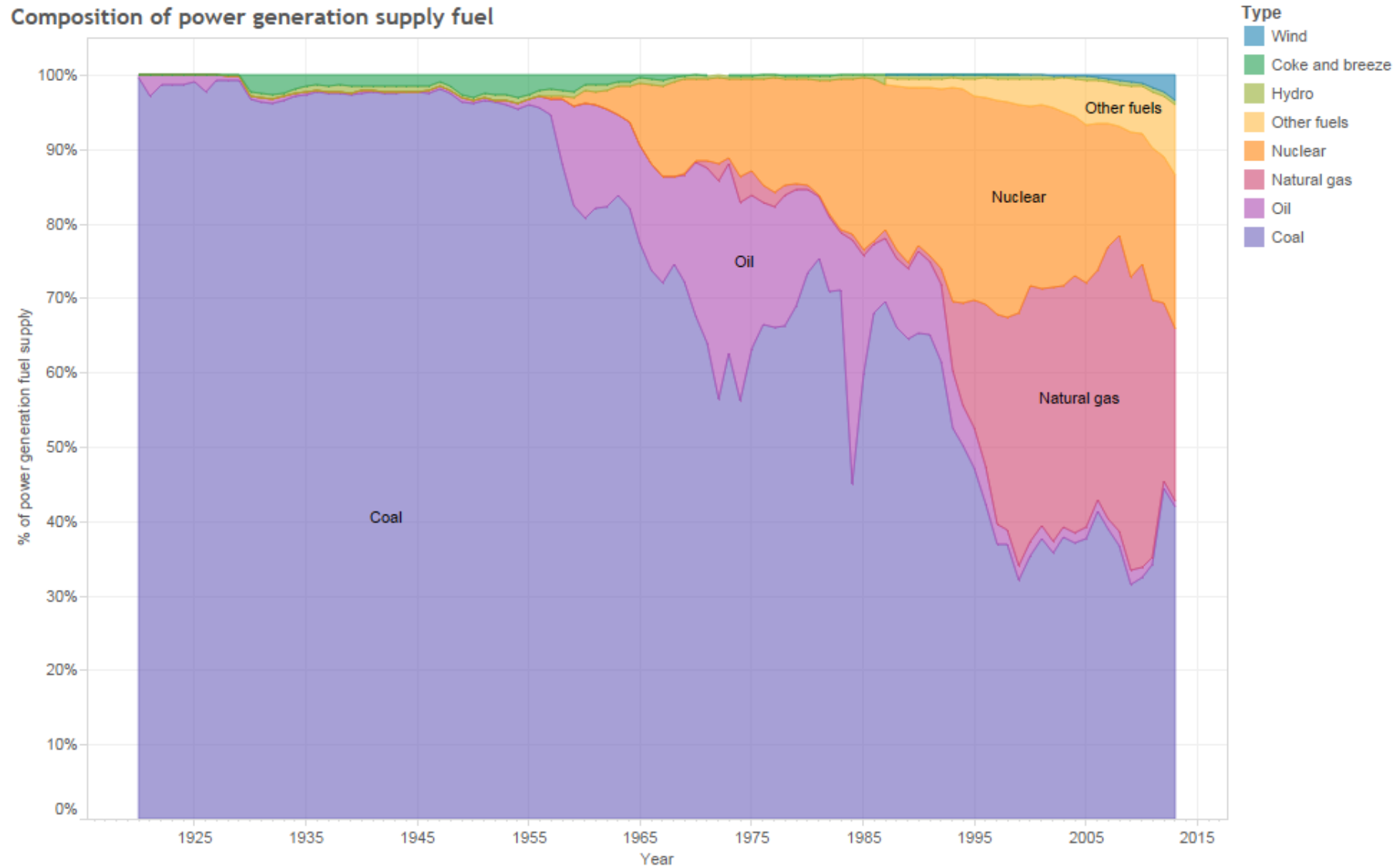
Context: Changes in comp. of energy supplies

Composition of primary energy use by sector

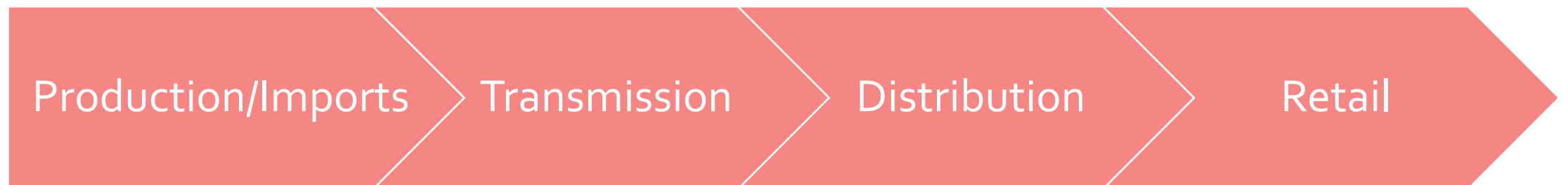
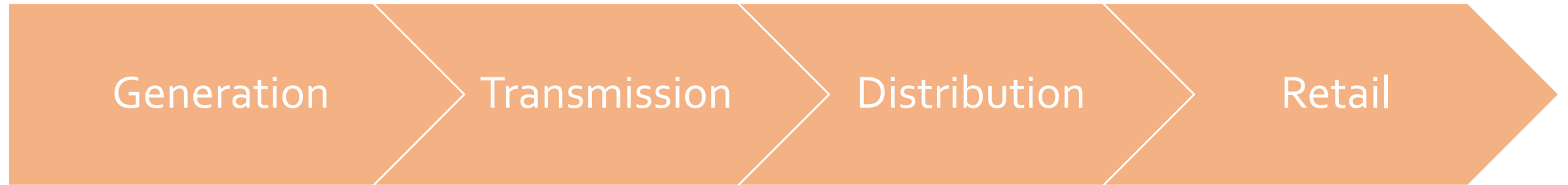


Data source: DECC

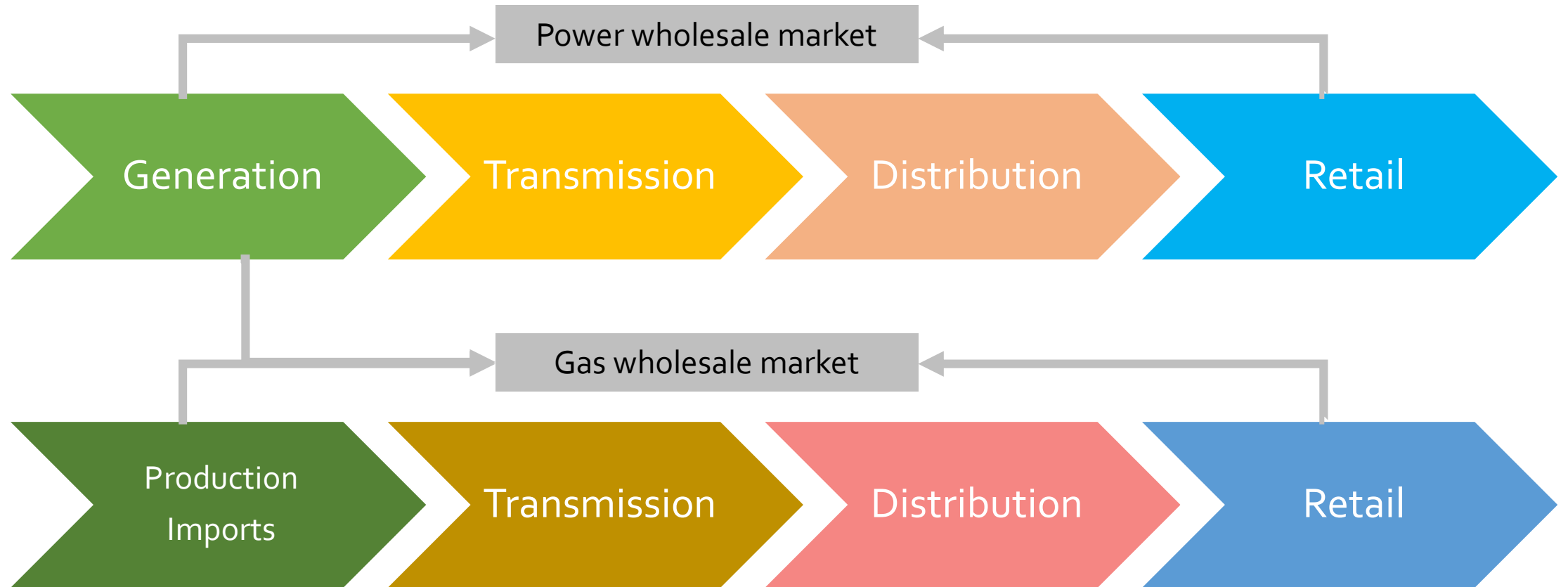
Context: Changes in comp. of energy supplies



Context: Changes in industry coordination



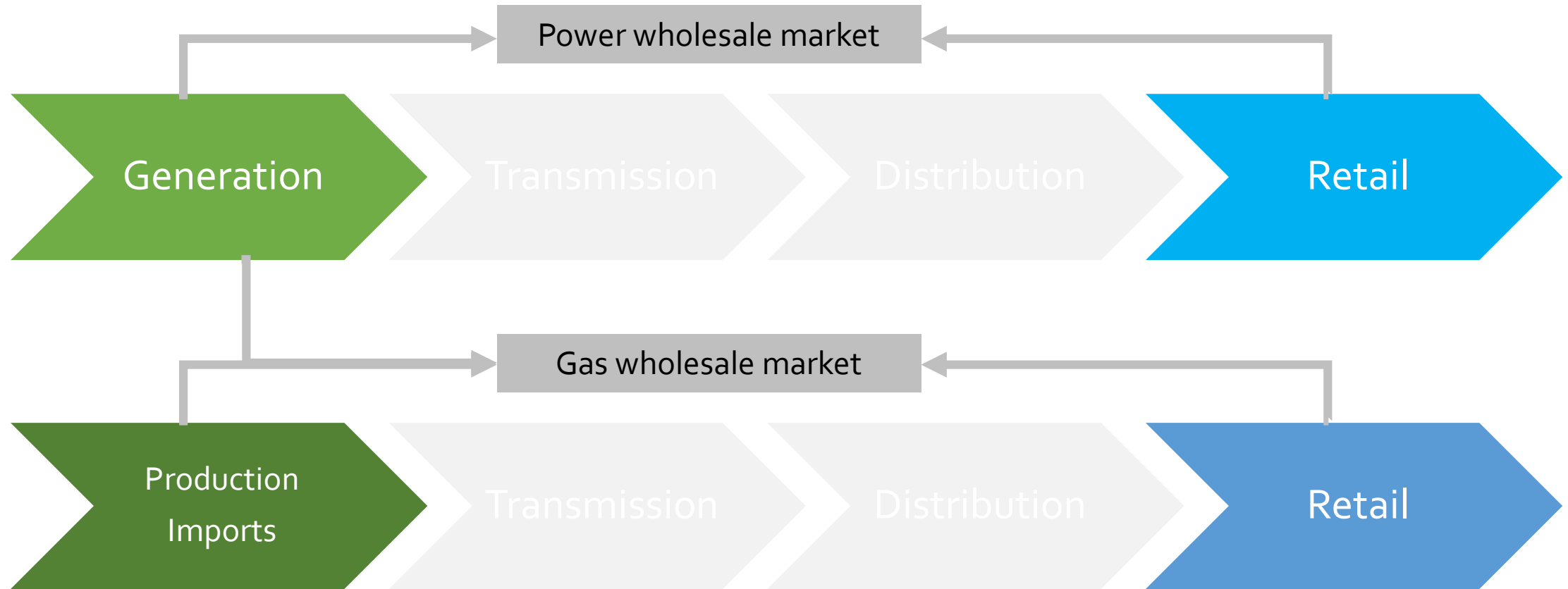
Context: Changes in industry coordination



What do we seek to understand?

1. What is **the nature, strength and dynamics** of interdependencies between the long-term investment decisions of the power and gas industries?

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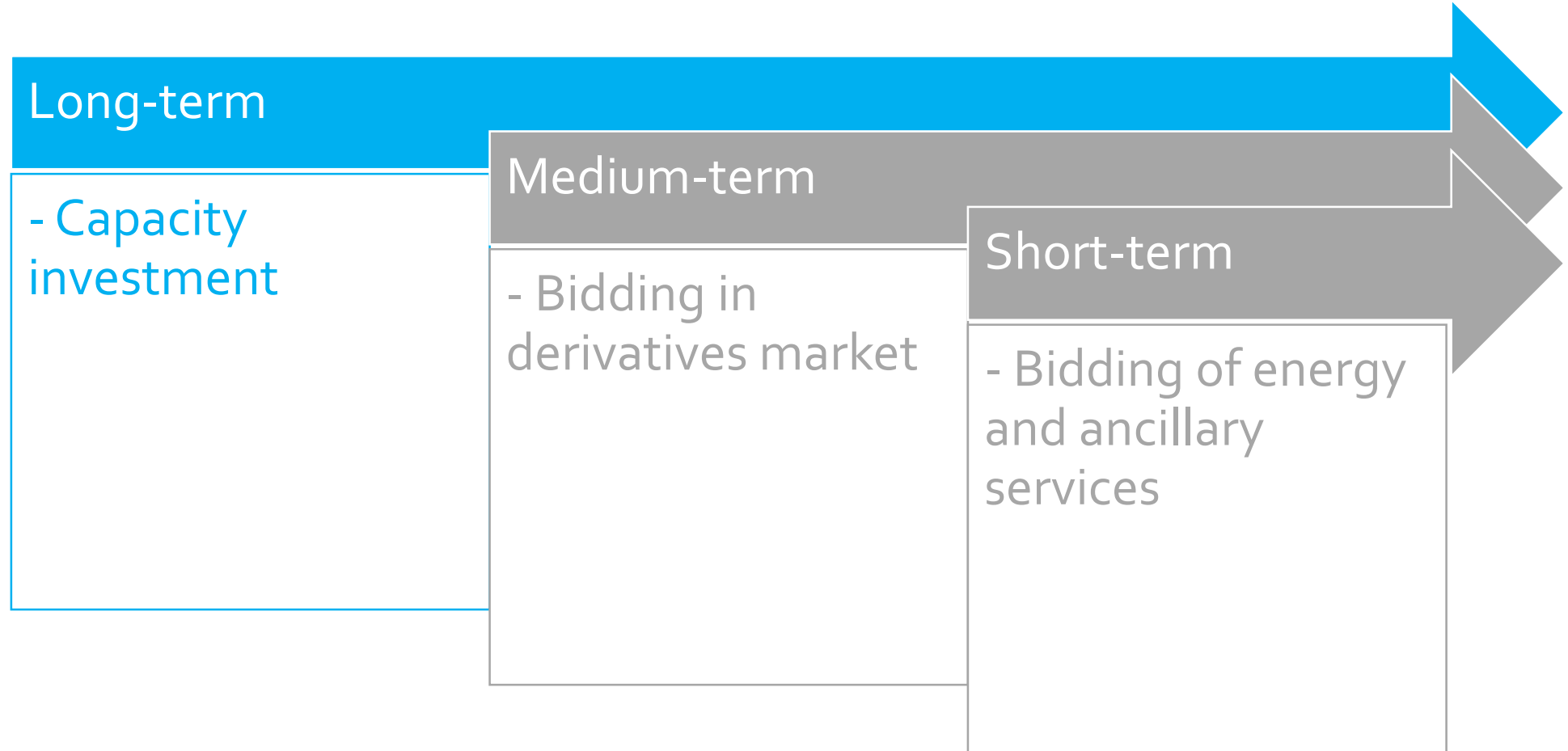


What do we seek to understand?

1. What is **the nature, strength and dynamics** of interdependencies between the long-term investment decisions of the power and gas industries?

2. How will these interdependencies play out **under uncertainty** in future energy demand, regulatory environment, and macroeconomic environment?

What do we seek to understand?

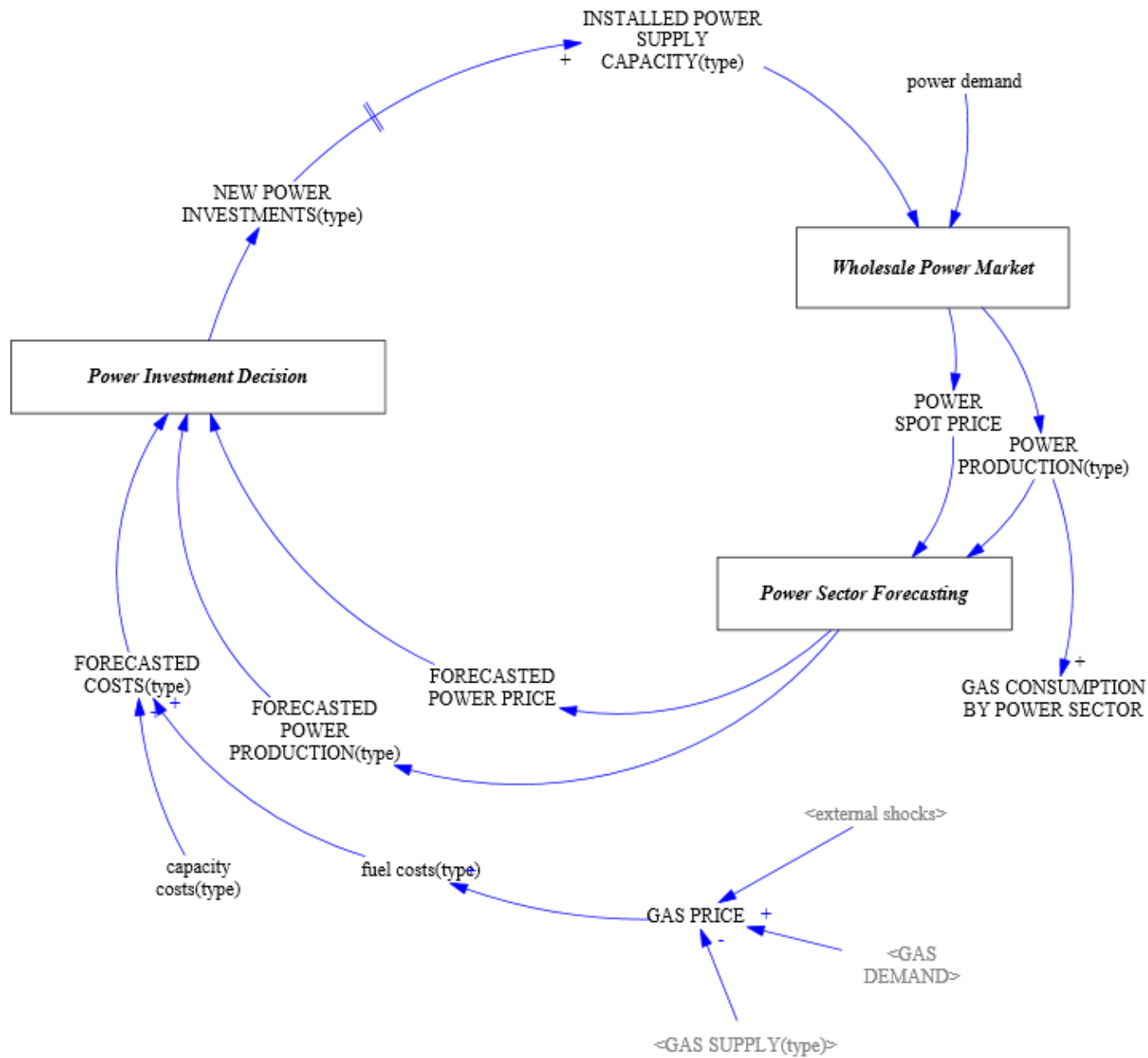


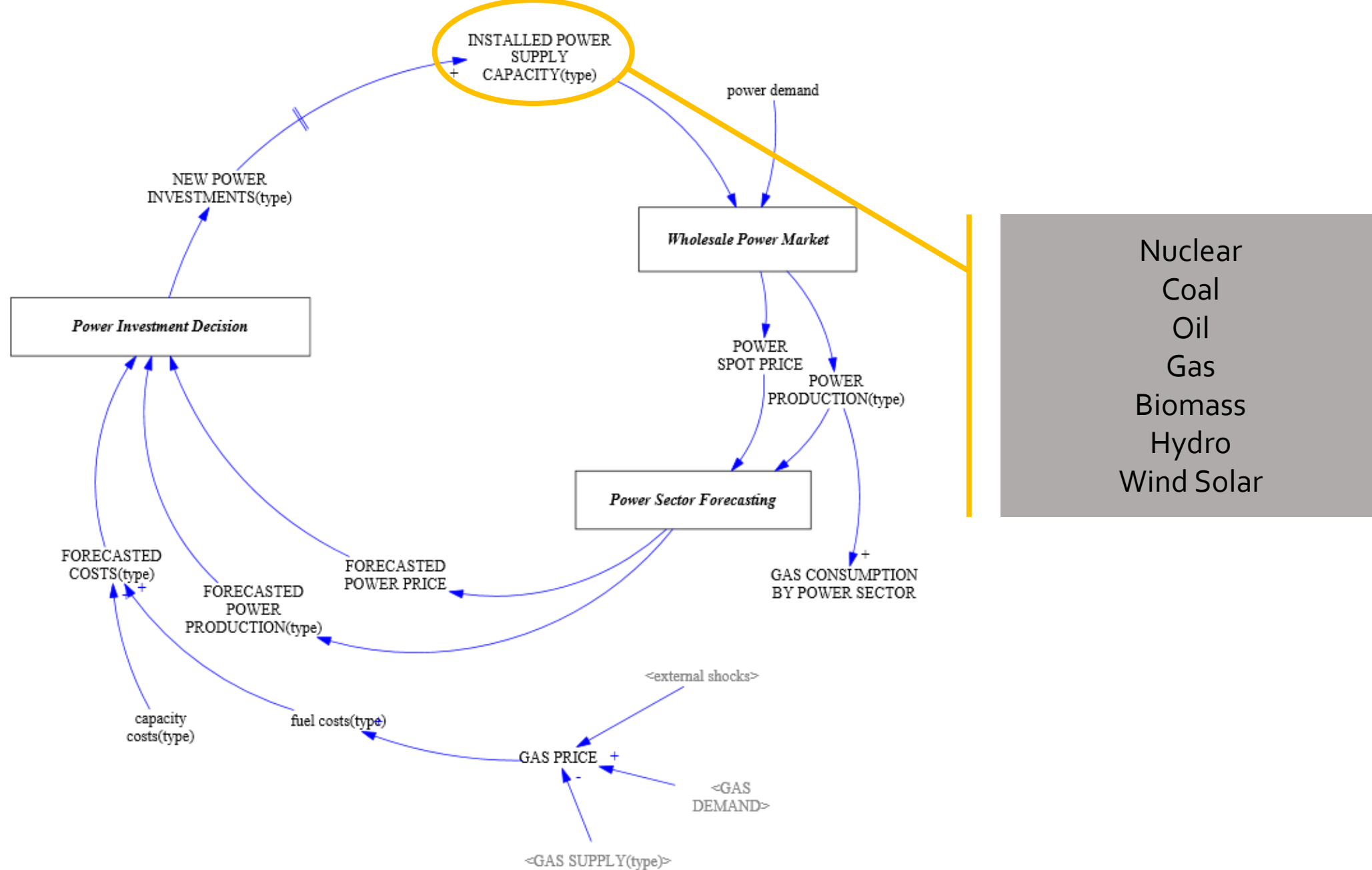
How will we answer these questions?

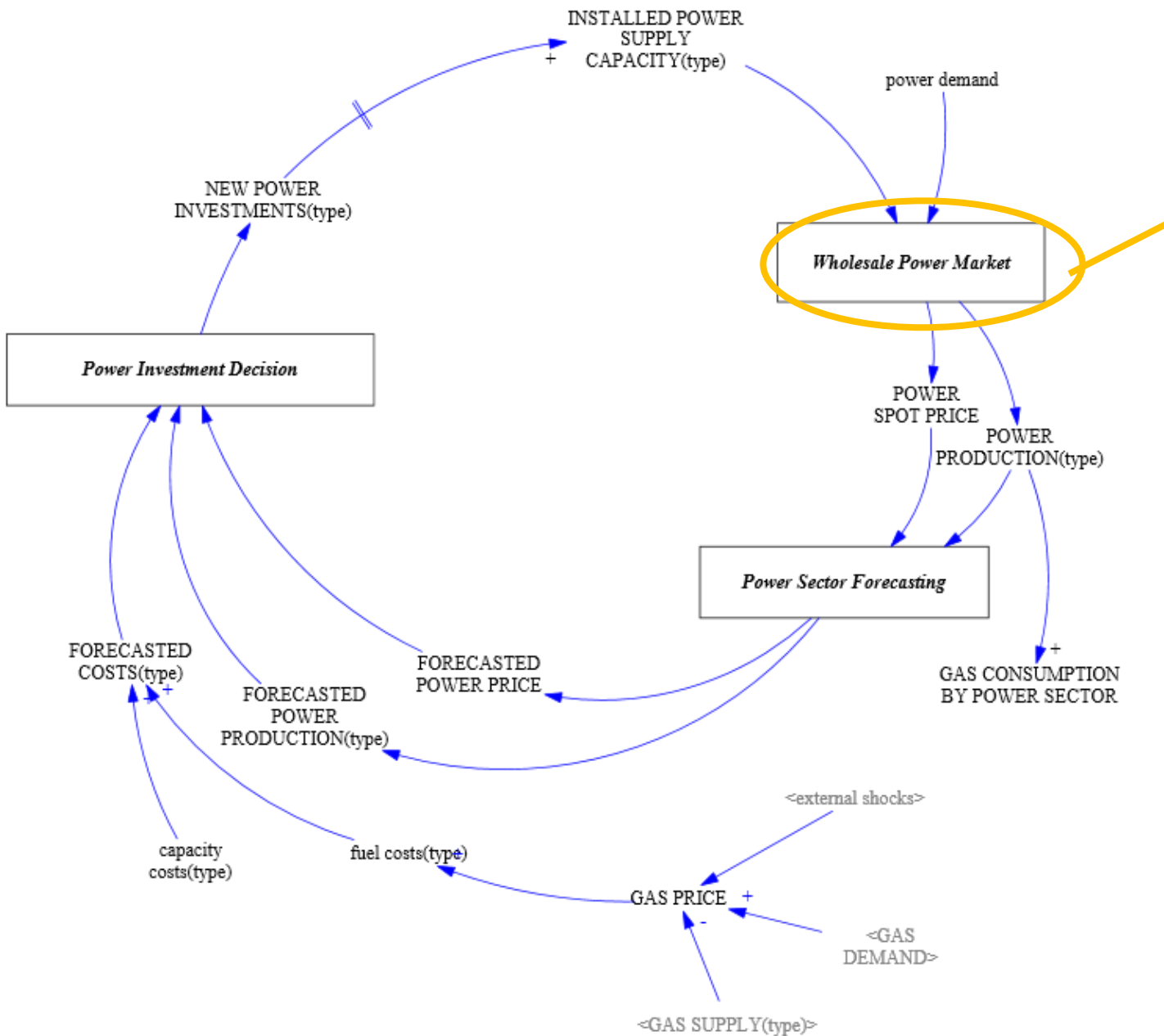
1. What is the nature, strength and dynamics of interdependencies between the long-term investment decisions of the power and gas industries?

2. How will these interdependencies play out under uncertainty in future energy demand, regulatory environment, and macroeconomic environment?

Formal model building with systematic scenario analysis







Constant evolving sets of institutions, procedures, social relations and infrastructures

Markets with different purposes:

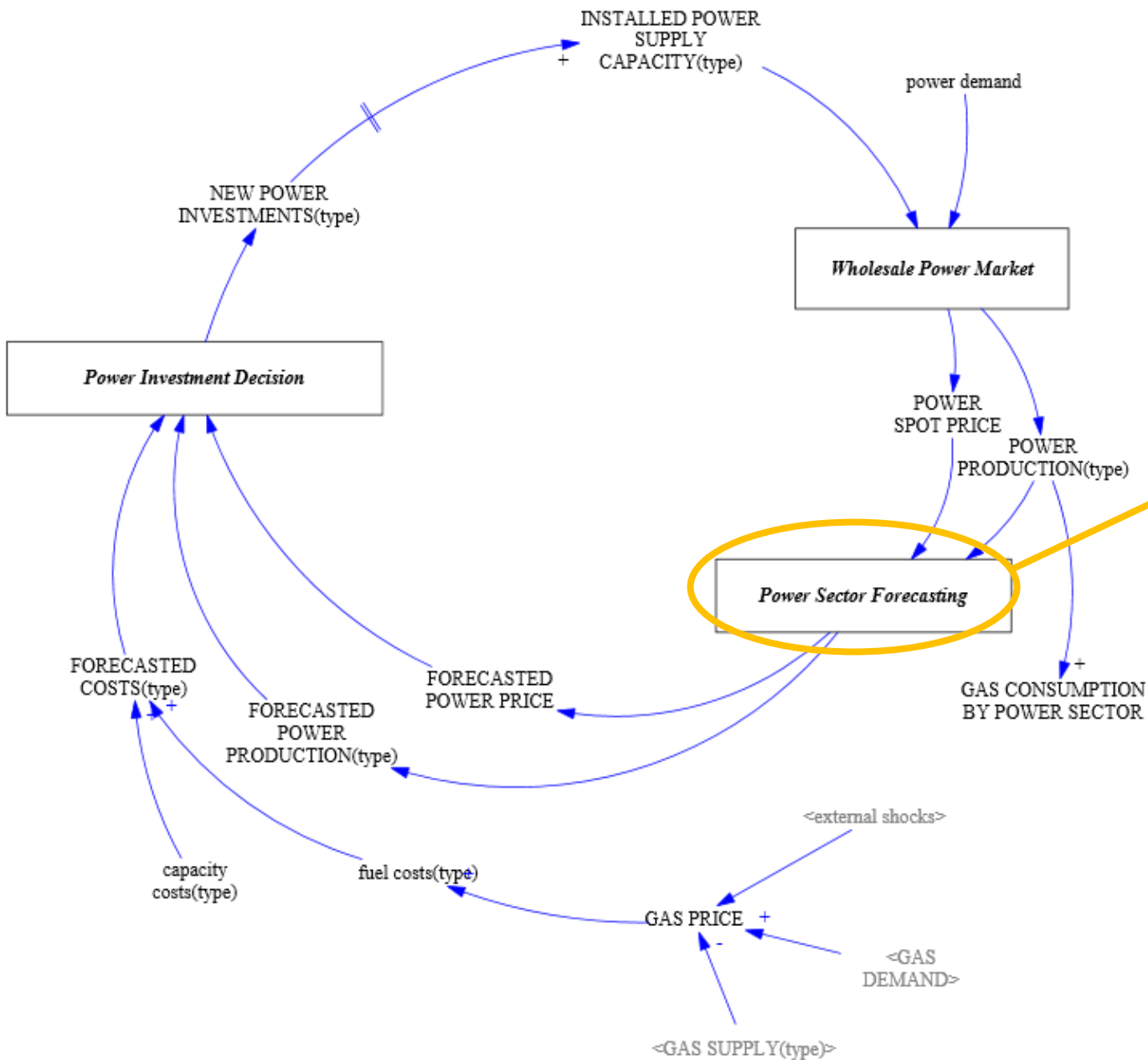
- Day-ahead, Intra day, Forward, Futures
- Meeting expected demand, ensuring system reliability, hedging market risk

Market structure and pricing:

- Perfect competition
- Oligopoly
- (Monopoly)

Changing boundaries:

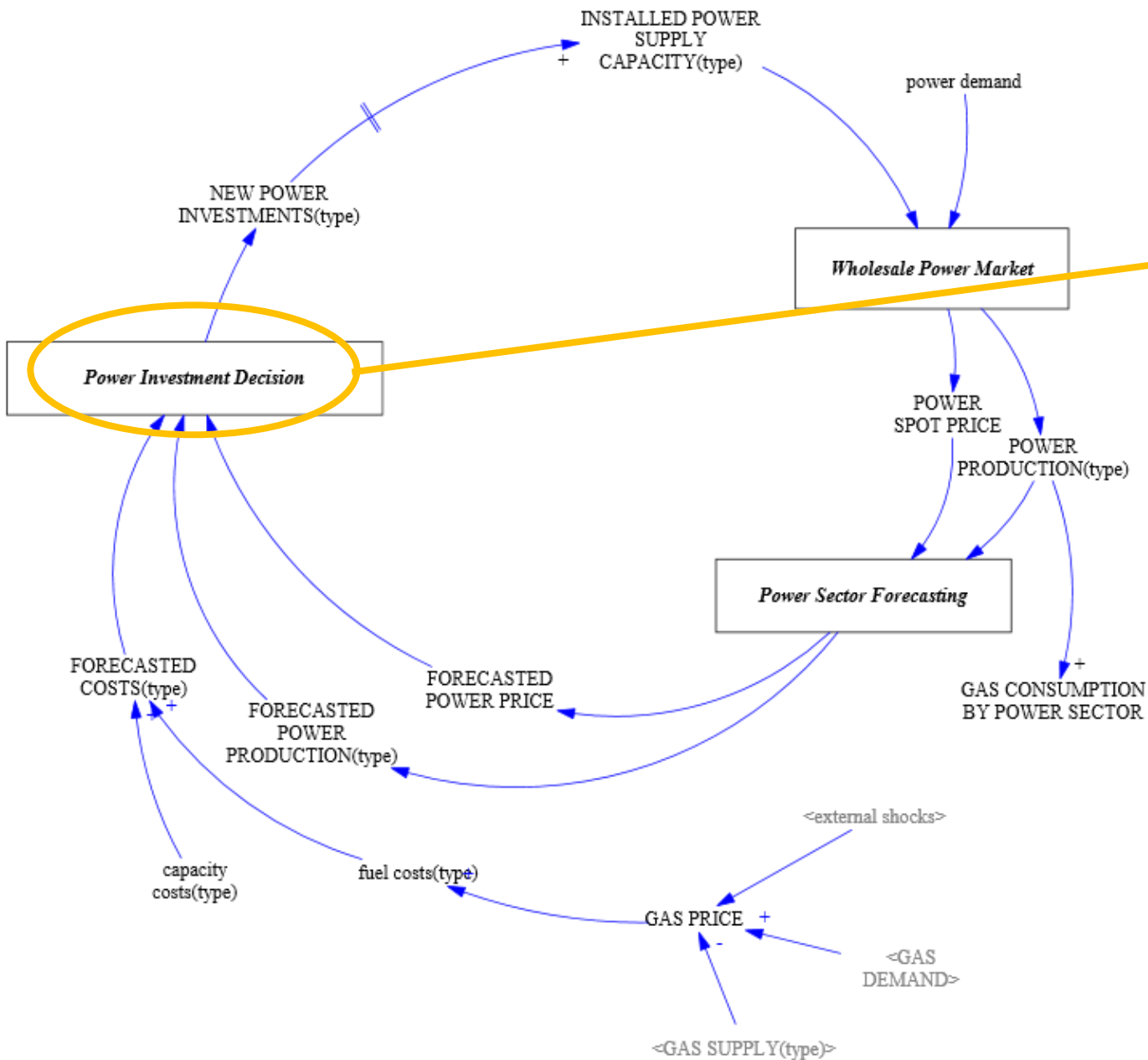
- Physical interconnections
- Harmonization of different power exchanges



From the simplistic:
Extrapolation of historical averages

...

To the complex:
Use of advanced formal models for prediction



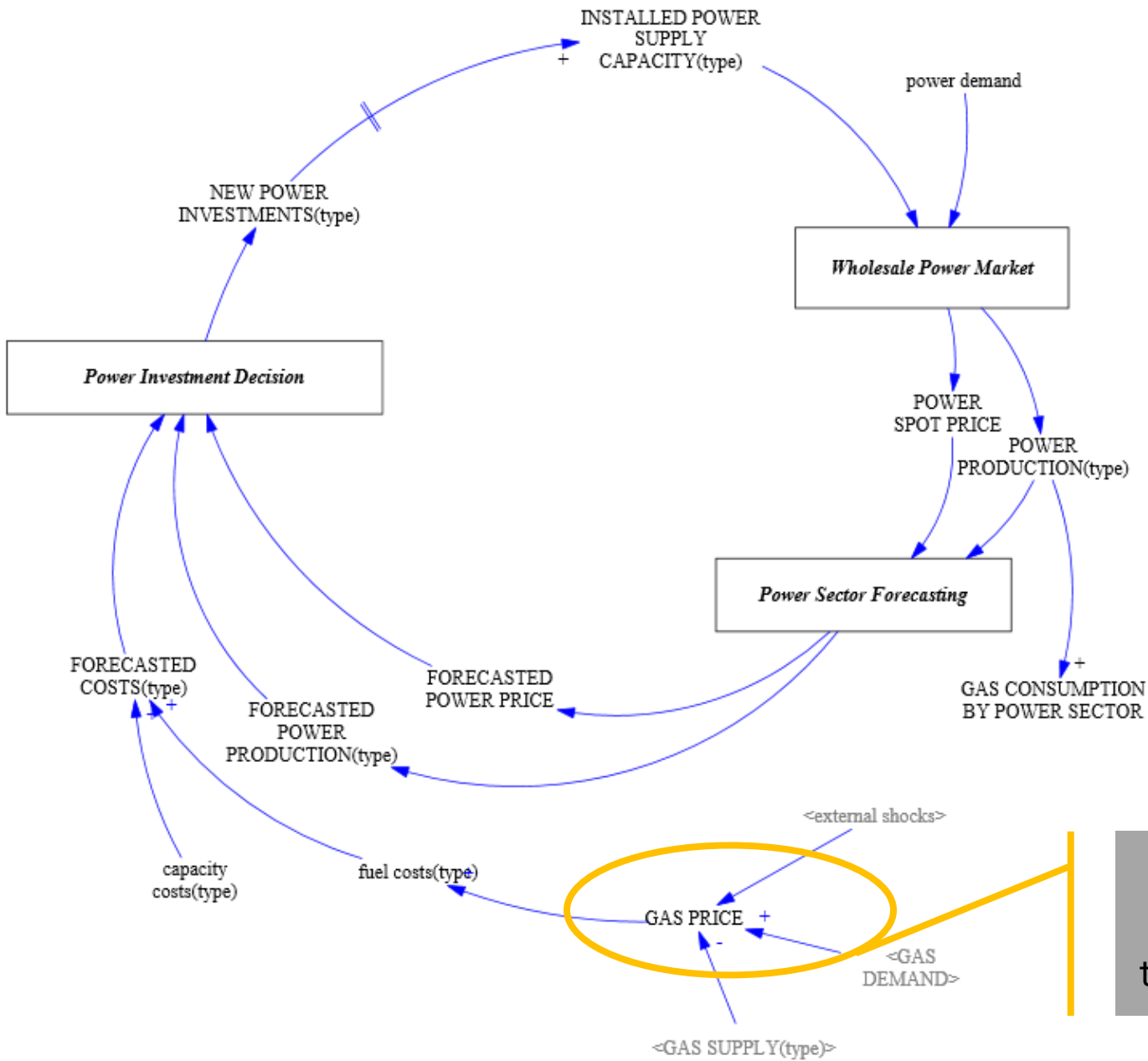
From the simplistic:

- Aggregated rational agent(s)
- optimizing expected profitability in the UK market
- given a budget and policy constraint

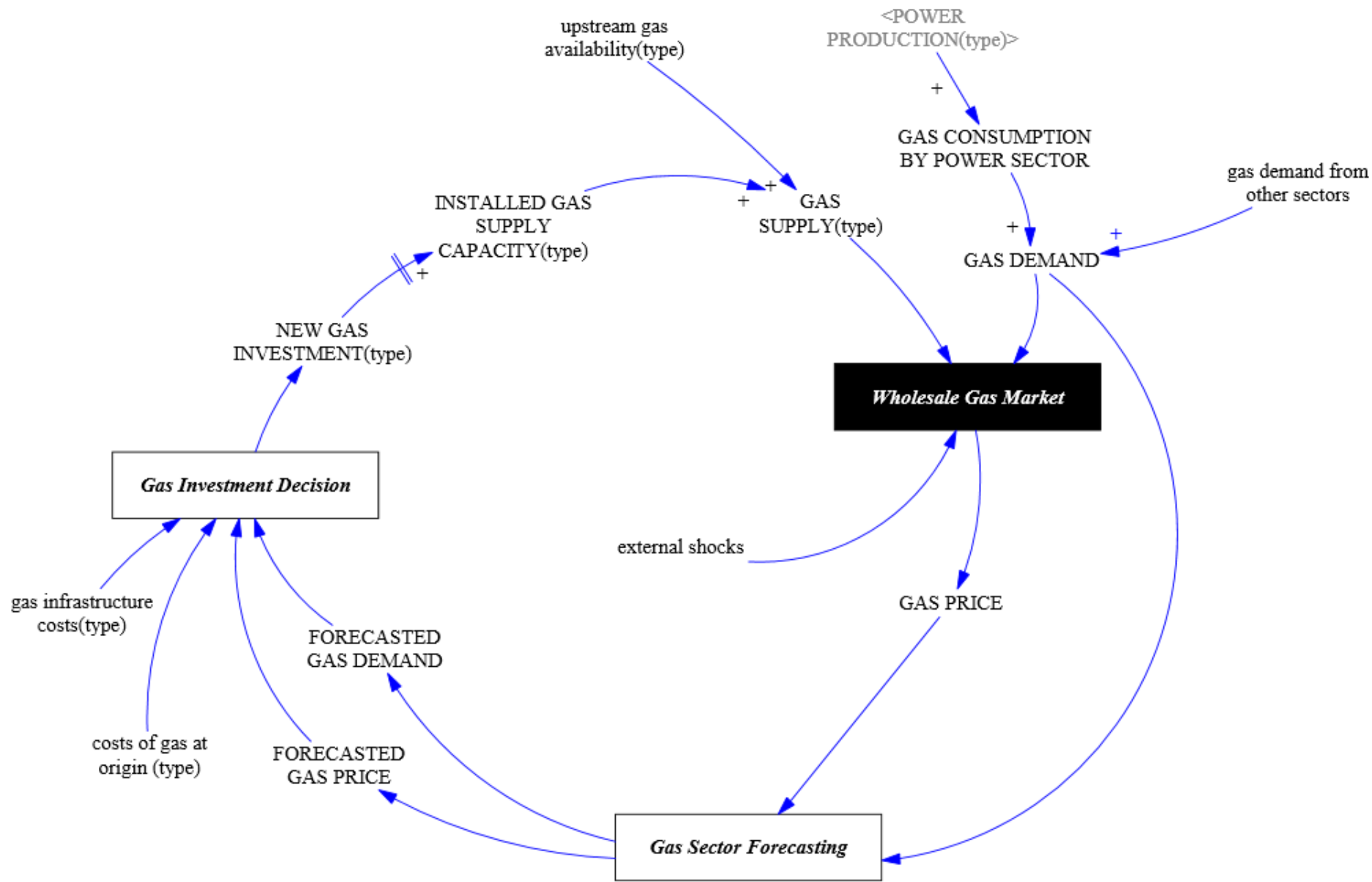
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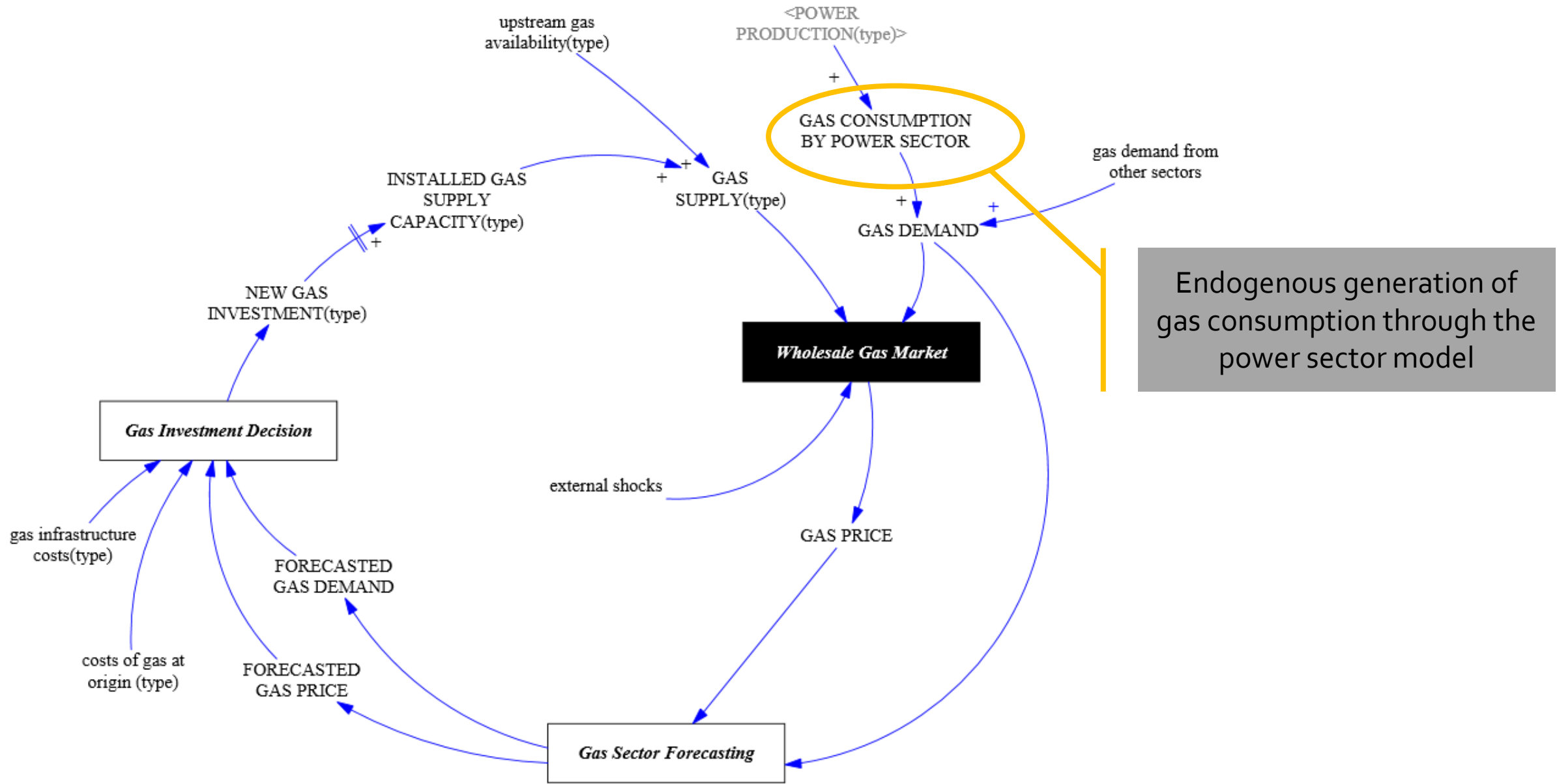
To the complex:

- Differentiated firms
- Managing varying interests across multiple industries and geographies
- With different ability to access funds and lobbying power

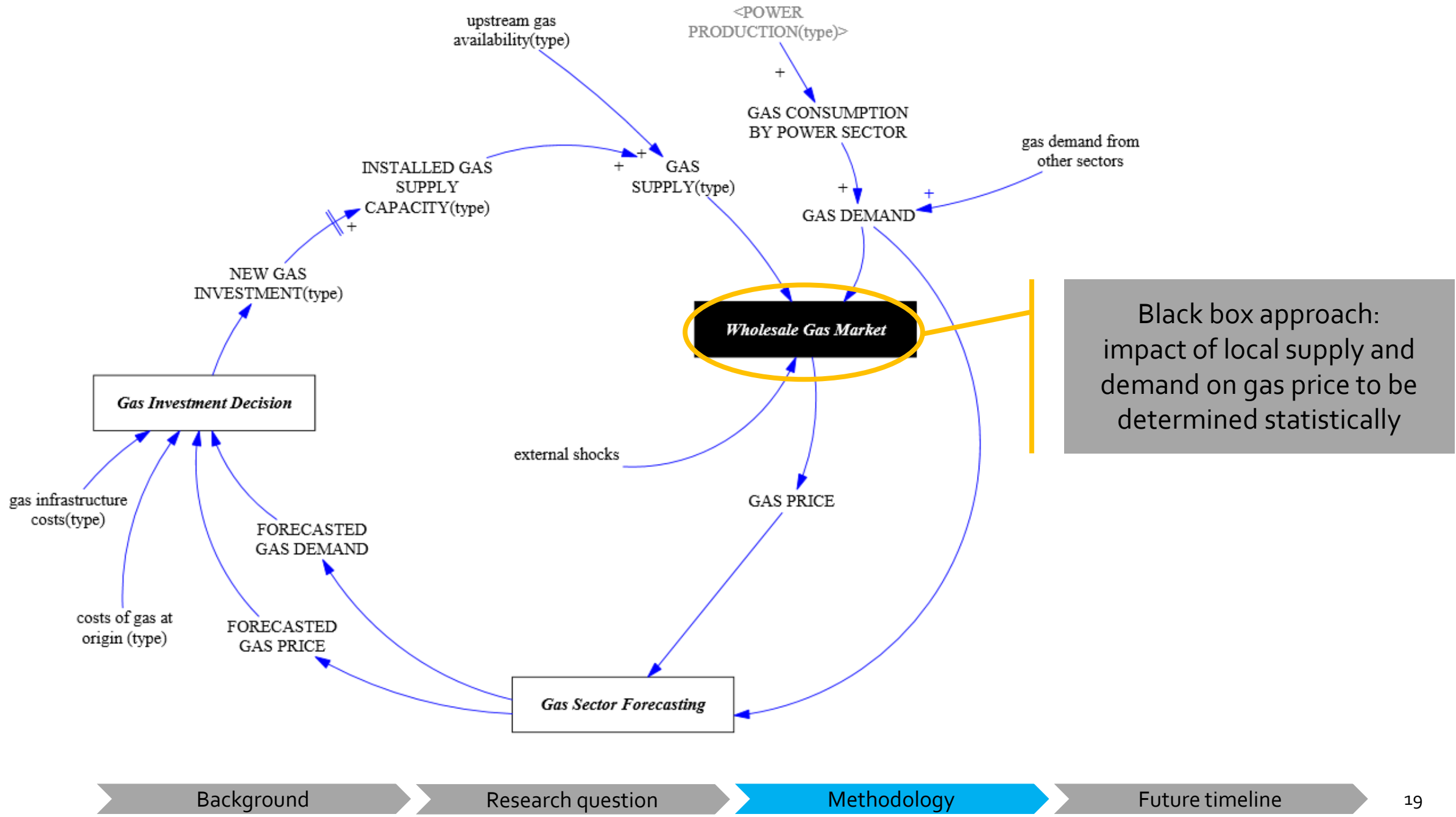


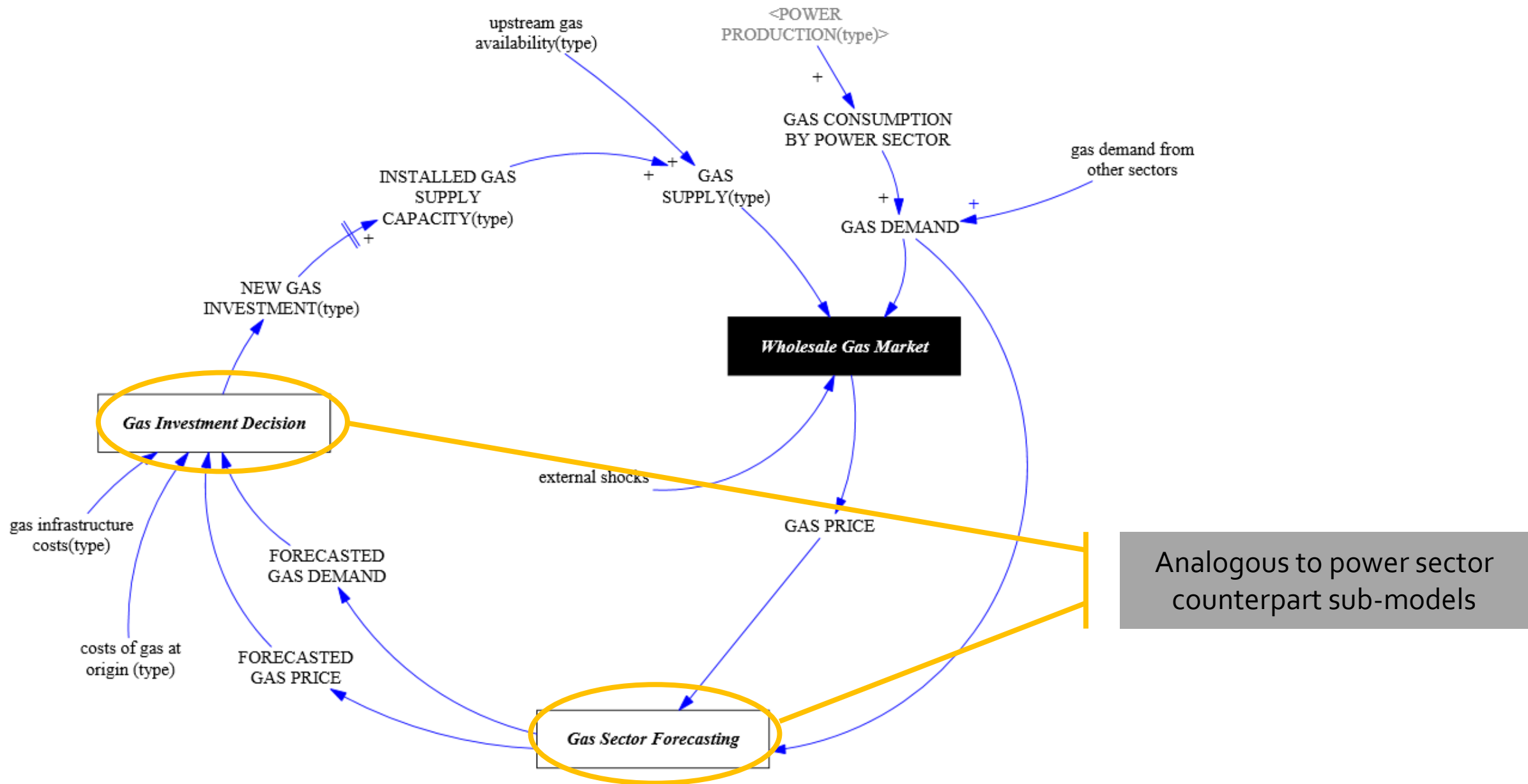
(Partially) endogenous generation of gas price through the gas sector model

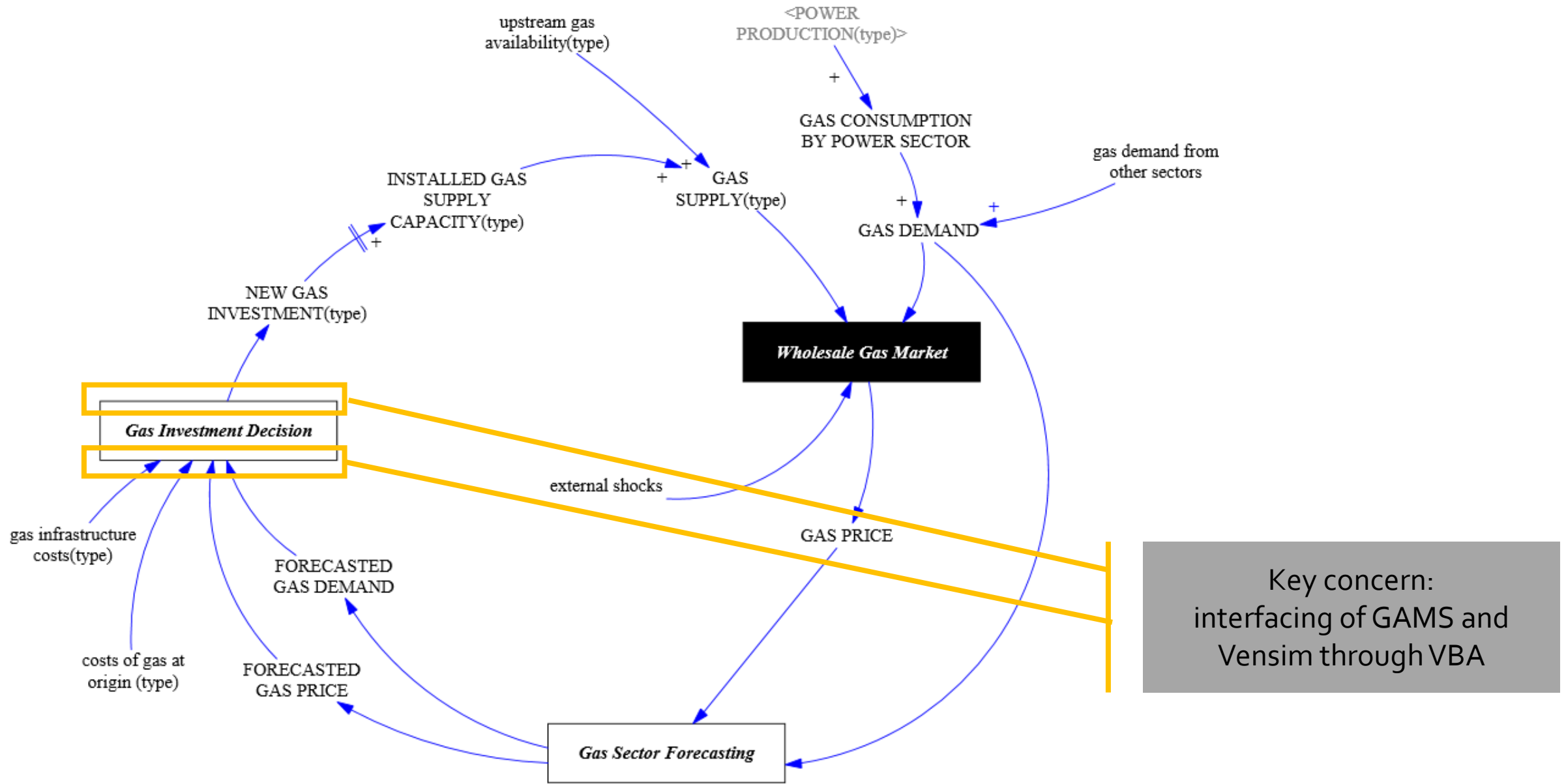




Endogenous generation of gas consumption through the power sector model







Key concern:
interfacing of GAMS and
Vensim through VBA

What are the next steps?

Literature review

- UK power and gas industry decision framework
- Modeling of investment decisions in deregulated markets

Model development

- Investment decision model development
- Forecasting sub-model development
- Wholesale market

Scenario development

- Identification of key uncertainties through sensitivity analysis
- Review of existing forecasts
- Formulation of sets of plausible future scenarios (3-5)

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Candidate variables:

- Discount rate
- Carbon price
- Power capacity payment
- Power demand (evolution)
- ...

Scenario development

- Identification of key uncertainties through sensitivity analysis
- Review of existing forecasts
- Formulation of sets of plausible future scenarios (3-5)

What are the next steps? (Continued)

Simulation

- Simulation of model using the scenarios formulated
- Revision of original model if necessary
- Development of non-modeler friendly user interface

Reporting

- Write, write, write
- Compilation of graphics

Final deliverables

- Master thesis and presentation at the Florence School of Regulation
- Oxford Institute for Energy Studies publication
- Future System Dynamics conference paper?

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