

# AMIRIS

Agent-based Model for the Integration of Renewables Into the MarketS

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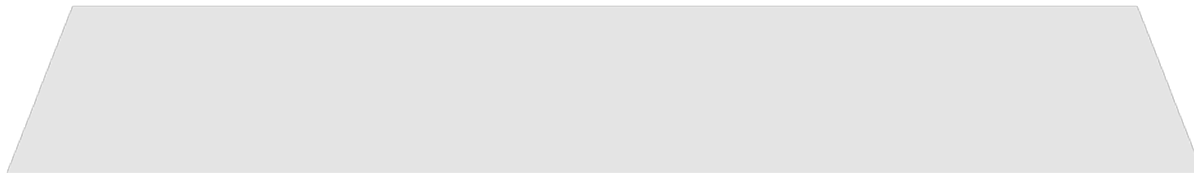
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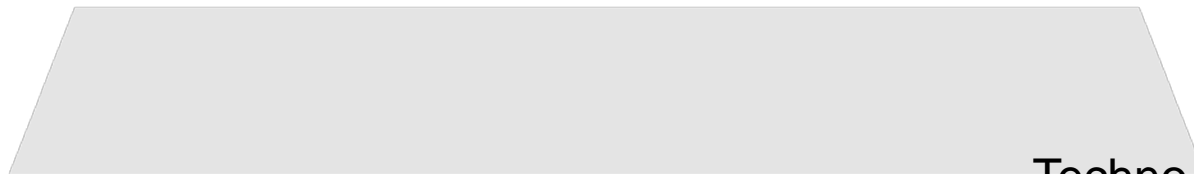
Knowledge for Tomorrow





# Techno-Economic Regime

- Technology of power plants
- Variable and fix costs

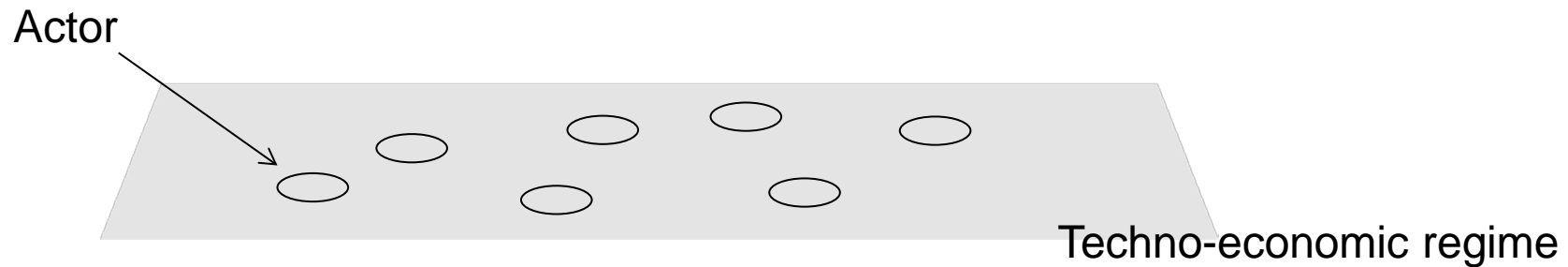


Techno-economic regime



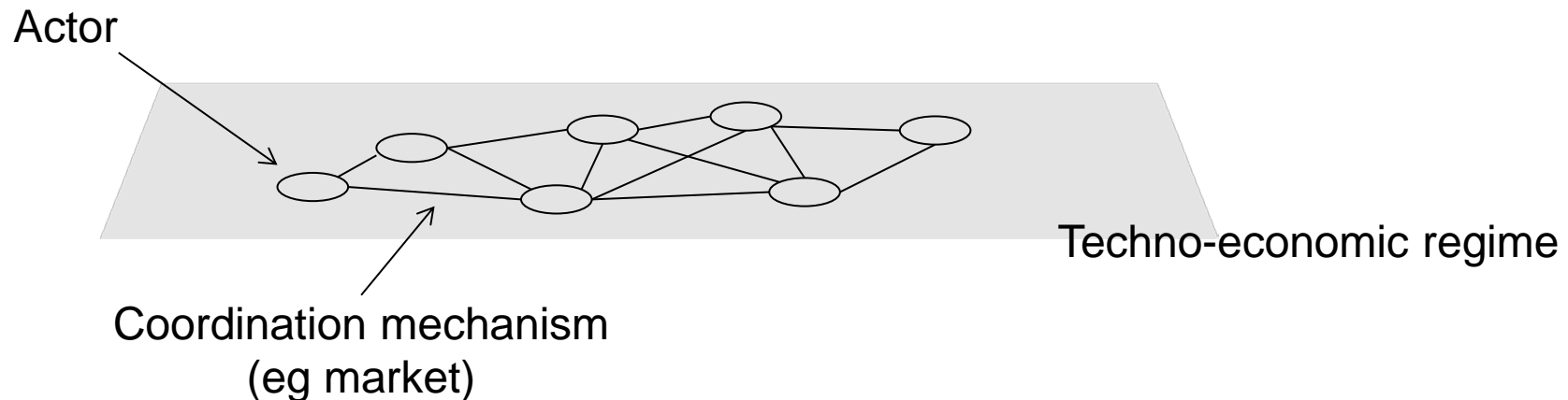
# Actors

- Investing in power plants
- Operating plants and generating electricity
- Demanding electricity

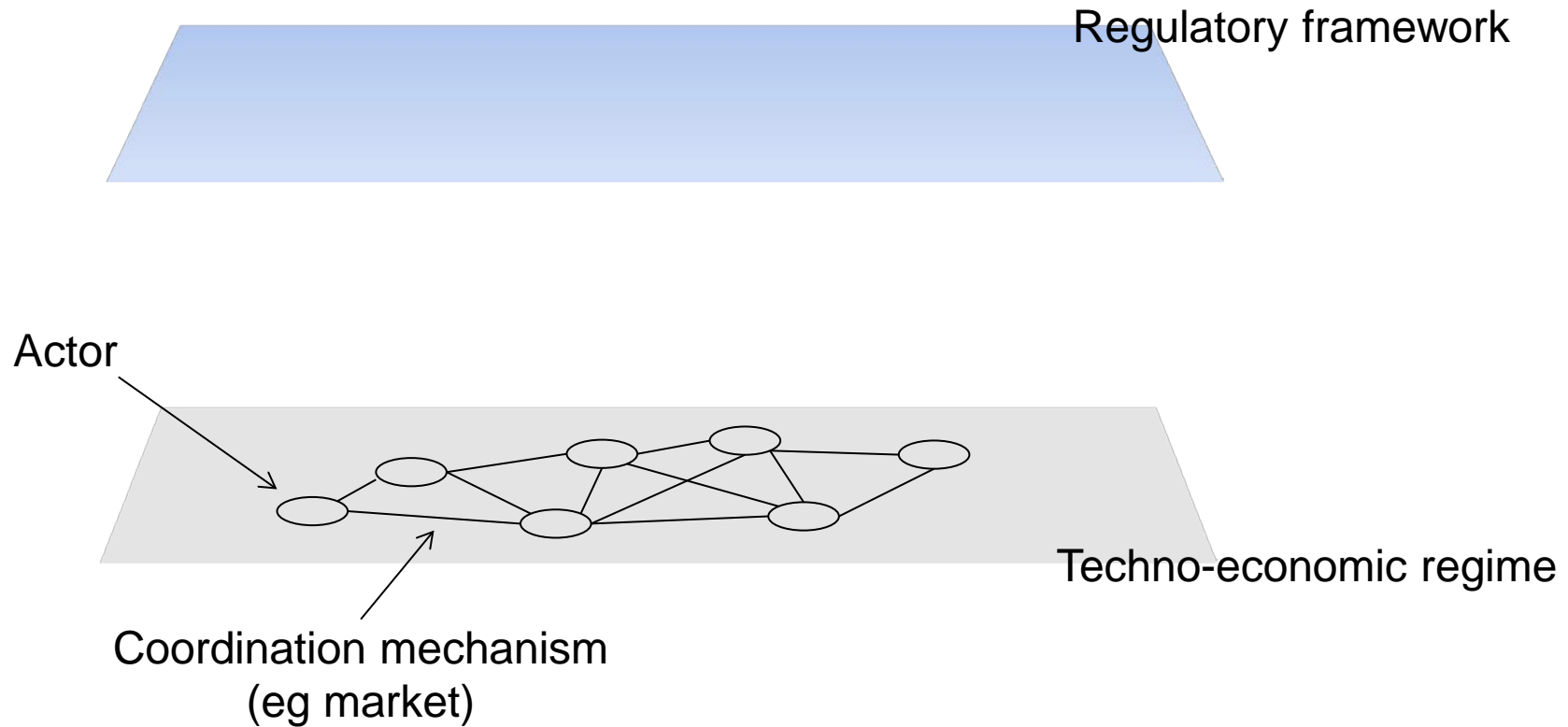


# Coordination Mechanism

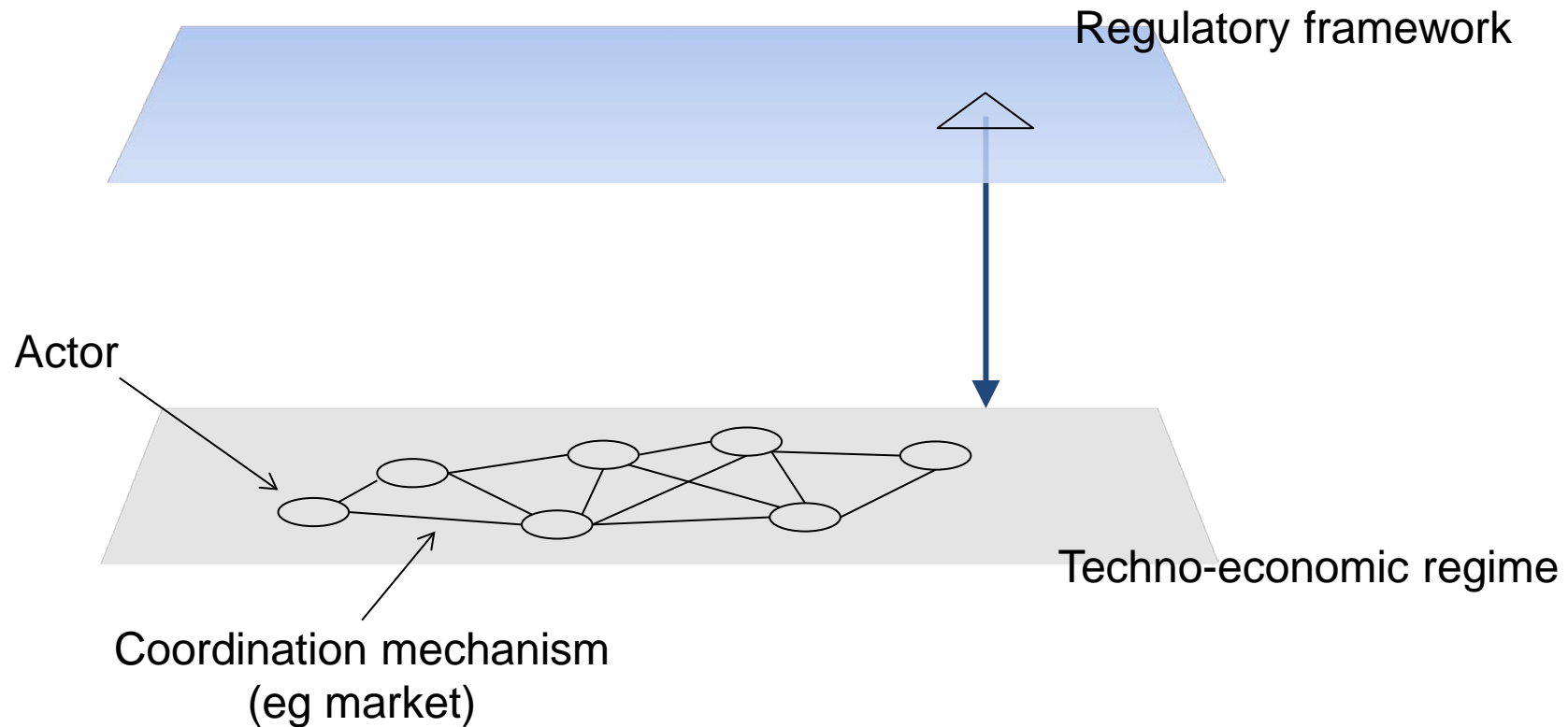
- Actors trade electricity via defined coordination mechanisms (eg. markets, bilateral business etc)



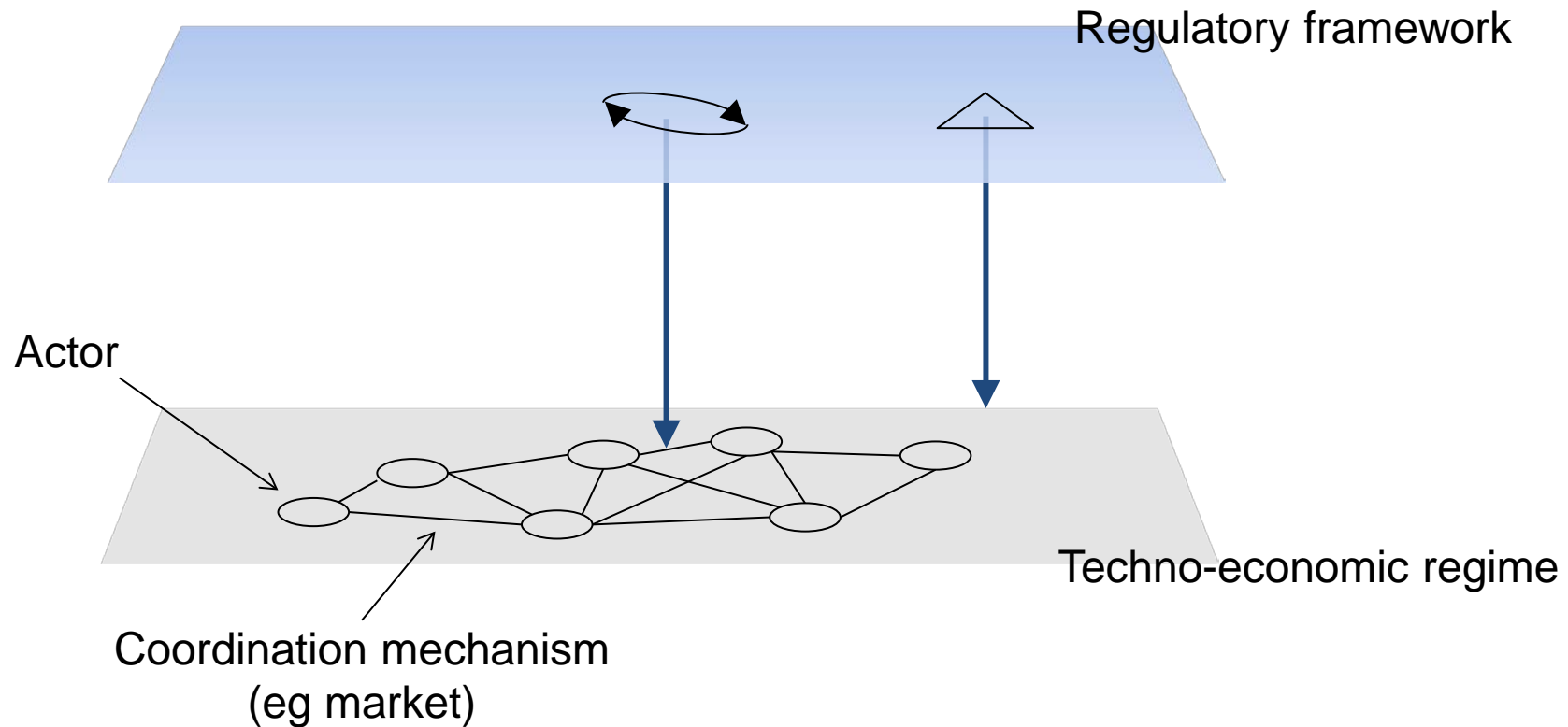
# Regulatory Framework



# Impact of Regulatory framework on the techno-economic regime

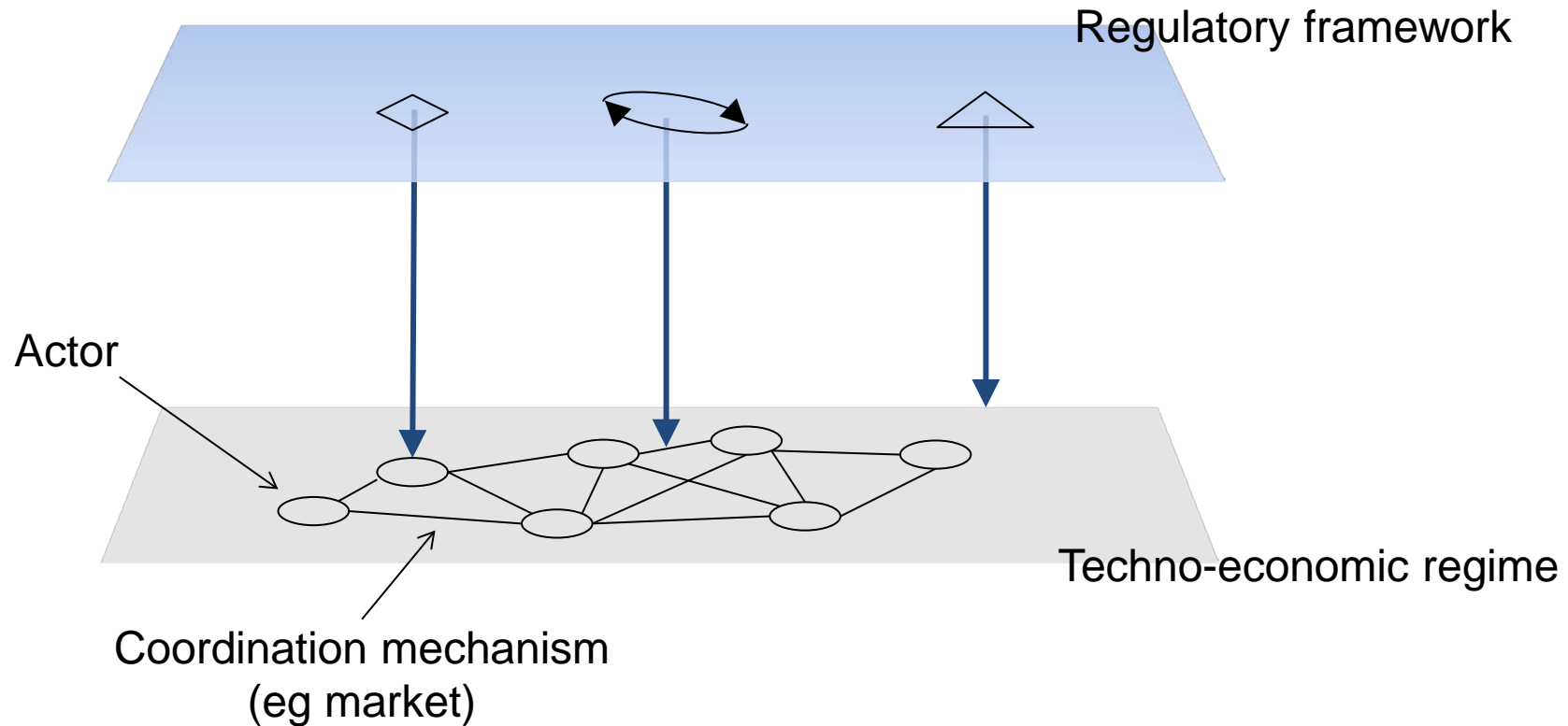


# Impact of Regulatory framework on the techno-economic regime & coordination mechanism

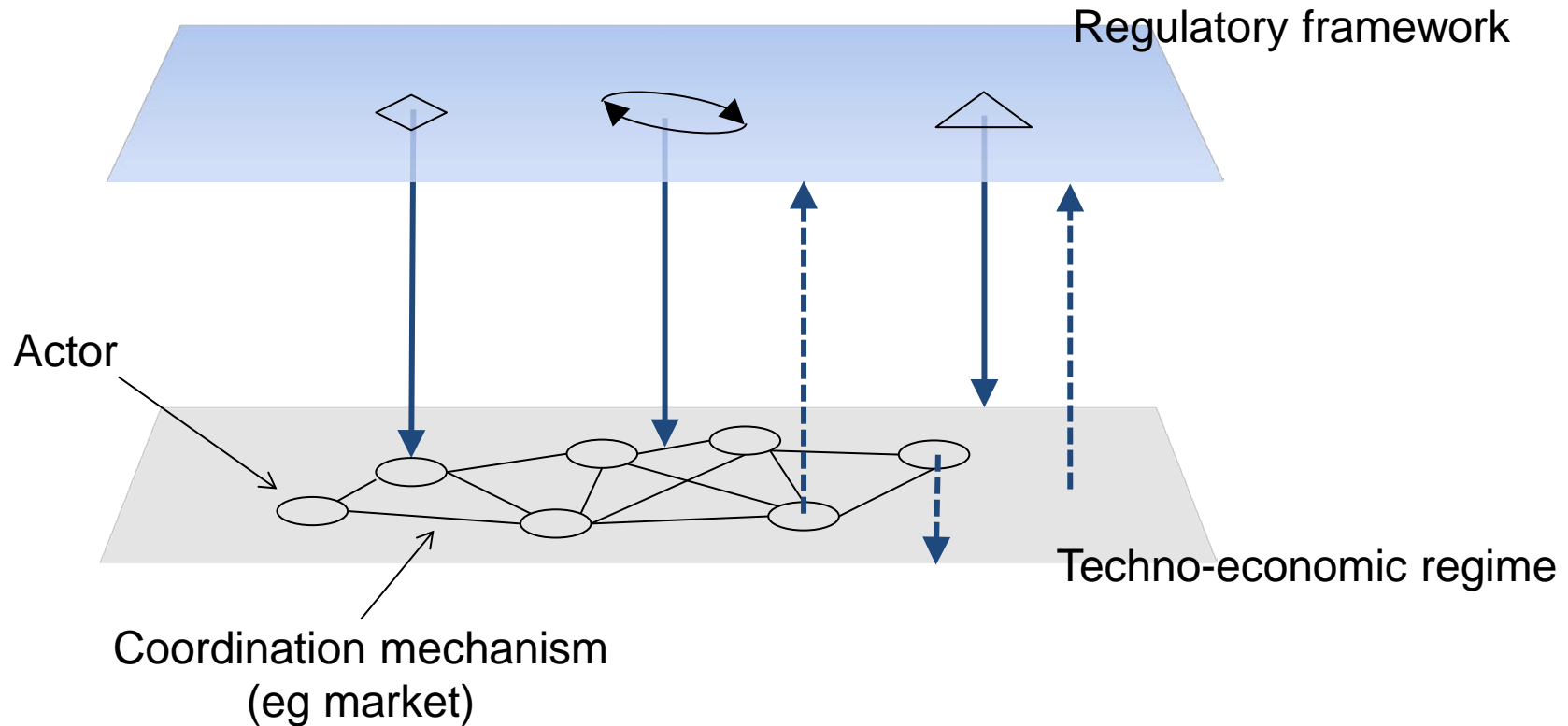




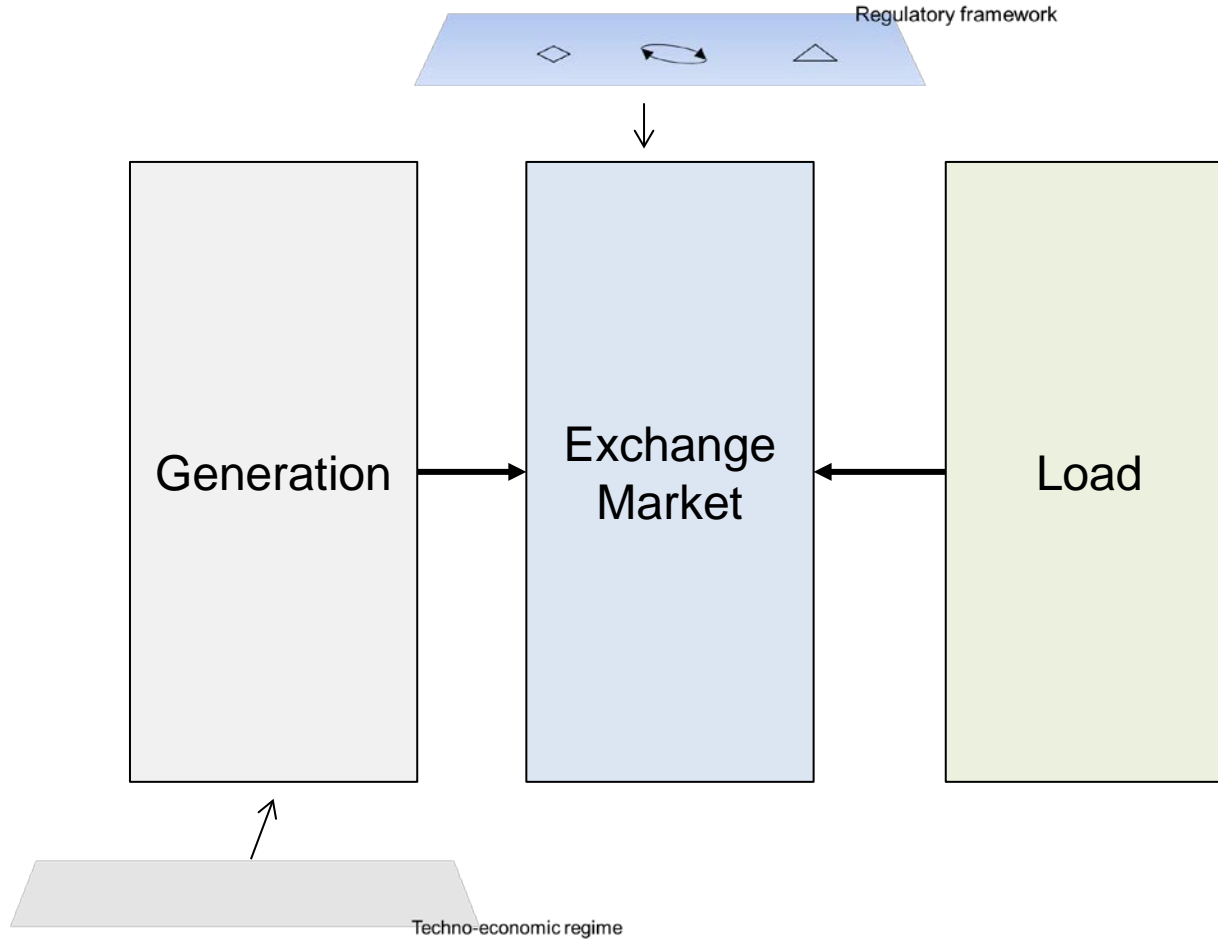
# Impact of Regulatory framework on the techno-economic regime & coordination mechanism & actors



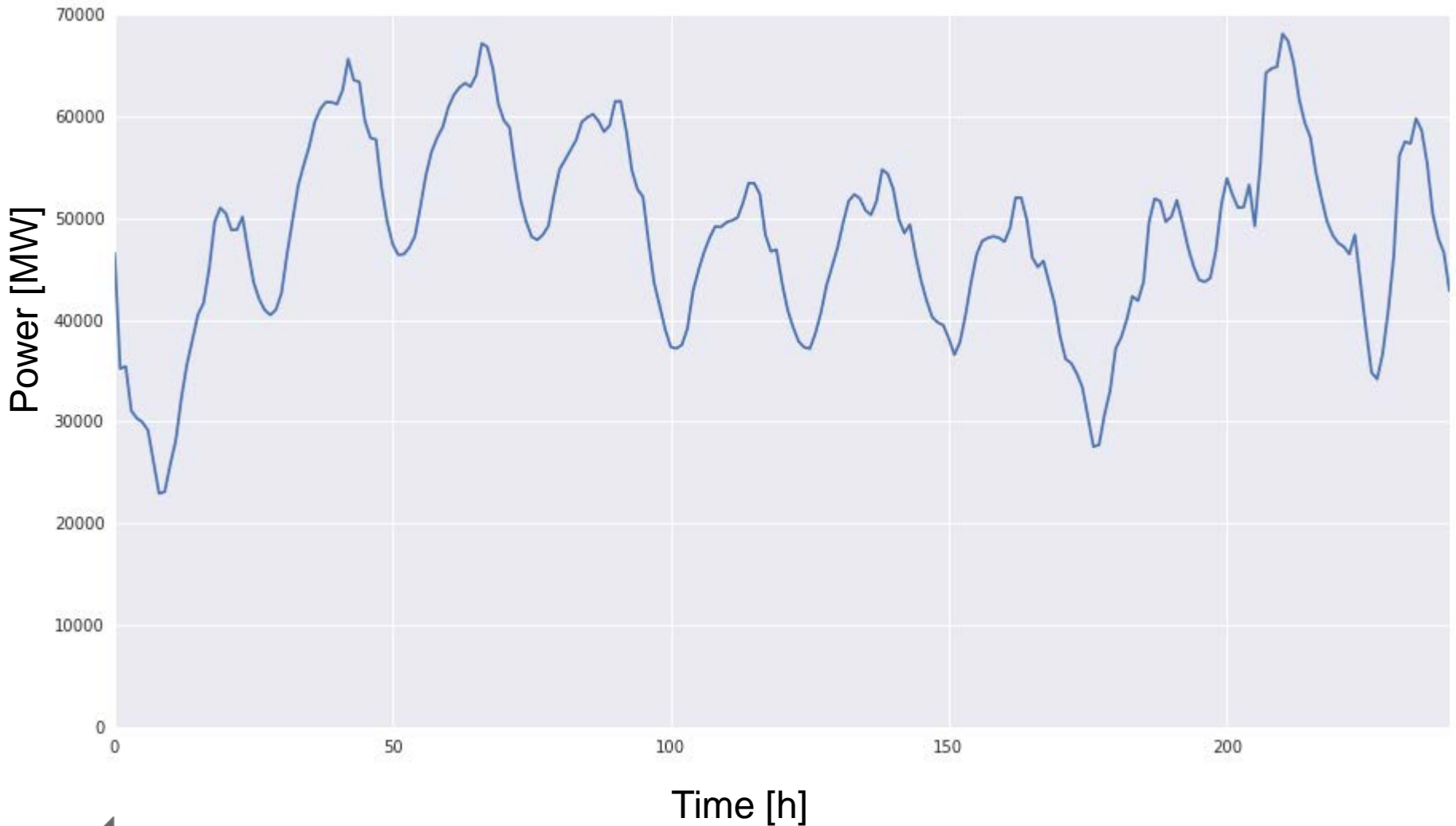
# What are the drivers?



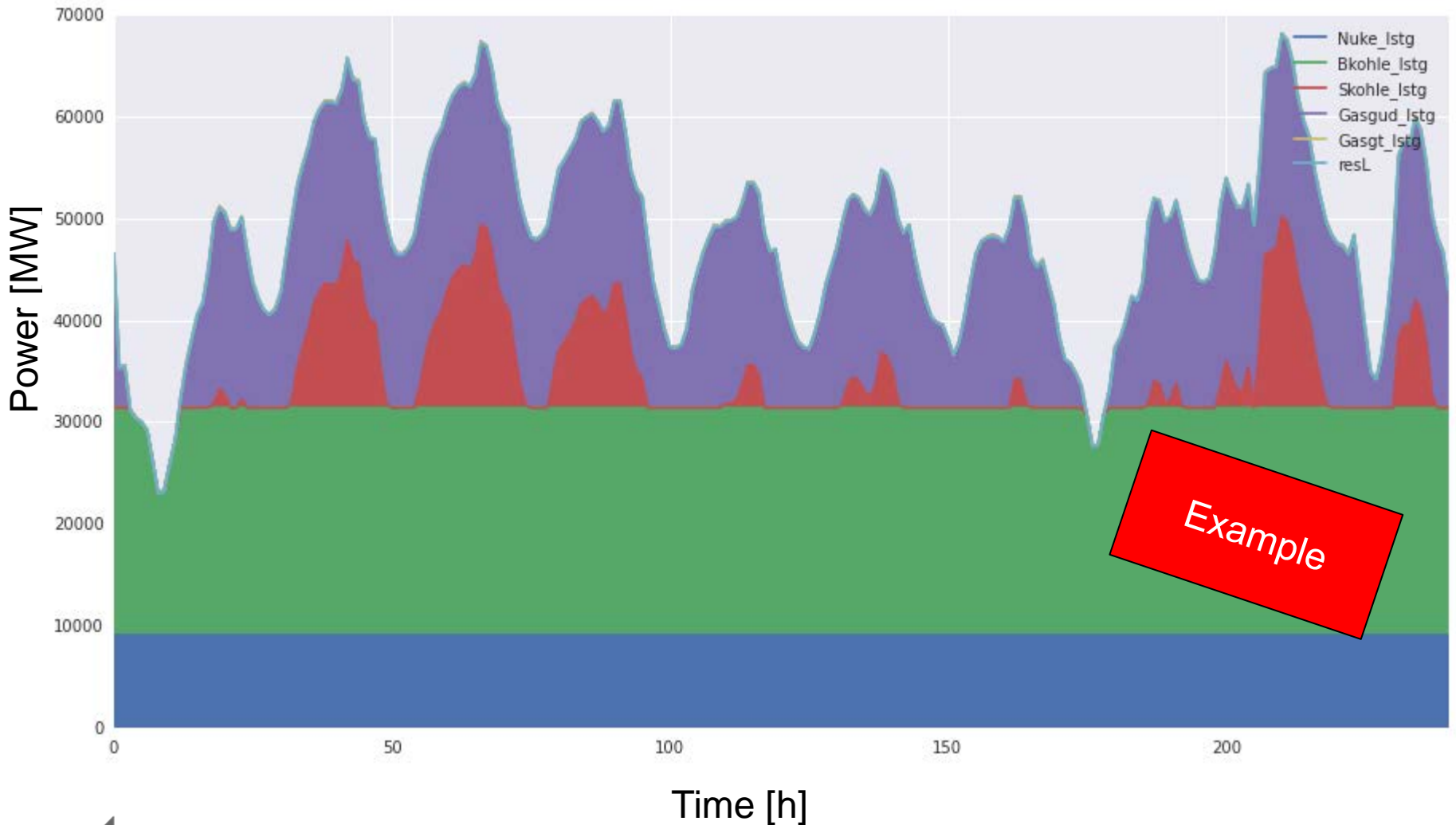
# Electricity Market Model AMIRIS I



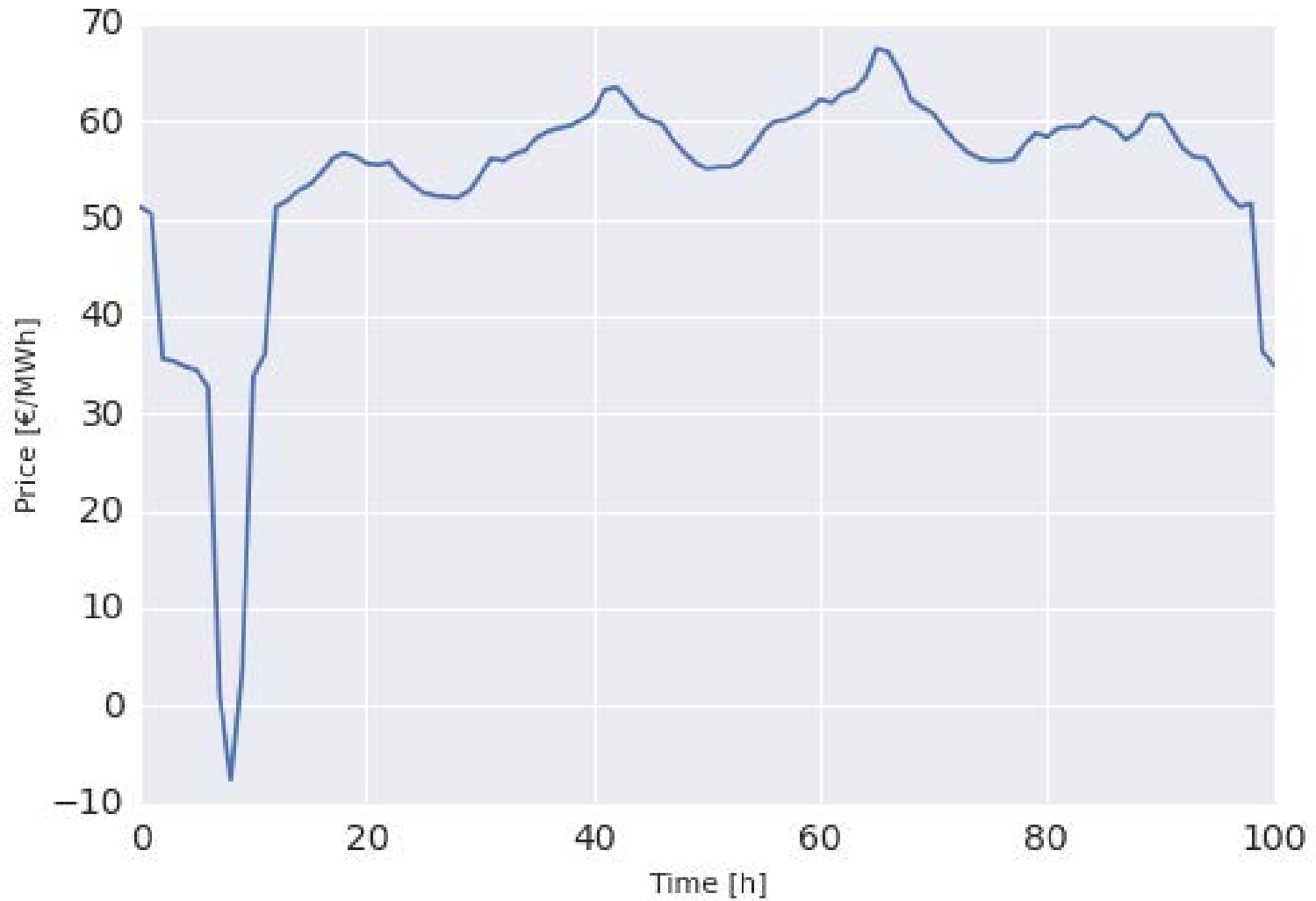
# Residual Load



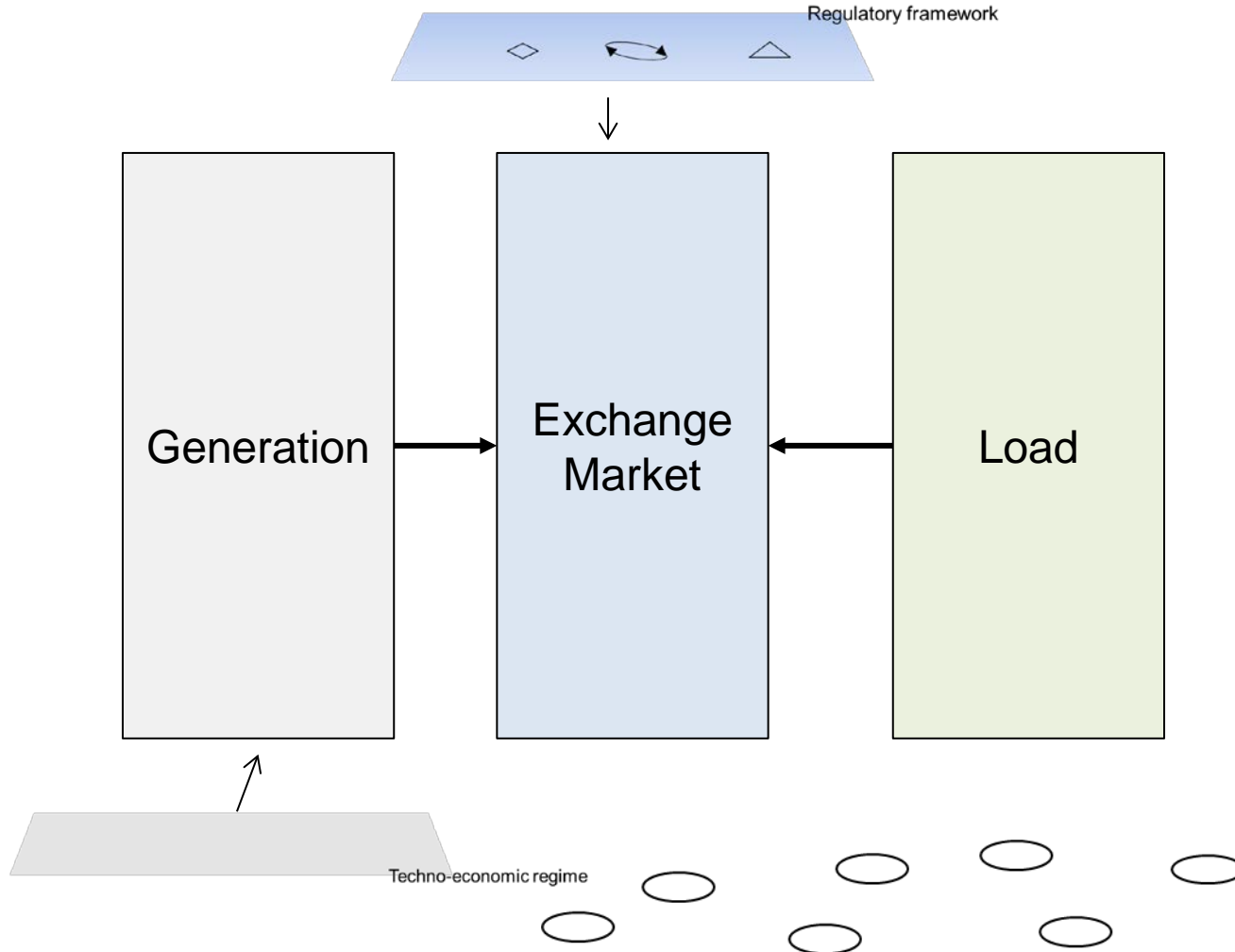
# Dispatch of Conventional Power Plants



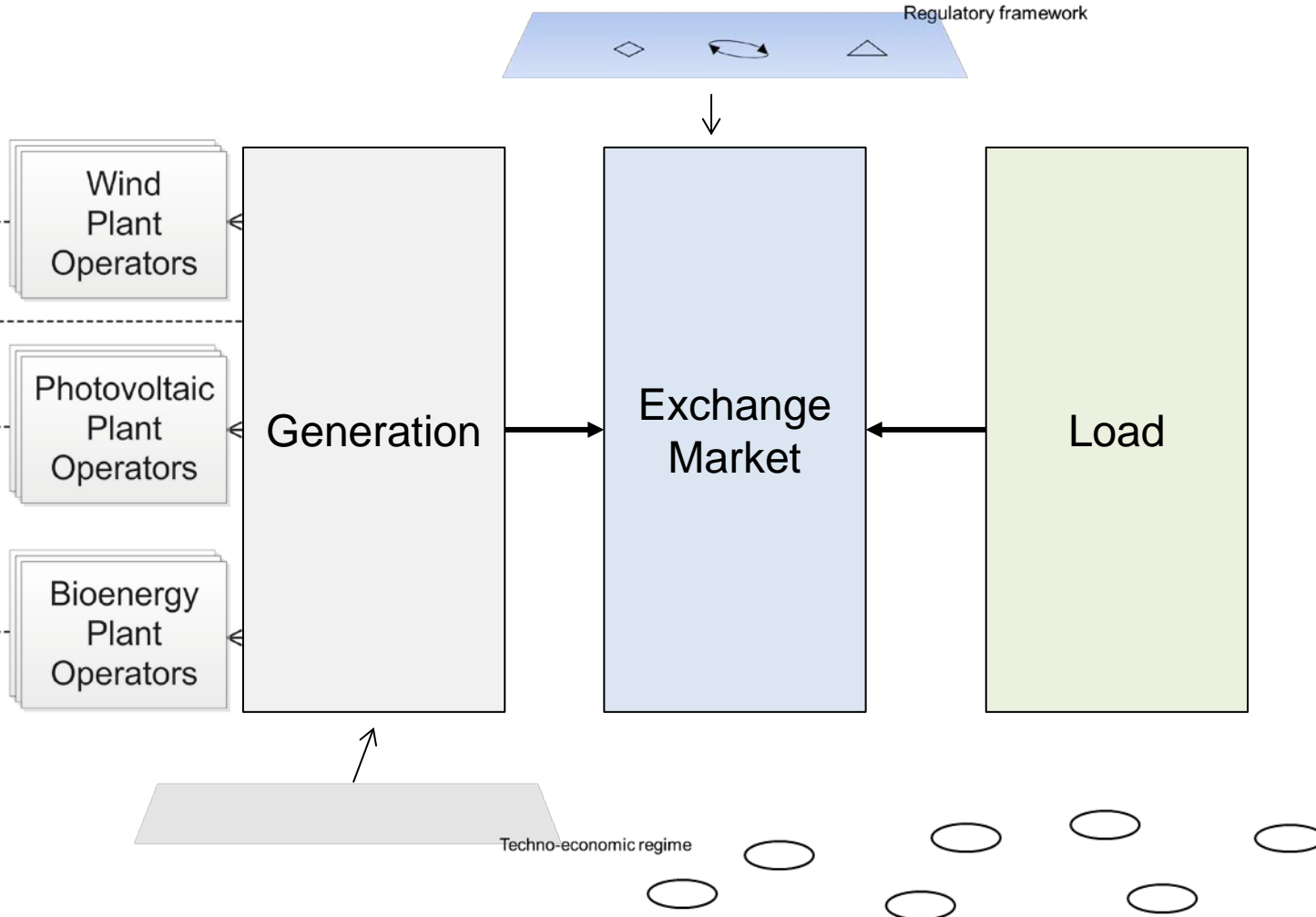
# Exchange Market Price



# Where are the Actors?

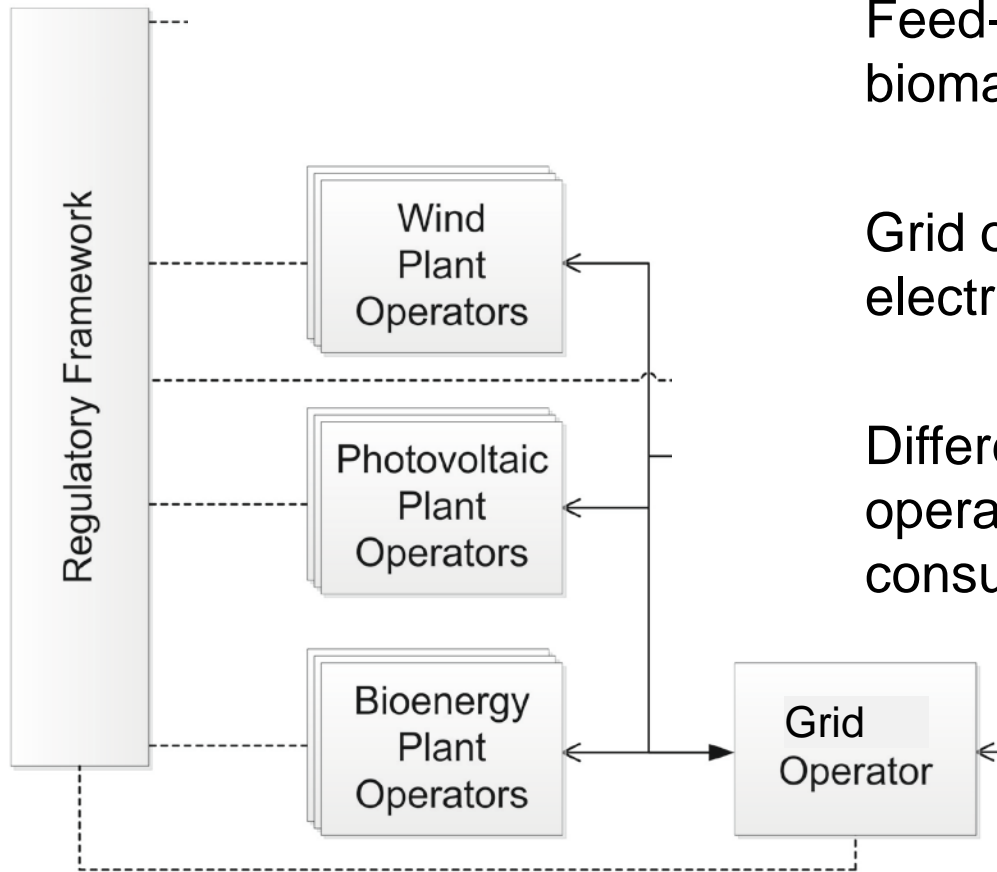


# Where are the Actors?





# Actors and German Renewable Energy Sources Act - BEFORE 2012



Feed-In tariff for wind, photovoltaic, biomass power plant operators

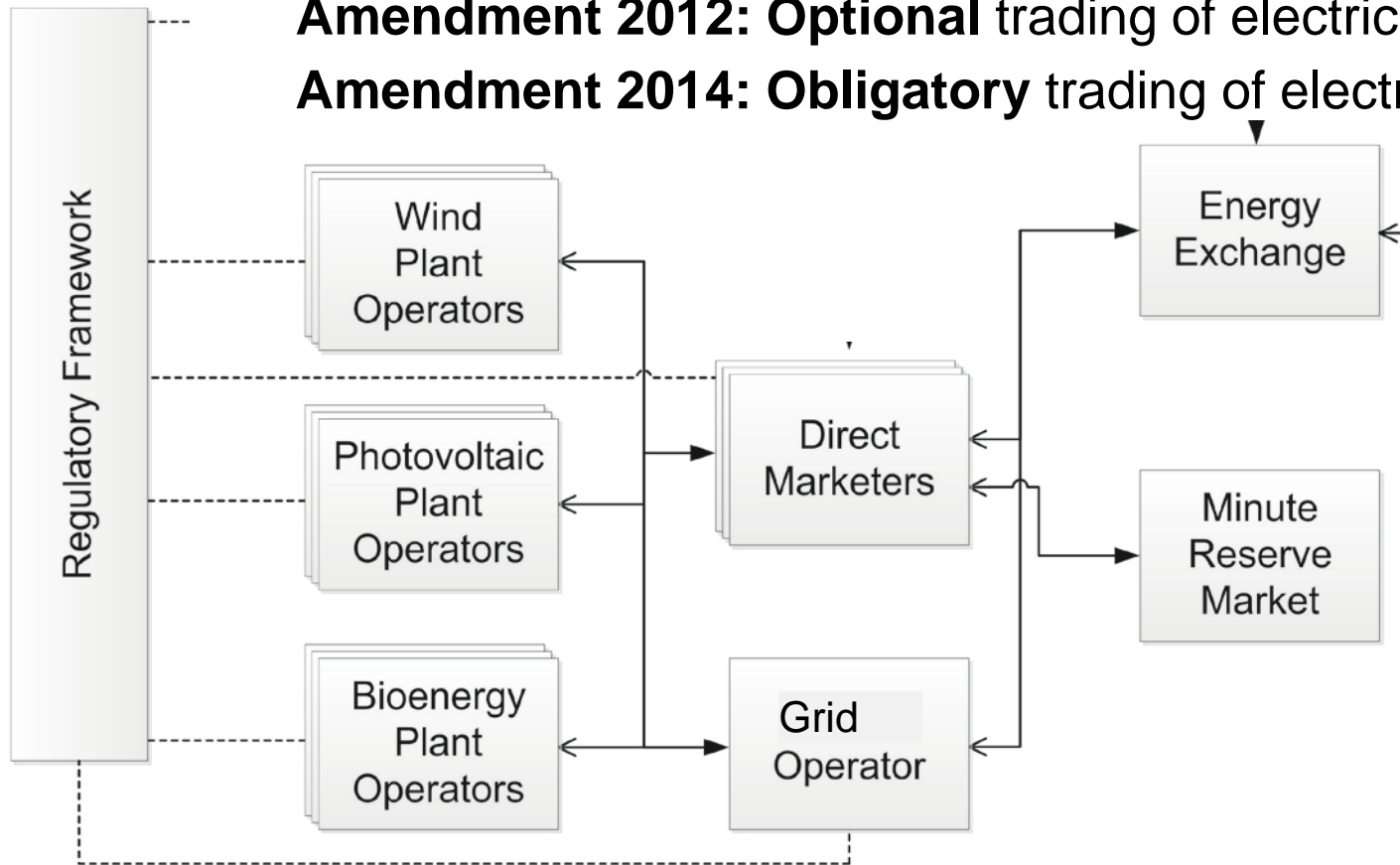
Grid operator distributes and sells electricity at market

Difference of income from grid operator to feed-in tariff payed by consumers



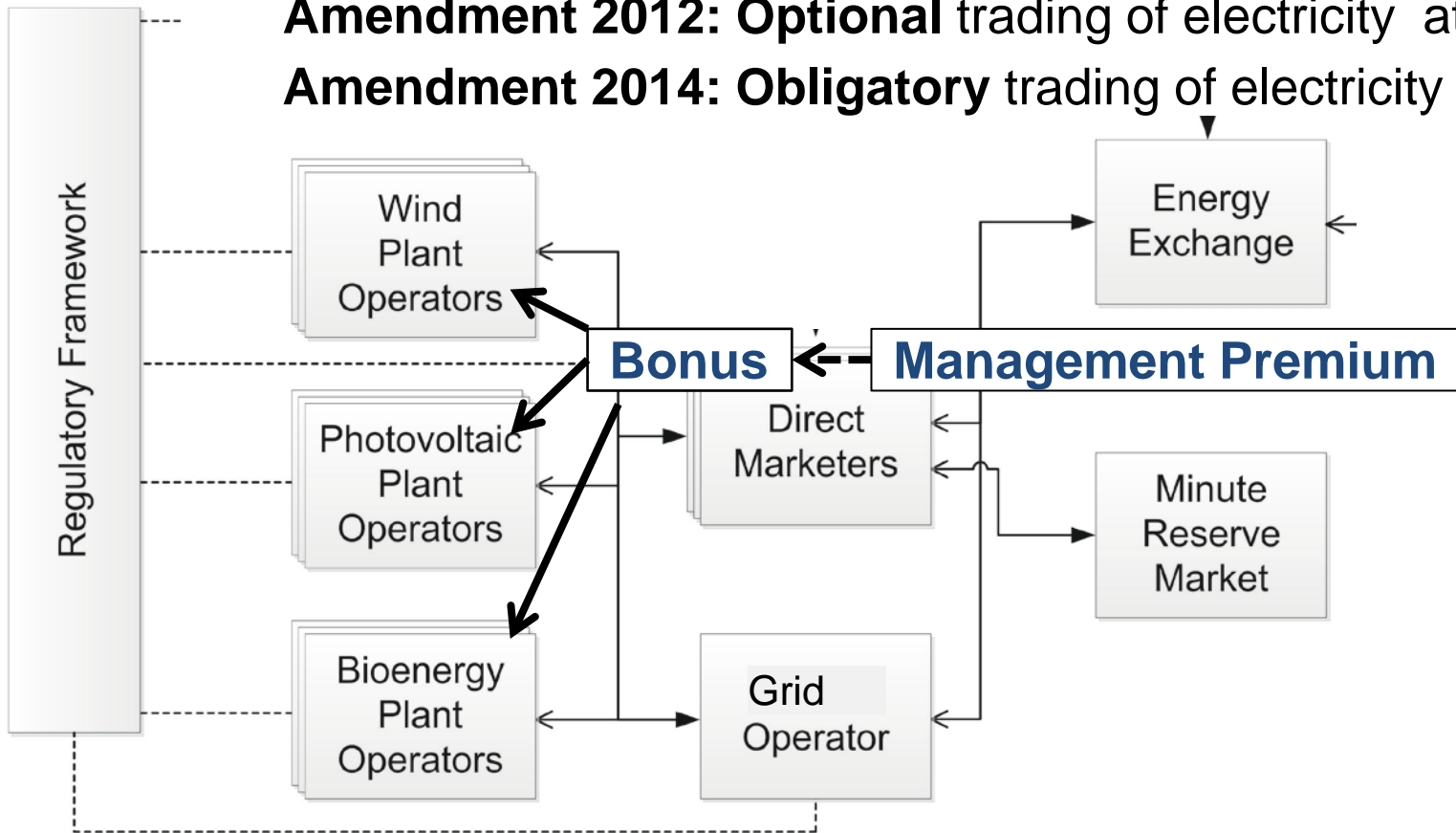
# Actors and German Renewable Energy Sources Act - AFTER 2012

**Amendment 2012: Optional** trading of electricity at markets  
**Amendment 2014: Obligatory** trading of electricity at markets



# Actors and German Renewable Energy Act AFTER 2012

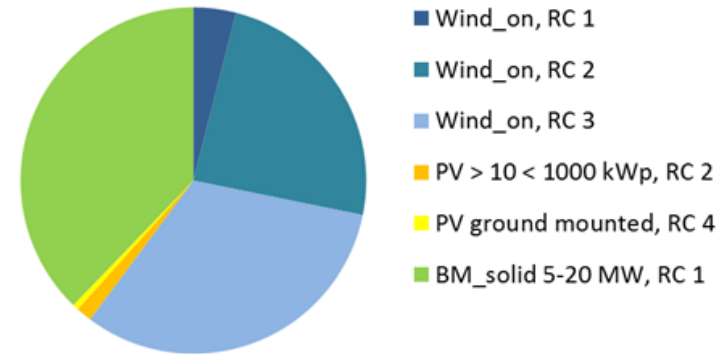
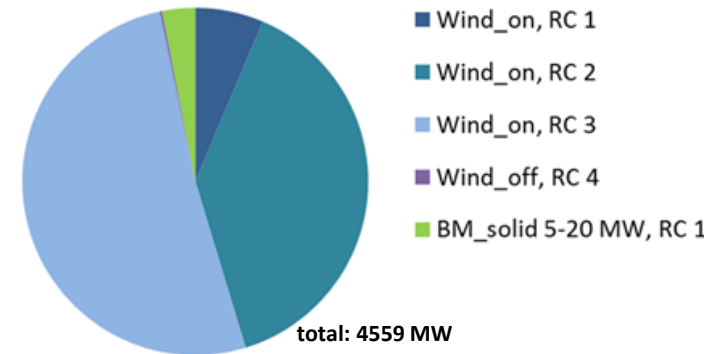
**Amendment 2012: Optional** trading of electricity at markets  
**Amendment 2014: Obligatory** trading of electricity at markets



# Direct Marketer Characterization

Marketers may differ with respect to

- Capital
- Generation portfolio composition and size
- Estimated value of generation forecast
- Uncertainty of generation forecast
- Uncertainty of exchange market price forecast

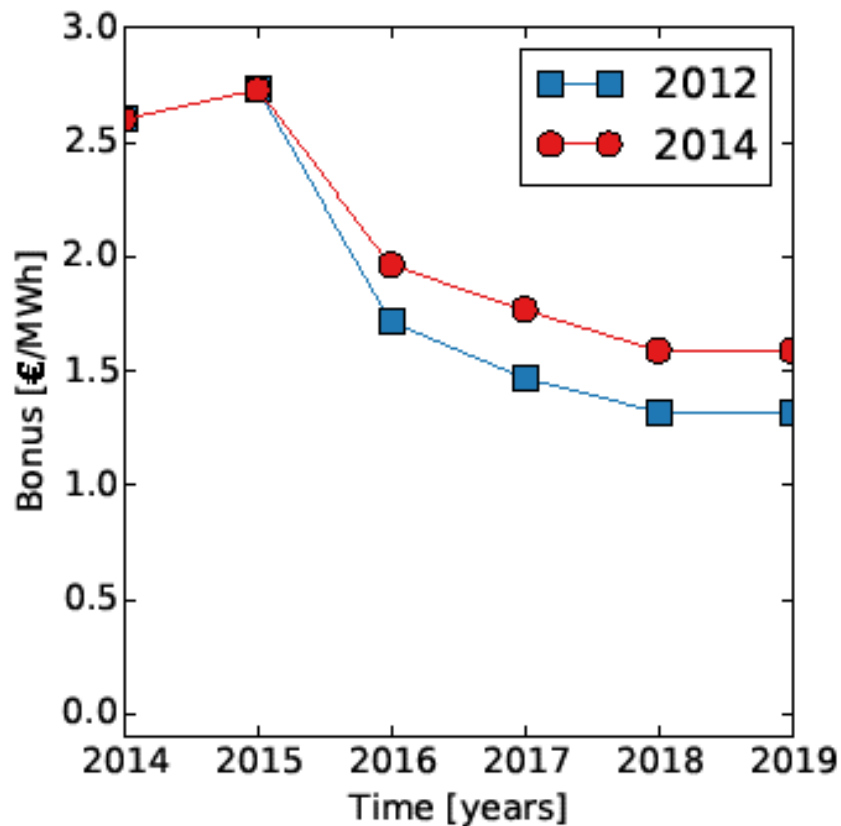
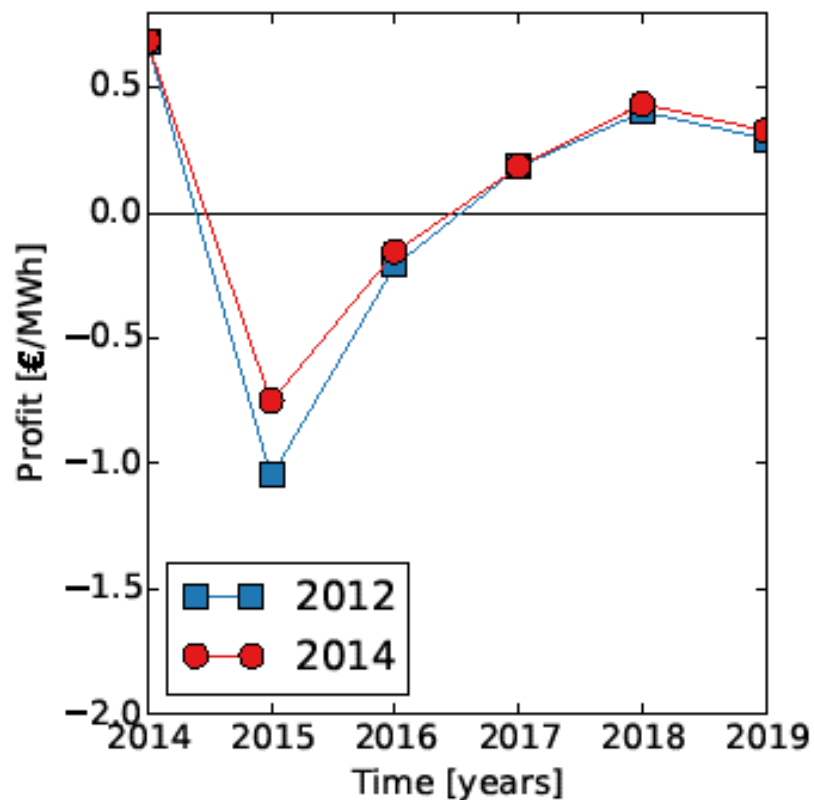


Possible question to address:  
Do policy measures influence actor heterogeneity?



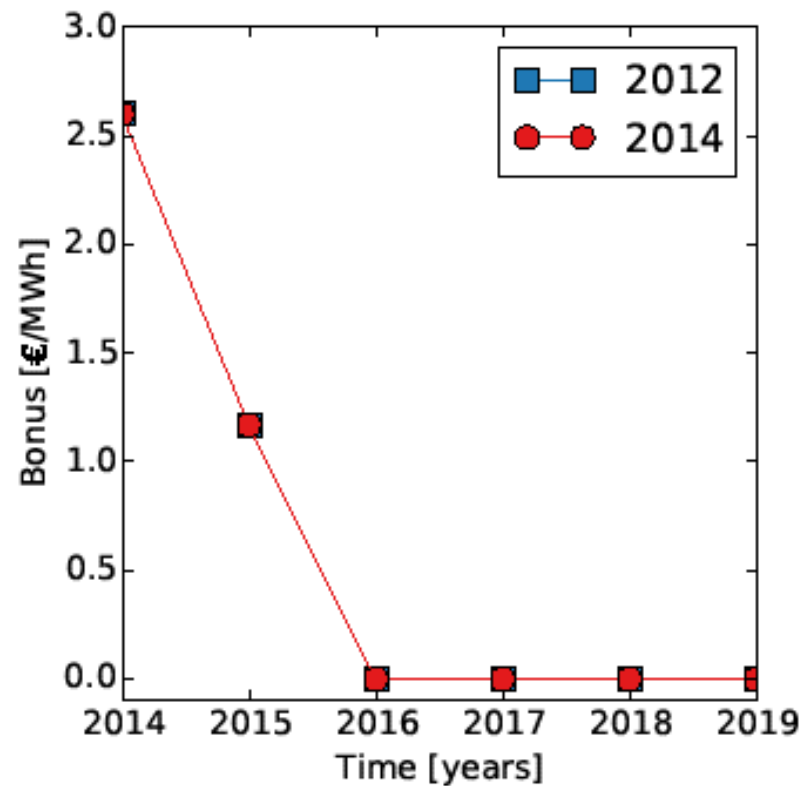
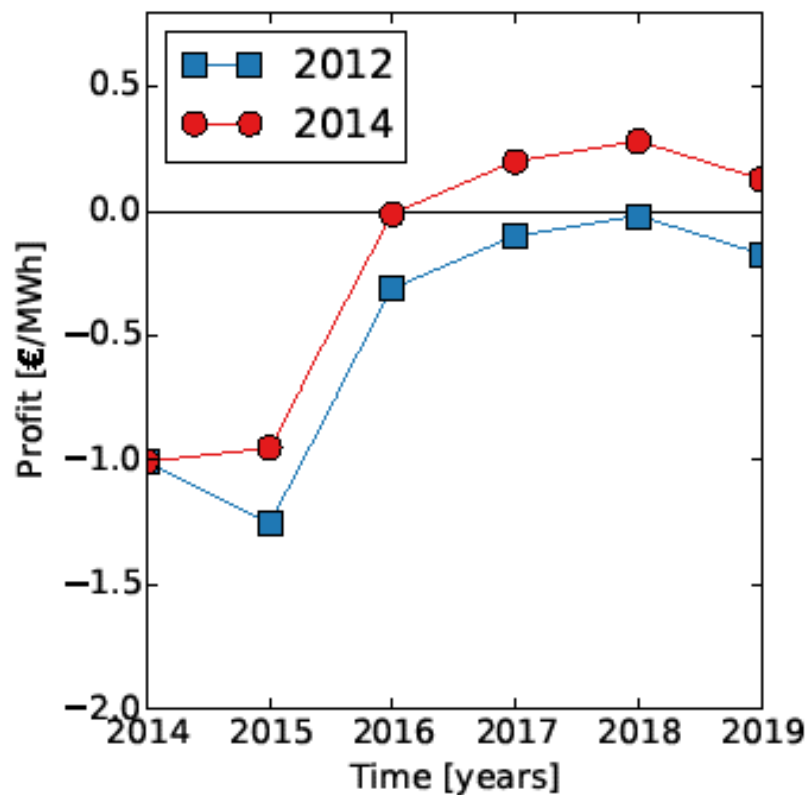
# Profit of Direct Marketer with GOOD generation forecast

Portfolio: much onshore wind, little offshore



# Profit of Direct Marketer with BAD generation forecast

Portfolio: much onshore wind, little offshore



# Summary & Outlook

Characterization of **actors** (portfolio, uncertainty, ...) and analysis of actors' profits wrt **regulatory framework** and **techno-economic regime**

Studying alternative market designs and promotion mechanisms

Detailed implementing of economic & technology parameters to evaluate refinancing of investments in renewables

Developing flexible demand side and analysing impact on system

Implementing decision analysis for model endogeneous deployment of power plants (cum grano salis)

Determining impact of policies on actors and on goals of desired energy transformation



# Thank you!

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