How can modeled electricity prices be adjusted to reflect real price spreads for flexible assets in the future?

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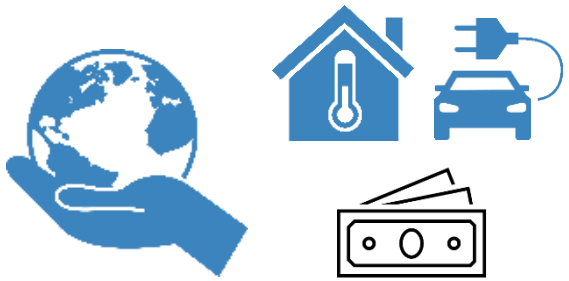
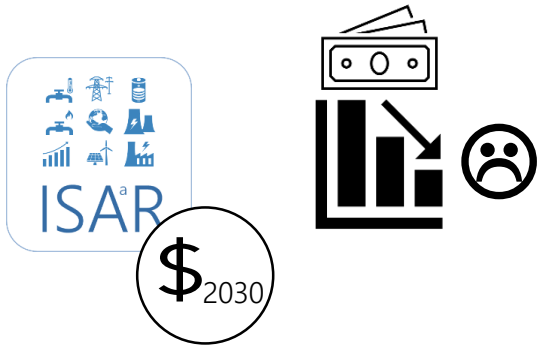
Motivation



Basis Situation:

For the future integration of flexible assets valid business model evaluation is necessary

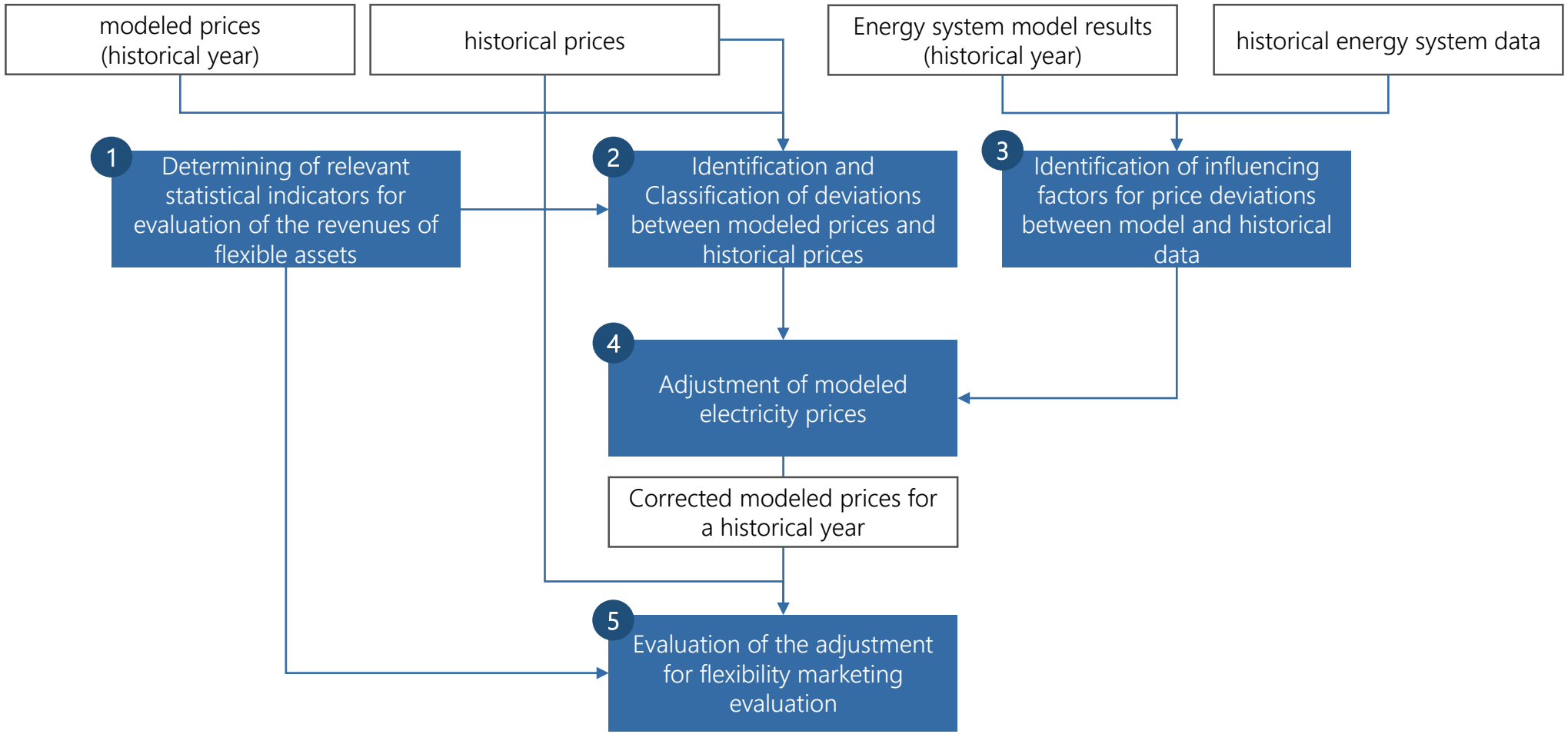


Problem:

Modeled long-term electricity prices often do not reflect real price volatility

How can modeled electricity prices be adjusted to reflect real price spreads for flexible assets in the future?

Methodology



Results

1 - Determining of relevant statistical indicators for evaluation of the revenues of flexible assets

Which statistical indicators exist?

- annual duration curve
- yearly standard deviation
- quarterly standard deviation
- monthly standard deviation
- daily standard deviation
- revenues of simple battery storage marketing tool

Not relevant for daily flexibility marketing

For further analyses the mean daily standard deviation and the simple battery storage marketing tool is used as evaluation indicator

Results

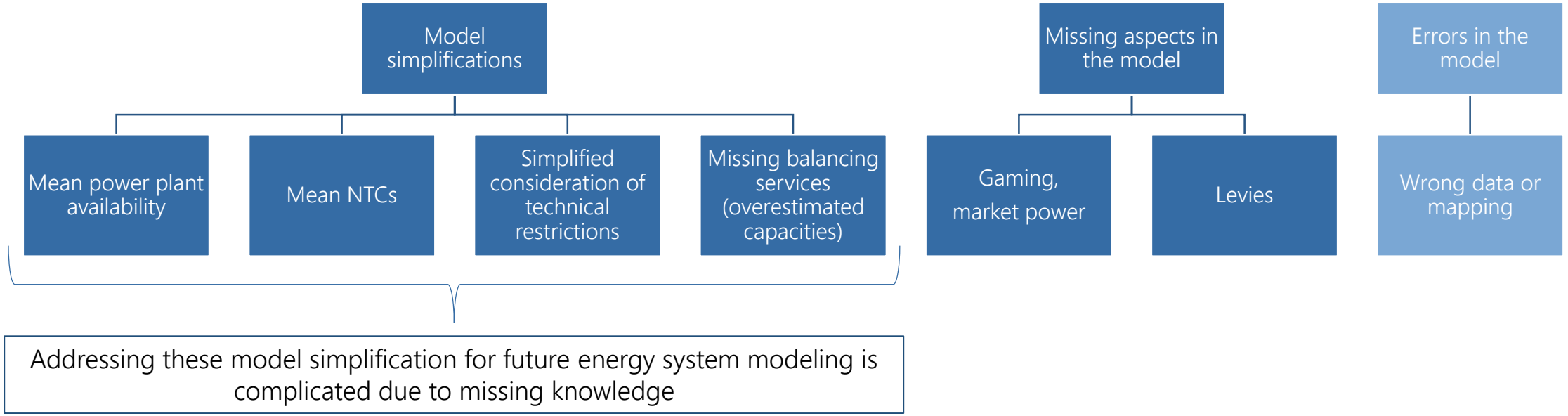
2 - Identification and Classification of deviations between modeling prices and historical prices

2018	Yearly revenues of battery marketing tool	Mean value of daily standard deviation
Modeled electricity prices	4,805 €/(a*MW)	5.3
Historical electricity prices	34,552 €/(a*MW)	9.8

Greatly lower daily standard deviation and lower revenues in marketing model even though the annual duration curve is similar

Results

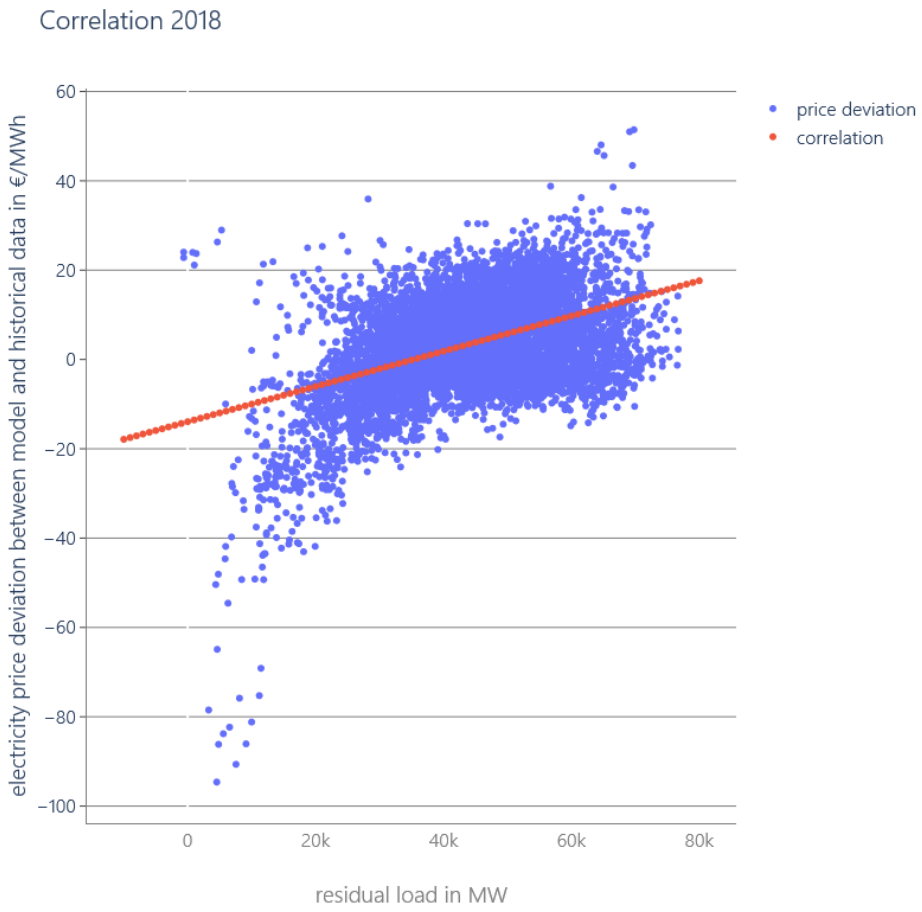
3 - Identification of influencing factors for price deviations between model and historical data



What indicator can we address for the future?

Results

4 - Adjustment of modeled electricity prices



Modeled electricity prices are adjusted with a regression function of the residual load as an indirect influence on price derivation

Results

5 -Evaluation of the adjustment for flexibility marketing evaluation

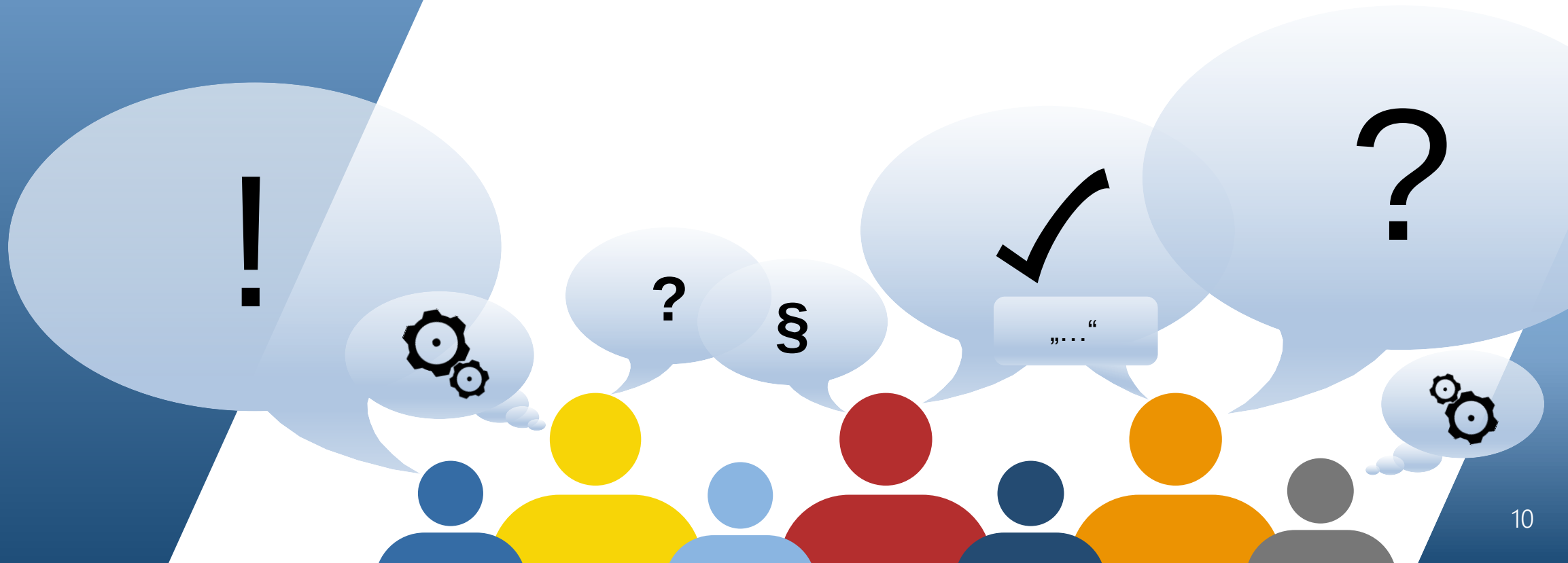
2018	Yearly revenues of battery marketing tool	Mean value of daily standard deviation
Modeled electricity prices	4,805 €/(a*MW)	5.3
Historical electricity prices	34,552€/(a*MW)	9.8
Modeled electricity prices with correction function	20,554 €/(a*MW)	7.9

Modeled prices for historical years can be improved to reflect the revenues for flexibility marketing, however, real revenues are not reached

Discussion – Use for future energy system modeling

	Yearly revenues of battery marketing tool	Mean value of daily standard deviation
Modeled electricity prices 2030	163,790 €/(a*MW)	31.4
Historical electricity prices 2018	34,552 €/(a*MW)	9.8

2030 has a totally different price characteristic with already high price spreads. Therefore, the usage of the adjustment function is not suitable here



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