EEM 19
16TH INTERNATIONAL CONFERENCE ON THE EUROPEAN ENERGY MARKET
18-20 September 2019, Ljubljana, Slovenia
IEEE PES Power & Energy Society®

Probabilistic Forecasting of Imbalance Prices in the Belgian Context

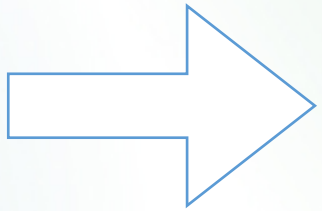
Jonathan Dumas

Ljubljana, 18 September 2019

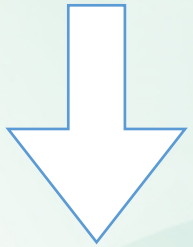
Introduction

Focus on **imbalance** prices

Probabilistic forecasting



A two-step **probabilistic** forecasting approach in the **Belgian** context

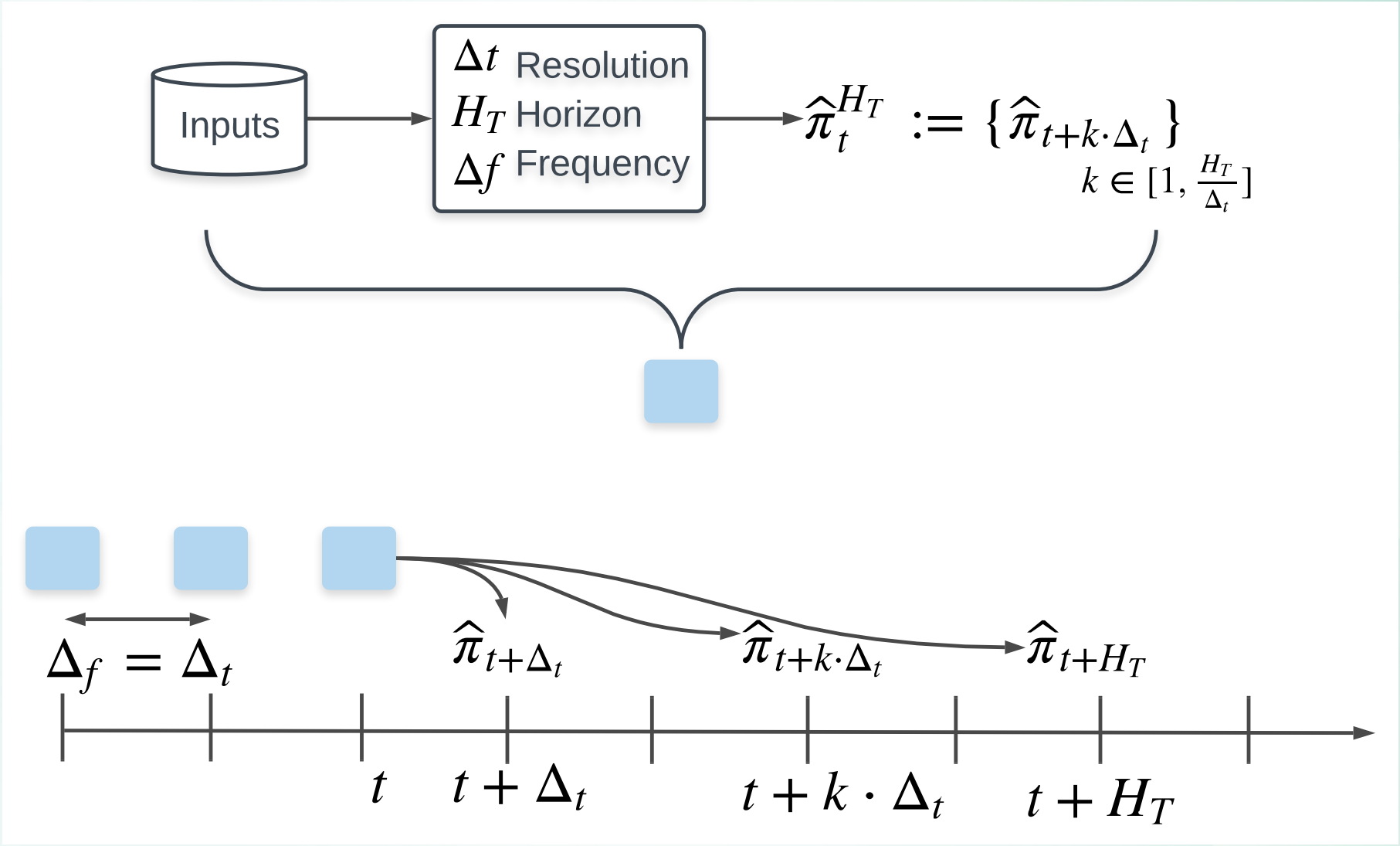


A tool for decision making

Summary

- **Problem formulation**
- Belgian Context
- A two-step probabilistic approach
- Case study description
- Numerical results
- Conclusions

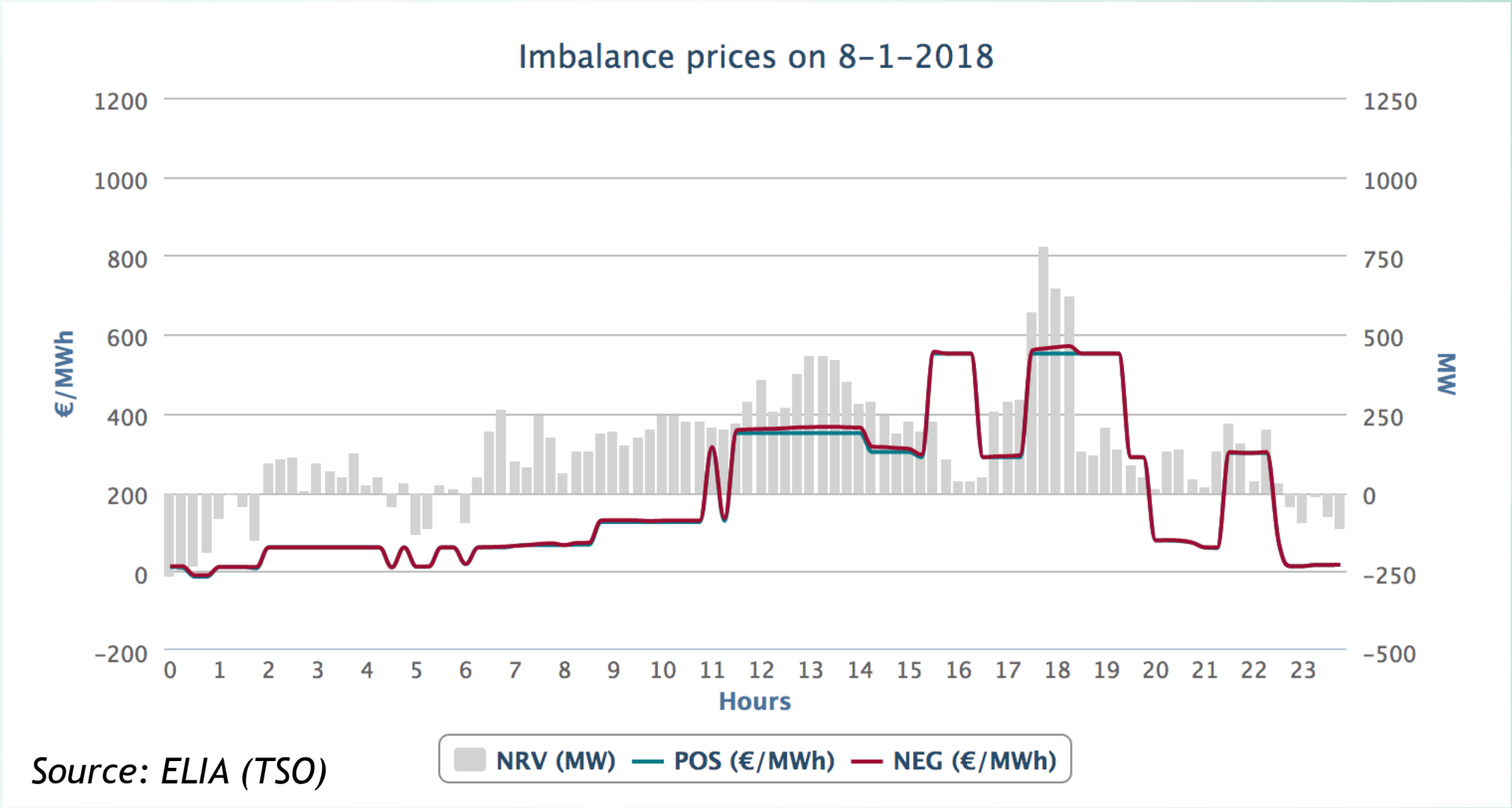
Problem formulation



Summary

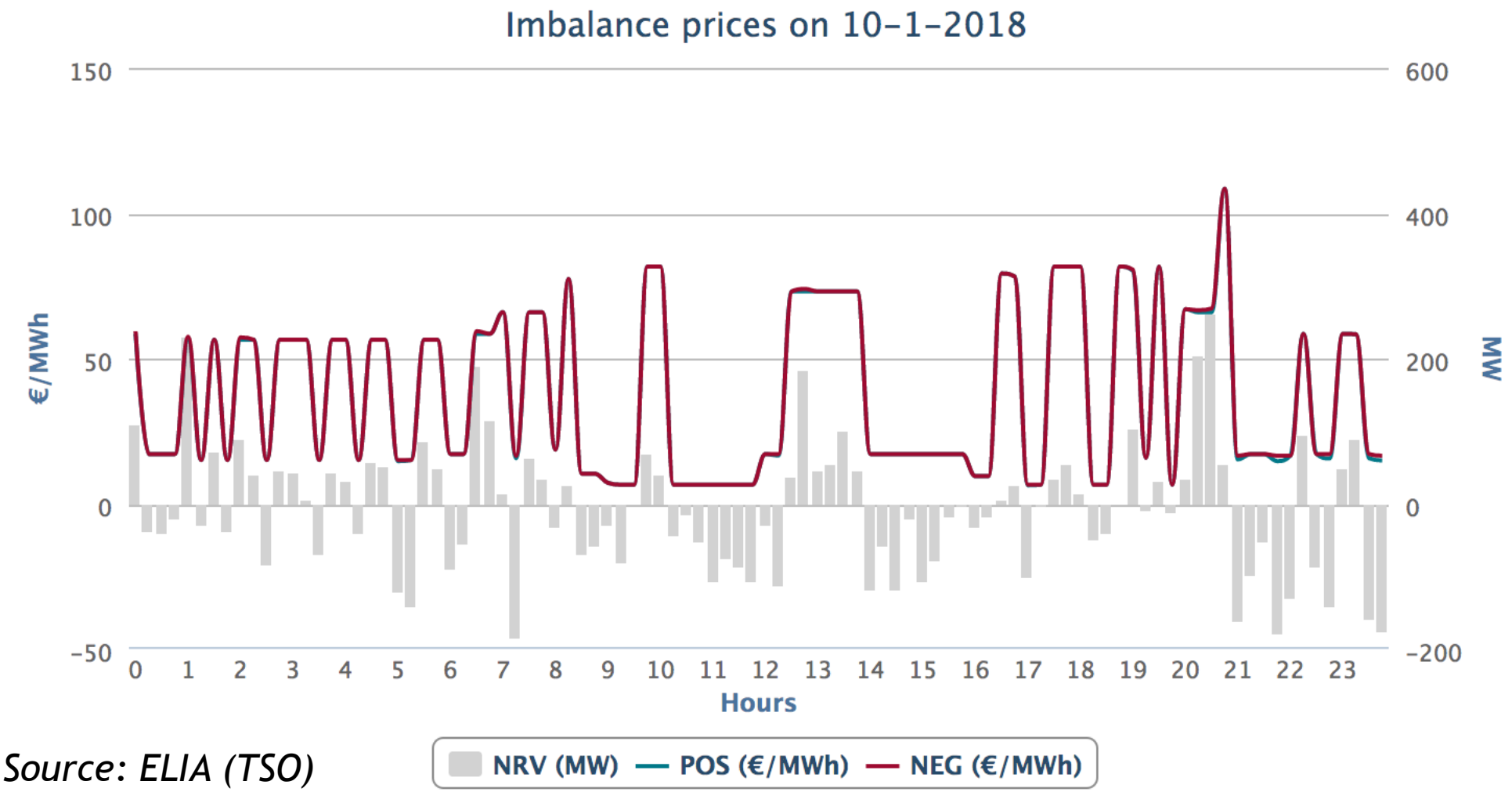
- Problem formulation
- **Belgian Context**
- A two-step probabilistic approach
- Case study description
- Numerical results
- Conclusions

Belgian context



Source: ELIA (TSO)

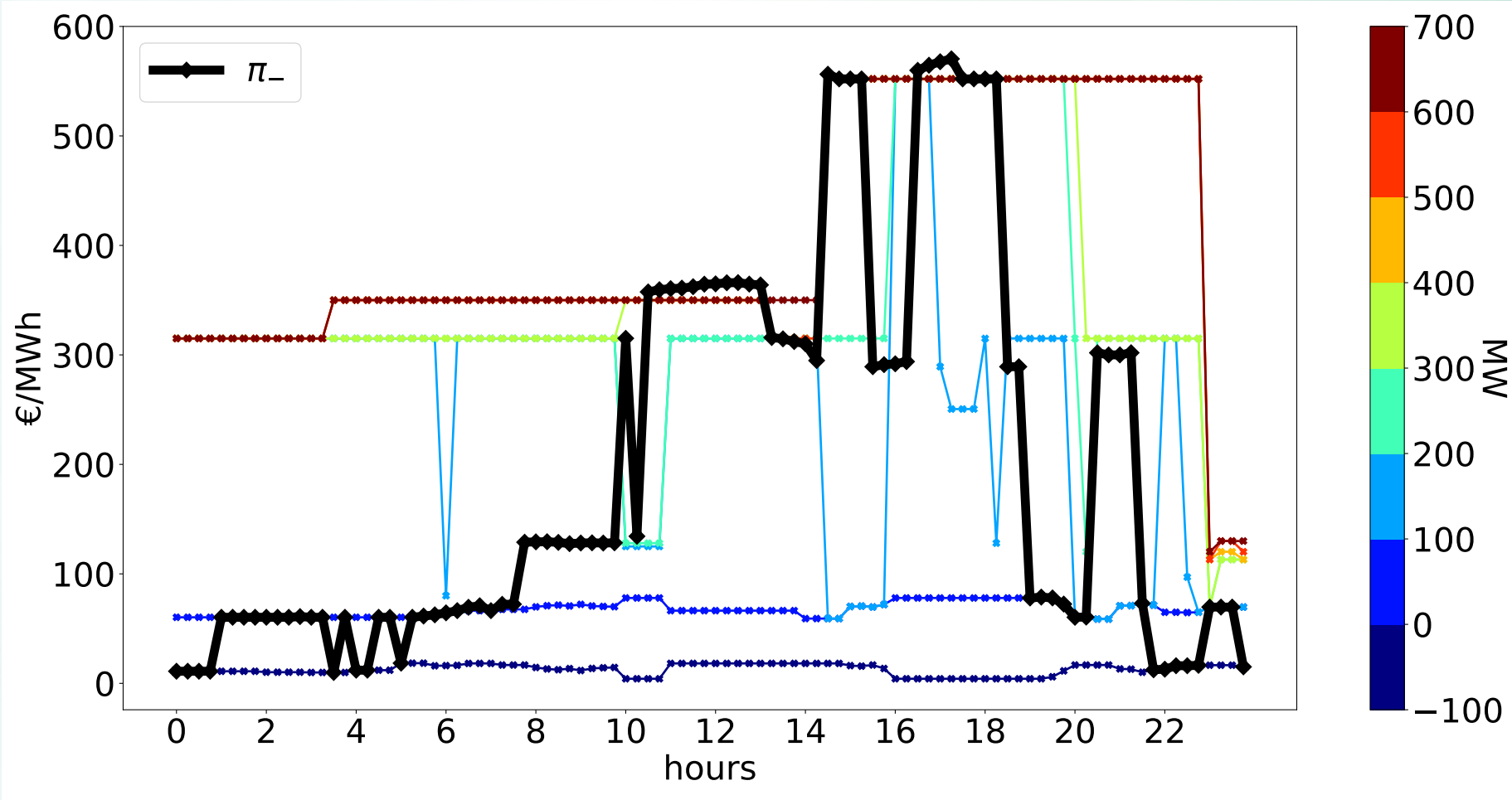
Belgian context



Source: ELIA (TSO)

Belgian context

Marginal and imbalances prices on 08/01/2018

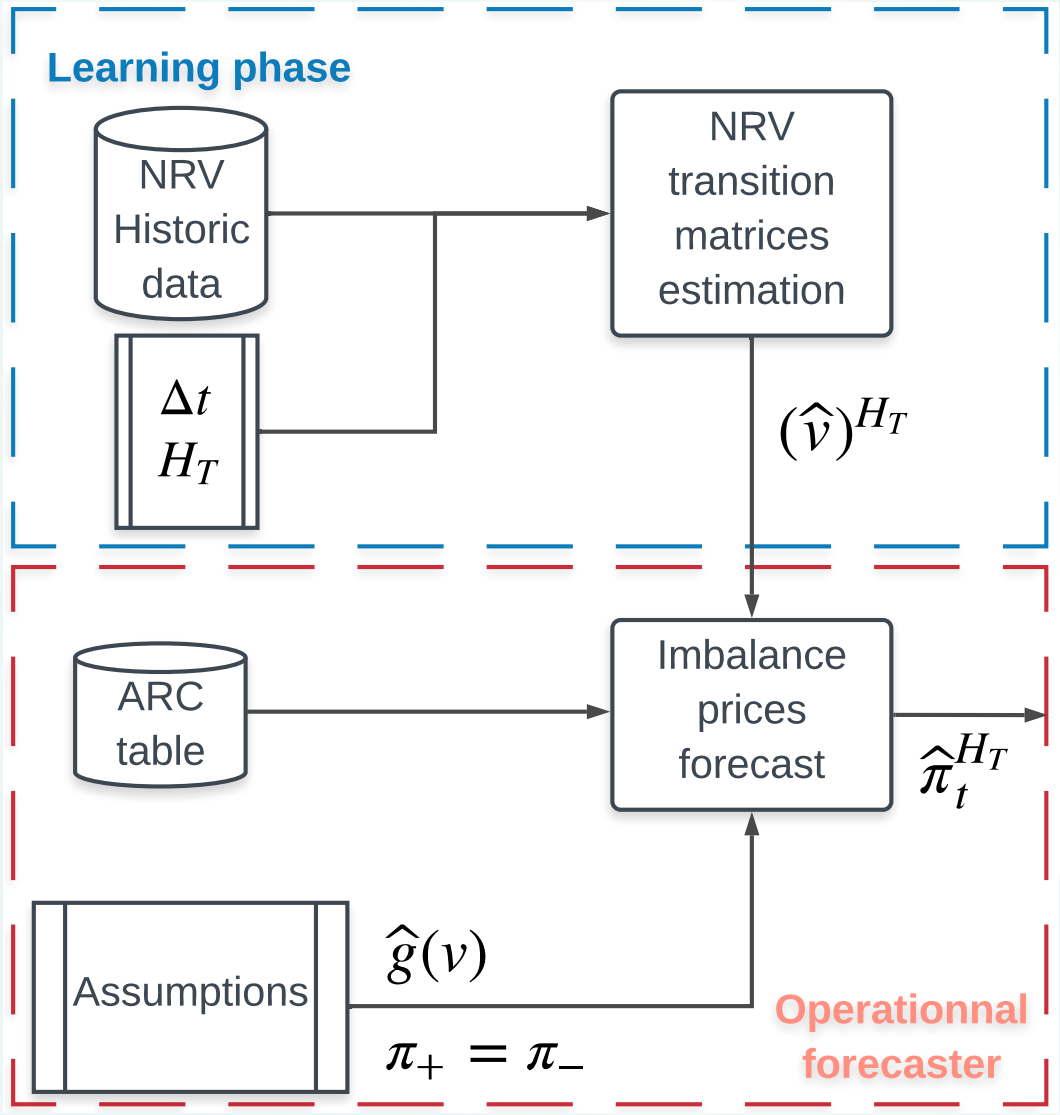


Source: ELIA (TSO)

Summary

- Problem formulation
- Belgian Context
- **A two-step probabilistic approach**
- Case study description
- Numerical results
- Conclusions

A two-step probabilistic approach



Step 1:
computing the NRV state transition probabilities

Step 2:
forecasting the imbalance prices

Summary

- Problem formulation
- Belgian Context
- A two-step probabilistic approach
- **Case study description**
- Numerical results
- Conclusions

Case study description: Belgium

Dataset: imbalance prices, NRV and ARC table
- Learning Set = 2017
- Validation Set = 2018

We compare to two approaches:
- **Deterministic:** Multi Layer Perceptron (MLP)
- **Probabilistic:** Gaussian Processes (GP)

Forecasting horizons: from 15 minutes to 6 hours ahead

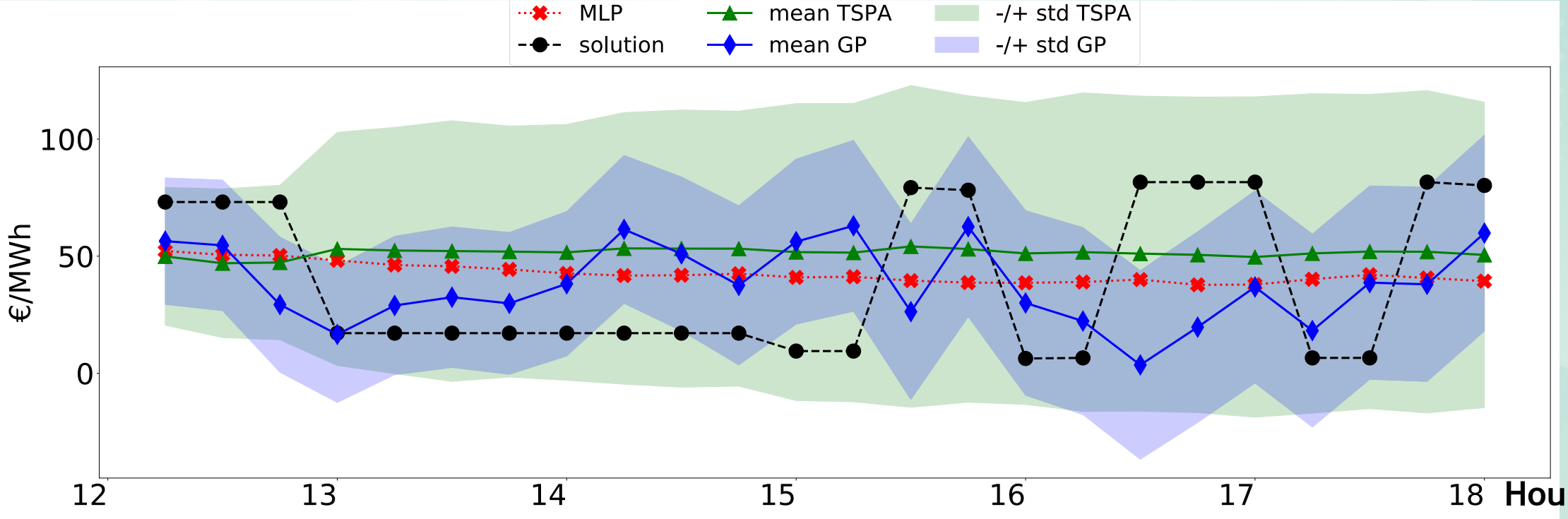
Metrics:
- Probabilistic: CRPS & PLF
- Deterministic: NMAE & NRMSE

Summary

- Problem formulation
- Belgian Context
- A two-step probabilistic approach
- Case study description
- **Numerical results**
- Conclusions

Numerical results: one-shot forecast

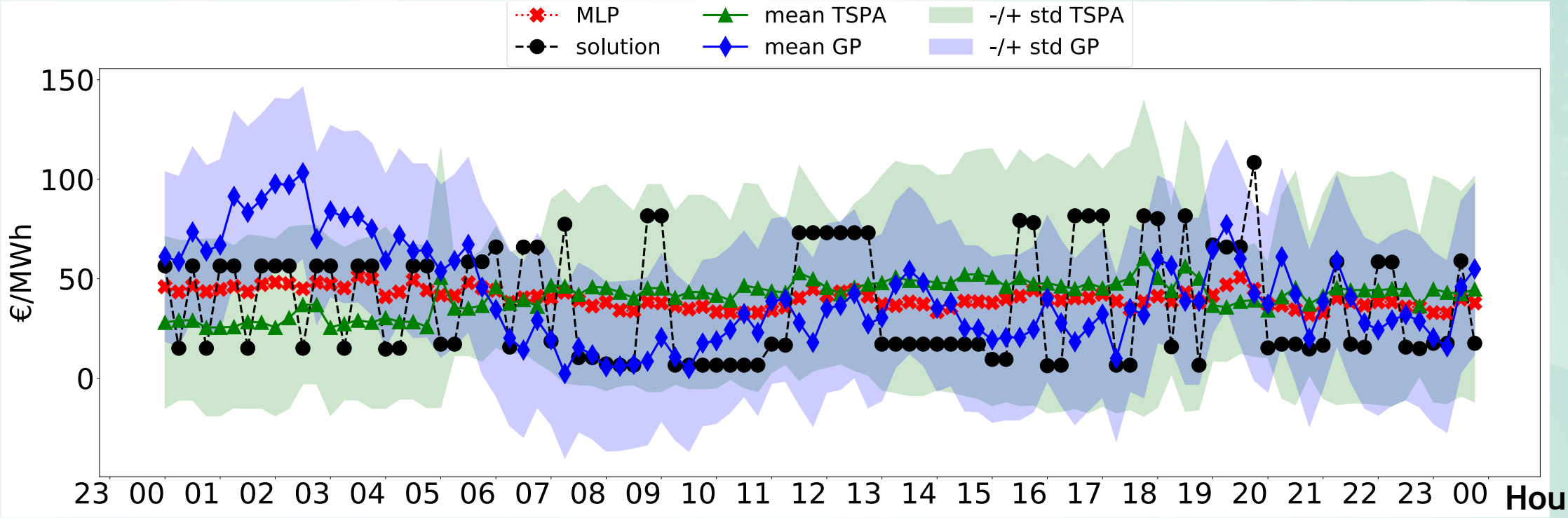
Horizon = 6 hours ahead 10/01/2018, 12h00 UTC



TSPA = Two-Step Probabilistic Approach

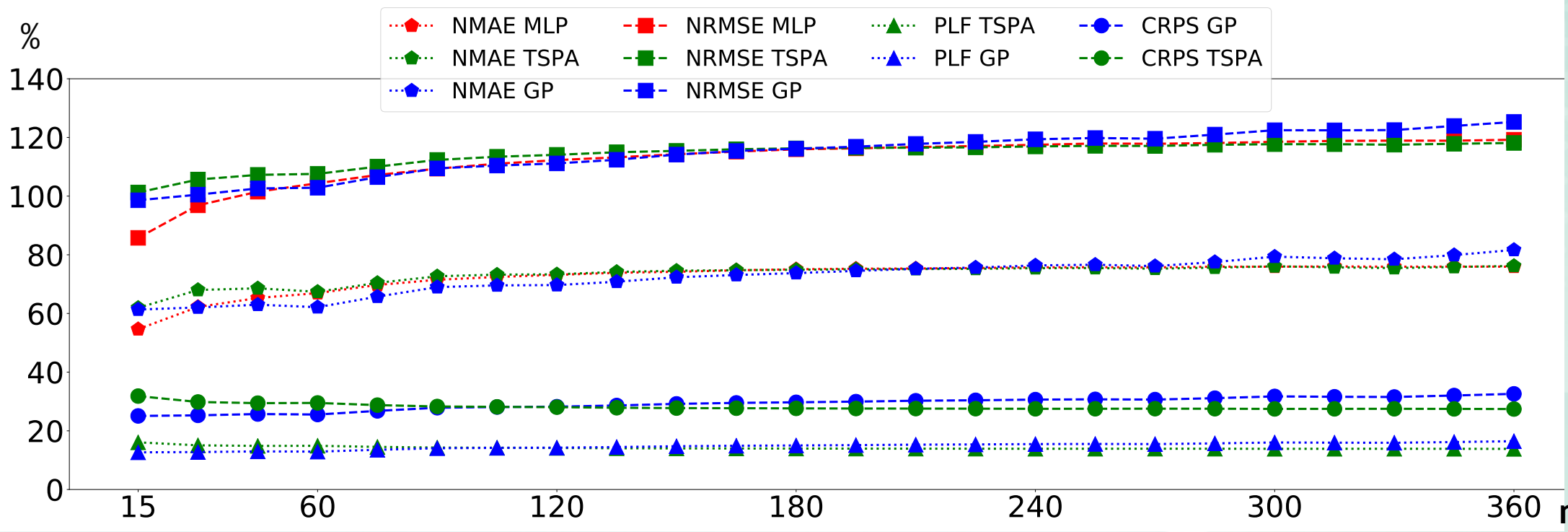
Numerical results: last value forecasted

Horizon = 6 hours ahead, 10/01/2018



Numerical results: scores

Mean scores for horizon from 15 to 360 minutes



Summary

- Problem formulation
- Belgian Context
- A two-step probabilistic approach
- Case study description
- Numerical results
- **Conclusions**

Conclusions

A first step:

- outperforms other approaches on probabilistic error measures
- is less accurate at predicting the precise imbalance prices

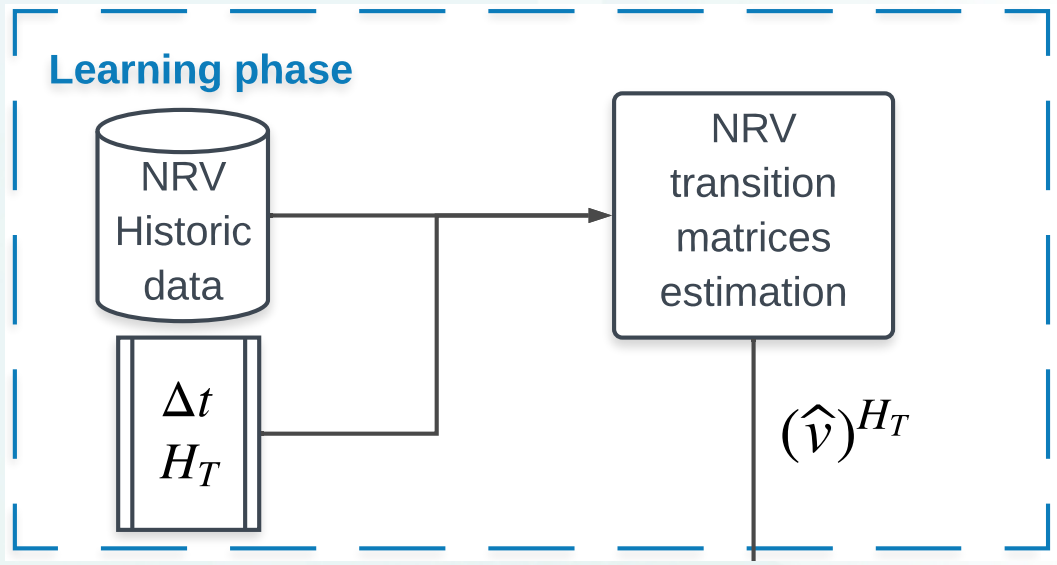
Future work:

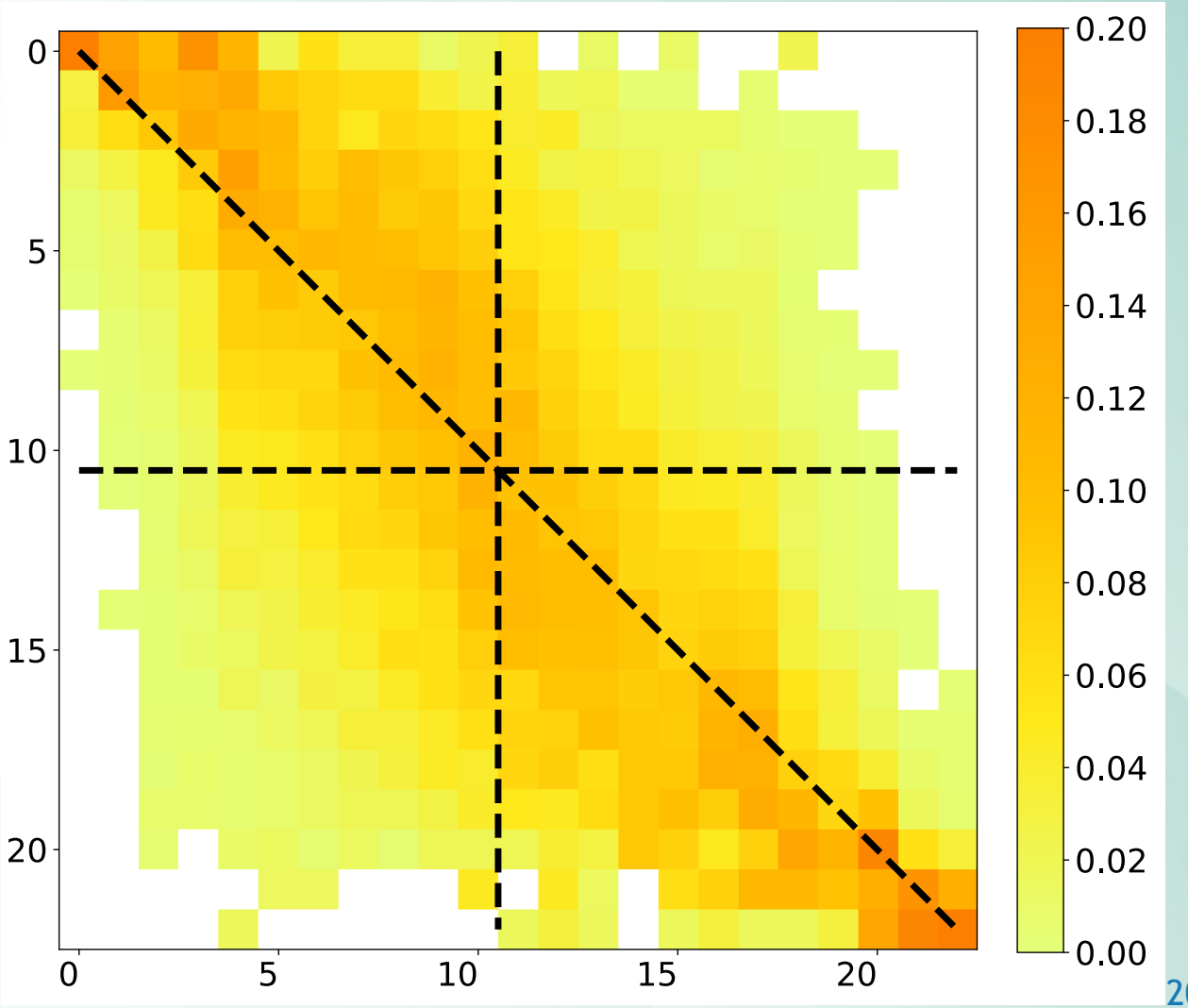
- add input features to better describe the market situation
- **extend** the approach to implement the **whole bidding strategy**

Thank you, any question?

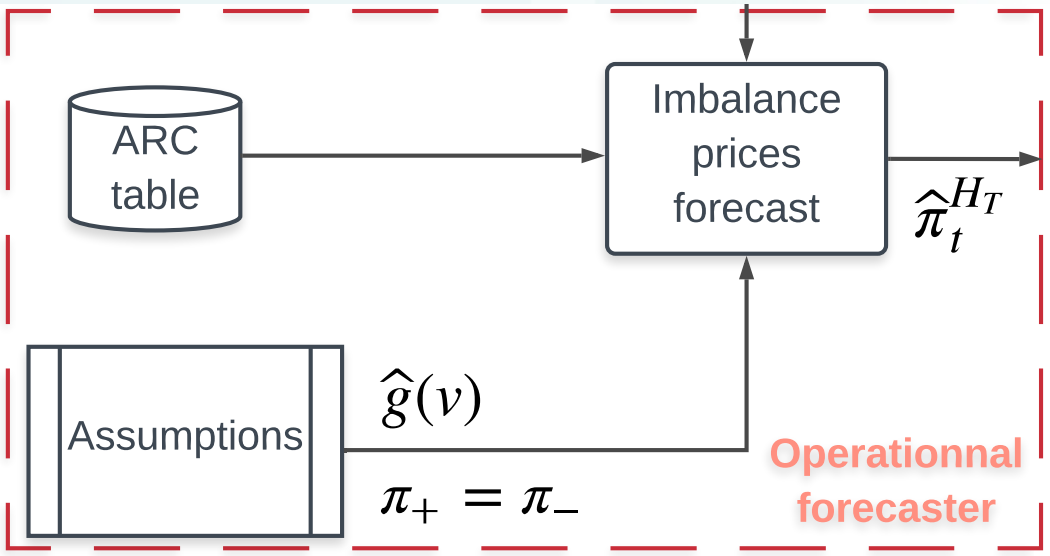
Acknowledgements

A two-step probabilistic approach





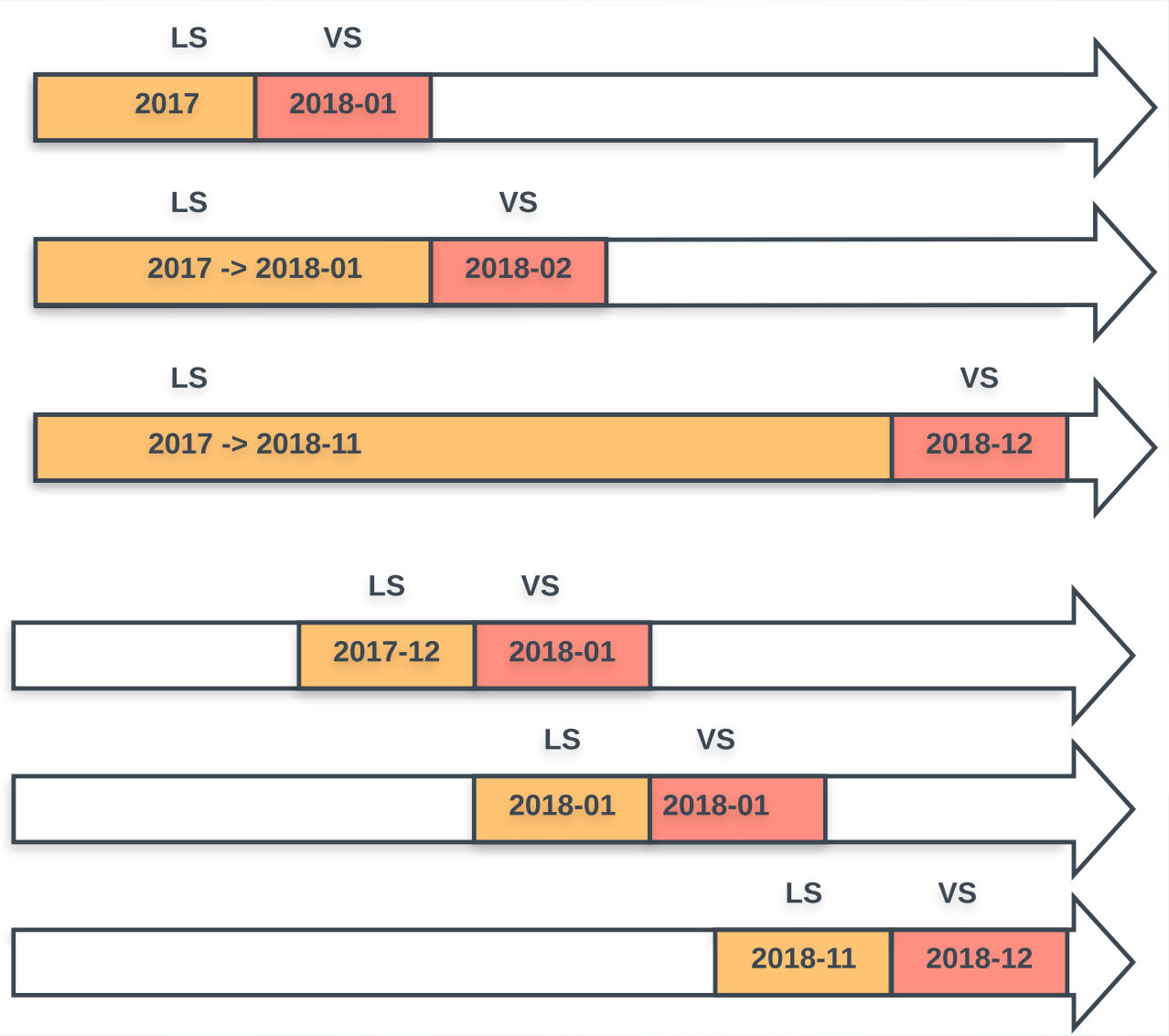
A two-step probabilistic approach



1. **NRV forecast**

2. Selection of the **most probable MIP/MDP** into the ARC table.

Case study description: Belgium



MLP & Two-Step Probabilistic Approach

GP