“RES forecasting from a TSO perspective”

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Market Design Renewable Energy

TenneT TSO

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Agenda

1. Role of the German TSOs.
2. TenneT TSO.
3. Challenges of the energy turnaround.
4. Renewable energies development in Germany up to 2022.
5. Conclusions.

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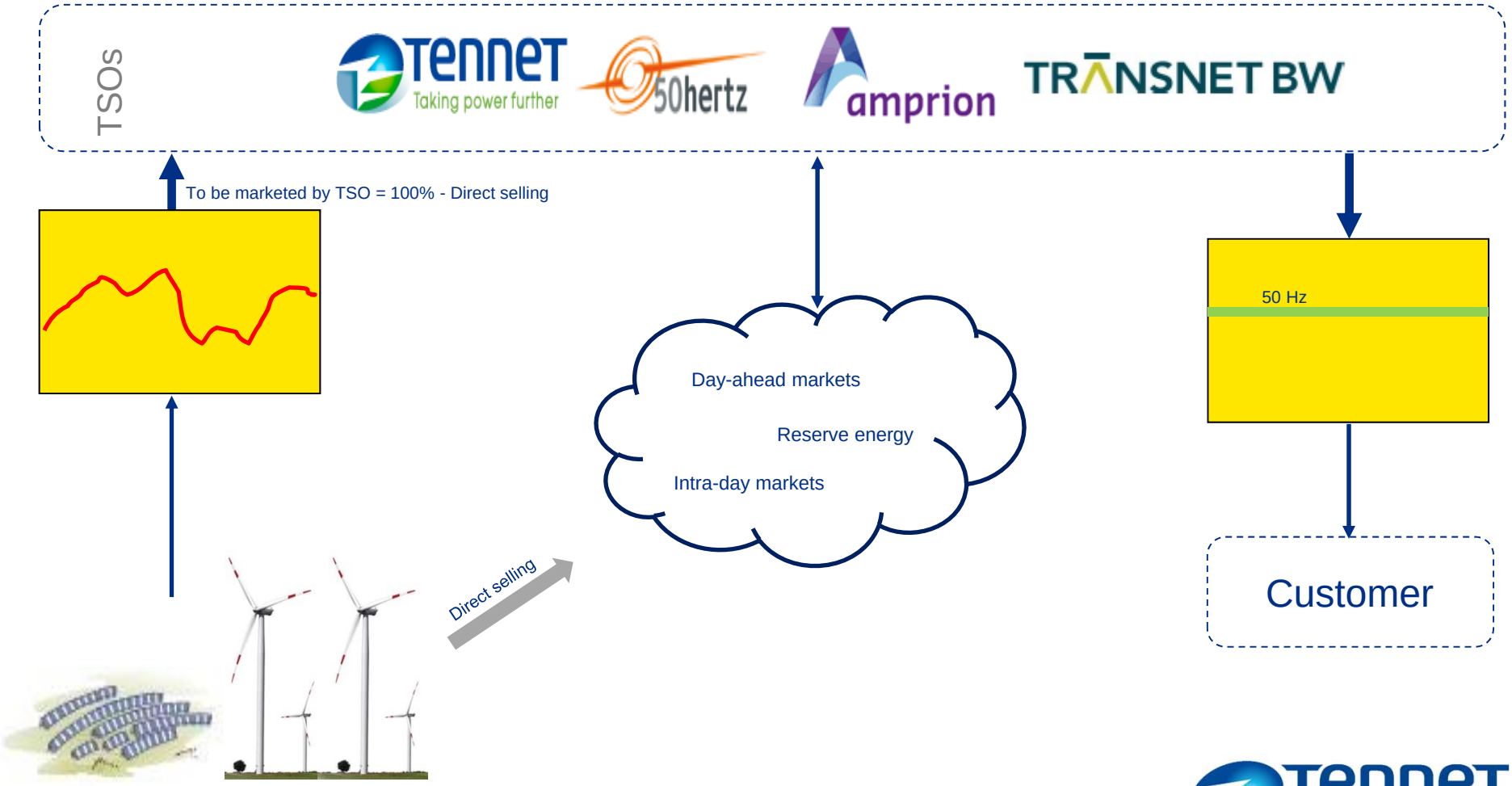
Role of the German TSOs

TSOs are obliged to take off the energy, bring it to market and balance the in-feed.



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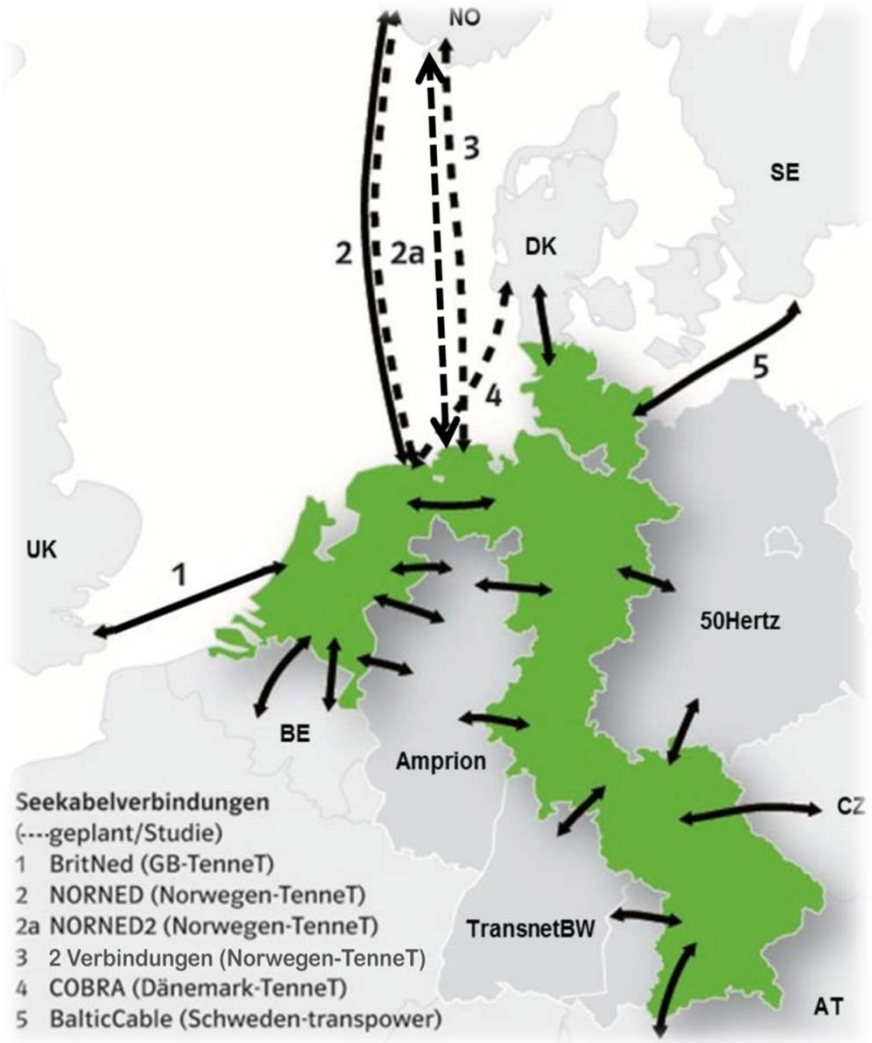
TenneT TSO

First European transnational TSO

- Connected to 10 TSOs
- More than 20.000 km of high and extra voltage power lines.
- 2.300 Employees.
- Legal mandate of grid expansion
- Power transport and Security of Supply
- EPEX Power exchange
- Implementation of energy turnaround



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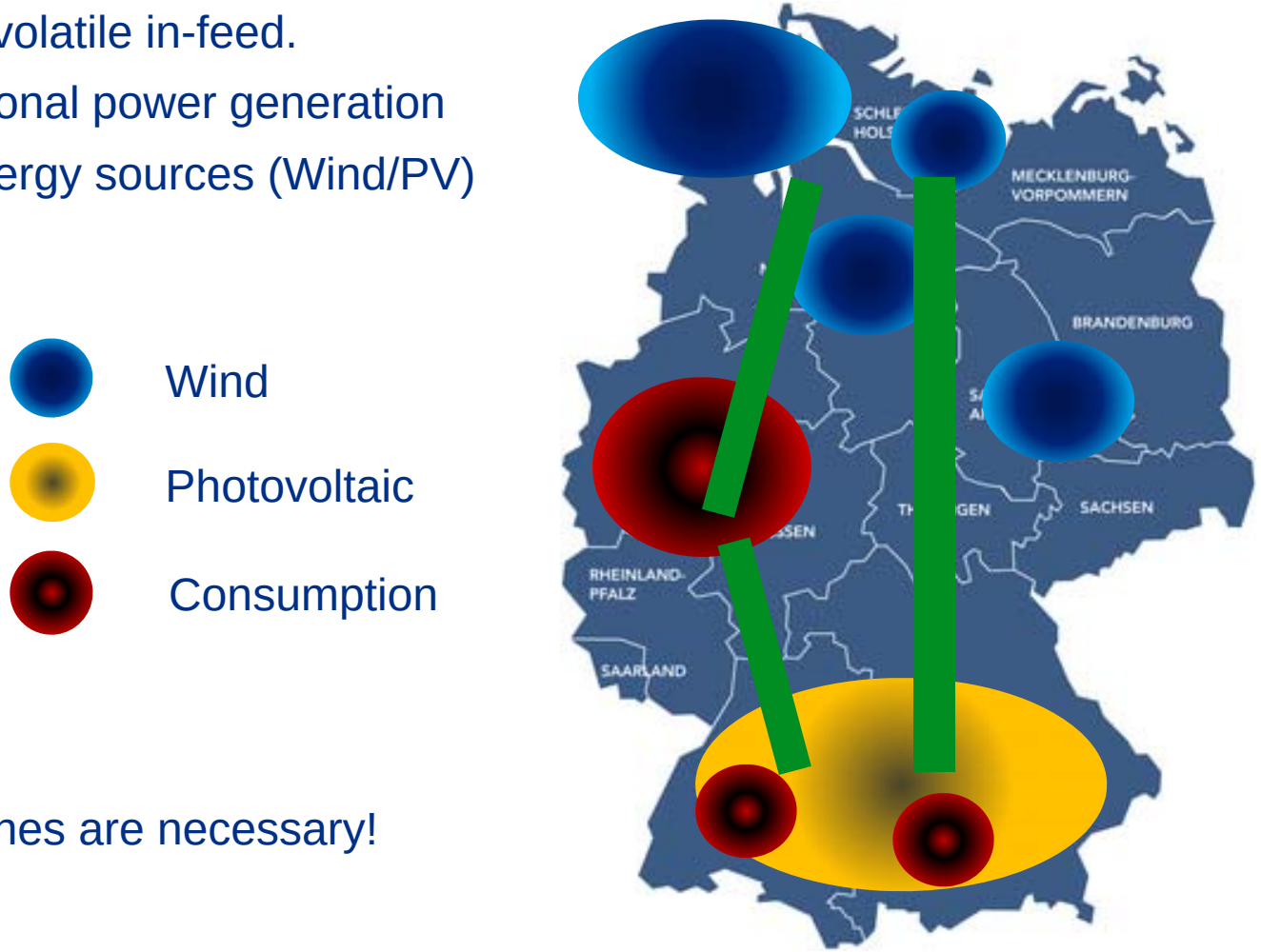
Challenges of the energy turnaround

1. High amount of volatile in-feed.
2. Imbalanced regional power generation of renewable energy sources (Wind/PV)



New power lines are necessary!

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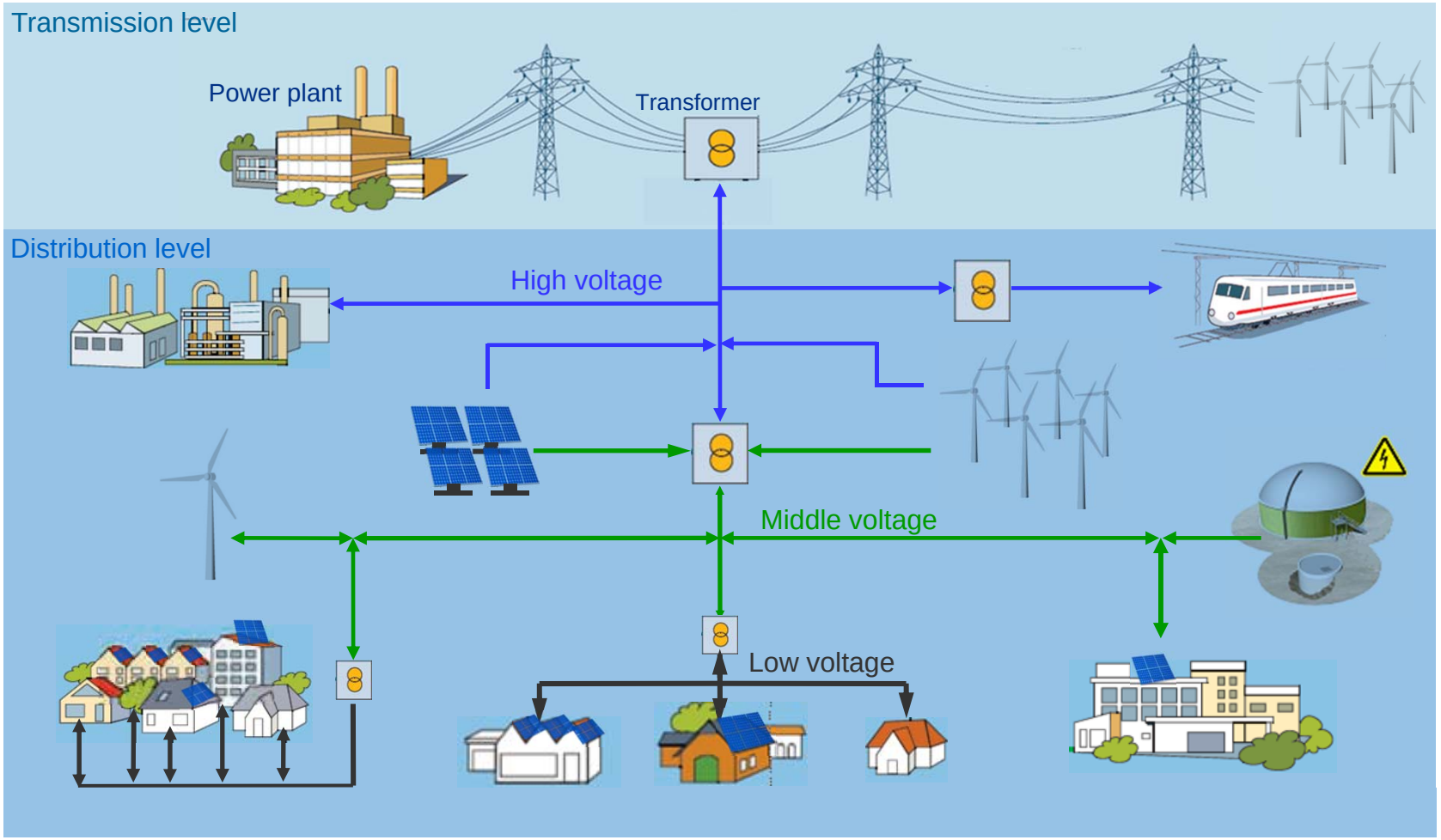
Change from a “Top-Down” to “Bottom-Up” structure



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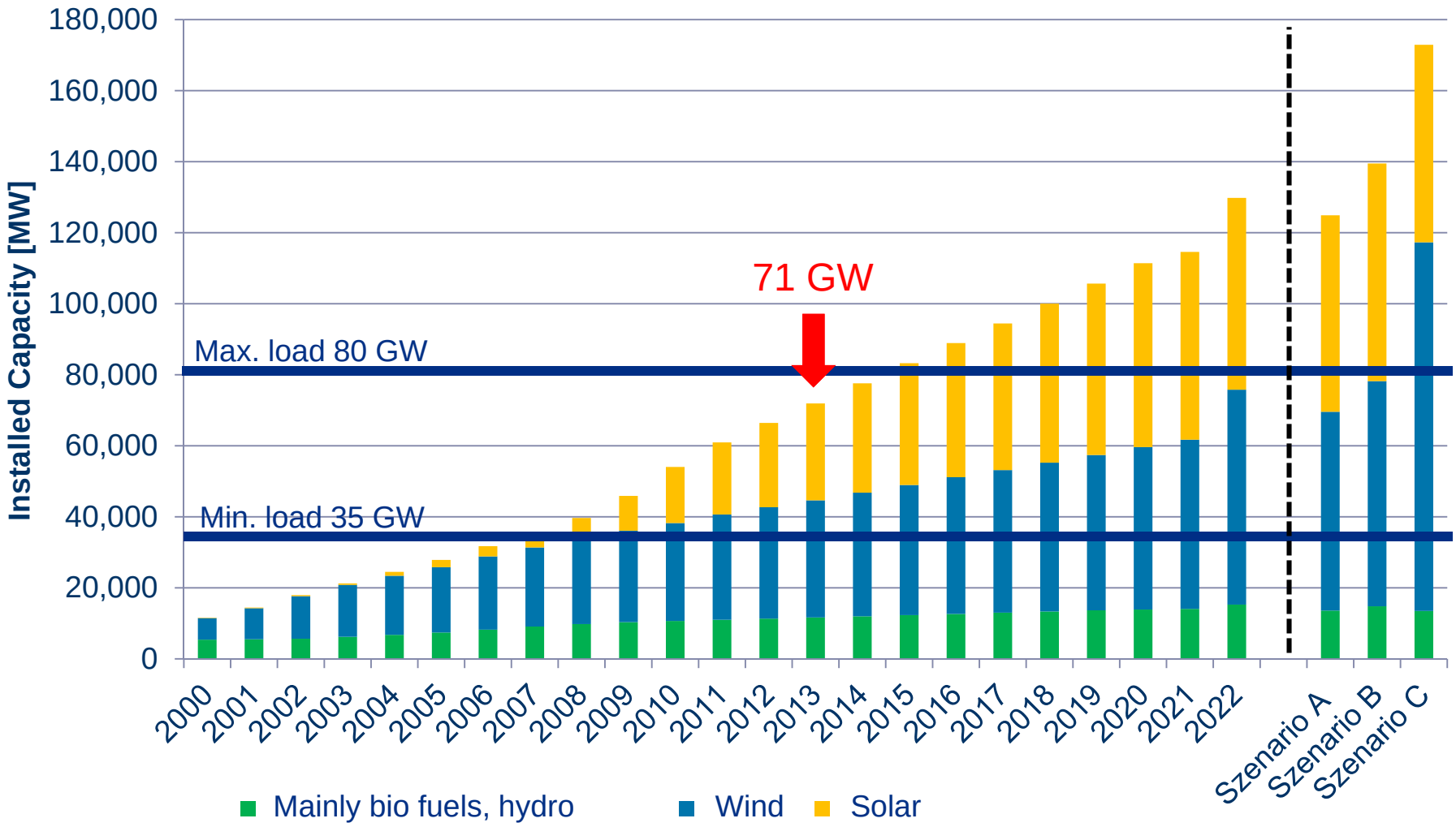
Renewable energies development up to 2022



Source: German Grid Development Plan

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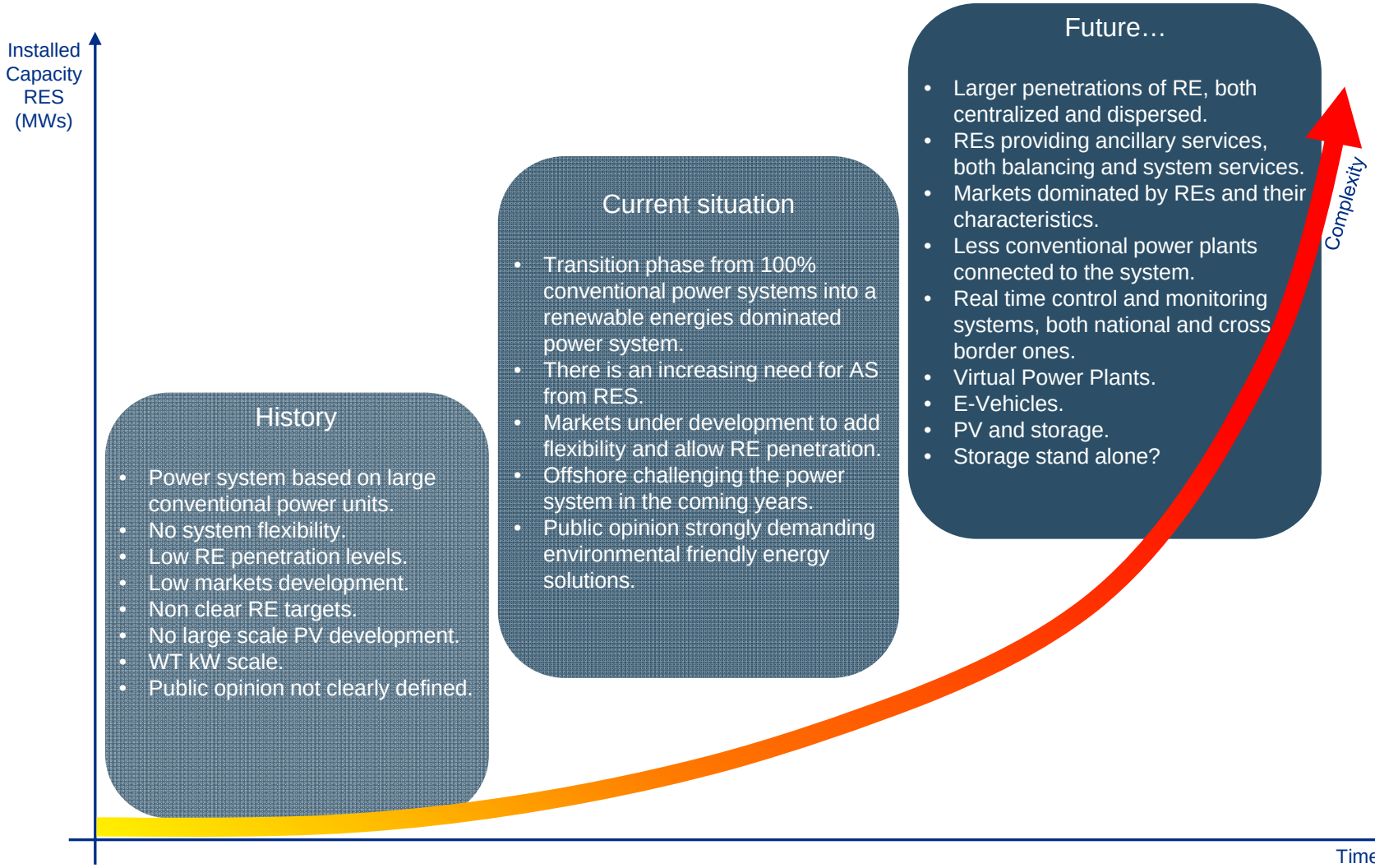
Where are we now?



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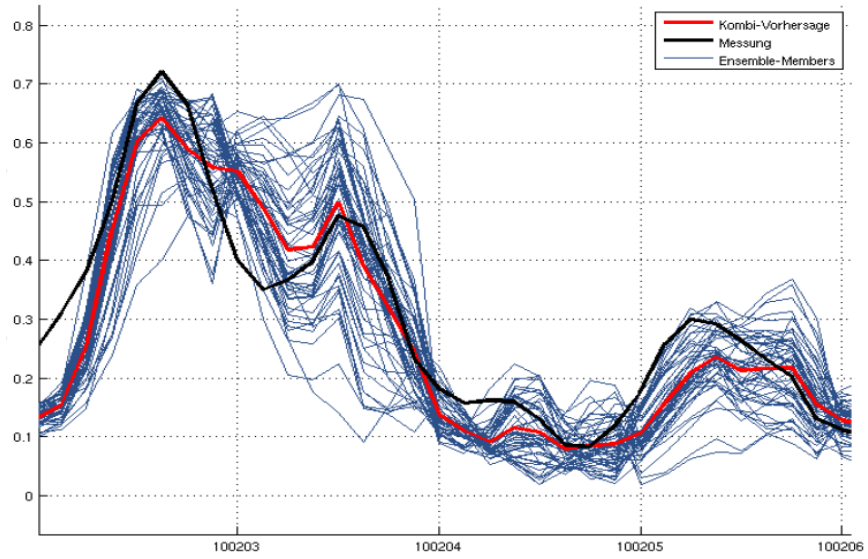
Combination of several forecasts within a “Meta-Forecast”

$$P_{Meta} = w_1 P_1 + w_2 P_2 + w_3 P_3$$

P_i: Forecast w_i: Weight



The main differences between forecasts are:

- Weather model
- Provider

Know-How

w_i ➡ TSO

P_i ➡ Meteorology

Calculation of the w_i

- Amount of forecast providers.
- Analysis from historical time series.
- Dependent on weather conditions and accuracy of weather models.
- Good quality of historical data.

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Conclusions

- Real time data is required.
  - Power, availability and curtailment information.
- Structures for dealing with large amounts of data.
  - In house structures.
  - Interfaces should be clarified.
- With real time data:
  - No extrapolations would be needed.
  - Strategies for markets would be better developed (for example during those hours with negative prices).
  - Better decision support process.
  - Node level analysis would be more accurate.

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Conclusions

- Grid reinforcement already scheduled (German Network Development Plan).
- Increase overall system flexibility.
- Provision of ancillary services with renewable energies.
- New market products are needed for new technologies to be deployed.
- Improve forecasting technologies from wind and solar power.
- Smart Grids at TSO and DSO level.
- Energy storage technologies should be considered at kW, MW and GW scale.
- Demand side management.
- TSO – DSO interaction in control and monitoring.

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Thank you for your attention.

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Market Design Renewable Energy

TenneT TSO

TenneT is Europe´s first cross-border grid operator for electricity. With approximately 20.000 kilometres of (Extra) High Voltage lines and 36 million end users in the Netherlands and Germany we rank among the top five grid operators in Europe. Our focus is to develop a north-west European energy market and to integrate renewable energy.

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