

Energyday 2016

Innovative market integration of renewable electricity

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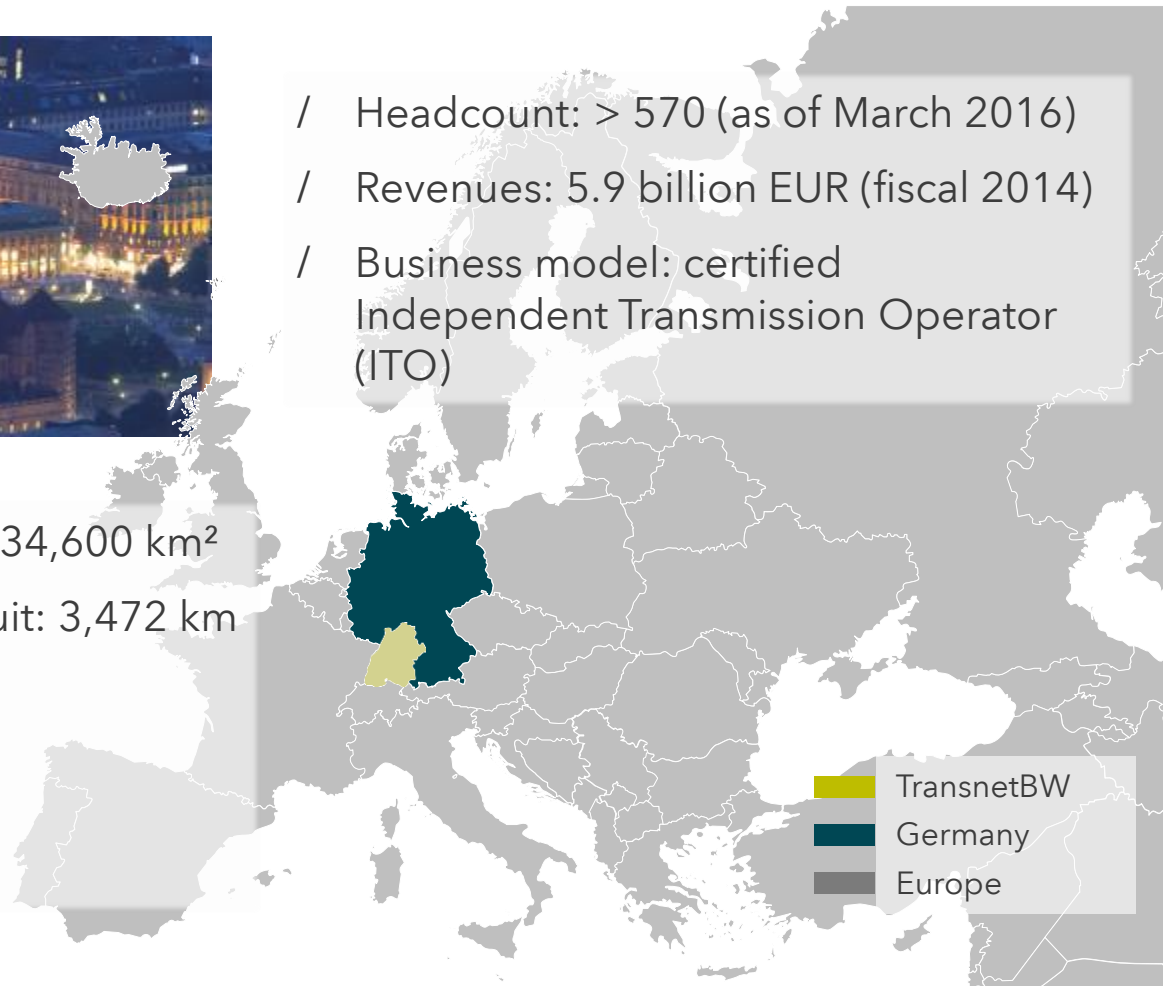
Our company

Our grid is a major lifeline for residents and businesses



- / Headcount: > 570 (as of March 2016)
- / Revenues: 5.9 billion EUR (fiscal 2014)
- / Business model: certified Independent Transmission Operator (ITO)

- / Area served by TransnetBW: 34,600 km²
- / Total 380/220-kV power circuit: 3,472 km
- / 49 substations
- / Baden-Württemberg:
Peak load*: 11 GW
Electricity demand*: 62 TWh



Our challenges

The *Energiewende* is not feasible without TSOs

Accelerated nuclear phase-out

- / The *Energiewende* imposes considerable demands on German and European TSOs in terms of system reliability
- / Delivering that reliability is an increasingly challenging task

Replacement with renewable sources

- / TSOs hold substantial responsibility for integration RES (marketing, funding, redistribution, energy, settlement)
- / Market and infrastructure integration of renewable sources

Renewable feed-in far from consumption

- / Because they link renewable energy producers in northern Germany with consumers in the south, the role of TSOs in Germany's national energy strategy will become more significant

Agenda

- 01 Funding renewables
- 02 Renewable energy and market effects
- 03 Structural developments in the market
- 04 Market integration of renewable energy
- 05 Perspective on further developments

01 Funding renewables

The act on the development of RES

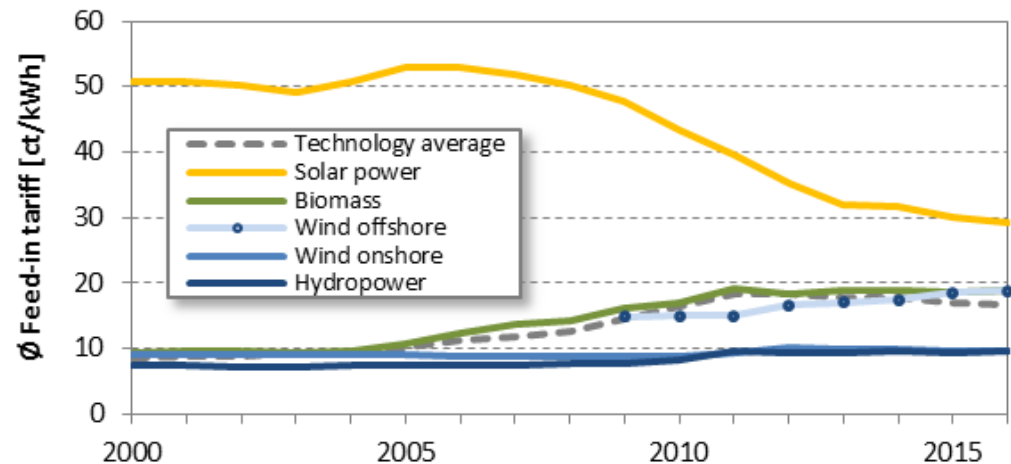
/ Political goals:

- / Developing energy supply in a sustainable way,
- / reducing the CO₂-emissions and diminish climate change,
- / reducing costs of economy,
- / preserve fossil resources,
- / further technical development

/ Therefore direct funding renewable feed-in:

- / decreasing for solar power
- / increasing for biomass, offshore wind
- / (relatively) stable for onshore wind, hydropower

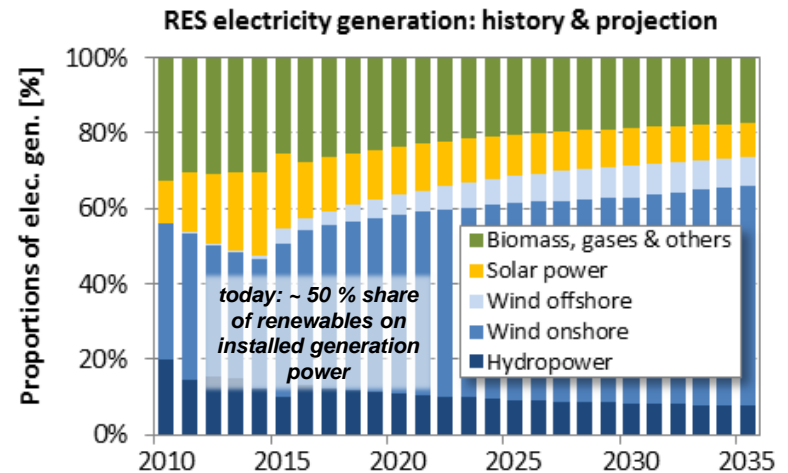
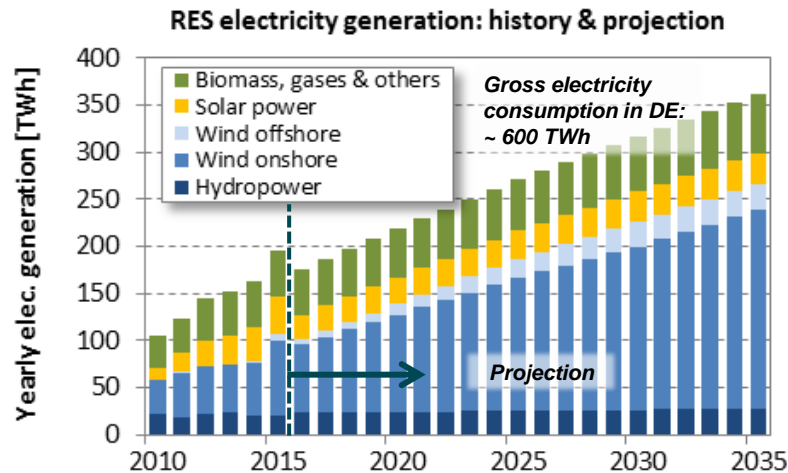
Average feed-in tariff for renewable electricity in Germany



02 Renewable energy and market effects

Increasing renewable energy ...

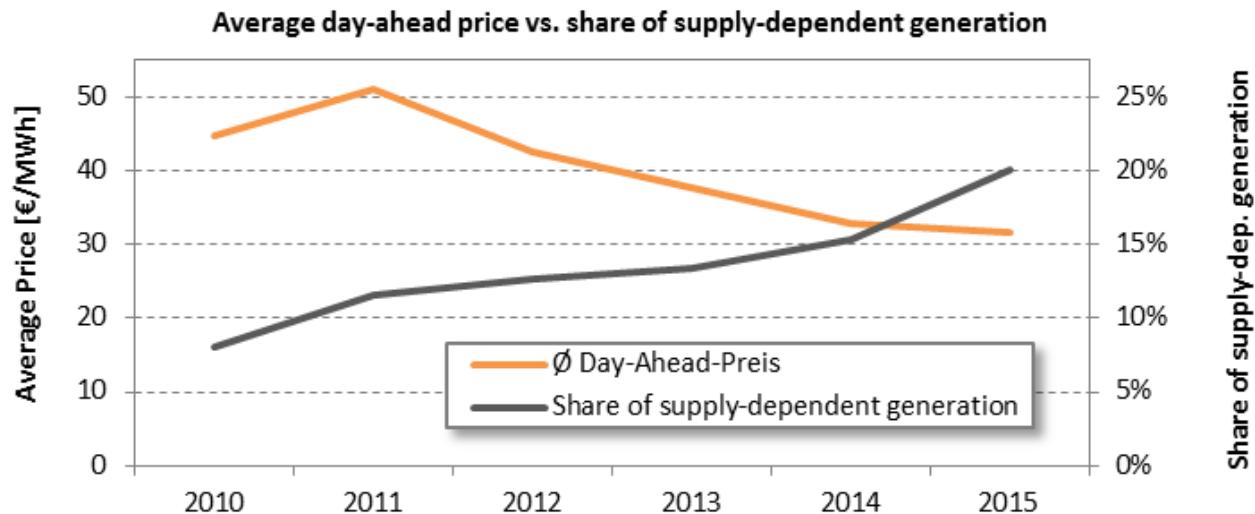
- / In recent years, the feed-in of RES increased significantly:
from 2010 to 2015 the RES electricity production increased by ~ 87 %.
- / Expectation for 2035: 220 GW_{peak} total installed capacity of renewables in Germany
(3times peak load of ~80 GW)
- Need for flexibility in the electricity system
- Need to adjust the structure of the wholesale market and its products



02 Renewable energy and market effects

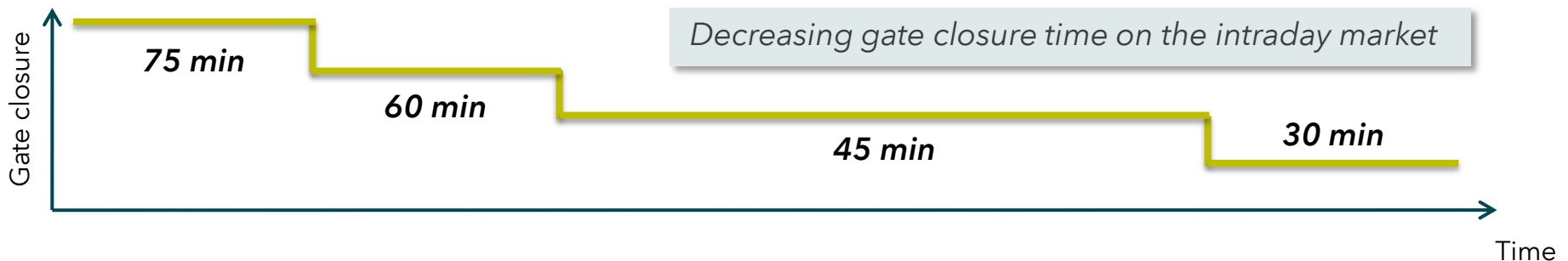
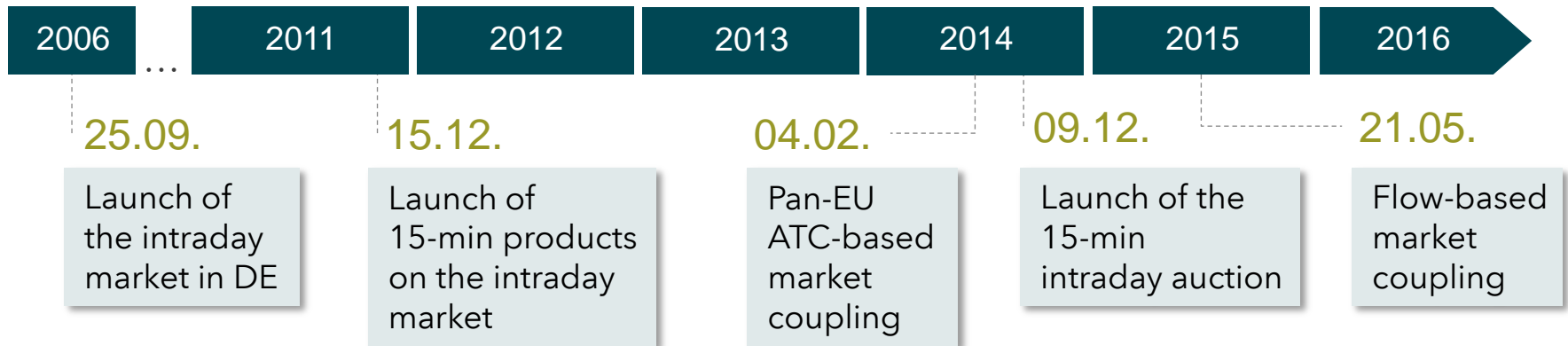
... and its effect on wholesale market prices

- / Prices on the wholesale market drop down whilst share of supply-dependent feed-in is growing (overlain by decreasing commodity prices in recent years)
 - Full load hours of conventional power plants decrease
 - Shutdown of several gas and coal fired power plants due to economic reasons
 - Increasing share of supply-dependent generation up to 20 % in 2015
 - Decreasing average wholesale prices by ~ 40 % over the last 5 years



03 Structural developments in the market

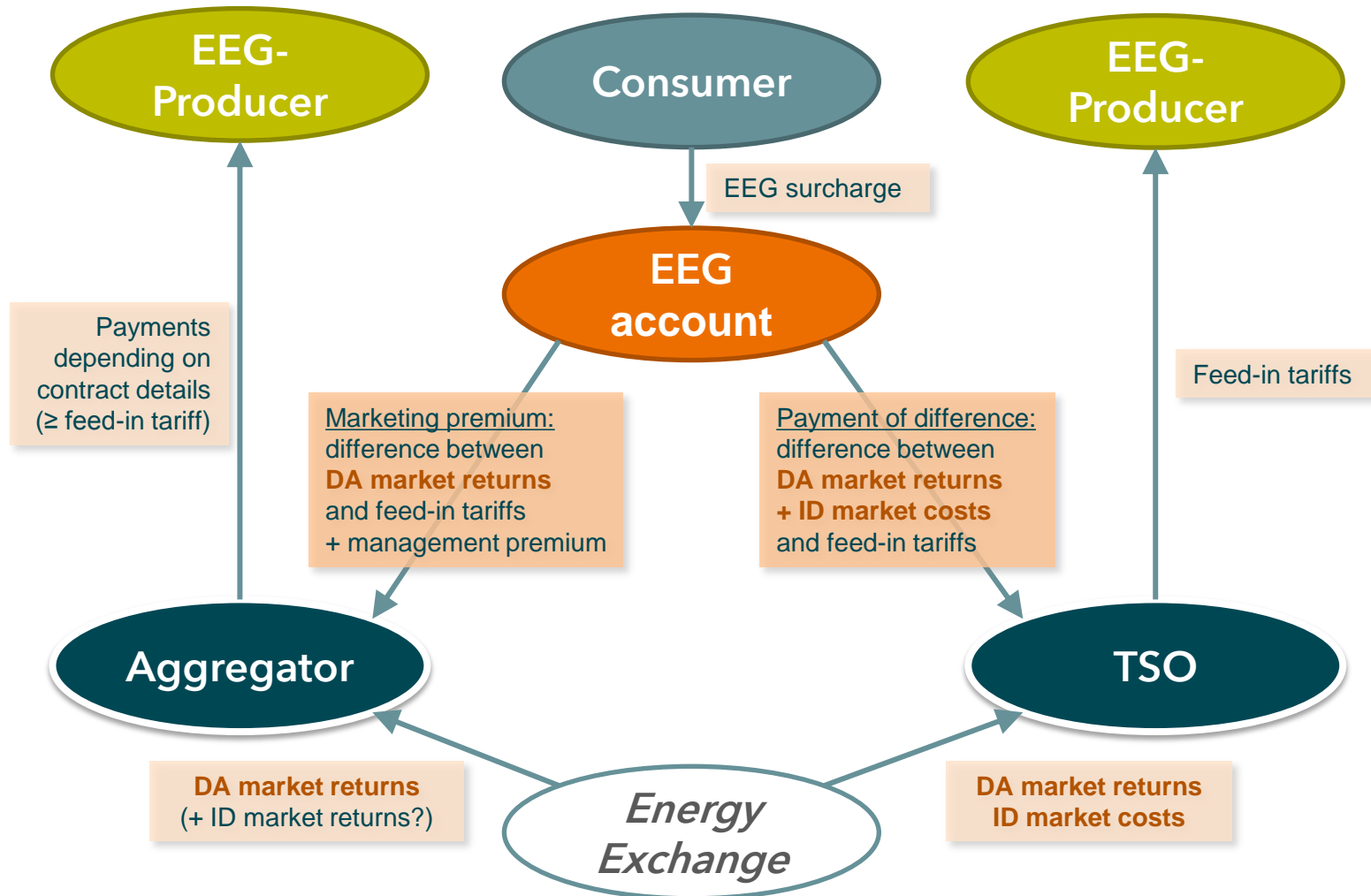
Evolution of market products



➤ **High market share and continuous trading efforts: TSO are driving forces of the market development**

04 Market integration of renewable energy

Cash flows in Germany due to EEG



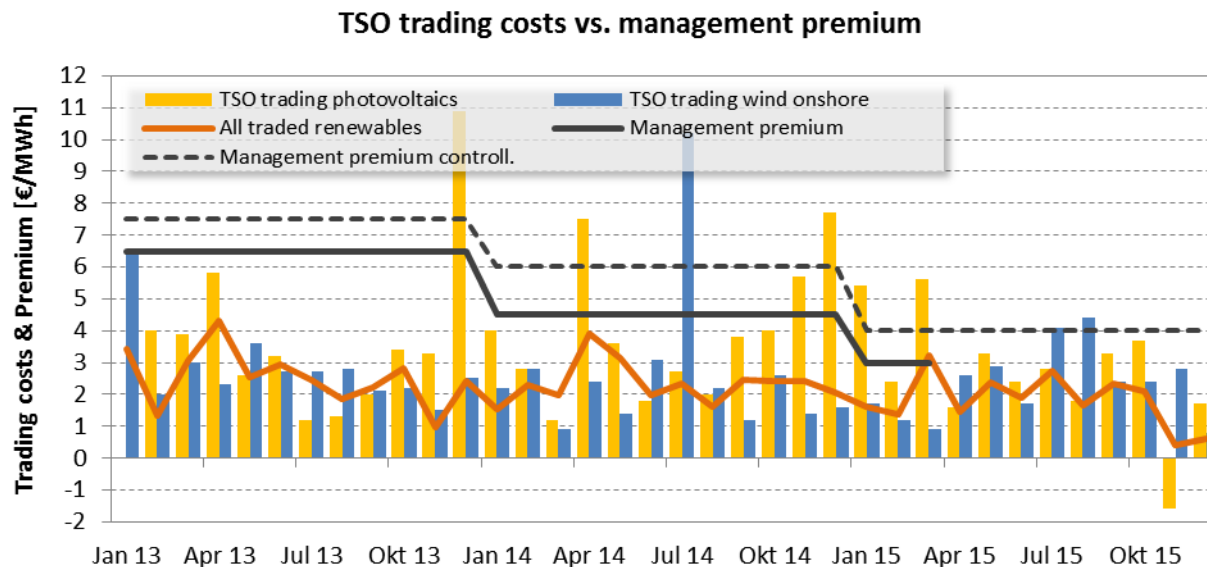
04 Market integration of renewable energy

Analysis of trading costs

- / TSO Trading costs in comparison with the management premium for third parties
- / Focusing on data of 2013 - 2015:
 - / TransnetBW reduced trading costs significantly
 - / TransnetBW trading costs lower than premium



TSO trading is benchmark for each commercialization of renewable energy



04 Market integration of renewable energy

Innovative trading leads to cost reduction

- / Long-term experience in forecasting renewable electricity production
- / Management of large generation portfolios
- / TransnetBW is focusing on further innovations and developments:

Algorithm based trading by TransnetBW achieves

- i. minimizing balancing power
- ii. significant reduction of costs for market integration of RES
- iii. straight signals to market for RES availability



Cost-efficient trading and market integration of renewable energy

... and ...

Transparency on the market is directly given

05 Perspective on further developments

Cost-effective and transparent market integration

- / Further extension of renewable electricity generation
- / Increasing need for flexibility in the electricity system
- / Tightening of the available and controllable overall generation capacity
- / Development of energy prices uncertain
- Regarding consumer energy prices the most **cost-effective commercialization** of RES electricity is required
- Substantial increased necessity for **transparent market signals:**
where, when how much renewable energy is available

Thank you for your attention.

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