

A photograph of several white wind turbines in a field of yellow rapeseed flowers under a clear blue sky. The turbines are positioned at different distances, creating a sense of depth. The field is in the foreground, and the sky is a uniform light blue.

# Incentives for demand-oriented renewable electricity production

Lessons learned from the German market premium scheme

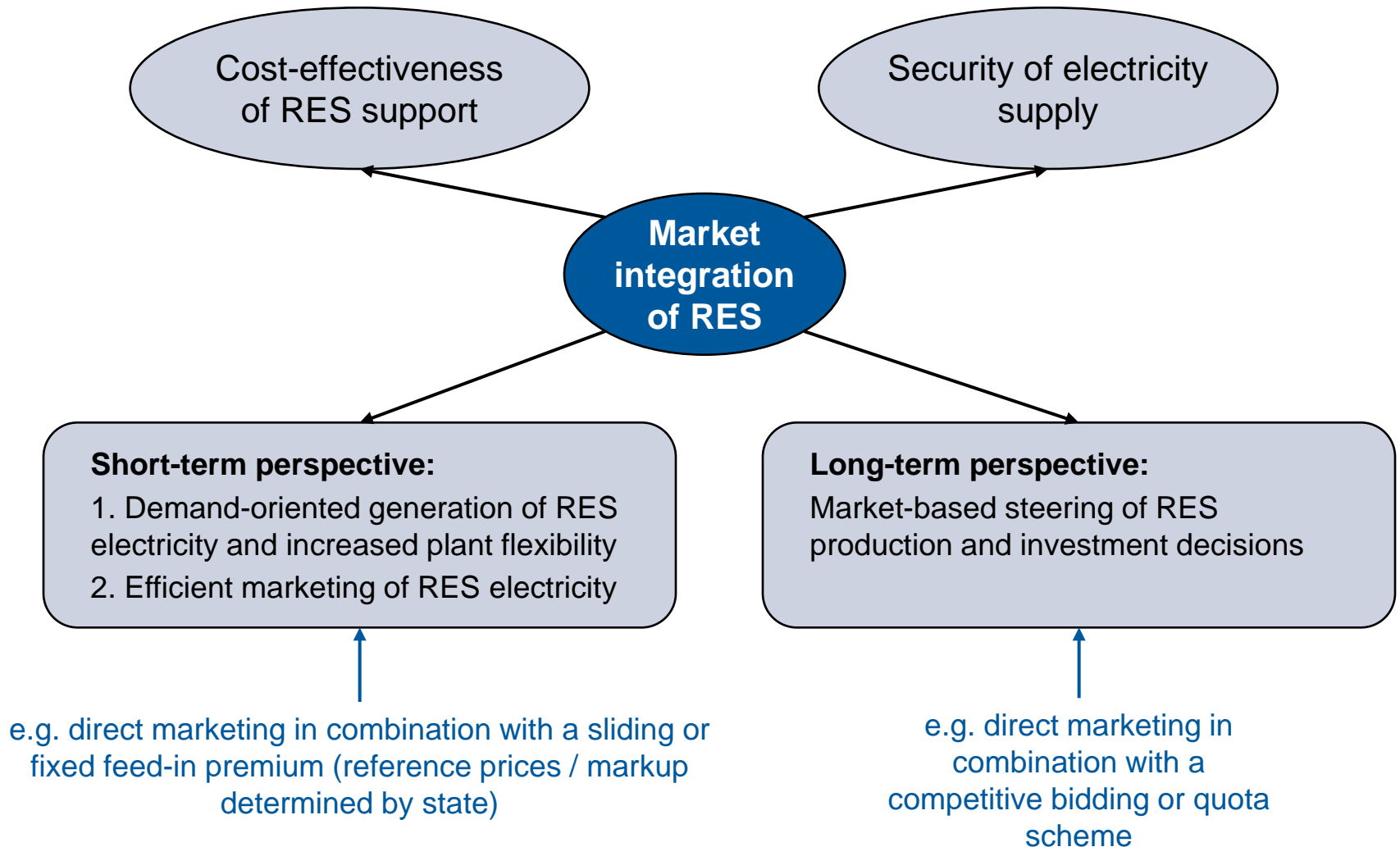
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**Biomass for energy – lessons from the Bioenergy Boom**  
Leipzig, Germany, 24-25 November 2014

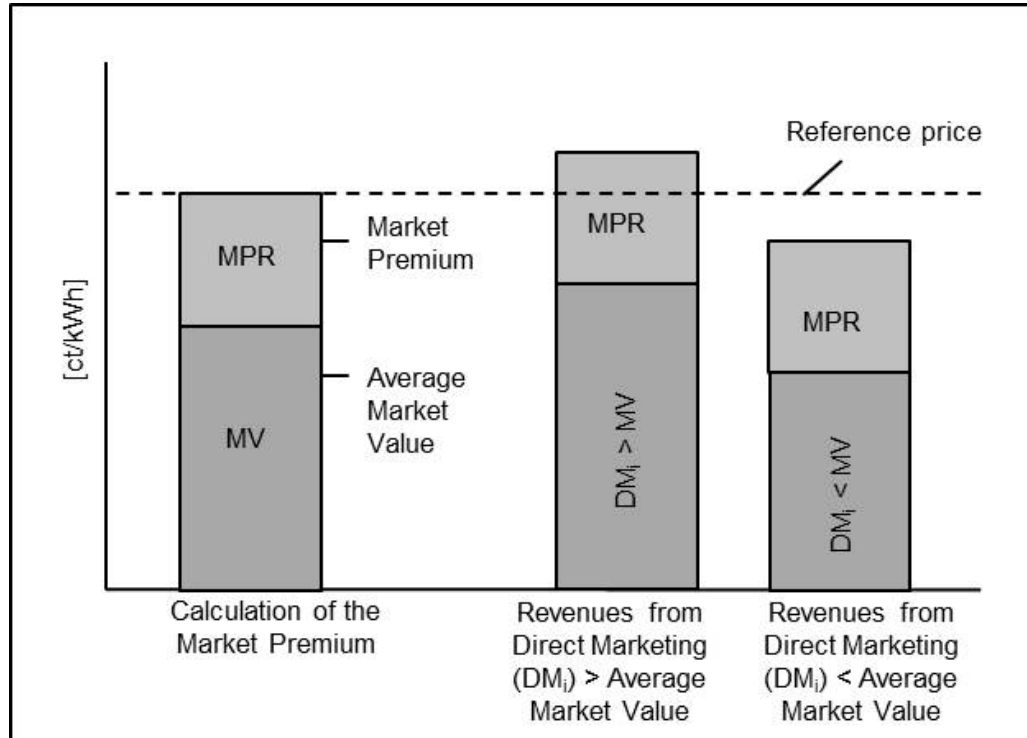
# Market integration of renewables

## Aims and instruments



# The German market premium scheme (MPS)

- Introduced as an optional alternative to fixed feed-in tariffs (FIT) in 2012, promoted to the standard model of remuneration in the EEG 2014
- FIT with centrally organized marketing: remains available for plants  $\leq 500$  kW until 31.12.2015, afterwards only for plants  $\leq 100$  kW



- Additional costs of direct marketing are reflected in reference prices (EEG 2012: separate management premium)
- Exceptional use of FIT remains possible for all plants (reference prices reduced by 20%)

Source: adapted from Gawel/Purkus (2013)

# Additional flexibility incentives

## EEG 2012:

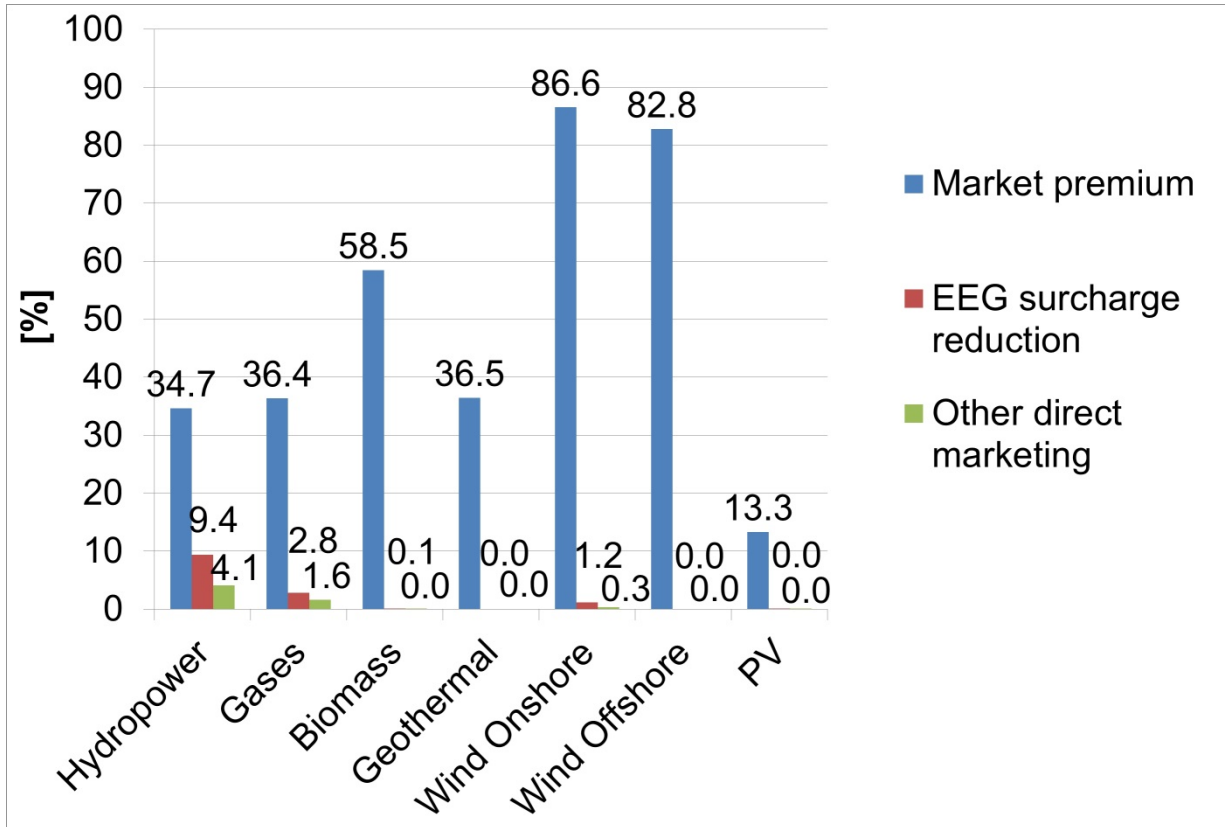
- Flexibility premium for biogas plants, to compensate for additional investments in flexible capacity (continued in EEG 2014)

## Additional measures in the EEG 2014:

- Remuneration is cut if electricity prices are negative for at least 6 consecutive hours (for new plants > 500 kW from 2016)
- To be eligible for the market premium, plants must have remote control capability
- New biogas plants > 100 kW: remuneration is limited to that part of annual electricity production which corresponds to a power rating of 50% of the installed electric capacity
- Further relevant changes for bioenergy: total expansion capped to 100 MW/year, significant reductions in reference prices

# Participation in direct marketing

## Share of installed RES capacity in direct marketing (April 2014)



Note: only RES capacities which are eligible under the EEG are included; „Gases“ encompass landfill, sewage and mining gases

Source: Purkus et al. (2014)

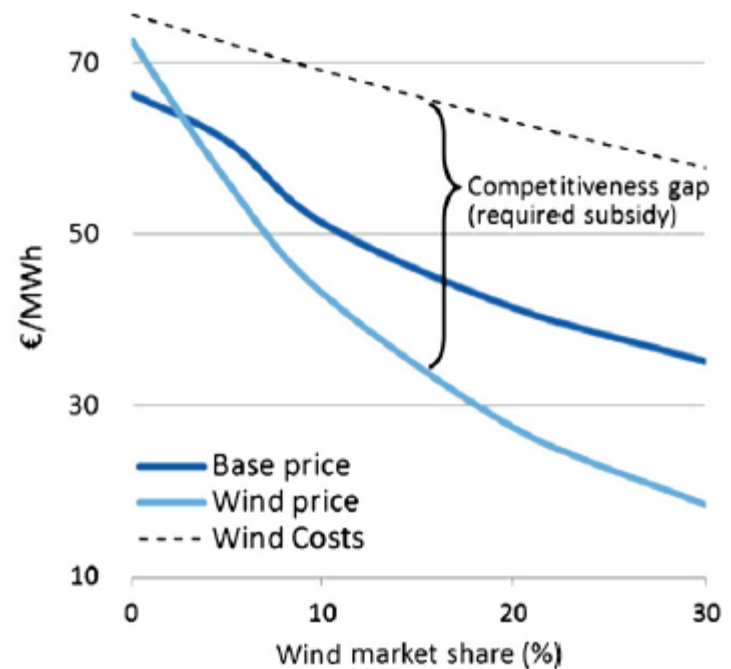
# Incentives for demand-oriented production and flexibility: Assessment

Demand-orientation and flexibility of RES production is increased, if the market premium sets incentives for:

- 1) Voluntary curtailment if supply exceeds demand (negative electricity prices)
- 2) Intermittent RES: Electricity price-oriented maintenance planning; alignment of plant design and location choices with the maximization of market values and systemic requirements
- 3) Dispatchable RES: targeted balancing of fluctuations in intermittent RES production (increase in feed-in when electricity prices are high)
- 4) Participation in balancing markets

# Incentives for voluntary curtailment

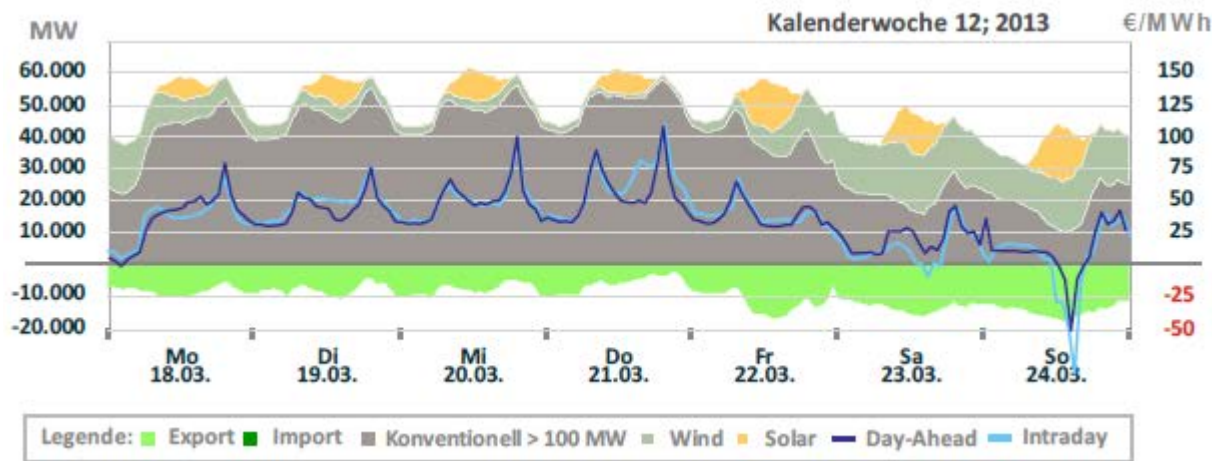
- Incentives for voluntary curtailment become effective if:
  - Market prices < Marginal costs of production - expected value of market premium
  - For example, directly marketed wind power plants curtail at ca. -65€/MWh (Götz et al. 2014)
- Main benefit: reduces RES support costs (EEG surcharge = reference prices – market value of RES electricity)
- But: the higher the market share of wind or PV, the lower their market value => general problem of integrating intermittent RES in energy only markets remains



Source: Hirth (2013)

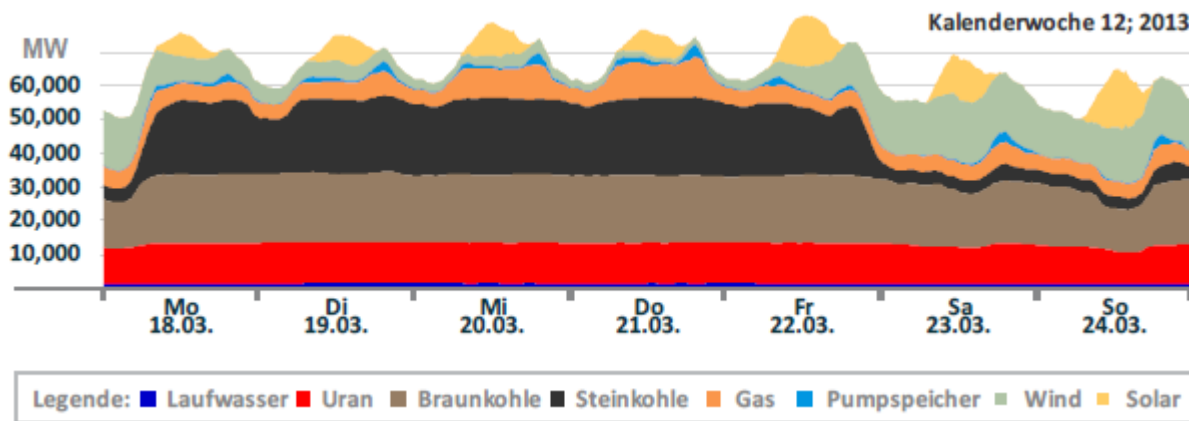
# Causes of negative electricity prices

Source: Fraunhofer ISE (2013)



Example for weekly course of spot market prices in March 2013; negative electricity prices on Sunday

→ RES curtailment reduces flexibility incentives for other market actors



Actual production by energy source for the exemplary week in March 2013

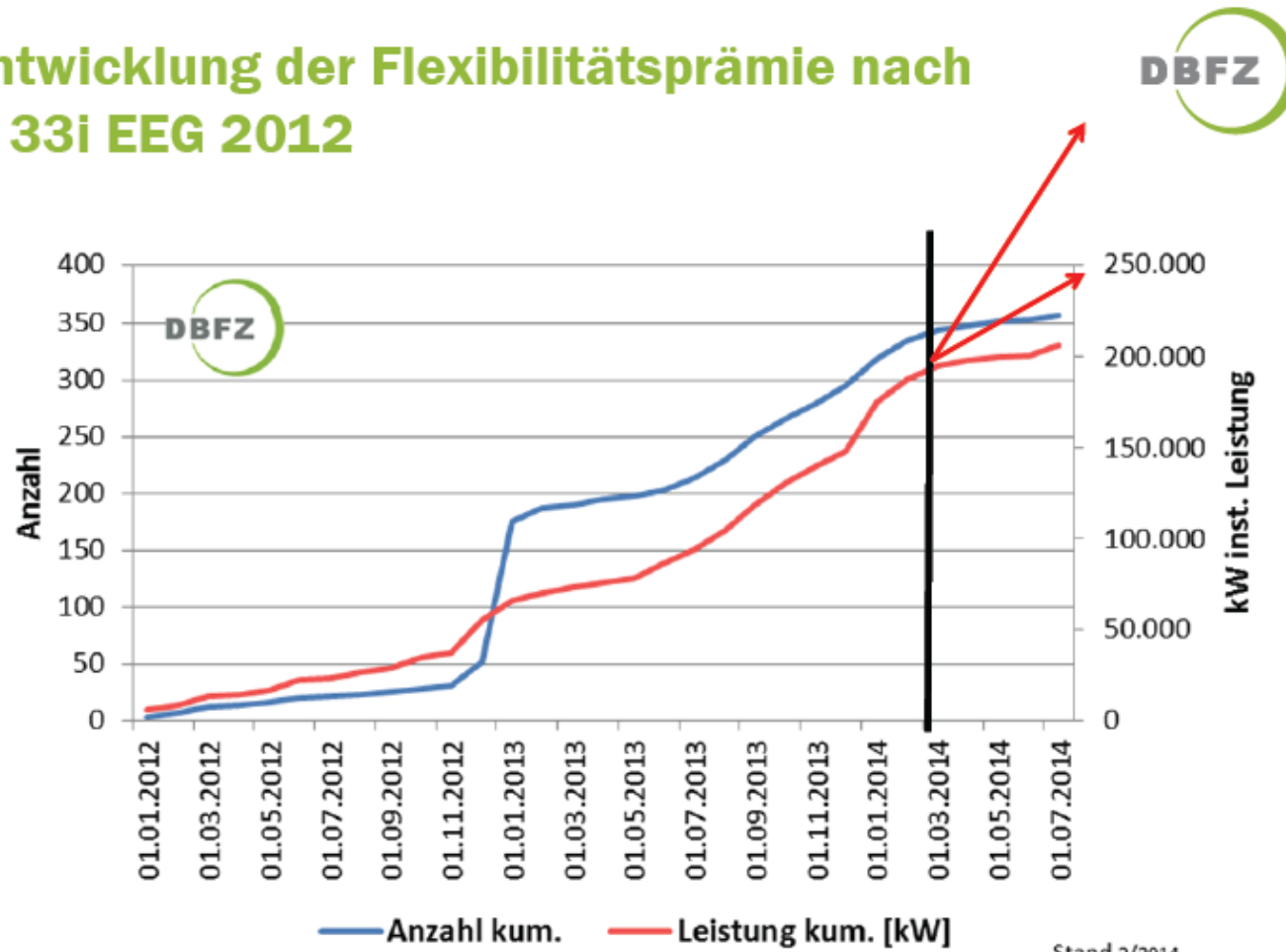


# Intermittent RES: Incentives for market- and system-oriented plant design

- Remote control capability has increased since 2013, when incentives were established in the management premium
- An optimization of maintenance planning is profitable, but there are few incentives to take demand profiles into account in investment decisions:
  - Price signals are too weak and unstable to make an alignment of location and design choices with market values instead of energy yields profitable
  - Higher market value of alternative plant concepts (e.g. east-west-PV, weak wind power plants) is eroded with increasing number of plants

# Dispatchable RES: Incentives for shifting load to hours with high electricity prices

## Entwicklung der Flexibilitätsprämie nach § 33i EEG 2012



April 2014: 370 plants, 11% of directly marketed biogas & biomethane capacity (Holzhammer 2014)

Price spread in spot market is currently too low to encourage positive load shifts

Stand 2/2014

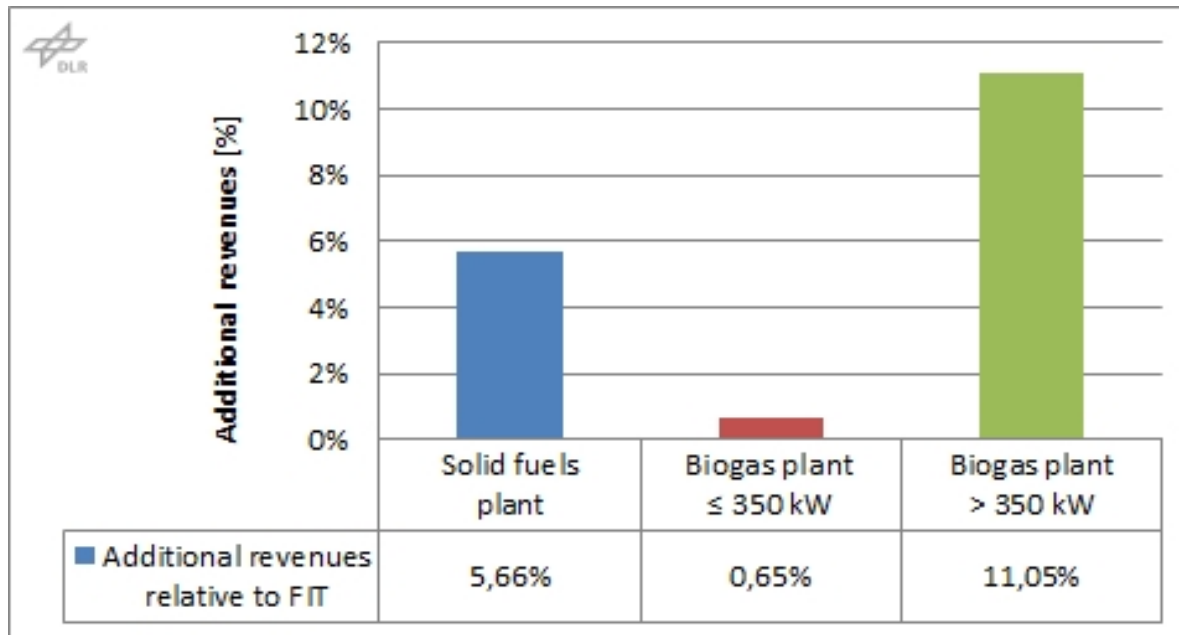
Source: Krautz (2014)

# Participation in balancing markets

Participation profitable for dispatchable plants:

- 24% of directly marketed bioenergy capacity was prequalified in April 2014, 43% in case of hydropower (Holzhammer 2014)
- Primarily negative balancing power is offered

Additional revenues of biomass plant operators through participation in balancing markets, as compared to FIT remuneration (AMIRIS modelling results)



Source: Purkus et al. (2014)

# Impacts on marketing efficiency – an outlook

- Majority of RES plant operators lack infrastructure or specific knowledge to market their electricity themselves: intermediaries required
- Impact on transaction costs of RES marketing: increased by parallel marketing of RES electricity by TSOs and direct marketing actors
  - Compensation payments as indicator for additional costs: ca. 354-400 Mio. € in 2013
- Compensation payments decrease over time: increases cost pressure on direct marketing intermediaries
  - Cost reductions primarily possible through economies of scale
  - Increases marketing efficiency, but concentration processes in the direct marketing market would weaken negotiation position of RES producers

# Impacts on marketing efficiency – an outlook

## Marketing channels



### Wind and PV:

- Intermediaries primarily use the same channels as TSOs (intraday, day-ahead spot market)
- Effective incentives for improved remote control capability, virtual power plants; better access to RES production data

### Bioenergy:

- Increasing participation in balancing markets
- Differences in plants' flexibility potential and heat use increase benefits of individualized marketing concepts



Image sources: A. Künzelmann/UFZ

# Conclusion

## Marketing efficiency:

- Market premium increases marketing efficiency for dispatchable RES, but few structural differences to marketing by TSOs for intermittent RES
- Cost reductions mainly through economies of scale, potential oligopolization tendencies of intermediary market should be monitored

## Incentives for demand-oriented production and flexibility:

- Curtailment remains the primary reaction option for intermittent RES, but reduction of flexibility incentives for conventional plants is highly problematic under climate policy and system transformation aspects
- Dispatchable RES: incentives for curtailment and provision of negative balancing power, few incentives for positive load shifts
- Bioenergy: effectiveness of incentives for existing plants is crucial, few new plants expected under EEG 2014

# Perspectives for future development of RES support

- Differentiation of support mechanism depending on RES' reaction possibilities to market price signals may be preferential (e.g. IZES et al. 2013, Jacobs et al. 2014)
  - Questionable, if increase in short-term price risks increases efficiency of intermittent RES support
  - For bioenergy, stronger market price signals can improve efficiency, but ability to tailor plant- and location-specific marketing concepts important
- Implication for transition to competitive bidding schemes from 2017:
  - Increases in security of supply and cost reductions in RES support are unlikely to be achieved by market integration efforts on the part of RES alone
  - Adjustment of market framework conditions to the requirements of RES necessary, including flexibility incentives for other market actors

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**Thank you for your interest!**

Image source: own

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