



# Implementation of new market design options with large shares of Renewables

Sustainable Energy week 2016

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# Outline

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- State of play- Changing landscape
- Making RES fit for the Market
- Making the market fit for RES
- Evolution Roadmap and conclusions





# The EU's Environmental and Energy State Aid guidelines


## Support scheme and obligations (from 2016)

- aid is granted as a **premium** in addition to the market price (premium);
- **balancing responsibilities**, unless no liquid intra-day markets exist;
- measures to ensure that generators have **no incentive to generate electricity under negative prices.**

*“As technologies mature and their production reaches a substantial share of the market, renewable energy production can and should react to market signals, and aid amounts should respond to falling production costs.”*

Source: DG Competition

## Competitive bidding processes for setting the premium (from 2017)

- **competitive bidding process** (clear, transparent and non-discriminatory criteria), unless MS can demonstrate that they lead to higher prices or there is lack of competition
  - It can be **technology specific** (opportunity to less mature technologies and diversification)
  - **Opportunities for all** (small installations or technologies in an early stage of development can be exempted).
    - <1 MW of power from other renewable sources, such as solar or biomass.
    - <6 MW or 6 generation units for wind energy.
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# Market instruments for solar PV energy in the EU

<b>Ireland:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Self consumption</li> <li>- Energy sale on el. market</li> </ul>
<b>UK:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Quota system</li> <li>- Self consumption</li> <li>- Energy sale on el. market</li> <li>- VAT reductions</li> <li>- Fiscal incentives</li> </ul>
<b>The Netherlands:</b> <ul style="list-style-type: none"> <li>- Green bonus tender scheme</li> <li>- Net metering</li> <li>- Energy sale on el. market</li> <li>- Fiscal incentives</li> </ul>
<b>Luxembourg:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Investment grants</li> <li>- Fiscal incentives</li> </ul>
<b>Belgium:</b> <ul style="list-style-type: none"> <li>- Green certificates</li> <li>- Net metering</li> <li>- Energy sale on el. market</li> <li>- VAT reduction</li> <li>- Fiscal incentives</li> </ul>
<b>France:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Tenders</li> <li>- VAT reduction</li> </ul>
<b>Portugal:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Self consumption</li> <li>- Energy sale on el. market</li> <li>- Fiscal incentives</li> </ul>
<b>Spain:</b> <ul style="list-style-type: none"> <li>- Self consumption</li> <li>- Energy sale on el. market</li> </ul>
<b>Austria:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Self consumption</li> <li>- Energy sale on el. market</li> <li>- Investment grants</li> </ul>

<b>Germany:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Premium tariff</li> <li>- Storage system</li> <li>- Tenders</li> </ul>	<ul style="list-style-type: none"> <li>- Energy sale on el. market</li> <li>- Investment grants</li> <li>- Beneficial credit terms</li> <li>- Self consumption</li> </ul>
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<b>Denmark:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Net metering</li> <li>- Self consumption</li> </ul>	<ul style="list-style-type: none"> <li>- Investment grants</li> <li>- VAT reduction</li> <li>- Fiscal incentives</li> </ul>
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<b>Sweden:</b> <ul style="list-style-type: none"> <li>- Quota system</li> <li>- Energy sale on el. market</li> <li>- Investment grants</li> <li>- Fiscal incentives</li> </ul>
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<b>Finland:</b> <ul style="list-style-type: none"> <li>- Investment grants</li> </ul>
<b>Estonia:</b> <ul style="list-style-type: none"> <li>- Premium tariff</li> <li>- Energy sale on el. market</li> <li>- Investment grants</li> </ul>

<b>Latvia:</b> <ul style="list-style-type: none"> <li>- Net metering</li> <li>- Self consumption</li> <li>- Energy sale on el. market</li> <li>- Investment grants</li> </ul>
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<b>Lithuania:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Investment grants</li> </ul>
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<b>Poland:</b> <ul style="list-style-type: none"> <li>- Green certificates</li> <li>- Energy sale on el. market</li> </ul>
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<b>Czech Republic:</b> <ul style="list-style-type: none"> <li>- Energy sale on el. market</li> </ul>
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<b>Slovakia &amp; Cyprus:</b> <ul style="list-style-type: none"> <li>- FiT</li> </ul>
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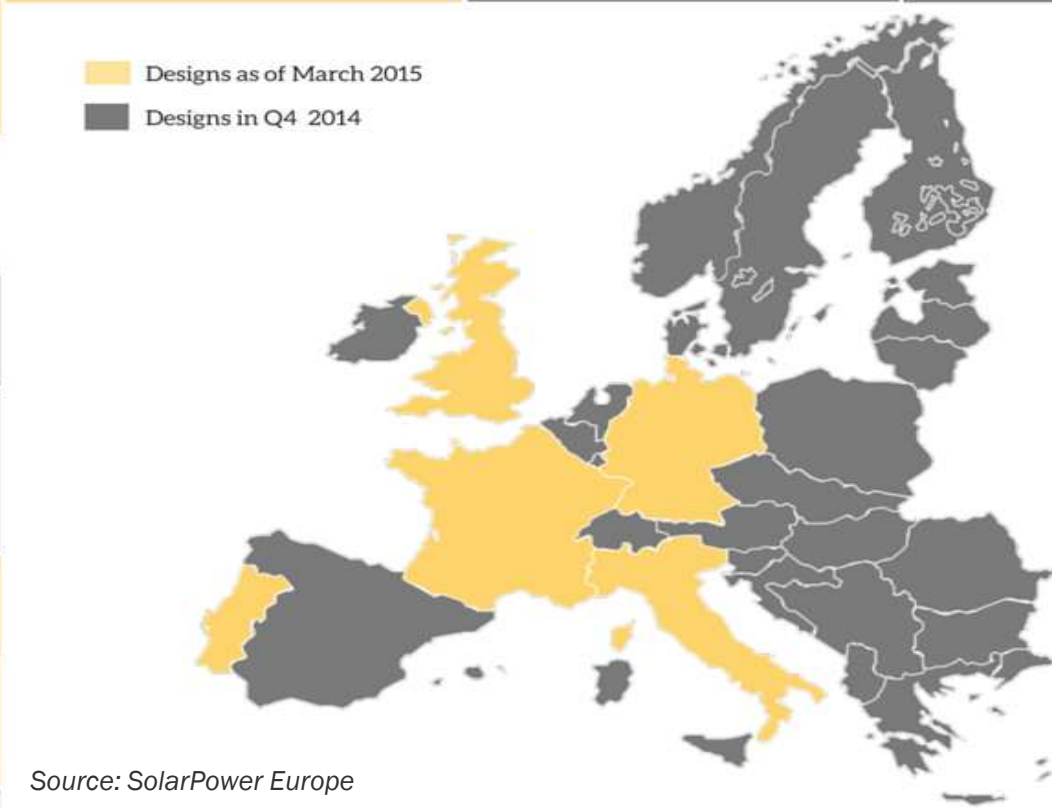
<b>Hungary:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Net metering</li> <li>- Investment grants</li> </ul>
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<b>Romania:</b> <ul style="list-style-type: none"> <li>- Quota system</li> <li>- Net metering</li> <li>- Energy sale on el. market</li> </ul>
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<b>Bulgaria:</b> <ul style="list-style-type: none"> <li>- FiT</li> </ul>
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<b>Greece:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Net metering</li> <li>- Fiscal incentives</li> </ul>
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<b>Slovenia:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Premium tariff</li> <li>- Energy sale on el. market</li> </ul>
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Source: SolarPower Europe

<b>Switzerland:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Self consumption</li> <li>- Energy sale on el. market</li> <li>- Investment grants</li> <li>- Fiscal incentives</li> </ul>
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<b>Malta:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Self consumption</li> <li>- Energy sale on el. market</li> </ul>
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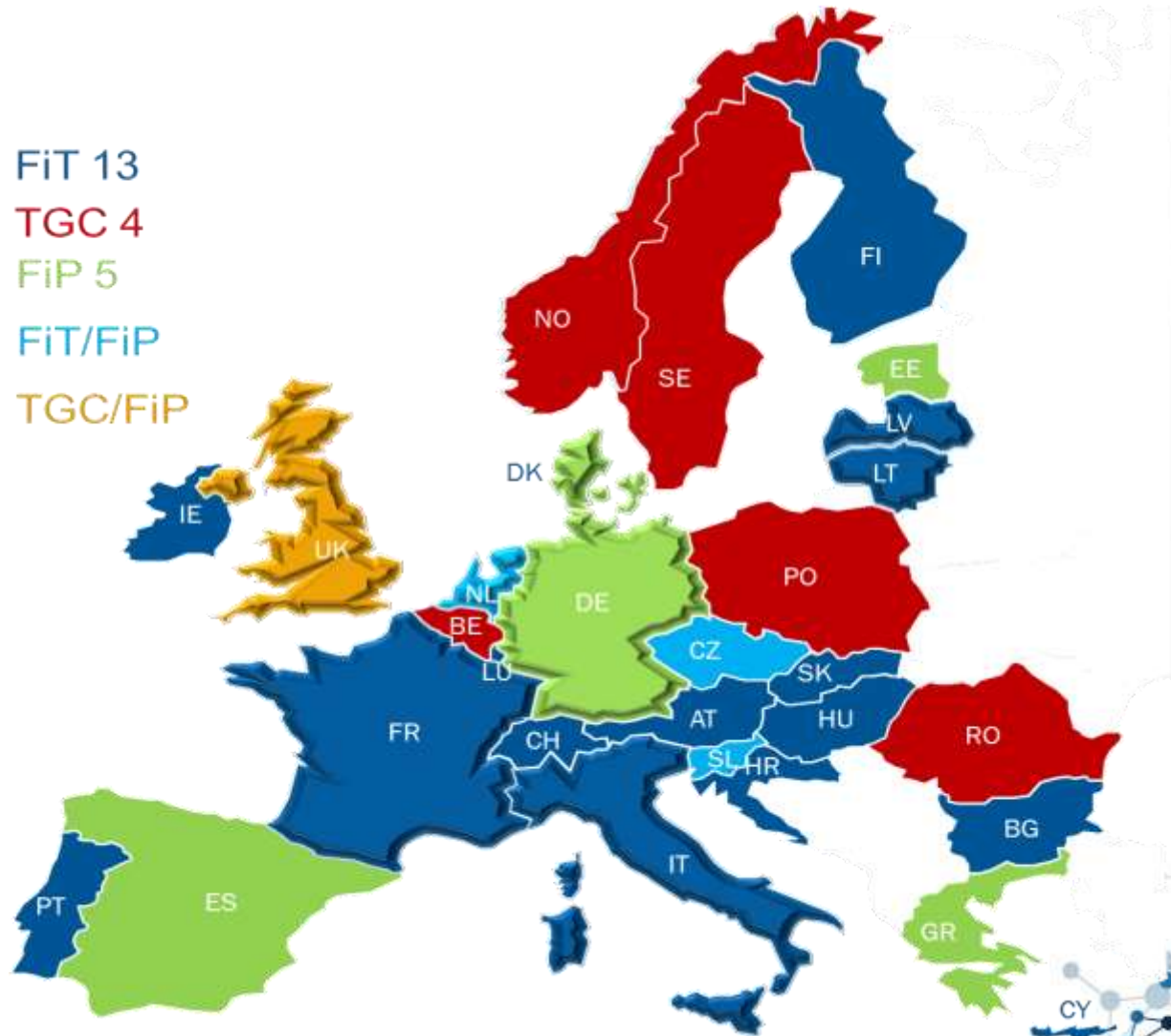
<b>Italy:</b> <ul style="list-style-type: none"> <li>- Net billing (Scambio sul Posto)</li> <li>- Indirect energy sale (Ritiro Dedicato)</li> <li>- Energy sale on el. market</li> <li>- Beneficial credit terms</li> <li>- VAT reduction</li> <li>- Sales incentives</li> </ul>
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<b>Croatia:</b> <ul style="list-style-type: none"> <li>- FiT</li> <li>- Self consumption</li> </ul>
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# Market instruments for wind energy in the EU

- FiT 13
- TGC 4
- FiP 5
- FiT/FiP
- TGC/FiP

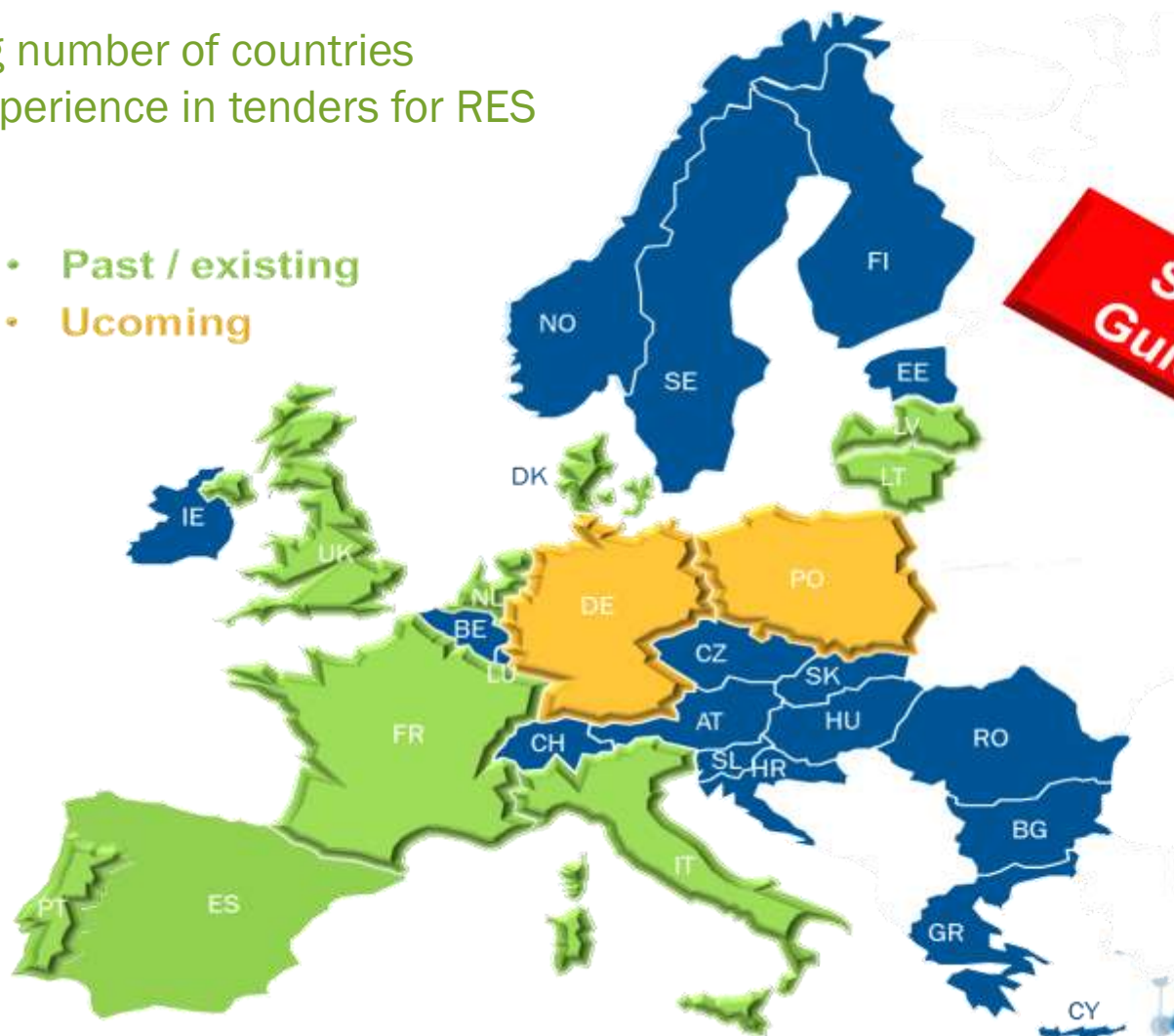


Source: WindEurope

# Tendering experience in the EU (Wind energy)

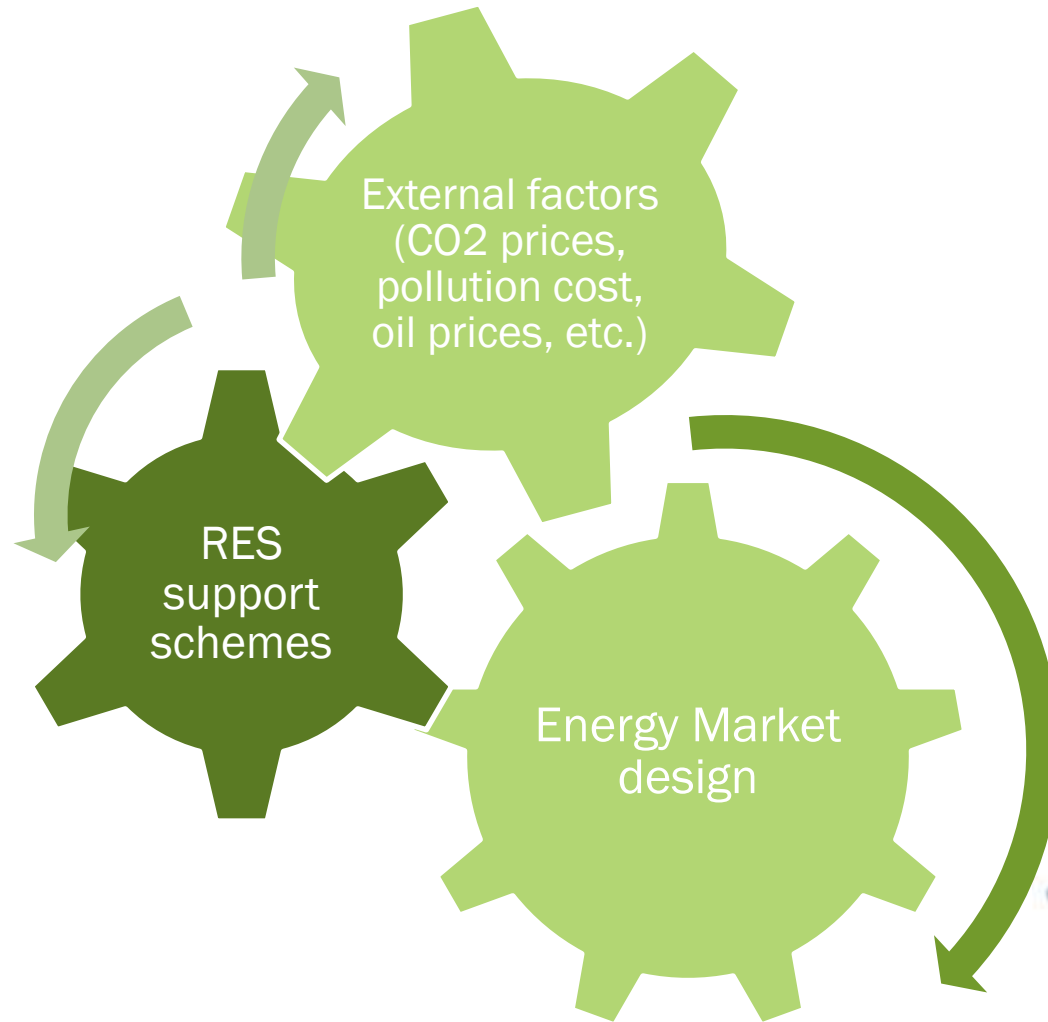
Increasing number of countries gaining experience in tenders for RES support

- **Past / existing**
- **Ucoming**



# RES fit for the market & Market fit for RES

- Main areas influencing the design of energy policy



# Project Initial Assessment of RES market instruments

Design Options	Weak points (-)	Strong points (+)
<ul style="list-style-type: none"><li>✓ Long term clean capacity auction</li><li>✓ Long-term clean energy auction<ul style="list-style-type: none"><li>✓ Certificates</li><li>✓ FIP (auction)</li></ul></li></ul>	<ul style="list-style-type: none"><li>• FIP (auction), Certificates, and energy auction create non-negligible distortion of short term prices</li><li>• Distortions created by FIP (auction), Certificates, and energy auction are not stable</li><li>• Relevant amount of support provided</li><li>• Create some barriers to RES participation in markets</li></ul>	<ul style="list-style-type: none"><li>• Limited distortion of efficient short term signals (negligible for LT clean capacity auction)</li><li>• Tend to foster liquidity as revenues (partially) depend on spot market prices</li><li>• Certificates promote Cost Causality</li><li>• Resilient to political intervention</li></ul>
<ul style="list-style-type: none"><li>✓ FIP regulated</li><li>✓ Net metering<ul style="list-style-type: none"><li>✓ FIT</li></ul></li><li>✓ Support conditioned to the provision of grid support</li></ul>	<ul style="list-style-type: none"><li>• All create relevant distortion of short term prices (FIT-largest, FIP regulated-relevant, Net Metering-localized)</li><li>• FITs, Net Metering, and Voltage condition reduce liquidity in short term markets</li><li>• Prone to political intervention</li><li>• Large support for regulated FIT and FIP</li><li>• Create some barriers to RES participation in markets</li></ul>	<ul style="list-style-type: none"><li>• FIP regulated promotes liquidity in short term markets</li><li>• Low overall support involved in Net Metering</li><li>• Grid support condition reduces the amount of support mobilized</li></ul>

 Most promising design options (overall strong grades)

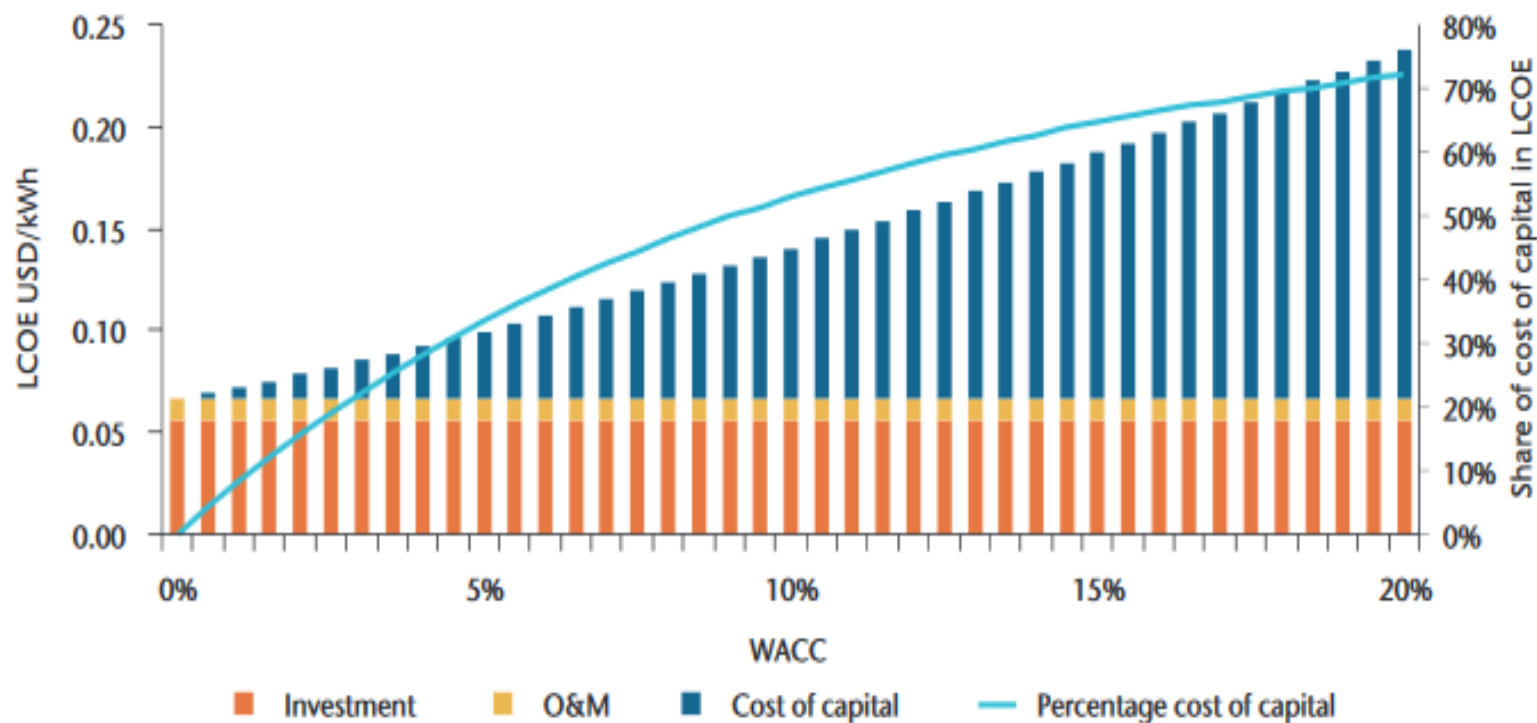
 Discarded design options (overall weak grades)



# A balance needs to be found between market exposure and overall policy support

## Impact of investment risk on PV generation cost

*Capital intensive technologies are much more sensitive to financing cost (investment risk)*



Notes: This example is based on output of 1 360 kWh/kW/y, investment costs of USD 1 500/W, annual operations and maintenance (O&M) of 1% of investment, project lifetime of 20 years, and residual value of 0.

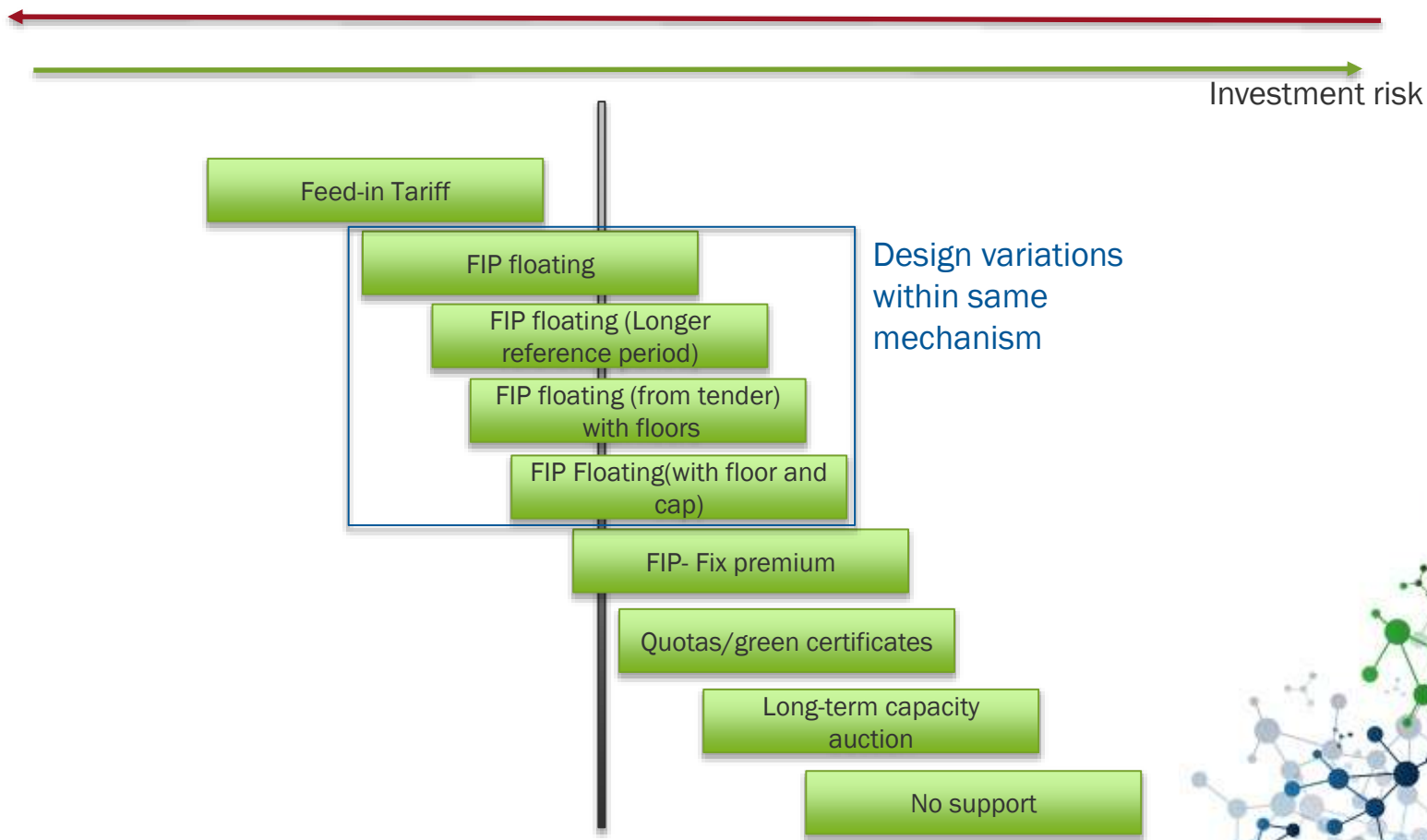
**KEY POINT:** When the WACC exceeds 9%, over half the LCOE of PV is made of financial expenditures.

Source:  
IEA

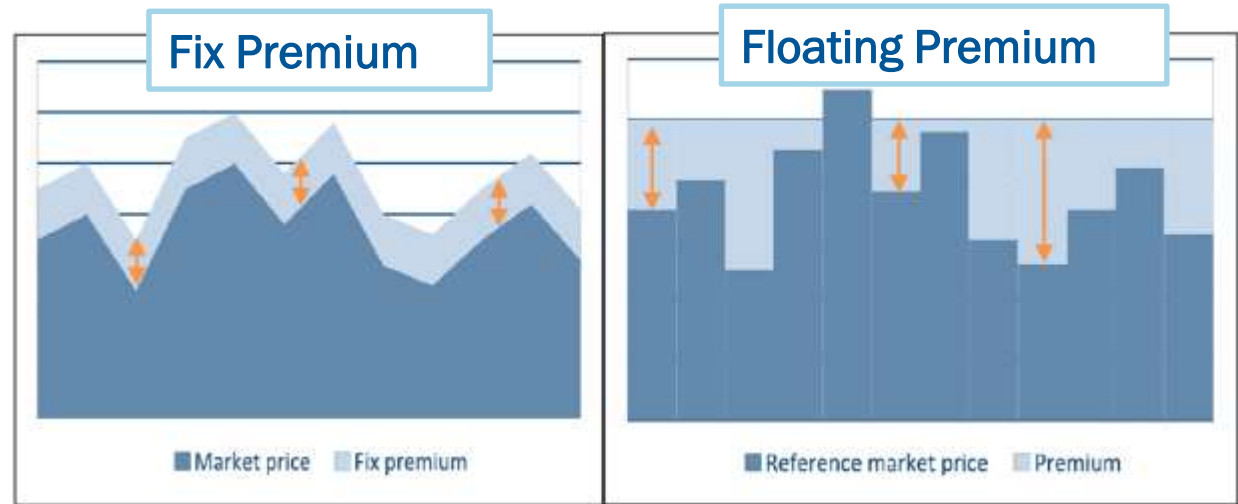
# The devil is in the detail...

The specific design aspects of a concrete market instrument is as important as the type of market instrument

Distortion with short-term dispatch



# Innovating on the premium scheme



Source: CEER report on support schemes, 2016

## Premium design options

- *Setting an appropriate timeframe: From hours to years*
  - *Hours: no market exposure, as with FIT (CfD in UK)*
  - *Monthly: some market exposure, high degree of certainty (DE)*
  - *Yearly: strong incentive to perform better than expected market outcome (NL, ES)*
- *Selecting an appropriate set of market prices values*
  - *Average market prices OR average market prices adapted to the production profile of the technology (DK- fix premium based on size of rotor)*
- *Deciding when to set the premium and for how long*
  - *Ex-ante vs. ex- post. Revision frequency*
  - *Calendar year vs fix amount of full-load hours*

# Design aspects to be considered for Tender systems

## Before

### Ensuring Certainty and visibility for investors

- Scope of the auction (national, regional, or European);
- Technology neutral vs. specific;
- Capacity and frequency of auctions;
- Size of systems included in an auction;
- Pre-qualification criteria;
- Entry-cost

## During

### Cost-effectiveness

- Price settlement (sealed-bid tender, descending clock);
- Caps
- Floors

## After

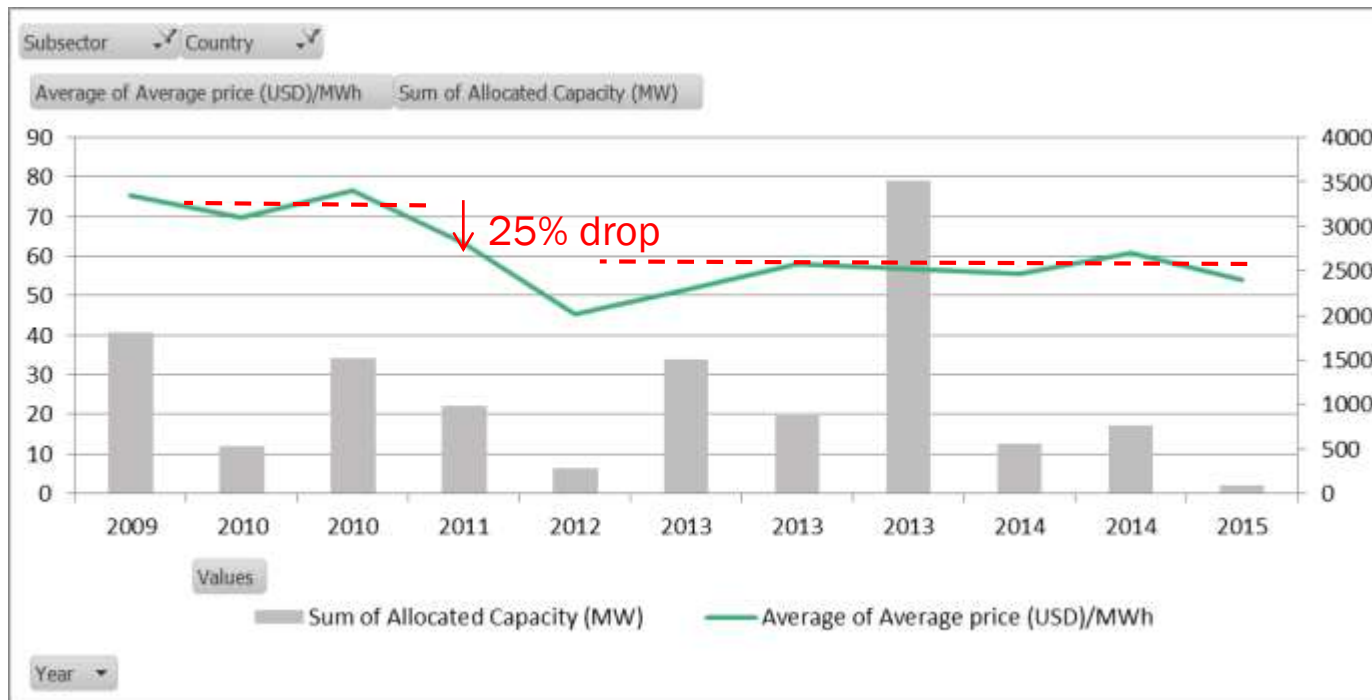
### Ensuring project fulfilment

- Time to deliver;
- Transparency on bids selected;
- Liabilities and penalties in case of delay or non-fulfilment;
- Secondary market and resubmission of unsuccessful bids.



# Cost Reduction Potential of auctions systems

- In Brazil there has been a sustained 25% drop in prices from the first year of onshore wind auctions.*
- It is however unclear whether further cost reduction will be triggered (or at which rate). Prices might go up over time.*



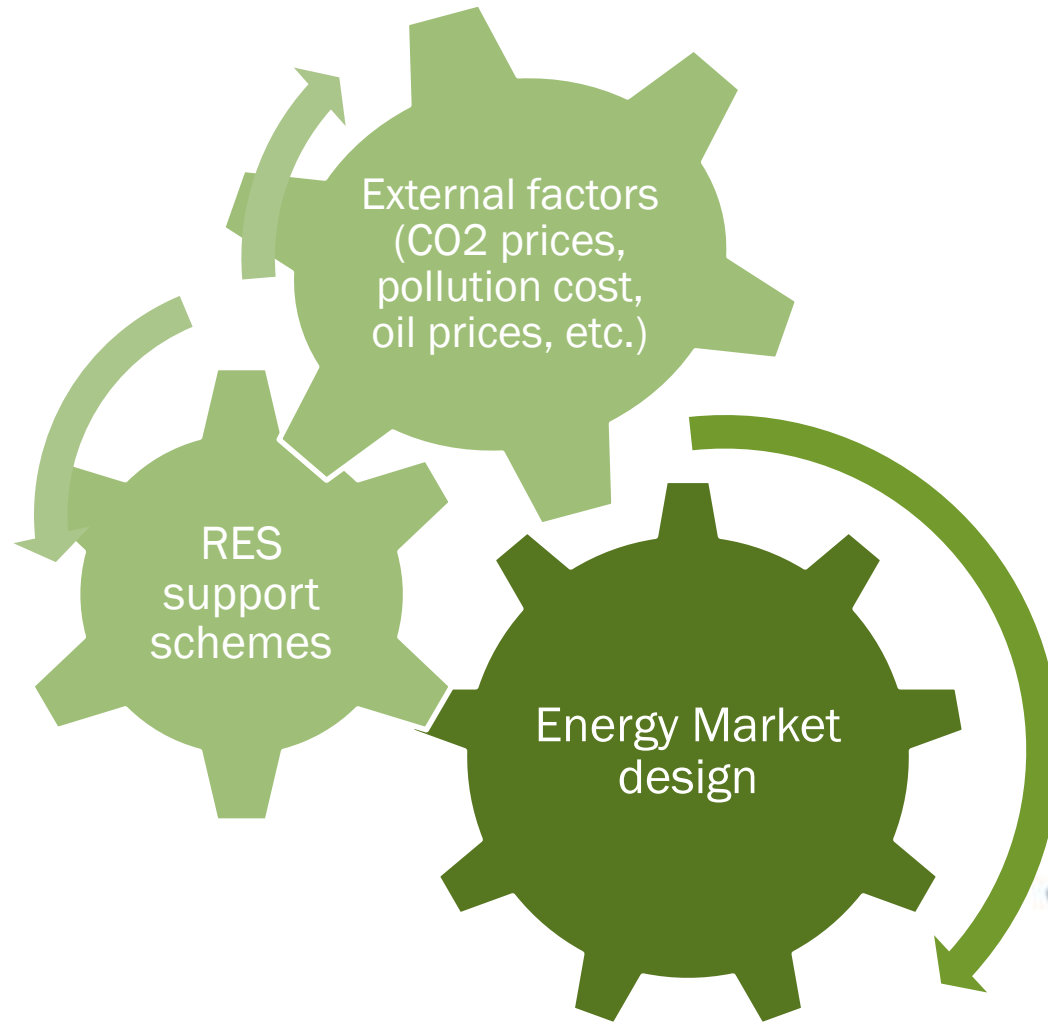
Source: BNEF

Impacts of auctions in the year that follows introduction:

- 15% to 50% reduction
- 35% average reduction

# RES fit for the market & Market fit for RES

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# Market fit for RES at all timeframes

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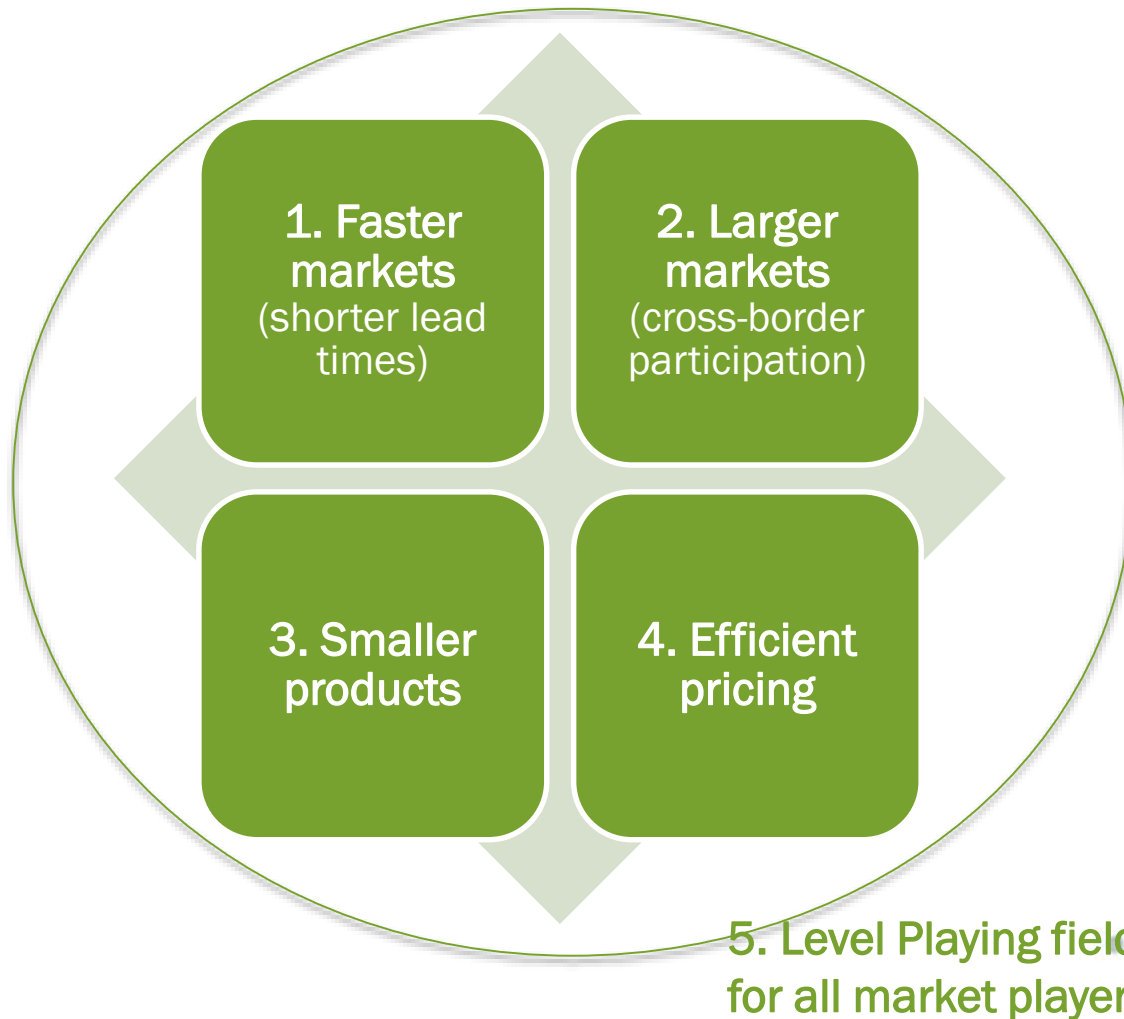


# Market fit for RES at all timeframes

Day-ahead

Intraday

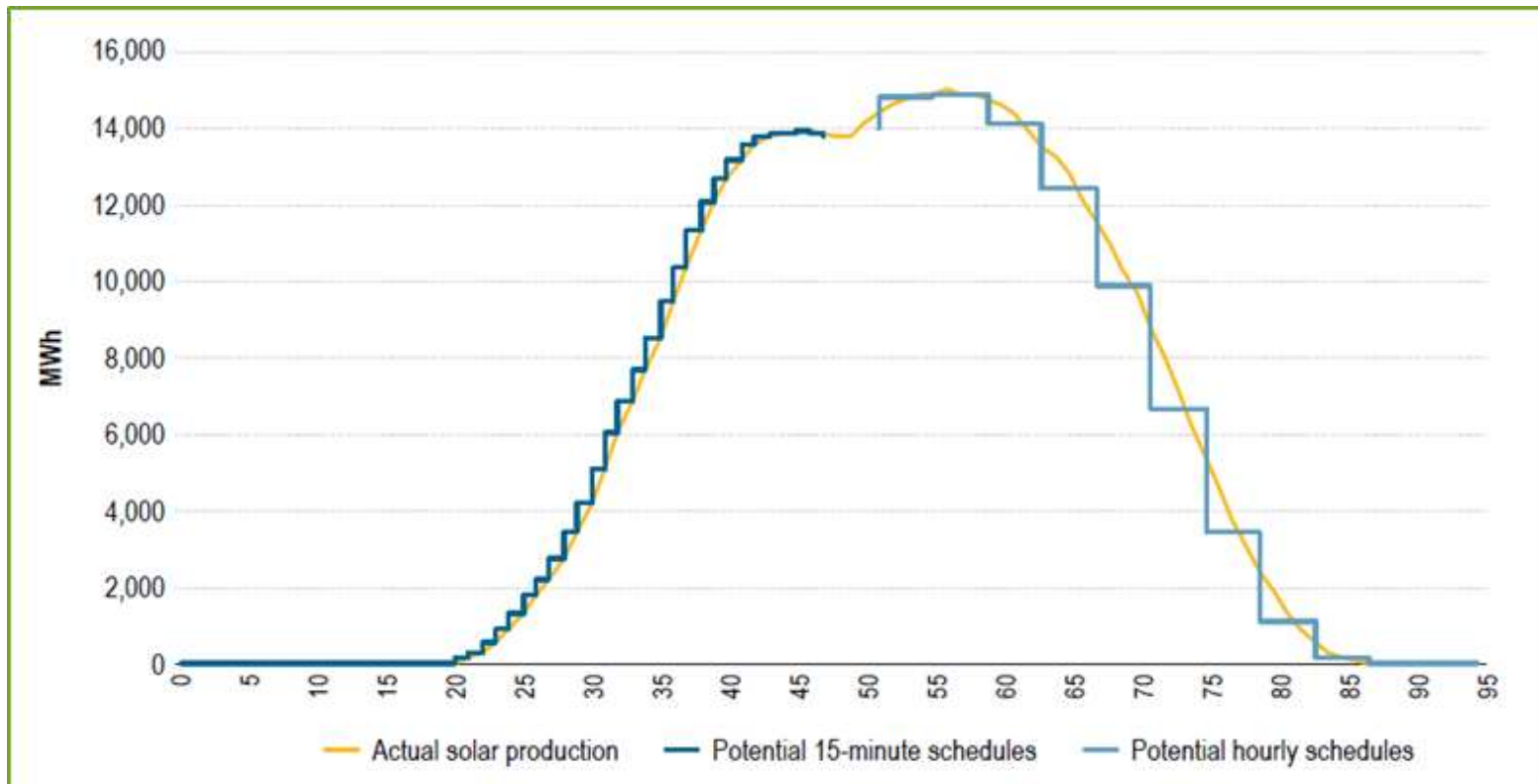
Balancing





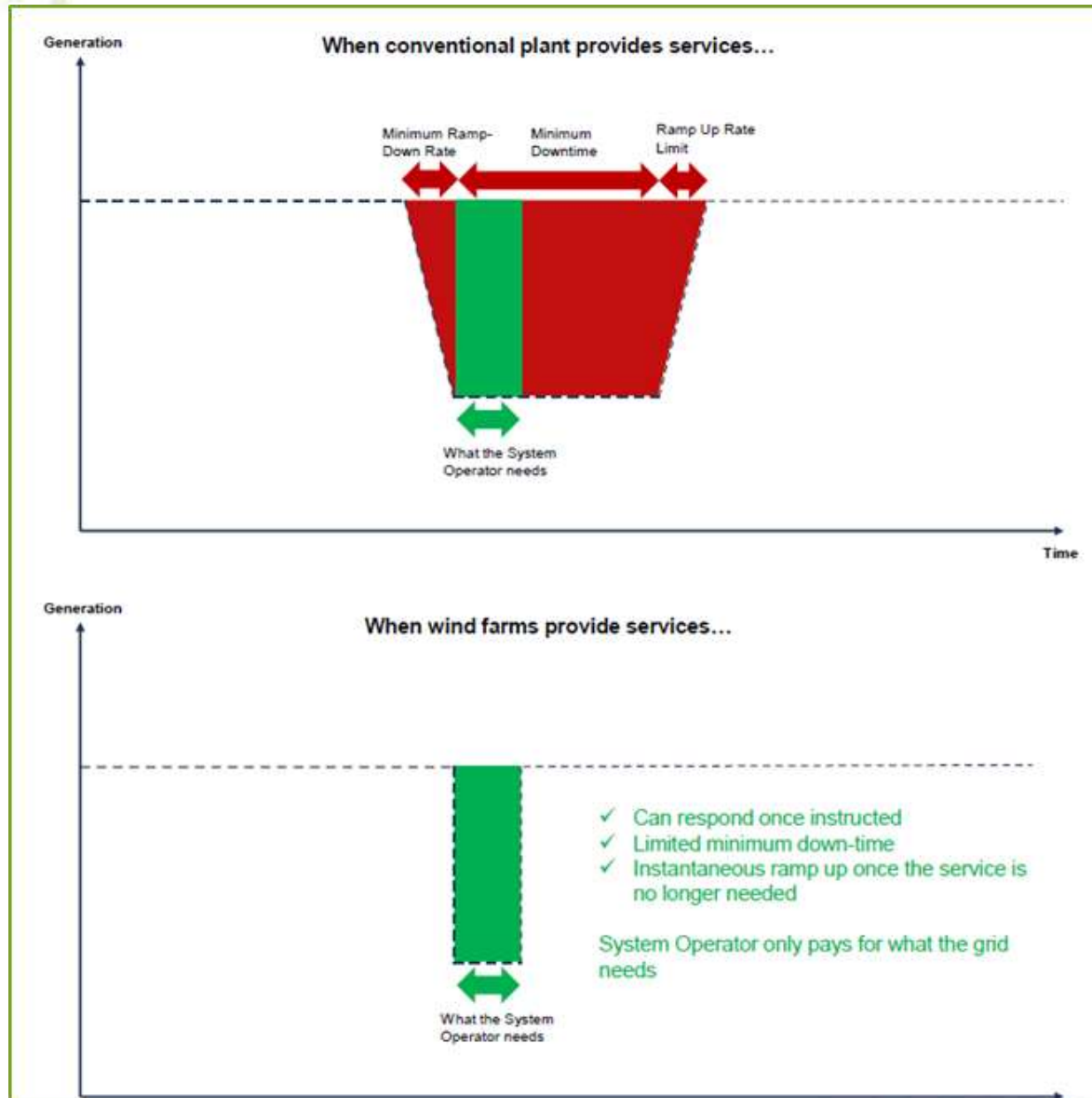
## Example: The advantages of smaller products (day-ahead and intraday)

Comparison of potential 15-min schedules vs. hourly schedules of solar production in Germany on 21 June 2014



Source: ACER 2014 Market Monitoring Report

## Example: The advantages of smaller products (balancing)



Provision of downward regulation by wind farms is more effective than by conventional generators

Source:  
DONG  
Energy



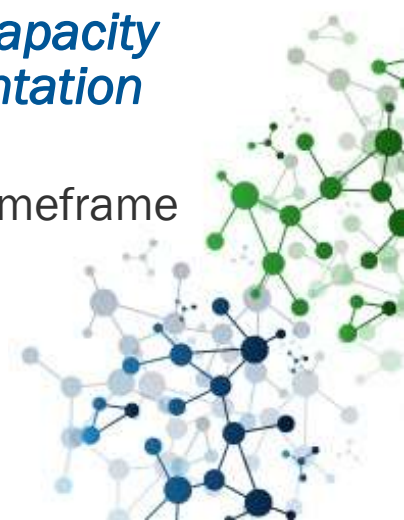
# Looking ahead- Regulatory implications

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## RES market instruments

- *State-aid guidelines review: process starts on 2017 (post-2020)*
  - Continuation of the existing principles (gain market experience)
  - Technology specific instruments
  - Market based- tenders
  - Market based- Premium (floating, fix): focus on revenue stabilization

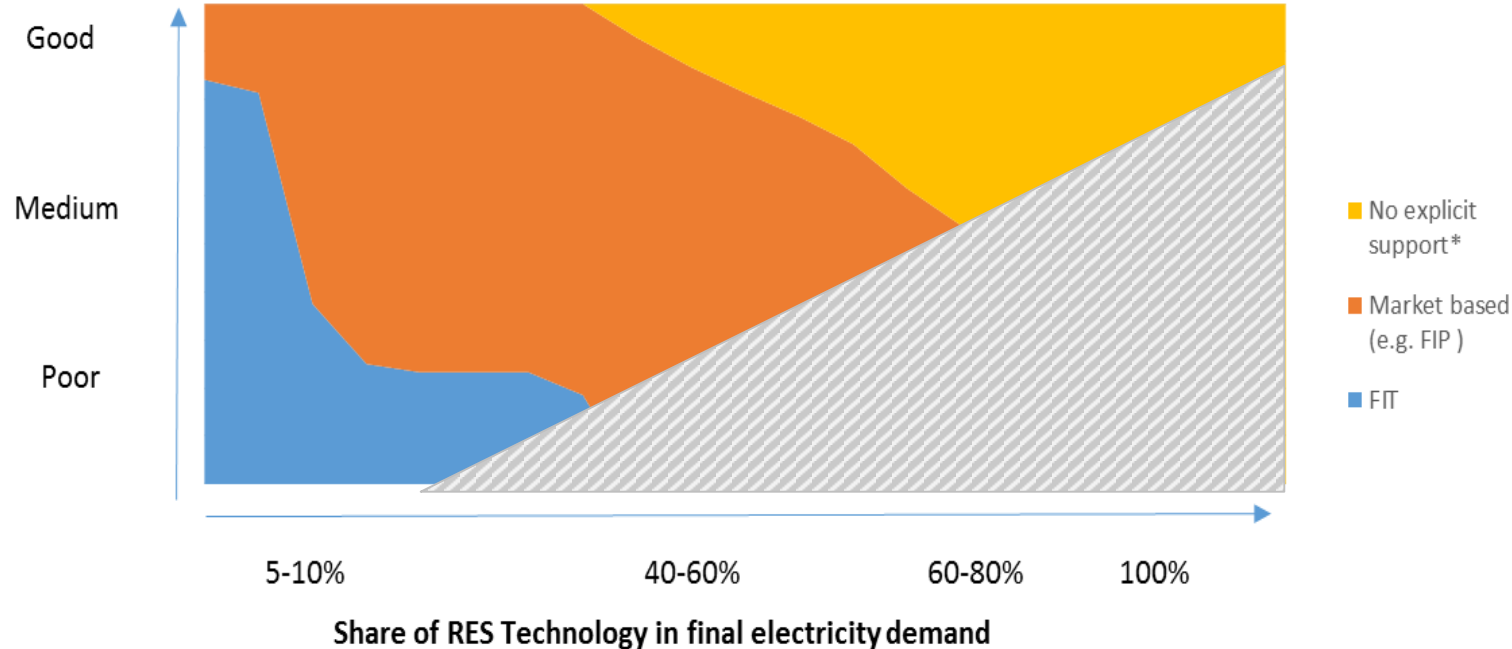
## Market integration and the target Model

- *Implementation of market network codes (Balancing, Capacity allocation and congestion management)- Full implementation after 2020*
    - Flow base capacity allocation, recalculation in the intraday timeframe
    - Integrated balancing regions, open to all market parties
- 

# Support schemes and overall market aspects should evolve in parallel

Market fit for RES

Market schemes depending RES penetration & market conditions



FIT needed in early technology introduction when market conditions not suitable

Market prices have strong impact on dependence of specific market instruments


\*Explicit support is needed when other complementary markets do not function correctly and when environmental externalities are not internalized.





# Conclusions

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- Adaptation of RES market instruments needs to be done in parallel to the adaptation of the electricity market (implementation of the target model)
  - Exposure to market needs to be balanced with investment risk as this will have direct impact on total policy support
  - Tenders need careful design as there are many potential counter-productive results ( overtime increasing cost, exclusion of small players, technology neutrality)
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Thank you very much  
for your attention



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# BACKUP






# Looking ahead- Regulatory implications

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## RES market instruments

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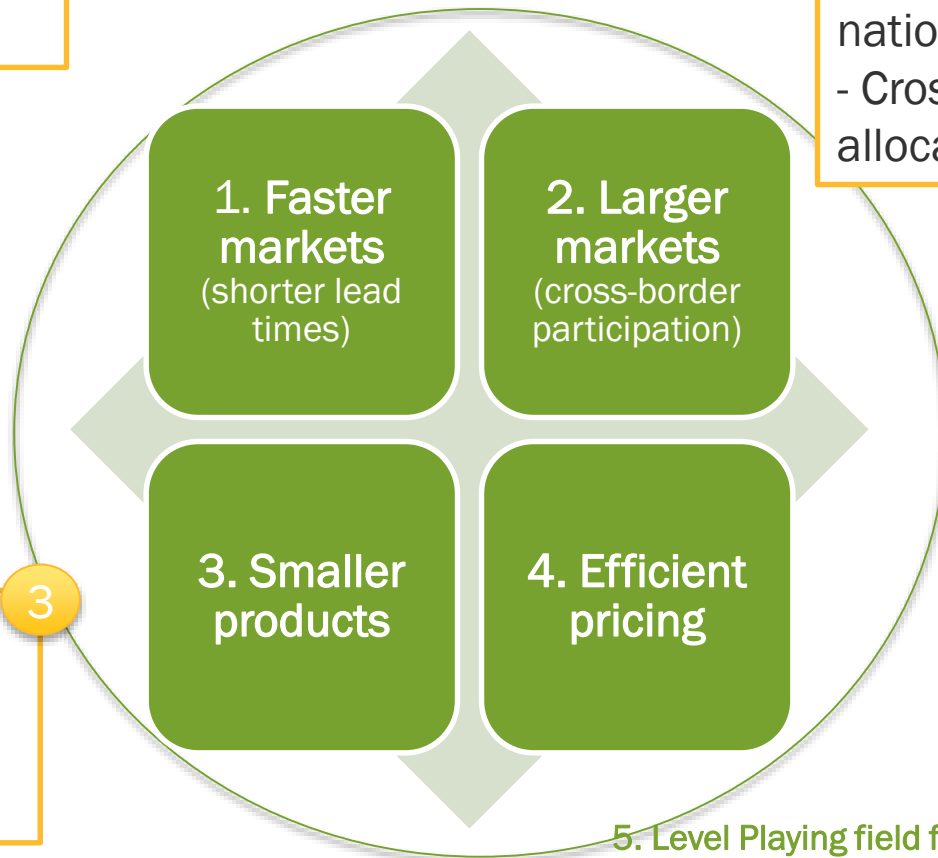


# Focus on Intra day Market

1  
Gate Closure time  
close real time  
(5' in BE/NL)

2  
-Harmonization toward 60' :  
need to reduce it to align with  
national GCT  
- Cross-border capacity implicit  
allocation

3  
Continuous  
trading +  
15' discrete  
auctions



4  
Hybrid system

5. Level Playing field for  
all market players

5  
Allow aggregation

# Adapting the balancing market

1

- Shorter Activation time
- GCT after ID GCT
- 15' Imbalance settlement period

2

CoBA per product (in the future 1 area for all products)

4

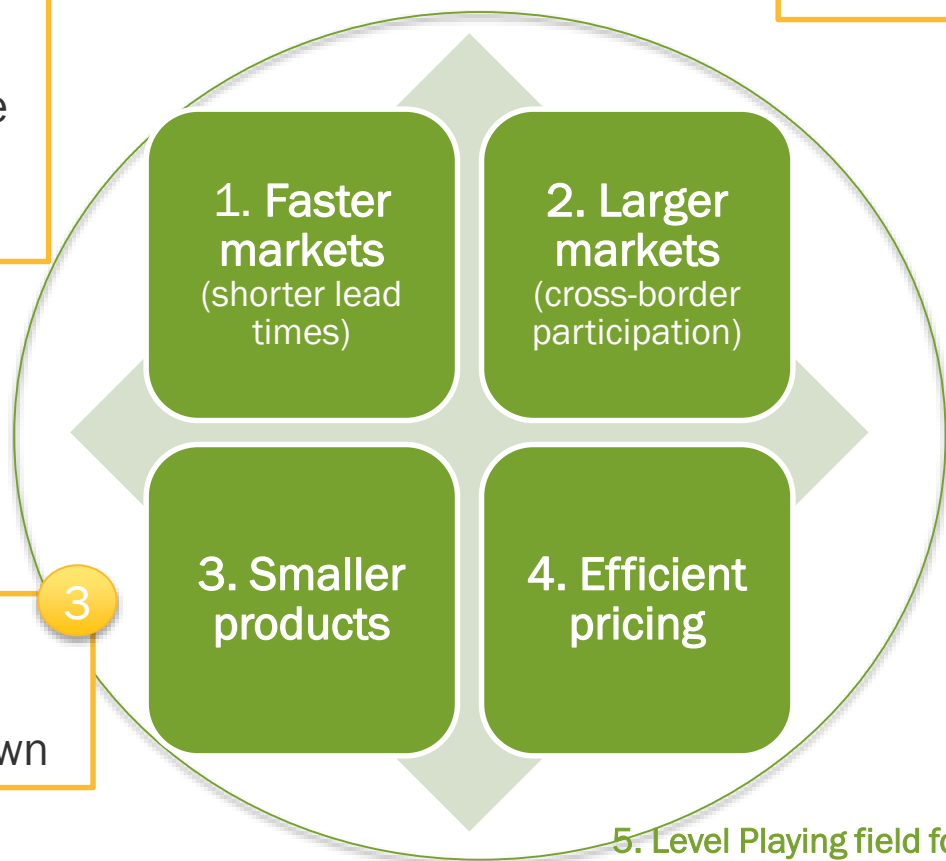
Marginal pricing

5

- All parties balancing responsible
- Energy bids allowed without capacity contract
- Single price Imbalance settlement

3

- 15' product as standard
- Separate up/down



5. Level Playing field for all market players