

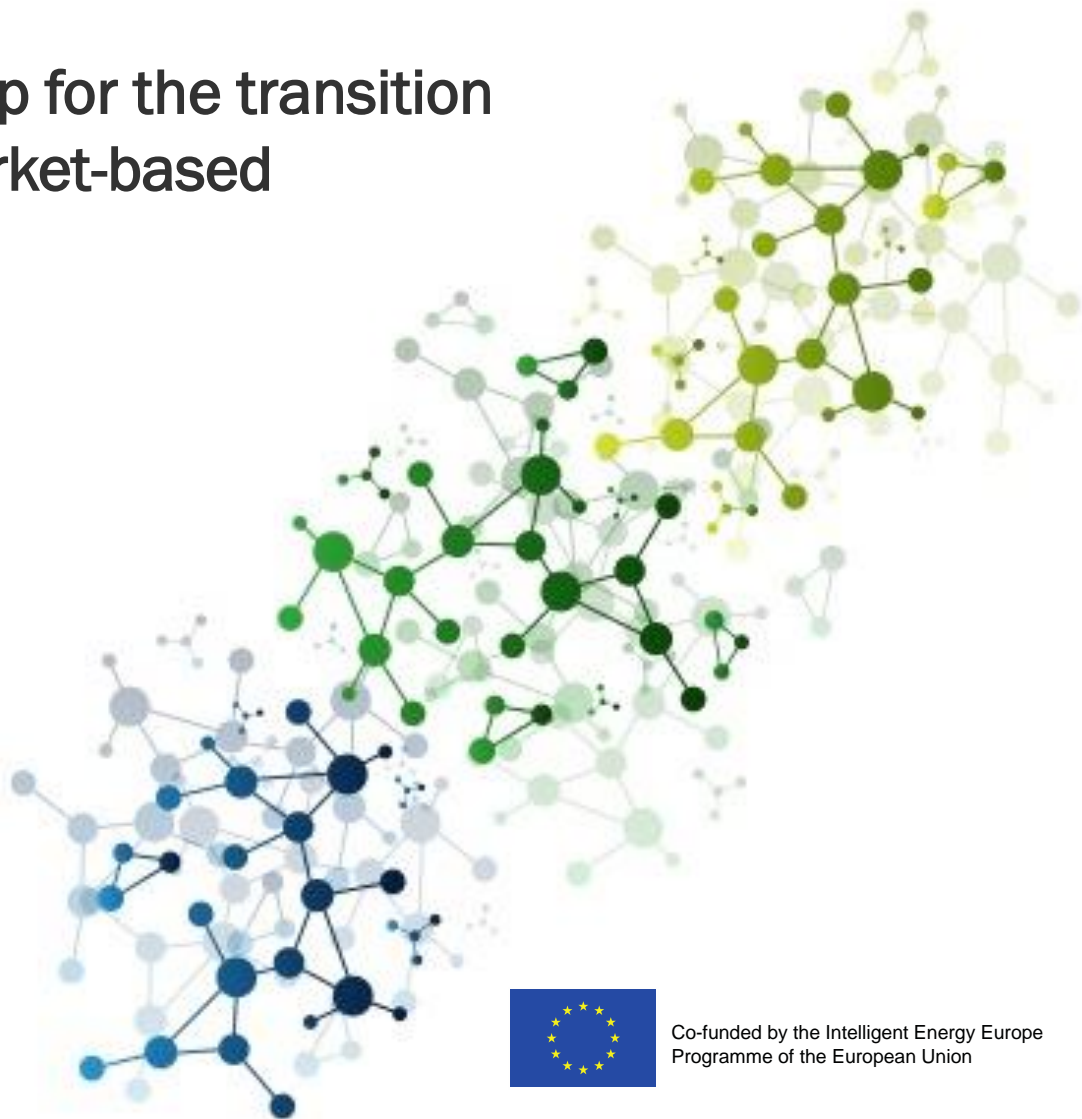


RES penetration: Roadmap for the transition from Feed-in-Tariffs to market-based schemes

Expert Workshop

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2016-05-19 Brussels



Co-funded by the Intelligent Energy Europe
Programme of the European Union



Outline

- State of play- Changing landscape
 - Force changed: state-aid
 - Support schemes overview
 - Making RES fit for the Market
 - Designing premium
 - Introducing auctions
 - Making the market fit for RES
 - Focus on Intraday
 - Balancing markets
 - Evolution Roadmap and conclusion
- 



The EU's Environmental and Energy State Aid guidelines

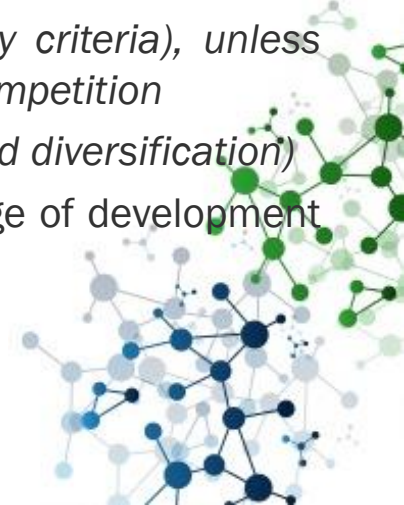
Support scheme and obligations (from 2016)

- 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.
- 

Support Mechanisms for solar PV energy in the EU

Ireland:

- FiT
- Self consumption
- Energy sale on el. market

UK:

- FiT
- Quota system
- Self consumption
- Energy sale on el. market
- VAT reductions
- Fiscal incentives

The Netherlands:

- Green bonus tender scheme
- Net metering
- Energy sale on el. market
- Fiscal incentives

Luxembourg:

- FiT
- Investment grants
- Fiscal incentives

Belgium:

- Green certificates
- Net metering
- Energy sale on el. market
- VAT reduction
- Fiscal incentives

France:

- FiT
- Tenders
- VAT reduction

Portugal:

- FiT
- Self consumption
- Energy sale on el. market
- Fiscal incentives

Spain:

- Self consumption
- Energy sale on el. market

Austria:

- FiT
- Self consumption
- Energy sale on el. market
- Investment grants

Germany:

- FiT
- Premium tariff
- Storage system
- Tenders
- Energy sale on el. market
- Investment grants
- Beneficial credit terms
- Self consumption

Denmark:

- FiT
- Net metering
- Self consumption
- Investment grants
- VAT reduction
- Fiscal incentives

Sweden:

- Quota system
- Energy sale on el. market
- Investment grants
- Fiscal incentives

Finland:

- Investment grants

Estonia:

- Premium tariff
- Energy sale on el. market
- Investment grants

Latvia:

- Net metering
- Self consumption
- Energy sale on el. market
- Investment grants

Lithuania:

- FiT
- Investment grants

Poland:

- Green certificates
- Energy sale on el. market

Czech Republic:

- Energy sale on el. market

Slovakia & Cyprus:

- FiT

Hungary:

- FiT
- Net metering
- Investment grants

Romania:

- Quota system
- Net metering
- Energy sale on el. market

Bulgaria:

- FiT

Greece:

- FiT
- Net metering
- Fiscal incentives

Slovenia:

- FiT
- Premium tariff
- Energy sale on el. market

Switzerland:

- FiT
- Self consumption
- Energy sale on el. market
- Investment grants
- Fiscal incentives

Malta:

- FiT
- Self consumption
- Energy sale on el. market

Italy:

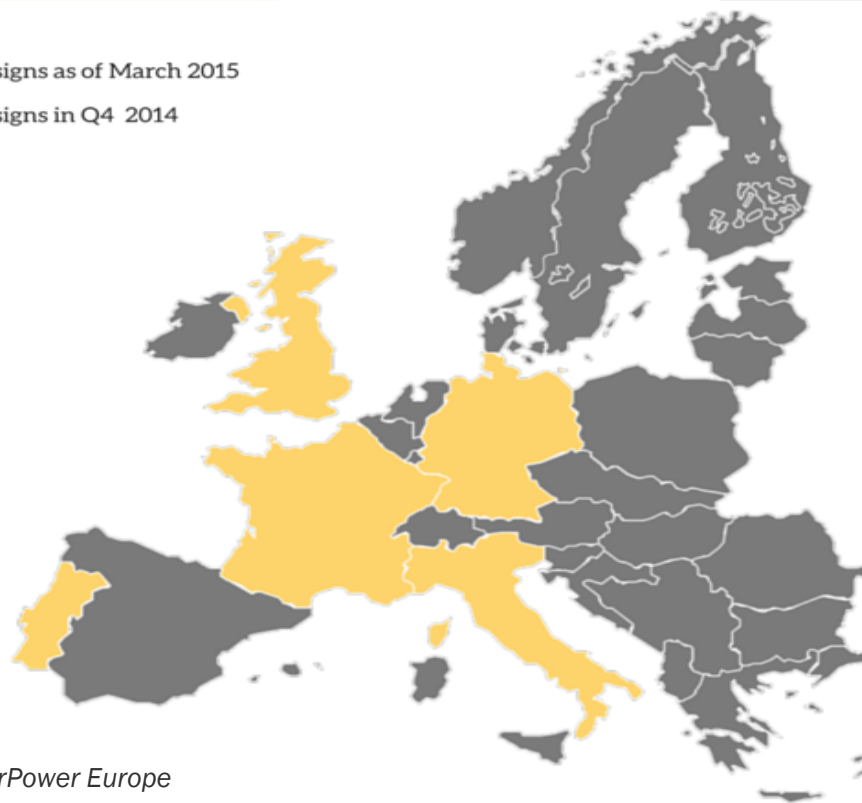
- Net billing (Scambio sul Posto)
- Indirect energy sale (Ritiro Dedicato)
- Energy sale on el. market
- Beneficial credit terms
- VAT reduction
- Sales incentives

Croatia:

- FiT
- Self consumption

Designs as of March 2015

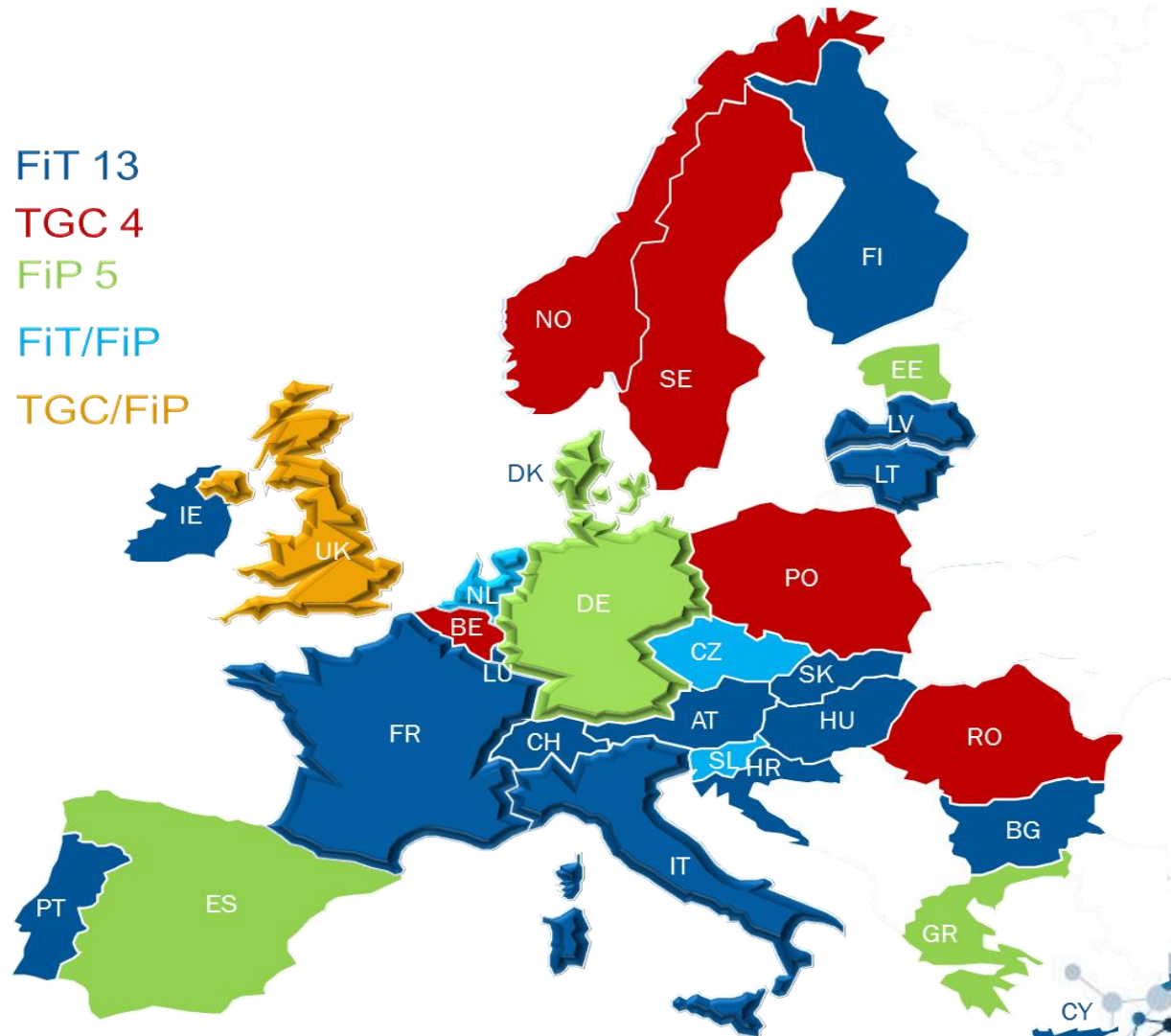
Designs in Q4 2014



Source: SolarPower Europe

Support Mechanisms for Wind energy in the EU

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

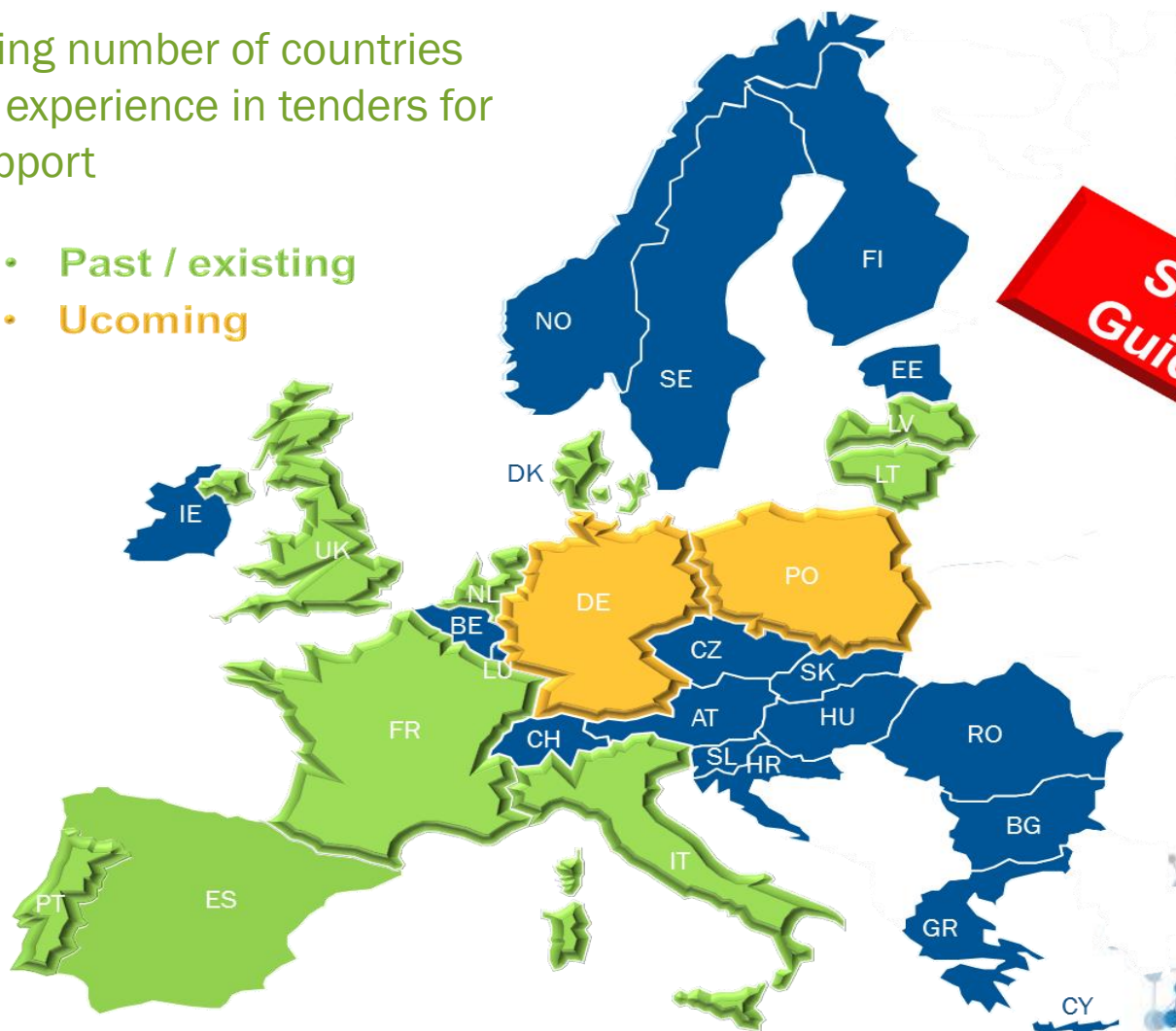


Source: WindEurope

Tendering experience in the EU (Wind energy)


- Increasing number of countries gaining experience in tenders for RES support


- Past / existing
- Ucoming



Project Assessment of RES market instruments

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

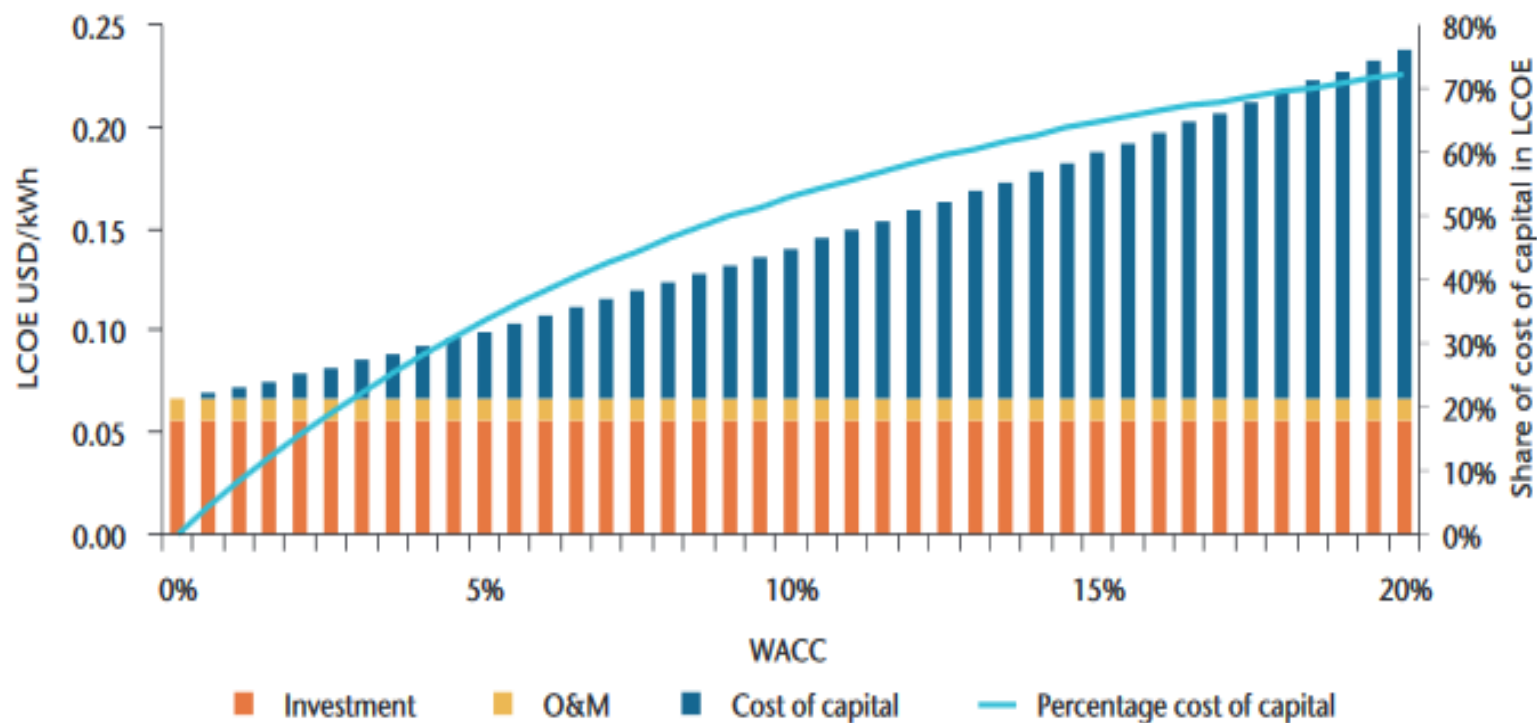
 Most promising design options (overall strong grades)

 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.

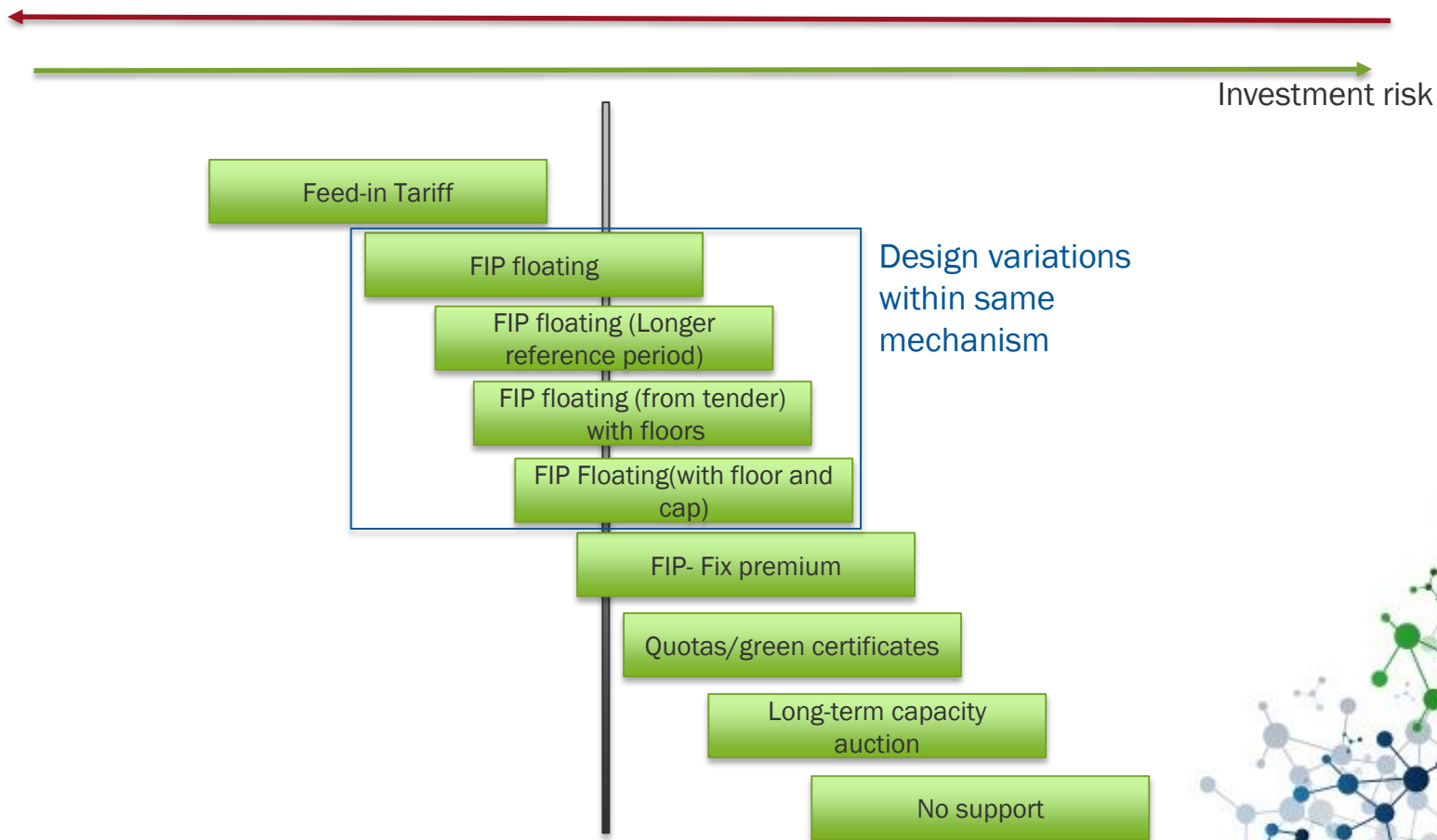
KEY POINT: When the WACC exceeds 9%, over half the LCOE of PV is made of financial expenditures.

Source:
IEA

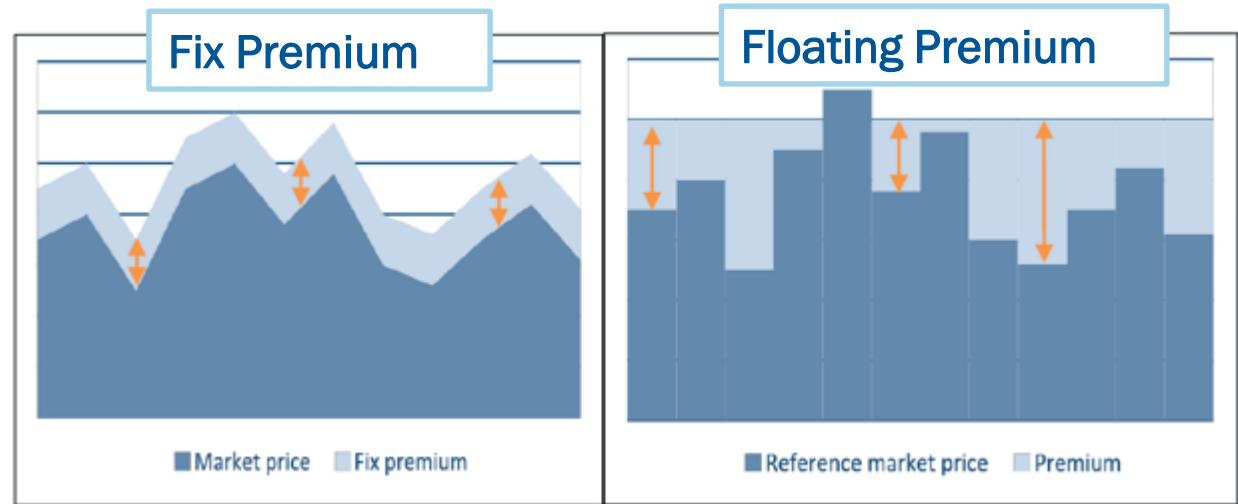
The devil is in the detail...

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

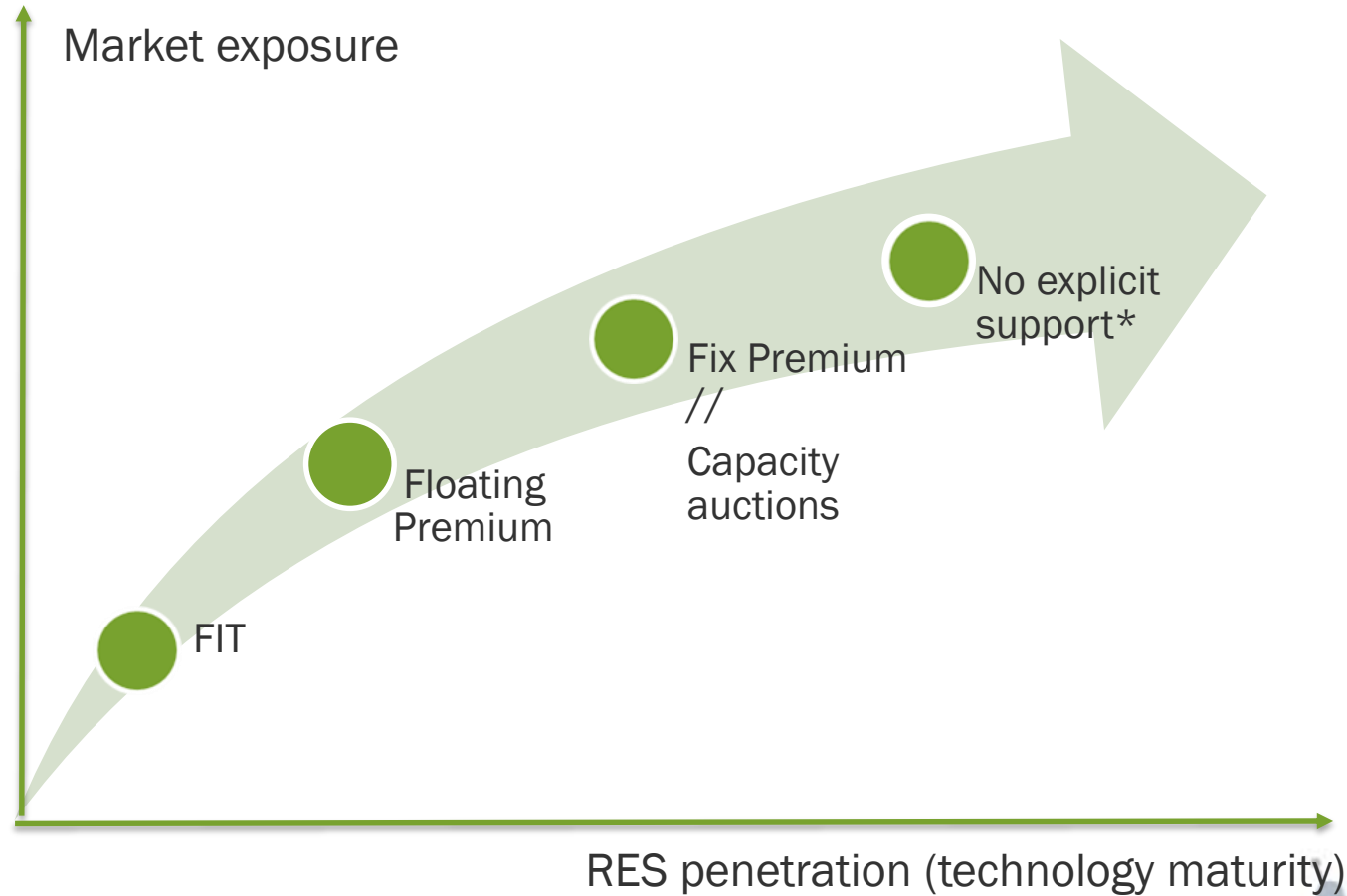


Source: CEER report on support schemes, 2016

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*

Possible evolution of RES market mechanisms



*No explicit support is dependent on the functioning of complementary markets (ETS) and internalization of external cost (Air pollution, nuclear waste management and storage), and overall evolution of wholesale electricity prices

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

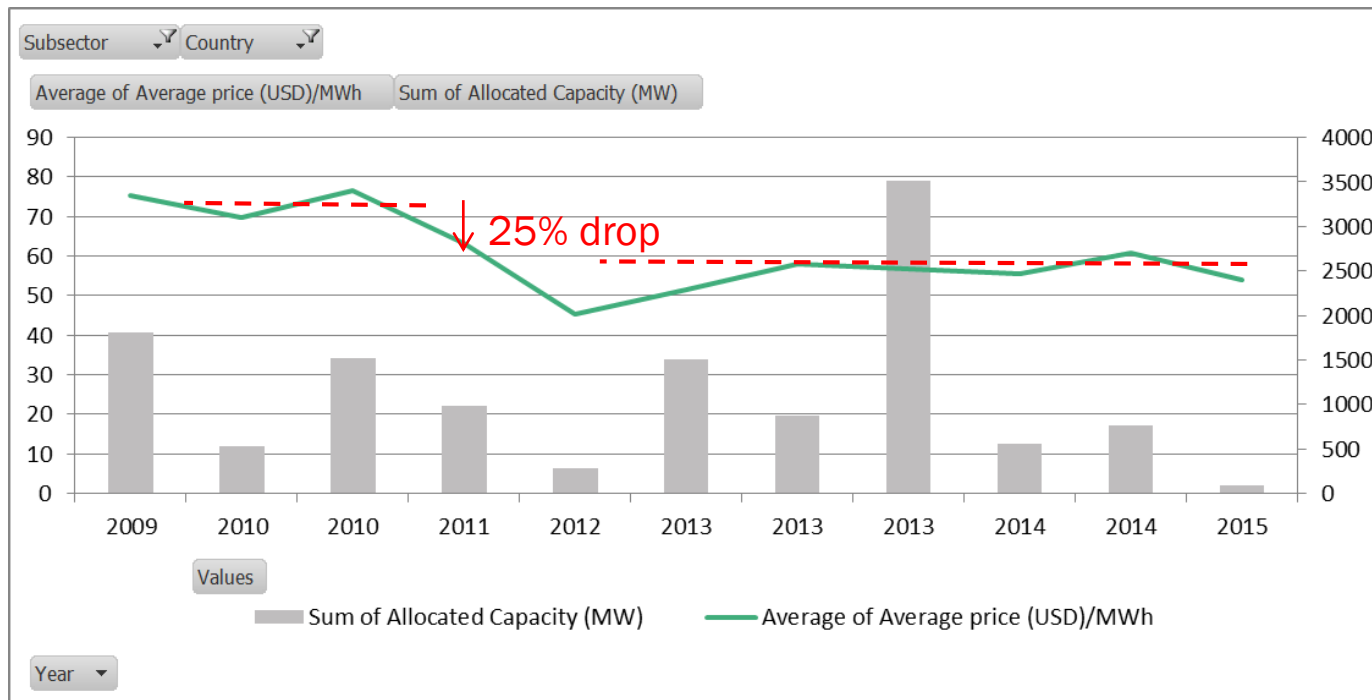
After

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.*



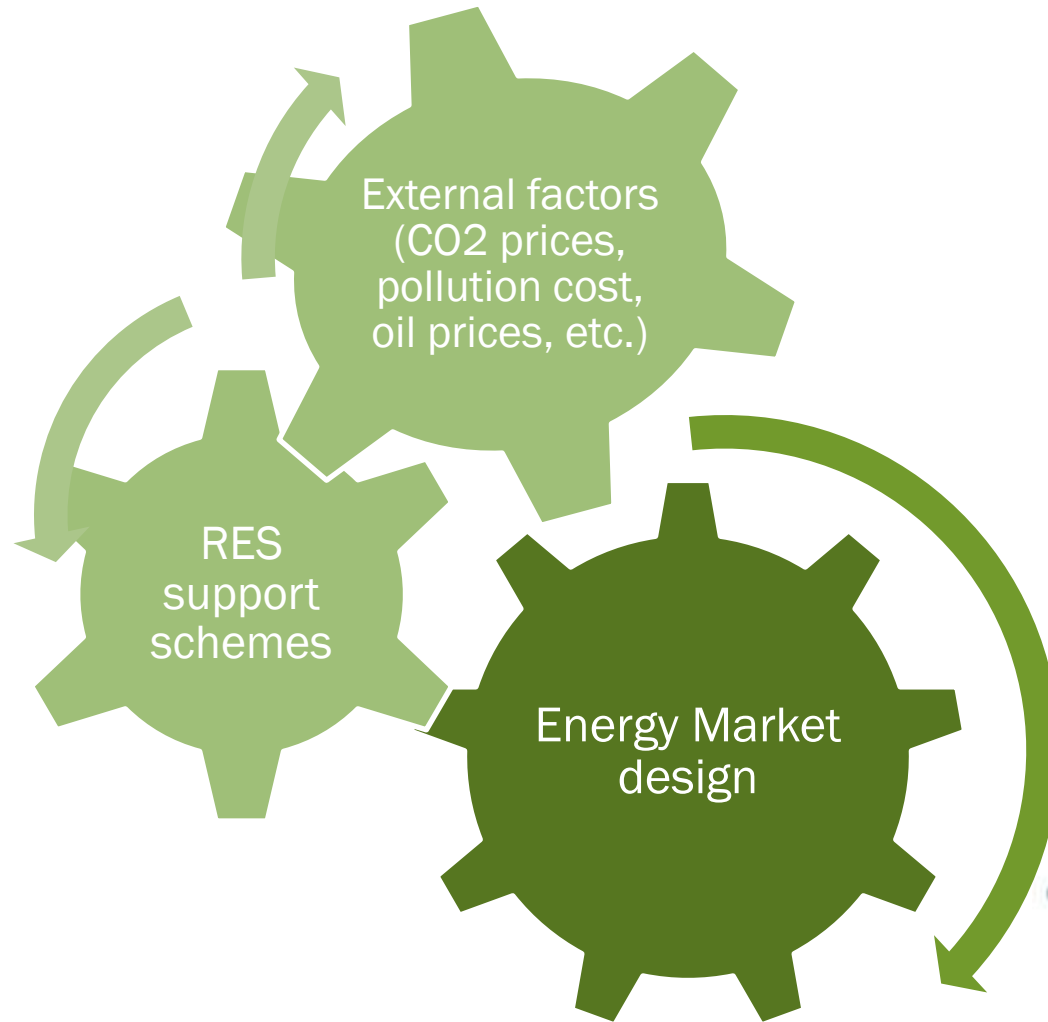
Source: BNEF

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 &

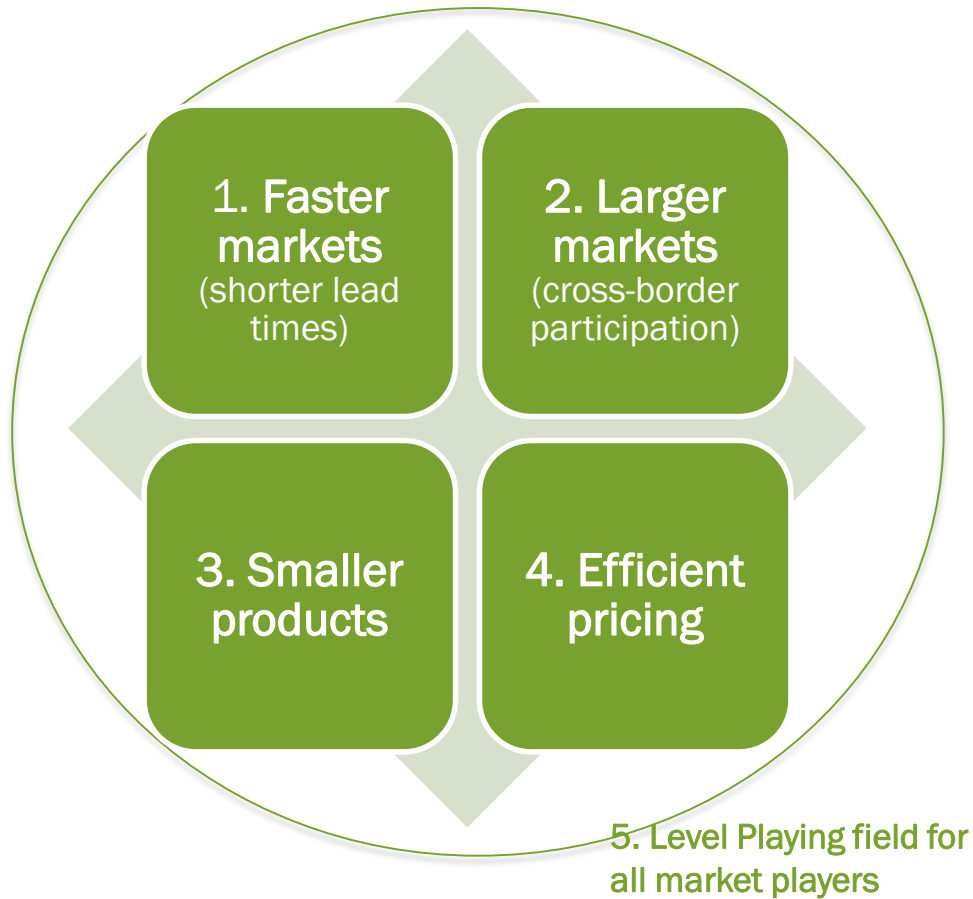
- Main areas influencing the design of energy policy



Market fit for RES at all timeframes



Market fit for RES at all timeframes



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
Allow aggregation

5. Level Playing field for
all market players

1. Faster
markets
(shorter lead
times)

2. Larger
markets
(cross-border
participation)

3. Smaller
products

4. Efficient
pricing

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

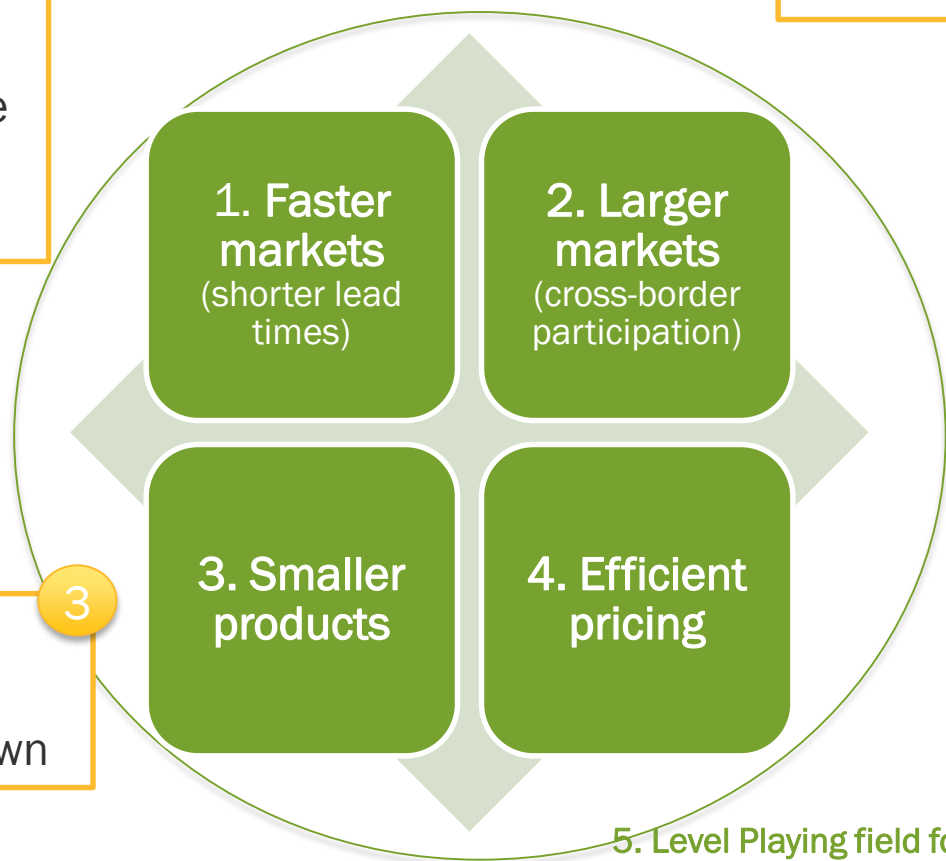
Marginal pricing

5

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

3

- 15' product as standard
- Separate up/down

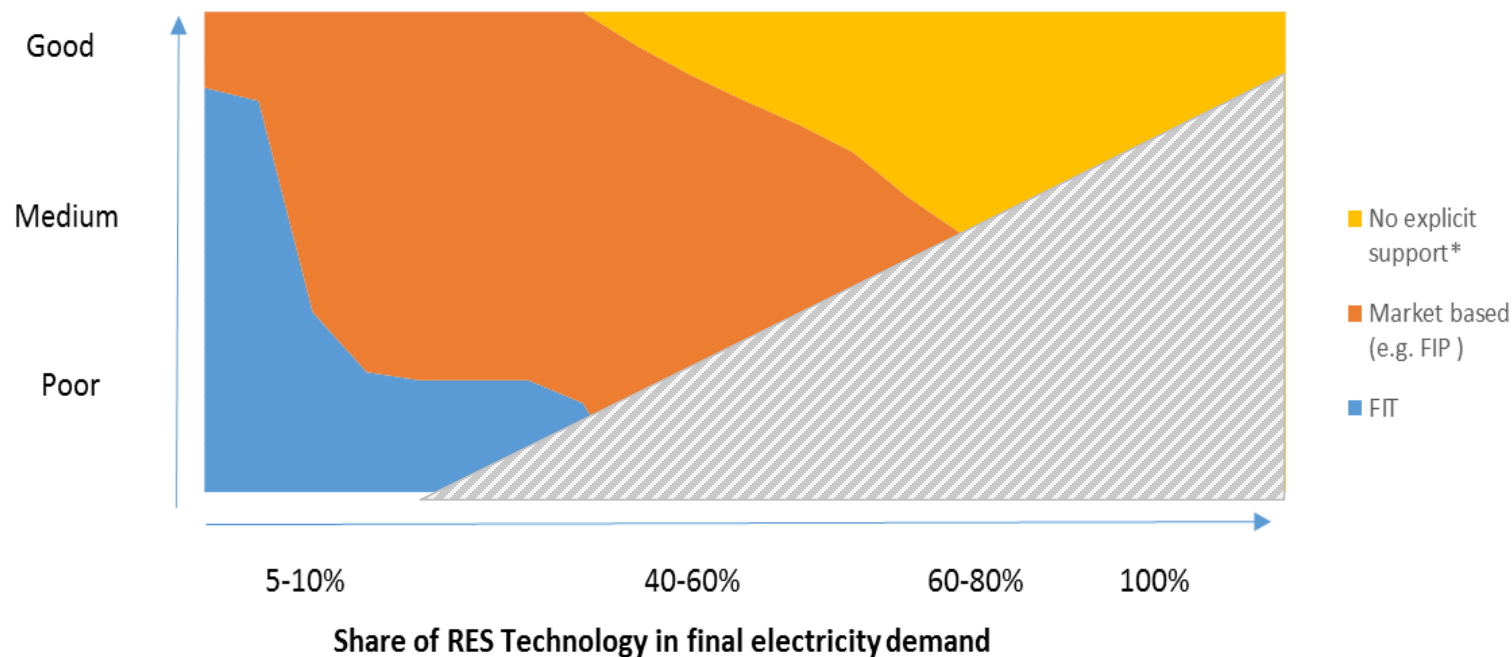


5. Level Playing field for all market players

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

- 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)
- 