CHAIRE EUROPEAN ELECTRICITY MARKETS
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The Economic Rationale of Renewables Support Schemes Reforms and Renewables Integration in Power Markets

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CHANGING RENEWABLES SUPPORT IN THE EU ELECTRICITY MARKETS:
Which impact on Renewables projects risks and Electricity Markets?
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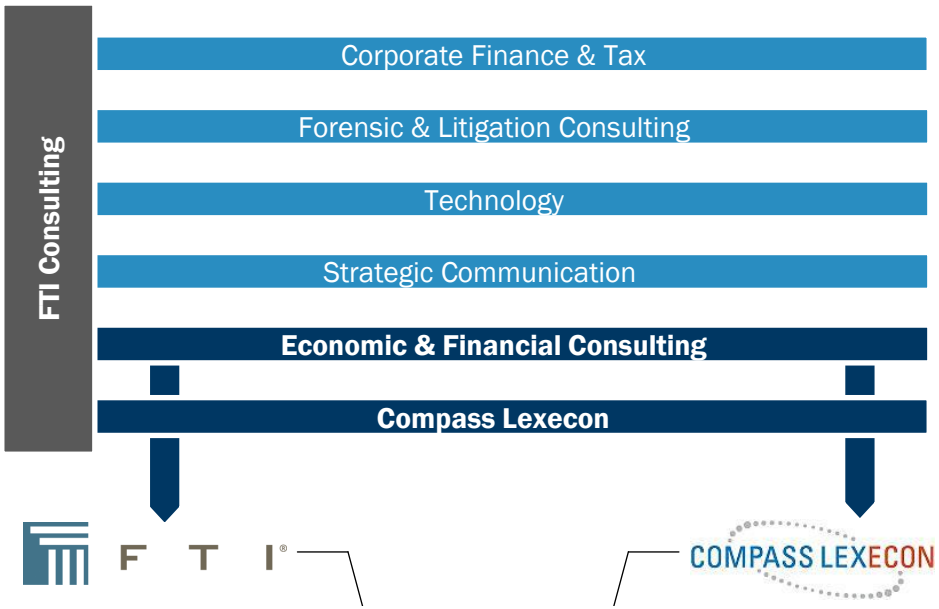

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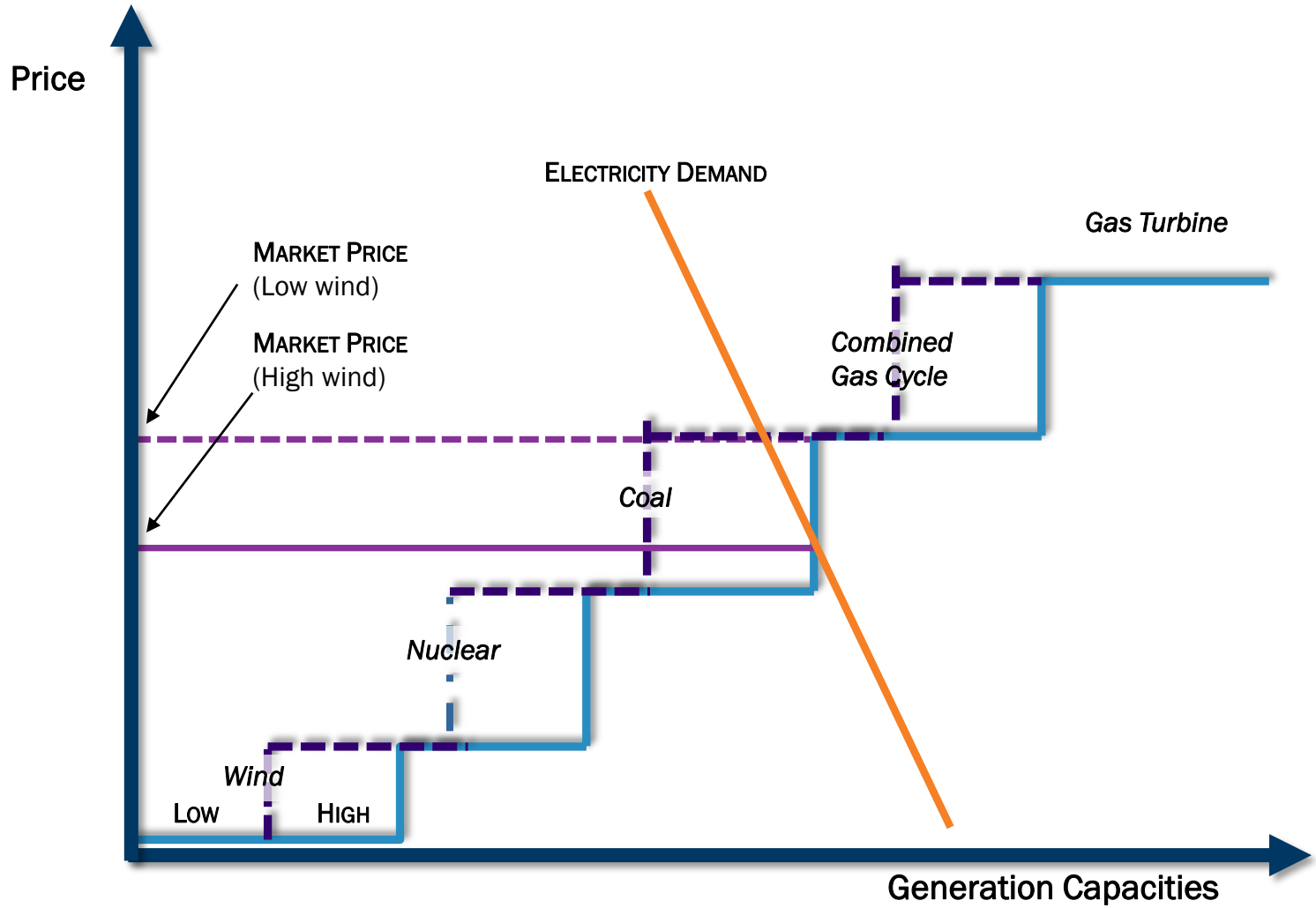
Agenda

- The impact of RES on wholesale electricity markets
- RES support schemes and negative wholesale prices: how to limit dispatch distortions?
- EC guidelines for RES support schemes
- Conclusions

The impact of RES on wholesale electricity markets

The ‘merit order effect’: RES’ depressive effect on wholesale prices



Low variable cost generators supported out-of-market displace other technologies in the merit order and lead to lower wholesale power prices. This benefits consumers in the short term, provided that it is not compensated by increases in others parts of the bill.

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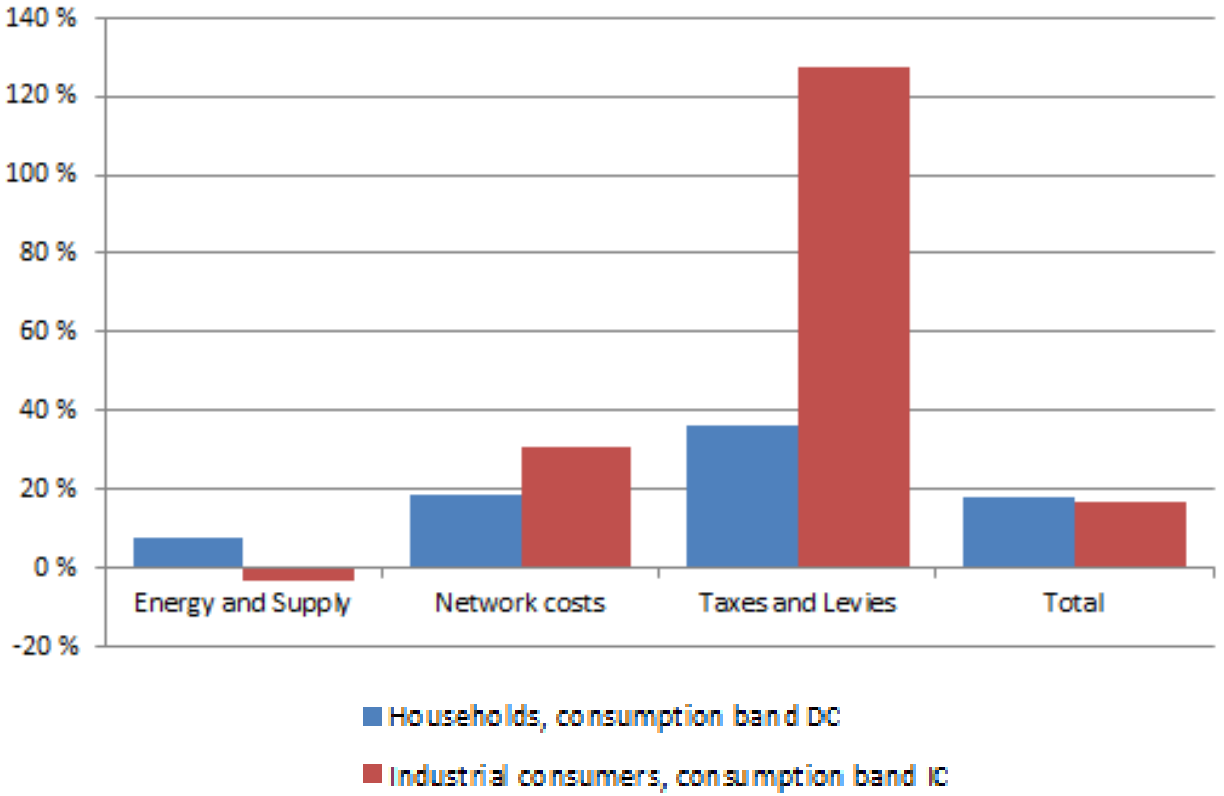
The ‘scissors effect’: wholesale price drop, but end user prices increase

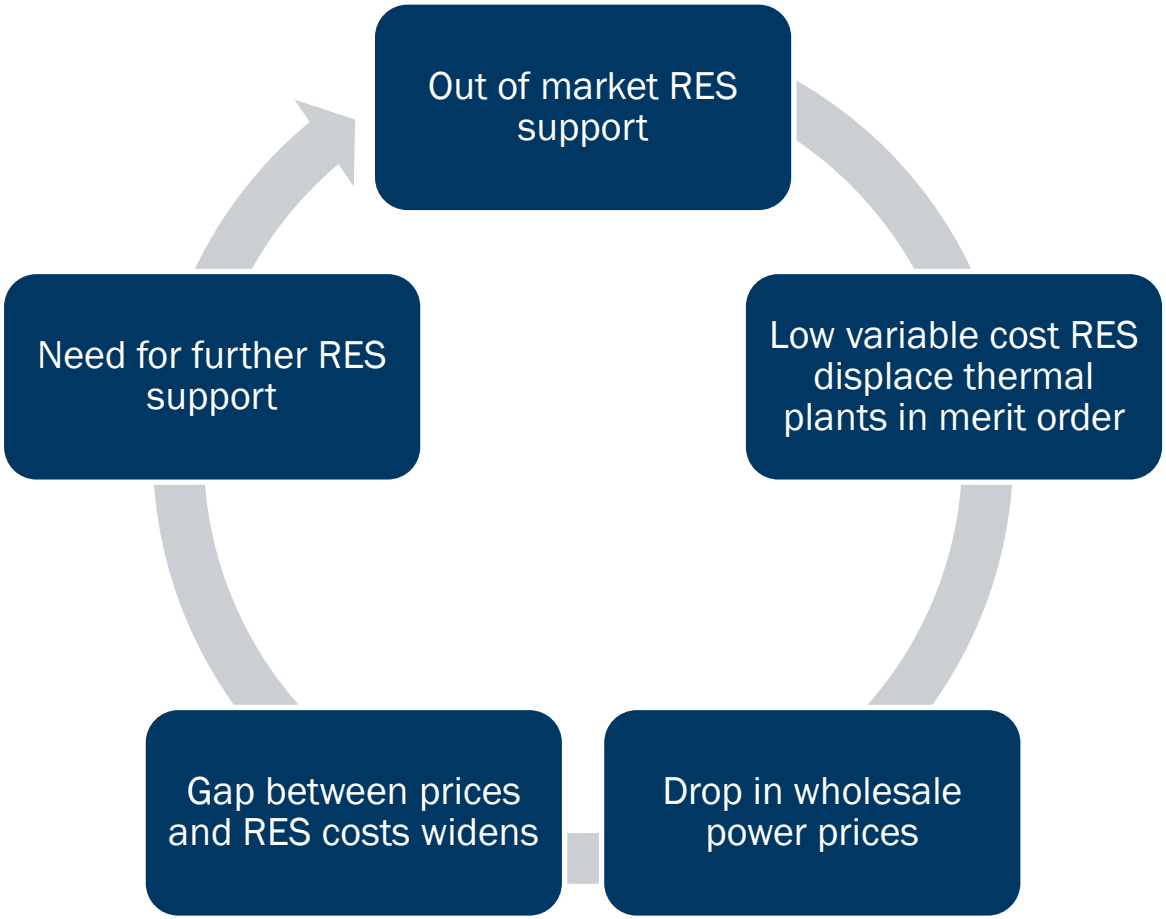
EU 28 wtd average retail electricity prices, 2008-2012 percentage change by component



- On average, EU household electricity prices increased by more than 4% a year between 2008 and 2012.
- The “scissors effect”: wholesale prices depressed by renewables, but network charges, taxes, and levies to support renewables drive retail prices up.
- Taxes and levies went up by 38% and 127% respectively for the EU weighted average price for households and industry.

Source: Energy prices and costs report, European Commission staff working document. {COM(2014) 21 final} {SWD(2014) 19 final} Brussels, 17.3.2014

The ‘cannibalisation’ effect: by reducing wholesale prices, RES undermine their own competitiveness



- The conventional wisdom assumes that the technology learning curve will bring RES costs down to eventually make them competitive in wholesale markets prices
- This assumes no feedback effect between RES penetration and wholesale power prices
- In reality, RES bring power prices down, thereby increasing the gap between RES costs and wholesale market prices
- In order for RES to become competitive, their learning rate and the associated cost reduction needs to outweigh the negative effect of RES on wholesale power prices

RES support schemes and negative wholesale prices: how to limit dispatch distortions?

Conditions for negative prices to occur

- **A negative price indicates that power generators are willing to pay the consumer to buy energy. Units may bid negative mainly for 3 reasons:**
  - Inflexible thermal production units have operational constraints to reduce and/or stop production in short time frames, that make it less costly not to reduce / stop production even if the market does not need this power (as the cost of restart may be important).
  - Access to support mechanism for renewables units is not market-based and may require the plant to run (e.g. production based support scheme).
  - CHP plants must run to produce heat as their primary revenue stream is sales of heat rather than power.

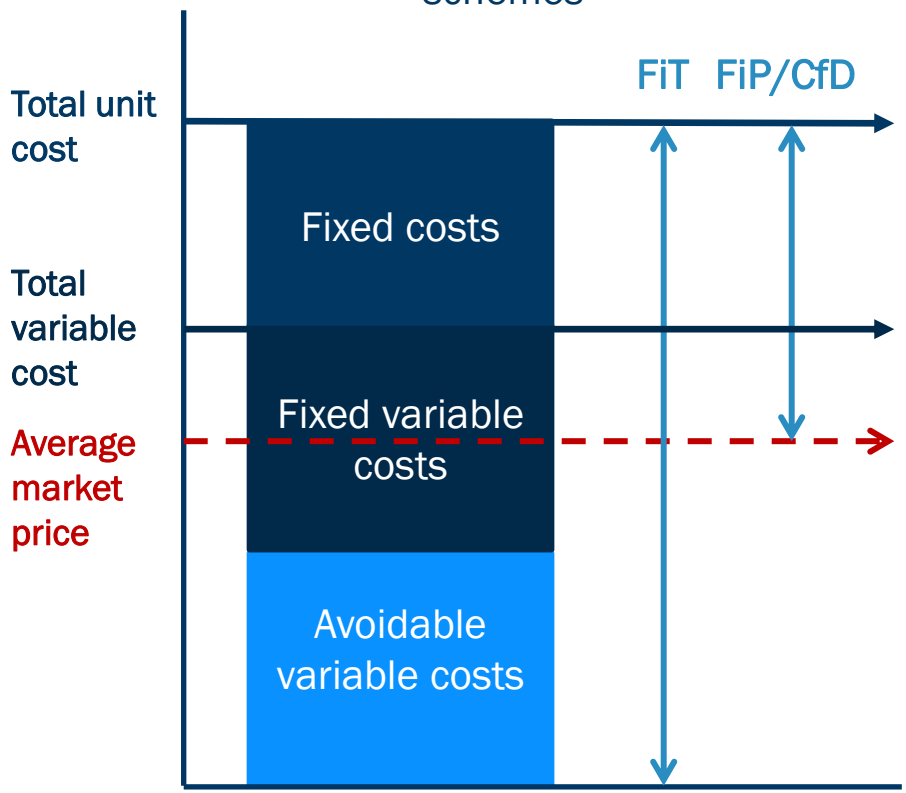
- **One can therefore expect negative prices when the following conditions are met:**
  - The generating fleet as a whole is relatively inflexible.
  - The combination between significant renewable generation capacity and low demand displaces conventional capacity.

The different types of RES support schemes

- **Member States have implemented different support schemes to promote renewables and CHP. Three main mechanisms can be distinguished :**
  - **Feed-in tariffs (FiT):** The support varies every hour so that generators receive a fixed price for its output, whatever the market price is. They are thus not sensitive at all to market prices.
  - **Feed-in premium scheme (FiP):** The support is fixed therefore generators receive a total price which follows the variations of the market price. They are thus sensitive to market prices.
  - **Green Certificates (GCs):** generators receive a variable premium to the market price, which depends on the value of the certificates. They are thus sensitive to electricity and certificate market prices.

- **The figure illustrates the different support schemes with reference to the costs of a RES or CHP generator.**
  - The FiT is set equal to the generator's total costs.
  - The FiP is set as the difference between total cost and the expected market price.

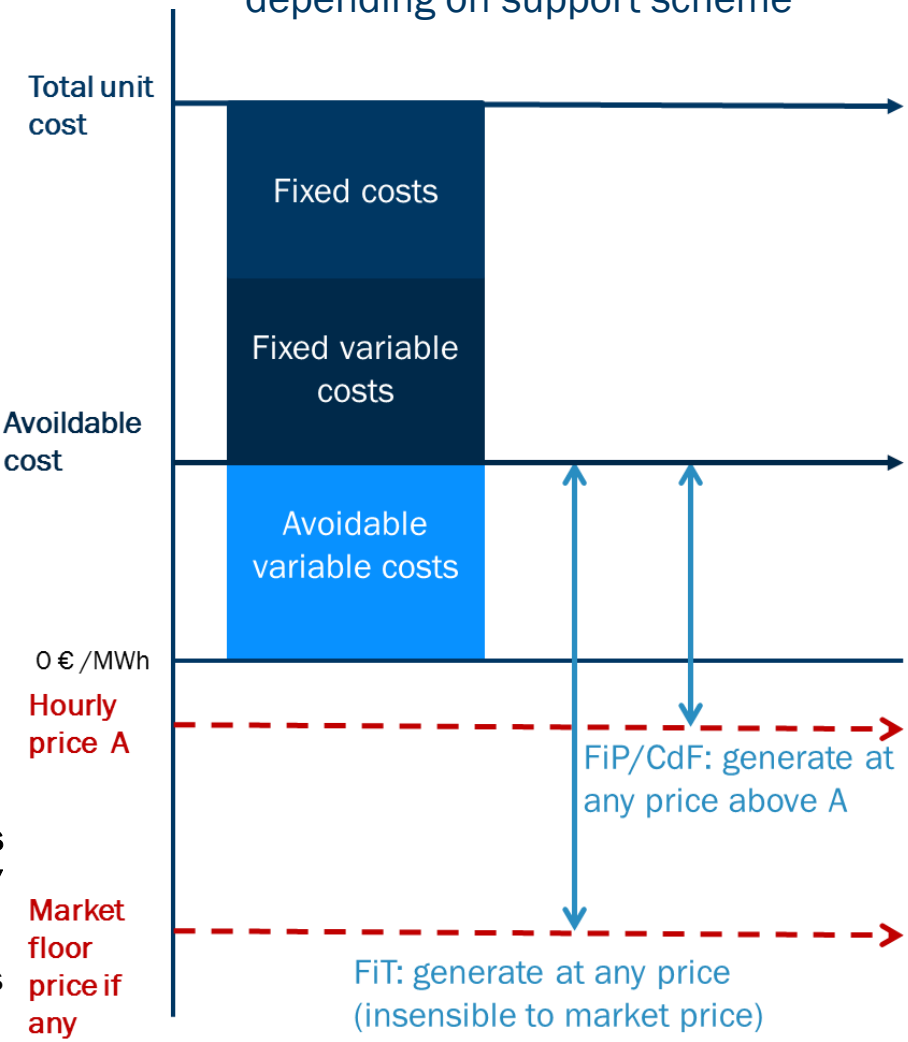
Illustration of the different RES support schemes



How RES support schemes can lead to negative prices

- **For all of the RES support schemes described the level of subsidy received by the plant increases with production.**
  - This results in an incentive to produce in hours where prices are below their avoidable costs, creating distortions in the merit order of the electricity market, and therefore increasing total generation costs to meet demand.
  - In markets which allow for negative prices (e.g. Germany or UK for balancing), these distortions can create artificial (and thus inefficient) negative prices.
- **The figure illustrates how the potential for dispatch distortion varies depending on the support scheme.** For each scheme it illustrates the price above which a RES producer is willing to generate.
  - In all cases this price is below the plants' avoidable costs. Thus, in all cases there is a certain potential range of prices which result in inefficient dispatch.
  - For instance, with a FiT the plant operator will produce at any price. The range of prices which lead to inefficient dispatch is greater the greater the size of the unitary support payment.
- **The Figure also illustrates that the potential for distortion varies depending on the cost characteristics of the plant (i.e. the fixed / variable cost ratio):**
  - The lower the avoidable variable costs the smaller the range of prices which lead to inefficient dispatch.

RES incentives to bid at negative prices depending on support scheme



EC guidelines for RES support schemes

EC State Aid Guidelines for design of RES support schemes

	Deployed technologies	Less deployed technologies (<[1-3%] in electricity production)	Small scale technologies (<1MW or <5MW / 3 units for wind)
Support scheme	FiP or equivalent Green certificates	FiP or equivalent Green certificates	Also FiT
Pricing	Transparent and competitive bidding process	Based on total levelised costs (- market price)	Based on total levelised costs (- market price)
Technology approach	Technology neutral possible to impose a minimum nb of techno	Per technology	Per technology
Energy marketing	Direct marketing	Direct marketing (not compulsory under GC)	Not compulsory
Balancing responsibilities	Standard balancing resp. if competitive intraday balancing market	Standard balancing resp. if competitive intraday balancing market	Not compulsory

EU State Aid Guidelines – Impact on RES generators

- **EU State Aid guidelines aim to integrate RES in power markets through the gradual introduction of market based mechanisms (Guidelines on State aid for environmental protection and energy 2014-2020 par {124}):**

"In order to incentivise the market integration of electricity from renewable sources, it is important that beneficiaries sell their electricity directly in the market and are subject to market obligations. The following cumulative conditions apply from 1 January 2016 to all new aid schemes and measures:

(a) aid is granted as a ***premium in addition to the market price*** *(premium) whereby the generators sell its electricity directly in the market;*

(b) beneficiaries are subject to standard ***balancing responsibilities****, unless no liquid intra-day markets exist;*

(c) measures are put in place to ensure that ***generators have no incentive to generate electricity under negative prices****."*

- **Issues to take into account:**

(a) **Moving from FIT to FIP increases the perceived investment risk for RES-e producers**. This could increase the rate of return requirements and the cost of capital – which could lead to an increase in RES project costs.

(b) **Currently, RES producers are subject to full or partial balancing responsibilities in 16 Member States**, eight of which make full balancing requirements mandatory.

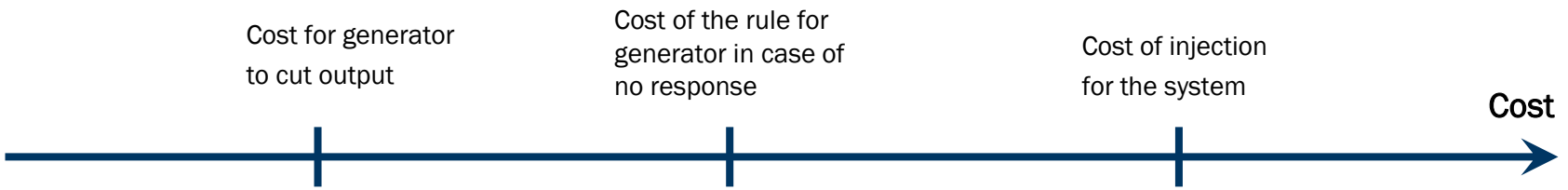
As a result RES generators (together with the relevant BRP) will have incentives to develop ancillary markets to cope with increasing load variability.

Balancing costs depend on the degree of penetration of RES. For low penetration levels, they are typically low: an overview of studies on balancing costs for wind gives estimates of the European Wind Integration Study on costs of managing the variability of wind ranging from EUR 2.1 to EUR 2.6 per MWh.

How to design an efficient “negative price” rule

- **For the rule to be efficient from the system cost point of view, it should meet the following (overlapping) three criteria**:
  - **Generators should have the technical ability to respond to the rule** by reducing or cutting power in the events when the rule applies. This means that the duration of the negative price event used as the rule trigger is compatible with the technical capacity to respond of the plant;
  - **The cost for a generator to cut the output in response to the rule (opportunity cost) should not exceed the cost to the system of the energy injection while the price is negative.** Otherwise, it is not efficient to induce this technology to shut-down during the negative price event. In this case, the rule may need to trigger not at a price below zero but below a negative value;
  - **The cost of the penalty for a generator in case it does not respond by reducing or cutting output should not exceed the cost to the system of the injection while the price is negative.** The currently envisaged level of penalisation is set at the level of the CfD payment, i.e. Strike Price minus the Reference Price.

- The last two bullets are illustrated below:



- **These criteria need to be adjusted to the cost structure and operating constraints of the different technologies** : PV, Wind, Nuclear, and Biomass.

EU State Aid Guidelines – Toward competitive bidding processes

The new guidelines foresee the gradual introduction of competitive bidding processes for allocating public support, while offering Member States flexibility to take account of national circumstances (par 126)

"From 1 January 2017, the following requirements apply:

***Aid is granted in a competitive bidding process on the basis of clear, transparent and non-discriminatory criteria**, unless:*

- *Member States demonstrate that only one or a very limited number of projects or sites could be eligible; or*
- *Member States demonstrate that a competitive bidding process would lead to higher support levels); or*
- *Member States demonstrate that a competitive bidding process would result in low project realisation rates (avoid underbidding).*

If such competitive bidding processes are open to all generators producing electricity from renewable energy sources on a non-discriminatory basis, the Commission will presume that the aid is proportionate and does not distort competition (…).

***The bidding process can be limited to specific technologies where a process open to all generators would lead to a suboptimal result** which cannot be addressed in the process design in view of, in particular:*

- *the longer-term potential of a given new and innovative technology; or*
- *the need to achieve diversification; or*
- *network constraints and grid stability; or*
- *system (integration) costs; or*
- *the need to avoid distortions on the raw material markets from biomass support."*

Concerns: Competitive bidding across technologies could hamper the deployment of immature RES technologies.

- The requirements focus on **static efficiency**, encouraging the deployment of those RES-e technologies that currently display the lowest cost. **Dynamic efficiency**, that is the promotion of continuous technical improvements with a longer-term perspective, is not taken into account.
- But **the flexibility provisions would mitigate this negative impact** as Member States could support immature technologies with dedicated support schemes.

Economic rationale for competitive tenders

Cost-efficiency gains due to the ability to reveal price information

- Information asymmetry between RES generators and the regulator, which does not have all the relevant information to determine a tariff/premium in line with industry costs.
- A bidding process, if appropriately designed, should lead RES generators to bid at the lowest rate, therefore revealing to the regulator information about the cost structure in the industry.
- Example: The Dutch SDE+ scheme shows substantial cost savings. Another example is Brazil, where the cost of wind power was halved since the introduction of auctions, even though it has to be noted that also other favourable circumstances played a role.

Long term directions for structural reform of RES support schemes: moving away from production based support to support for investment?

- This would eliminate completely adverse bidding incentives in power markets
- And align remuneration with the cost structure of the industry: high ratio of fixed/ variable cost of dominant technologies suggest greater role for competition on capital costs
- Example: the new Spanish RES support scheme

Conclusions

Conclusions

- **The new EC State Aid Guidelines reflect the increasing maturity of RES and aim to gradually introduce market based mechanisms :**
  - Transition from FIT to FIP should reduce distortions but not eliminate them;
  - Exposing RES generators to standard balancing responsibilities requires implementation of liquid intra-day markets so that imbalances can be hedged;
  - Measures to be put in place to ensure that generators have no incentive to generate electricity under negative prices should be differentiated by technology in order to minimize total system costs.

- **The new EC State Aid guidelines foresee the gradual introduction of competitive bidding processes for allocating public support:**
  - The requirements focus on **static efficiency**, encouraging the deployment of the lowest cost RES technologies. This will drive c**ost-efficiency gains due to the ability to reveal price information.**
  - **Dynamic efficiency**, that is the promotion of continuous technical improvements with a longer-term perspective, is taken into account through the flexibility measures for compliance given to each MS.

- **In the long term, RES support schemes should move away from production based support to support for investment**
  - This would **eliminate completely inefficient bidding incentives** in power markets
  - And **align remuneration with the cost structure of the industry**: high ratio of fixed/ variable cost of dominant technologies suggest greater role for competition on capital costs
  - This could eventually possibly lead to a level playing field across thermal and RES technologies through technology neutral auctions for investment

Merci pour votre attention

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