EWEA position paper on network tariffs and grid connection regimes (revisited)

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Main Messages

- Diverging network charges across EU member states lead to investment distortions and hold back an efficient deployment of wind energy in Europe.

- The structure of network tariffs and connection regimes are highly interdependent and must be evaluated and harmonised in a combined effort.

- The primary role of tariffs are to remunerate the grid reconstruction and maintenance. Distortive and non-harmonised tariffs will increase the system's long-term costs, which is ultimately borne by the system's customers.

- G-charges should be harmonised as soon as possible, and removed in the long term as future investment decisions will be driven by resource availability. These costs should, therefore, be socialised, as recognized by ACER.

- Locational and power based G-charges tend to penalise wind power plants. Therefore, G-charges should be energy-based and abstain from a general inclusion of locational signals. Locational signals should instead be provided by efficient congestion management.

- New generating capacity should not be charged the full cost of overall grid reinforcements emerging from their marginal contribution to the power system in comparison to older, exempted, power plants. Therefore, shallow grid connection charging regimes, both at transmission and distribution level, should be best practice across Europe, notably in Member States where power-based G charges and disproportionate locational signals apply in parallel.

- ACER should draft Framework *Guidelines for a Network Code on harmonised transmission tariff structures* as soon as possible, as provided for in the 3rd Liberalisation Package.

Rue d'Arlon 80 | T:+32 2 213 1811
1040 Brussels | F:+32 2 213 1890
Belgium | E: ewea@ewea.org

THE EUROPEAN WIND ENERGY ASSOCIATION asbl/vzw

www.ewea.org

1. Introduction and rationale of the paper

With ongoing energy market liberalisation, the increasing share of wind energy in the EU power system and the overall aim to have all power generators compete in a single internal market, there is a clear need to harmonise charges for access and use of the transmission and distribution network in order to create a level playing field and avoid investment distortions.

On a regulatory level, this objective is enshrined by the ITC-regulation requiring ACER to monitor the level of harmonisation of the charges to generators for use of transmission networks (also called G-charges) between countries and propose new limits on the latter by 2015[1]. Secondly, the 3rd Liberalisation Package provides the possibility of so-called EC-guidelines on G-charges aiming at progressive harmonisation of the principles for setting such charges[2].

Historically, the transmission grid was built by vertically integrated utilities to accommodate the first conventional power plants. These were mainly coal and fuel oil fired. Later, gas, large hydro and nuclear power plants were also integrated. The grid assets were developed with state subsidies and levies on electricity bills, thereby socialising all costs.

With the deployment of wind energy both in remote land areas and offshore, the question of how to charge use and access to the network has gained relevance. In this new configuration, it is not always most cost efficient to build generation capacity close to demand centres; investments are made taking into account resource availability.

In the context of this paradigm shift, the design of transmission and distribution (annual) charges and whether power plants should be charged to connect to the grid via, so-called, deep or shallow grid connection charges (one payment) is being looked at. The latter system requires generators to pay their grid connection to the closest point of connection available in the grid, which in the case of resource driven wind generators can be quite far from the existing network. In contrast, deep connection charges entail an extra charge for general grid reinforcements on top of the costs to connect to the closest point in the network.

An overview of network tariff structure and the application of different charges across Europe are presented.

[1] EU regulation 838/2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission charging.
[2] EU regulation 714/2009 on conditions for access to the network for cross-border exchanges in electricity.

2. Impacts of divergent charging regimes- The case for harmonisation

a) *Different G-charge in each country lead to investment distortions*

Recent studies find ample proof of the negative impact on the Internal Energy Market (IEM) of diverging generator transmission charges. A study by Frontier Economics concluded that a lack of harmonisation under the existing system of G-charges had three different types of impact on economic welfare, which could amount to €22 billion over the next 2 decades[3]:

- Distorted investment decisions. If generator transmission charges are high in market A, investors may opt to locate in market B and export power to market A. This would be inefficient if other aspects of cost (e.g. land or labour) were higher in market B.
- Distorted operational decisions. If a low cost generator in market A faces high transmission charges, it may not produce electricity, with demand instead being satisfied by a higher cost generator in market B where transmission charges are lower
- Increase investors' perceptions of risk and potential reduction of investments in power generation.

According to ACER,[4] energy based G-charges should be set equal to 0€/MWh, as they could distort competition and investment decisions in the internal market. ACER was required to provide their opinion to the EC regarding the need for harmonization of G-charges which are regulated under the Commission Regulation 838/20105 (part B). This regulation establishes that G-charges must be between 0-0.5 €/MWh, except Denmark, Finland, Ireland, Romania, Sweden and the UK (GB and NI). However it is not clear why these countries benefit from such exemptions, and how the levels have been determined. G-charges can be up to 1.2 €/MWh in Denmark, Finland and Sweden, up to 2 €/MWh in Romania and up to 2.5 €/MWh in the UK and Ireland.

Table 1. List of exempted countries to set different levels of G-Charges

G-charge range	Exempted countries
0-0.5 €/MWh	General rule
<=1.2 €/MWh	Denmark, Finland and Sweden
<=2 €/MWh	Romania
<=2.5 €/MWh	UK and Ireland

[3] Frontier Economics (2013) – Transmission tariff harmonization supports competition
[4] ACER opinion on the appropriate range of transmission charges paid by electricity producers (2014)- Annex A: http://www.acer.europa.eu/Official_documents/Acts_of_the_Agency/Opinions/Opinions/ACER%20Opinion%2009-2014.pdf
[5] Commission Regulation No. 838/2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission charging (2010) - OJ L250/5

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b) Locational signals acerbate investment distortions, even within one country

As presented in the Annex, G-charges within a country could differ depending on the specific location. The so-called locational signals, which distinguish between transmission tariffs according to the distance of the power plant to the main load, are increasingly applied in Member States (UK, Ireland, Sweden, Romania), as presented in table 2. These signals aim at internalising costs of transmission investments and incentivise generators to locate their power plant where the existing grid can accommodate the additional generation capacity with no or minimal additional investments.

However, locational signals tend to discriminate wind power generation since the choice of location when making an investment decision is driven by availability of resource rather than vicinity to load centres. Moreover, the cost of grid reinforcement accruable to wind power generation alone is highly dependent on where the wind power plants are located relative to load and existing grid infrastructure. It is not surprising that these costs vary greatly from country to country.

Table 2. Variable G-Charges across EU- 2012 values. Source: EWEA based on ACER 2014

Country	Min (€/MW)	Max (€/MW)
Great Britain	-16,380	27,060
Ireland	4,076	10,500
Northern Ireland	4,076	10,500
Sweden	2,500	6,300

Country	Min (€/MWh)	Max (€/MWh)
Romania	1.12	2.29
Portugal	0.43	0.55

For instance, while the annual average G-Charge in UK is 6,004€/MW, a generator located in one of the most windy areas in Europe (west Scotland) is charged the upper limit (27,060€/MW per year). At the same time a generator located in the south west, could actually be exposed to negative charges (incentive) as high a -16,380€/MW.

In order to reflect location constrains, the connection charges are the best vehicle to do it, as the locational signal would no longer have an effect on the marginal generation cost.

c) Power-based G-charges penalize generators with lower running hours

According to ACER, power-based G-charges may have significant distortive effects on investment decisions if they are not cost-reflective, lack proper justification or are not set in an appropriate and harmonised way[6].

Power-based charges penalise power plants with lower running hours, such as wind power plants. In a simplified theoretical example (table 3), we can see that a 30MW wind power plant producing an average of 2,000MWh/MW per year would face annual cost up to 180,000€ in the case of power based G-charges while they would be reduced to 60,000€ if energy based. A thermal unit with

[6] ACER (2014) – see footnote 4

significant higher running hours, would be exposed to the same cost (180,000€) while they would make use of the grid more time and their return from electricity sales will be 3 times higher. An energy-based charge would rightly correspond to the cost associated for an increased utilization of the grid.

Table 3. Simplified example to illustrate how capacity based G-charges penalize technologies which lower capacity factors

Type of Plant	System size (MW)	Capacity factor (h/y)	Total production (MWh)	Energy based charge (€/MWh)	Power based charge (€/MW)	Annual cost (€)
Wind Farm	30	2,000	60,000	0	6,000	180,000
Wind Farm	30	2,000	60,000	1	0	60,000
Thermal Unit	30	6,000	180,000	0	6,000	180,000
Thermal Unit	30	6,000	180,000	1	0	180,000

While acknowledging the potential distorting effect of power based G-charges, ACER unfortunately considers it is *"unnecessary to propose restrictions on cost-reflective power-based G-charges".*

3. Connection Charges- Fair accrual of grid reinforcement cost through grid connection regimes

Financing of grid reinforcements needs to be considered in the broader context of the development of the internal electricity market. Therefore, the benefits of grid development should not be related to an individual project or technology. Grid development benefits all producers and consumers and, consequently, its costs and benefits should be socialised.

In Sweden, for instance, grid operators are not required to incur the costs of grid expansion (deep connection charges). For connections in the far north of Sweden, it exists the so-called "threshold effect". This means that if reinforcement is required in a specific area, the first generator to ask for a connection would bear the whole investment cost (super deep). This fact contributes to delays in the expansion of renewable energy as it represent a too high cost barrier.

It is not possible to identify one (new) point of generation as the single cause of grid congestions and resulting needs for reinforcing the grid, other than it being 'the straw that broke the camel's back'. Consequently, the risk of adverse effects from allocation of costs necessary to accommodate a single new generation plant to that plant only (e.g. a new wind power plant) should be taken into account by regulators. In that regard, Shallow grid connection charging regimes should applied across Europe, as well as the basis for a harmonised approach on how to calculate them.

4. Conclusion and Policy Recommendations

Diverging network charges across EU Member States lead to investment distortions and hold back an efficient deployment of renewable energy sources. Network tariffs that include locational signals as well as deep connection charges need to be assessed against total system costs. New generation built close to demand centres may not be more cost effective once assessed on a life-cycle basis, since the reduced energy yield in a suboptimal location over the lifetime of a power plant can outweigh any anticipated savings in grid reinforcement costs.

The following recommendations should be reflected in *new electricity market design initiative* from the European Commission, as well as a forthcoming *EC Guideline or Network Code on harmonised transmission tariff structures*, as provided for in the 3rd Liberalisation Package.

With regard to variable G-Charges:

- ⇨ *If the market is to make the most cost-effective use of renewable resources across Europe, the plethora of G-charges should be harmonised as soon as possible, and removed in the long term as future investment decisions will be driven by resource availability. These costs should, therefore, be socialised.*
- ⇨ *In the meantime, injection charges should be energy-based and abstain from a general inclusion of locational signals.*
- ⇨ *The inclusion of locational signals in the harmonisation of network tariffs should be carefully evaluated. If locational signals are applied in a Member State they should be scrutinised against distortive effects on investment decisions. It is recommended to reflect locational signals in connection charges, rather than through G-charges. In any case, locational charging must be cost-reflective and be properly justified.*

With regard to first connection charges:

- ⇨ *A level playing field between new and existing generation on connection charges is necessary. New wind generating capacity should not be charged the full cost of overall grid reinforcements emerging from their marginal contribution to the power system in comparison to older, exempted, thermal power plants. Cases with very deep connection charges (i.e. "threshold effect") should be avoided.*
- ⇨ *Shallow grid connection charging regimes, both at transmission and distribution level, should be best practice across Europe, notably in Member States where power-based G charges and disproportionate locational signals apply in parallel.*

For further information please contact: Daniel Fraile at Daniel.fraile@ewea.org

ANNEX 1- Analysis of transmission and distribution network tariffs and grid connection charges

Network tariffs, both at the distribution and at the transmission level allow system operators (DSOs and TSOs) to recover the investments needed to operate and reinforce the grid infrastructure (“allowed revenues”). In practice, the allowed revenues are recovered through tariffs applied to generators (G) and load (L). In all countries, the L element of the charge represents the major share of the overall tariff, while a G-charge is implemented in some Member States. In addition to the G-charge, generators are usually also levied ancillary services, transmission losses and connection charges.
Each member state has developed a methodology to define a (network) tariff that will allow system operators to obtain the allowed revenues. The schemes will depend on some of the following parameters:

- **Load versus generation split**
- **Size:** it can be defined by the connected power and/or by the energy consumed/injected
- **Consumption patterns**
- **Network structure:** voltage levels and geographical areas (location);
- **Time:** seasonal and time-of-use (peak, off-peak, weekend etc.).

In a generic way, Network tariffs applied to generators can be structured as follows:

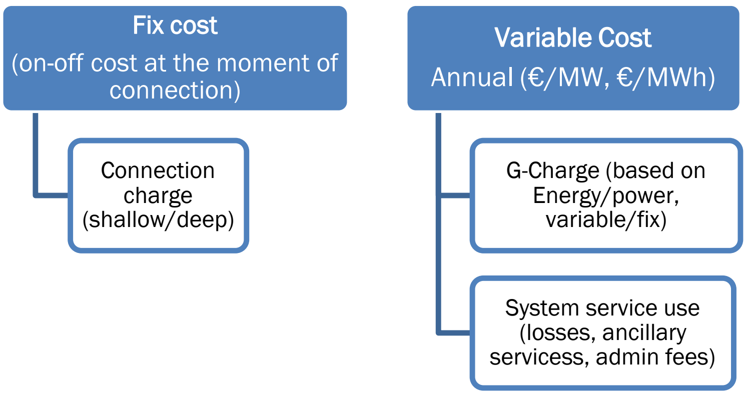

Figure 1. Generic structure of Network tariffs

This generic structure can apply to both transmission and distribution tariffs. While connection charges are always applied to generators, the application of the rest of costs items is dependent on network type, system size and country. At distribution level, small generator tend to be exempted from some of the variable charges. G-charges at transmission level do have a cross-border impact, and thus they are regulated at European level. Although it is important to note that not all components of Network tariffs are subject to European control and efforts for harmonization. The variable charges and levied associated to ancillary services and transmission losses, as well as the connection charges are excluded from the ranges set out in Commission Regulation[7].

[7] See footnote 1

a) <u>G-Charges across Europe</u>

Every Member state have a different strategy to define network charges. G-charges (at transmission level) are applied in 13 member states (see figure 2). Among these countries, four of them apply an addition charge which is directly related to the provision of ancillary services and energy losses (Austria, Belgium, Romania and Sweden).

As it can be observed in figure 2, there are two types of G-charges:

- Energy-based (charges payable on every unit of energy produced) or
- Power-based (charges payable on the capacity connected to the grid)[8] [9].

G-Charges can be fixed at a value for the whole national territory or can vary depending on the location. As presented in figure 2, five countries apply location-based variable charges. The distorting effects of energy vs power charges and the locational signal are presented in sections 2 of this paper

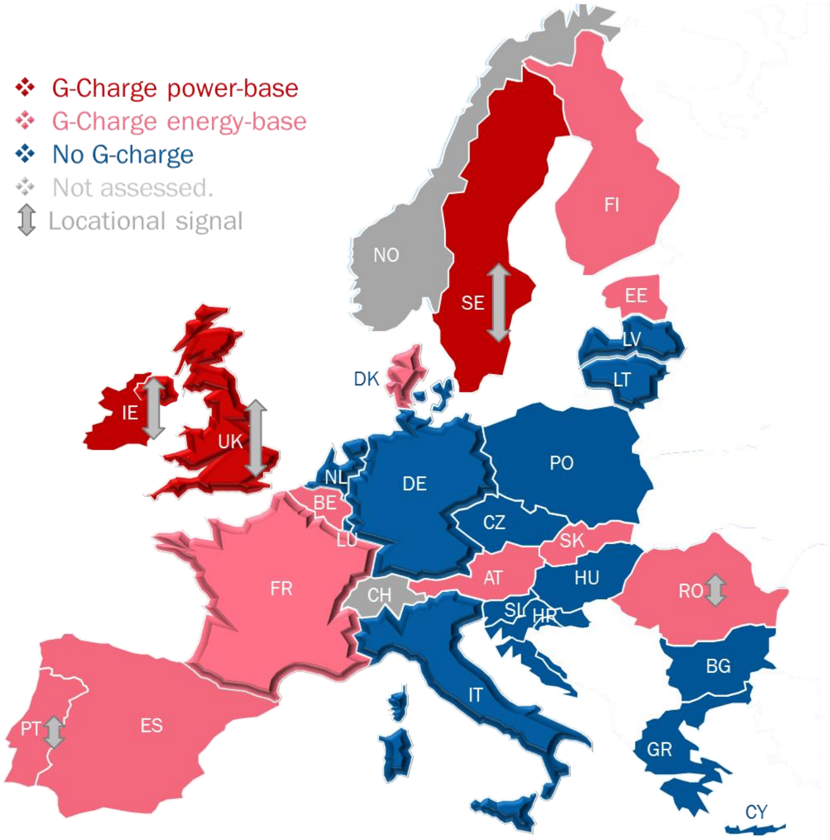

Figure 2 Transmission charges for Generators (G-Charges) across Europe. Source: EWEA based on ENTSO-e and ACER reports

[8] A full list is available at ENTSO-E Overview of Transmission Tariffs in Europe: Synthesis 2015 https://www.entsoe.eu/publications/market-reports/Documents/ENTSO-E%20Overview%20of%20Transmission%20tariffs%202015_FINAL.pdf

[9] ACER (2014) – see footnote 4

In most countries where G-charge exist, they are applied to generators irrespectively to the voltage level they are connected to, with a notable exception, France. In France only generators connected to high-voltage grid are exposed to these costs. In the UK, the charge is locational dependent, even negative, to incentive investments in local areas with strong demand and lack of generation.

Some countries however have introduced charge exemptions to small generators. For instance, in Austria plants below 5 MW are not exposed to these charges[10]. In Sweden plants below 1.5MW are exposed to a reduced tariff[11].

b) <u>Connection charges</u>

First connection charges are a one-off payment, generally applied to all generators. These can differ depending on the grid generators connect to. The following definitions used by ENTSO-E[12] can be used to classify them in both grids, distribution and transmission, although some connection charges do not fall exactly within this classification:

- ***Super-shallow:*** All costs are socialized via the tariff, no costs are charged to the connecting entity;
- ***Shallow:*** grid users pay for the infrastructure connecting its installation to the transmission grid (line/cable and other necessary equipment);
- ***Deep:*** shallow + all other reinforcements/extensions in existing network, required in the transmission grid to enable the grid user to be connected.

Connection charges level generally differ between transmission and distribution. In some countries, small renewable generators connected to the distribution grid are exempted (e.g. Denmark) or pay reduced fees (e.g. Finland). In general, the size of the generator, as well as the distance to the nearest point of connection have an impact on the type of the charge applied. At the transmission level, charges can also present locational signals. The following figures an overview of connection charges for both distribution and transmission level.

[10] Study on tariff design for distribution systems, AF Mercados EMI, Report commissioned by EC DG Energy, January 2015
[11] "Integrating Distributed Generation: Regulation and Trends in Three Leading Countries" , Cambridge University, December 2014
[12] See footnote 4

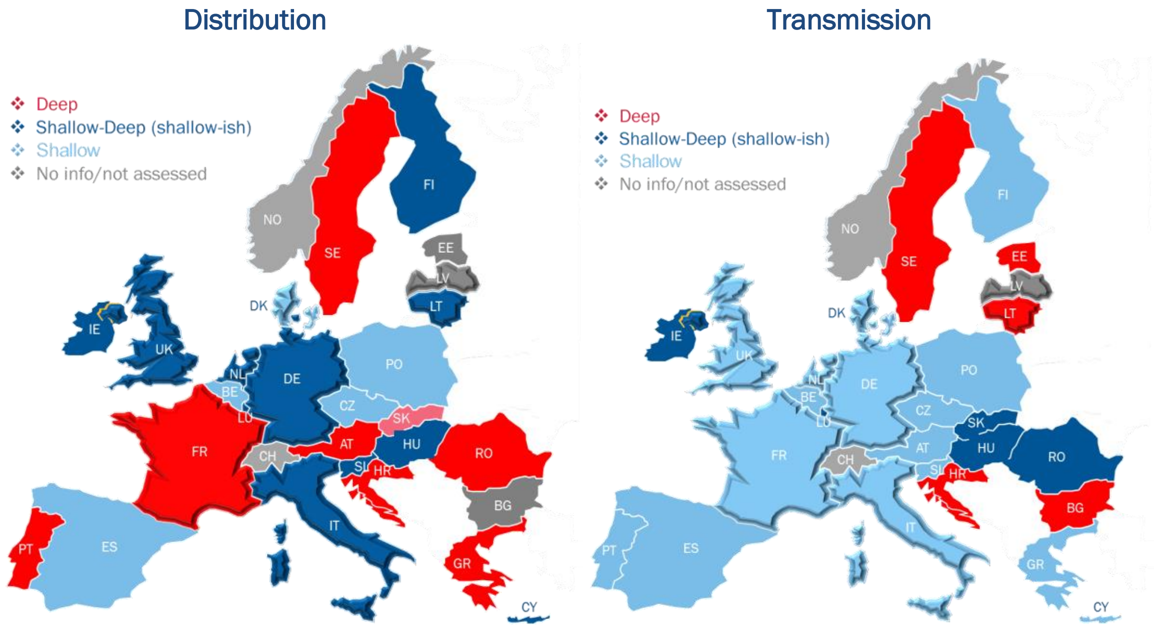

Figure 3. Connection charges for generation at distribution and Transmission level. Source EWEA analysis 2015, based on "Study on tariff design for distribution systems", Report commissioned by EC DG Energy, 2015, "Network tariff structure for a smart energy system", Eurelectric 2013, "Integrating Distributed Generation: Regulation and Trends in Three Leading Countries", Cambridge University, 2014, on ENTSO-E, 2015