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Submission To Ofgem Paper.  
Cap and floor regime:  
Update on our Initial Project Assessment of the  
Greenlink interconnector. 10th August 2015

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Glossary

Eirgrid, The Irish TSO

SEM, The Single Electricity Market in Ireland

BETTA, The British Electricity Trading and Transmission Arrangements

GB, Great Britain

SNSP, System Non Synchronous Penetration

SMP, System Marginal Price from which the wholesale price of electricity is derived in SEM

EP, Element Power

1. Price differentials between SEM and BETTA

Ireland currently has the third highest electricity prices in the EU while the UK is ninth<sup>1</sup>. Ireland is last on the gas pipeline in Europe and imports almost all its gas from the UK. Therefore, it is highly unlikely that the wholesale prices in Ireland will ever be lower than that of the UK. As we will see, gas will remain central to Ireland's electricity fuel mix into the future and will therefore set the SMP.

## **2. Requirement for conventional generators in the Irish system**

The Ofgem paper states *“that the preferred market design is more likely to use the unconstrained wholesale price in the day-ahead market (ie where wind is not curtailed and other generation is not constrained on)*

There is currently a requirement for five of the gas and coal power stations in the Irish system to be on load at all times<sup>2</sup>. The current SNSP limit is 50%<sup>3</sup> and plans are underway to bring this up to 75%. It is important to note that nowhere in the world has this level of SNSP being achieved<sup>4</sup>. As a result, there are significant uncertainties as to whether this can be achieved. Indeed, ESB Generation, operator of the majority of conventional generation in Ireland have highlighted these uncertainties to the Energy Regulator<sup>5</sup>:

*Due to the uncertainty associated with technical capability of the Irish generation fleet, ESB GWM does not believe that this is an appropriate response from the CER. If this modification is approved in principle, a future process is created whereby generators will need to seek a derogation for non-compliance with a standard that is not yet established as being feasible. Generators can only establish their level of compliance post completion of the technical studies.*

Therefore, curtailment of wind and *constrain-on* of conventional generators is a certainty in the SEM for the foreseeable future. In fact, logic would dictate that it will happen more frequently in 2020 than it will in 2015 as higher penetrations of intermittent and uncontrollable wind energy is allowed into the grid, requiring fast acting gas plant to balance it.

## **3. Impact of high wind penetration on Wholesale Prices in SEM**

The conclusion that one can draw from Part 2 above is that gas will still be the marginal fuel source in the I-SEM and will therefore set the wholesale price for all generator units. If we take two days, 2nd and 23rd February, 2015 we can see that on the 2nd, there was low levels of wind while on 23rd, high levels of wind energy :

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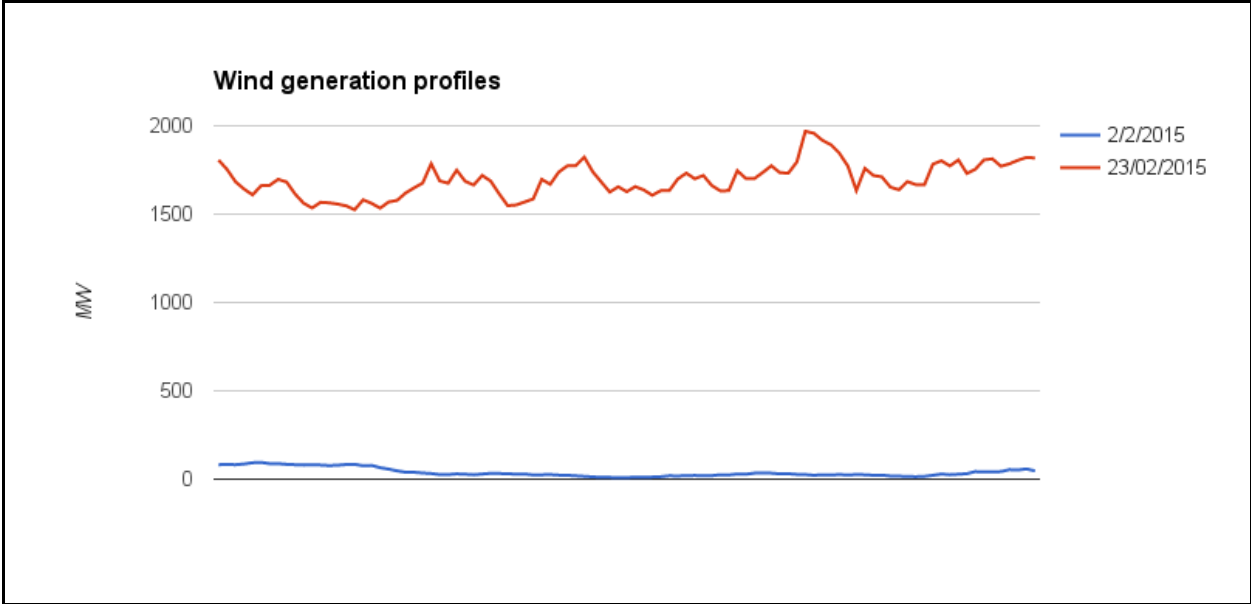
<sup>1</sup><http://ec.europa.eu/eurostat/documents/2995521/6849826/8-27052015-AP-EN.pdf/4f9f295f-bb31-4962-a7a9-b6c4365a5deb>

<sup>2</sup>[http://www.eirgrid.com/media/OperationalConstraintsUpdateVersion1\\_28\\_July\\_2015.pdf](http://www.eirgrid.com/media/OperationalConstraintsUpdateVersion1_28_July_2015.pdf)

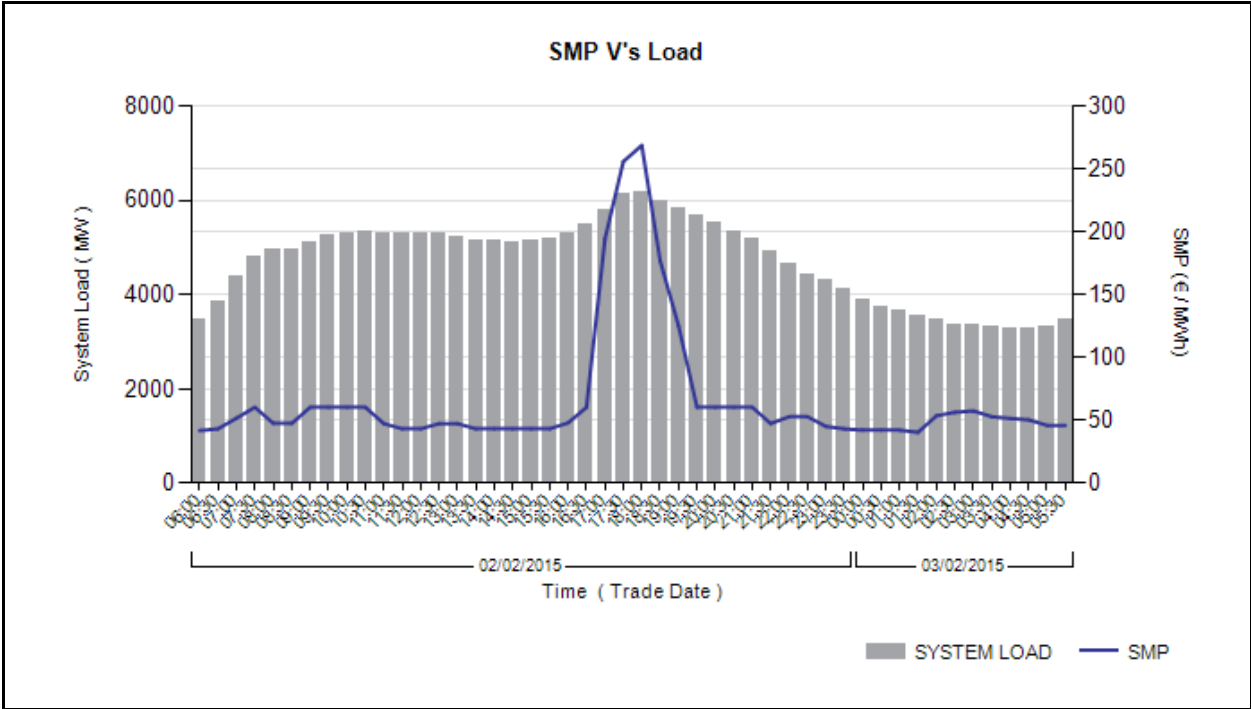
<sup>3</sup>[http://www.eirgrid.com/media/OperationalConstraintsUpdateVersion1\\_28\\_July\\_2015.pdf](http://www.eirgrid.com/media/OperationalConstraintsUpdateVersion1_28_July_2015.pdf)

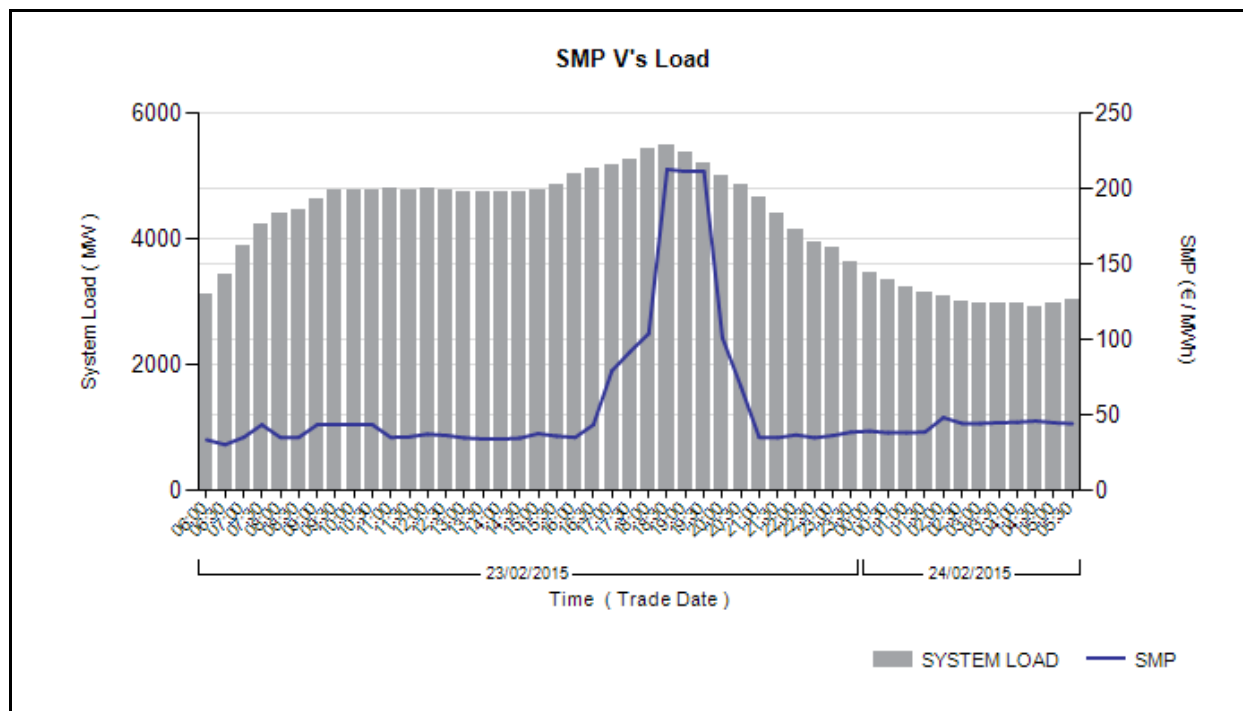
<sup>4</sup> This is because Ireland's installed wind capacity is high relative to its small demand.

<sup>5</sup><http://www.cer.ie/docs/000745/CER14081i%20ESB%20GWM%20Response%20to%20CER-13-143.pdf>



SEMO provides SMP data for each day. We can see that for both days the SMP is on average the same, around € 50 / MWh. This coincides with the prevailing gas price, which is currently around € 50-55 MWh.





So the impact of allowing higher penetrations of wind into SEM will have minimal effect on the wholesale prices.

#### 4. Reactive response / Inertia Services to GB from Greenlink

Ofgem's initial assessment states<sup>6</sup> :

*Reactive response - Reactive power availability on the transmission system affects voltage level. NGET manages voltage levels so that voltage is maintained. Interconnectors are able to provide reactive voltage support and displace the capital cost of reactive equipment required on the network. This benefit depends on the GB connection location however.*

The Irish system is simply not capable of providing reactive response to any other market.

There is a shortage of reactive voltage support in the Irish system as it is and uncertainty exists as to whether Irish conventional generators will be capable of providing stability **to the Irish system, let alone to the UK system,** under an SNSP of 75% (as explained in Number 2 above).

The HDVC East West Interconnector is classified as Non Synchronous by Eirgrid and therefore lacking in inertia<sup>2</sup>.

<sup>6</sup>[https://www.ofgem.gov.uk/sites/default/files/docs/2015/03/ipa\\_march\\_2015\\_consultation\\_-\\_final\\_0.pdf](https://www.ofgem.gov.uk/sites/default/files/docs/2015/03/ipa_march_2015_consultation_-_final_0.pdf)

## 5. Future Wind Generation Capacity in Ireland

Element Power's assumptions of 6GW for installed wind capacity by 2020 is significantly overstated. As can be seen in the below graph, Eirgrid estimated in 2009 that there would be 3,000MW of wind by 2014<sup>7</sup>.

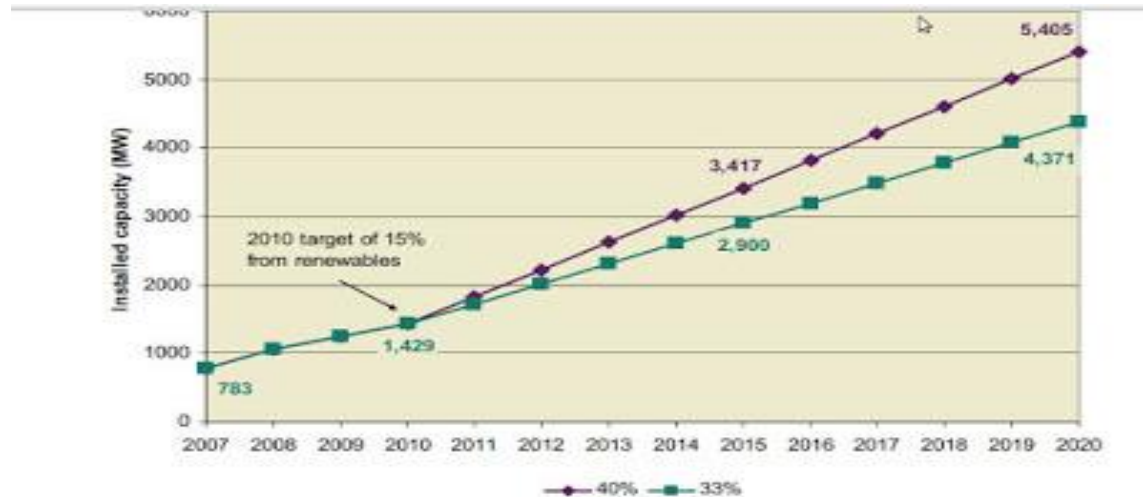


Figure 4-5 Linear projection of installed wind cap required to meet 2020 targets.

But in reality, there was only 2,211 MW of installed wind capacity at the end of 2014<sup>8</sup>.

Due to the fact that Ireland's renewable programme was deemed by UNECE Compliance Committee as been non legally compliant in July 2014<sup>9</sup>, many new wind farm applications are been challenged in the Irish Courts. This will lead to even more delays in the construction of new wind farms.

## 6. NSNP Limit on the Irish system

In the Ofgem paper, there is an assessment of *"Impacts of Greenlink on GB with NSNP limit excluded from I-SEM scheduling"*

It is envisaged by Eirgrid and SEMO that the NSNP limit by 2017 will be 75%. Nobody is suggesting that there will be no limit and that 100% wind will ever be allowed into the system :

<sup>7</sup>Eirgrid Generation Adequacy Statement 2009-2015  
<http://www.eirgrid.com/media/GAR%202009-2015.pdf>1

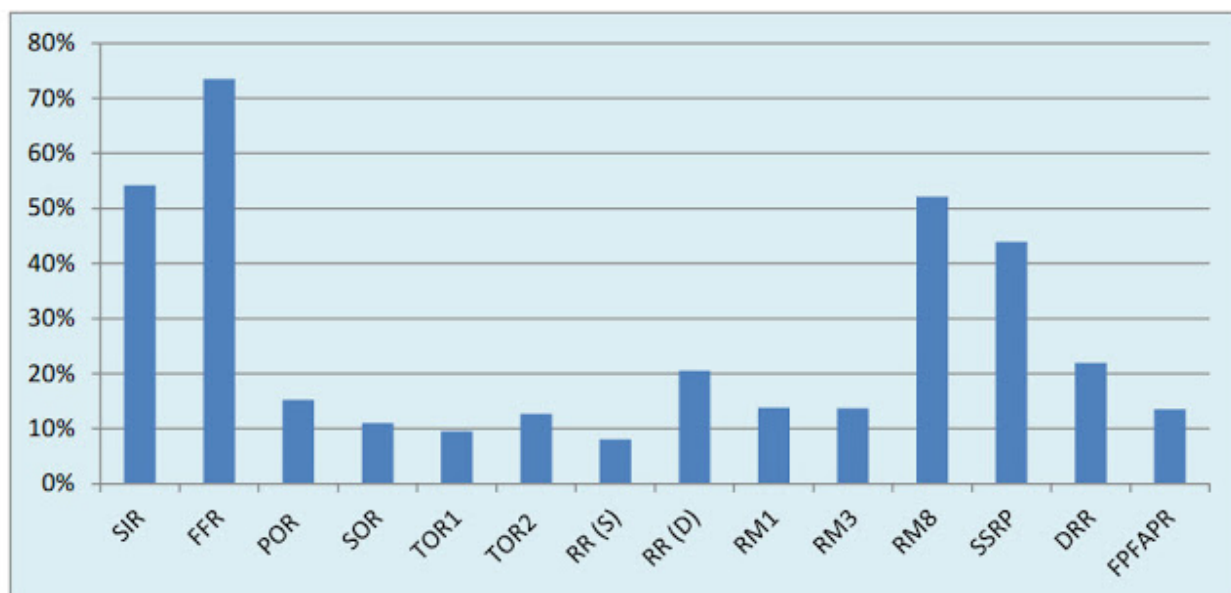
<sup>8</sup>Eirgrid All Island Wind and Fuel Mix Summary 2014  
[http://www.eirgrid.com/media/All\\_Island\\_Wind\\_and\\_Fuel\\_Mix\\_Summary\\_2014.pdf](http://www.eirgrid.com/media/All_Island_Wind_and_Fuel_Mix_Summary_2014.pdf)

<sup>9</sup><http://www.unece.org/environmental-policy/conventions/public-participation/aarhus-convention/tfwg/envppcc/pre-admissibilitycommunications/ireland-european-platform.html>

The DS3 Programme aims to address the various factors that influence the SNSP limit, with the ultimate aim of increasing the limit from 50% to 75%<sup>10</sup>.

Indeed, SEM-O are currently making arrangements for increasing the installed capability from conventional generators to maintain grid stability at 75% SNSP<sup>11</sup> :

Figure 4: Required Increase in Installed Capability to Achieve SNSP of 75% under the Selected Scenario



These generators will require compensation from the wholesale market for running on these low loads during high wind penetrations. It is well known among engineers that at these low loads, generators consume more fuel than on normal loads due to operation inefficiencies.

Even under the scenario that EP propose, given lower wholesale prices, and hence the exit of conventional baseload plant from the market, this benefit to GB will be negated by the loss of potential ancillary service benefits such as FFR envisaged in your recent analysis (as conventional plant will be shutdown).

The reason for an SNSP limit is to maintain inertia and system stability. If GB envisage benefits from lower wholesale prices in the Irish SEM due to large amounts of non synchronous wind, then it cannot expect to at the same time receive synchronous inertia services. In other words, both benefits are mutually exclusive, and you must only take account of one or the other in your analysis. Lower wholesale costs in Ireland means higher constraint costs for GB.

Therefore, the statement in your paper (5) below is flawed :

<sup>10</sup> Eirgrid DS3 Programme Brochure [http://www.eirgrid.com/media/DS3\\_Programme\\_Brochure.pdf](http://www.eirgrid.com/media/DS3_Programme_Brochure.pdf)

<sup>11</sup> SEM Committee, DS3 System Services Procurement Design and Emerging Thinking, 19th December 2014

*However, the combined effect of both changes, together with non quantified upside potential from fast frequency response, would potentially provide such a justification*

## **7. Curtailment of wind energy in the Irish system**

The most recent analysis of wind curtailment in Ireland shows that for 2013, total annual wind curtailment was 3.5% of total available wind energy<sup>12</sup>. As previously stated, the prevailing SNSP limit is 50%. Therefore, this demonstrates that SNSP (mostly wind) rarely goes above the 50% limit. One can then surmise that increasing the SNSP limit to 75% will not reduce curtailment of wind by any significant amount, simply because high levels of wind energy do not occur regularly in Ireland.

Wind maps for Europe show that the higher capacity factors for wind farms in Ireland occur in and around North and Western coastal regions<sup>13</sup>. EP are currently planning to construct two large wind farms in the Irish midlands<sup>14</sup> - an area with lower than average wind speeds, and consequently lower capacity factors.

Large amounts of surplus wind energy are simply not available to make this project feasible in terms of “a strategic piece of infrastructure which provides access to Ireland’s rich renewable resources”<sup>15</sup>.

## **8. Conclusion**

To summarise, If we assume that GB will benefit from lower wholesale prices as the Ofgem Paper suggests might happen, then conventional plant in SEM will be in financial difficulty resulting in their closure. This will mean zero inertia in the Irish system and zero voltage control leading to wide scale blackouts across the island of Ireland. Under this scenario, there will be no Irish electricity system for GB to import from. It is simply never going to happen. In any event, as we have shown in Part 3, wind energy has little effect on the wholesale price in the SEM.

We would advise that the Greenlink Project will not bring any benefits to the GB consumer or indeed the Irish consumer. The evidence shows that it is simply not economically feasible. In all likelihood, if the interconnector is built, GB will be importing relatively more expensive gas powered generation for most of the time.

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<sup>12</sup> [http://www.eirgrid.com/media/Annual\\_Wind\\_Constraint\\_and\\_Curtailment\\_Report\\_2013\\_Non\\_Technical\\_Summary.pdf](http://www.eirgrid.com/media/Annual_Wind_Constraint_and_Curtailment_Report_2013_Non_Technical_Summary.pdf)

<sup>13</sup> <http://turbotricity.com/training/wind-energy-information/>

<sup>14</sup> 120MW Emlagh Wind Farm (<http://emlaghwindfarm.ie/>) and 125MW Maighne Wind Farm (<http://maighnewindfarm.ie/>). <http://www.elpower.com/operations/markets/europe/ireland>

<sup>15</sup> Quote taken from EP statement on Greenlink project in March 2015

<http://www.elpower.com/news/greenlink-developers-disappointed-and-surprised-of-gems-minded-decision>