

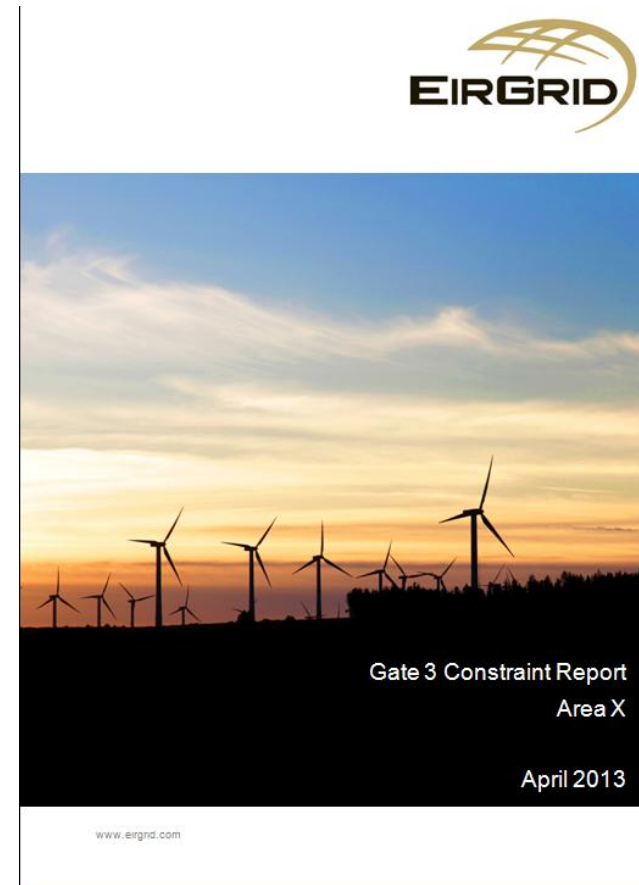
Gate 3 Constraint Report Results Overview

Customer Connections Forum
16 April 2013



Introduction

- Studies for the Gate 3 constraint reports have been completed following the publication of a final tie-break decision by the SEM Committee.
- High-level results are available.
- There are some general trends that have been observed in the results.
- Work is now in progress to produce and issue the detailed Gate 3 constraint reports.



Assumptions

Scenarios



- Two scenarios covered:
 - 33% uptake of Gate 3
 - This is achieved by derating all Gate 3 projects to 33% of their MEC.
 - 100% uptake of Gate 3
- The build-out rate is the same for both scenarios.



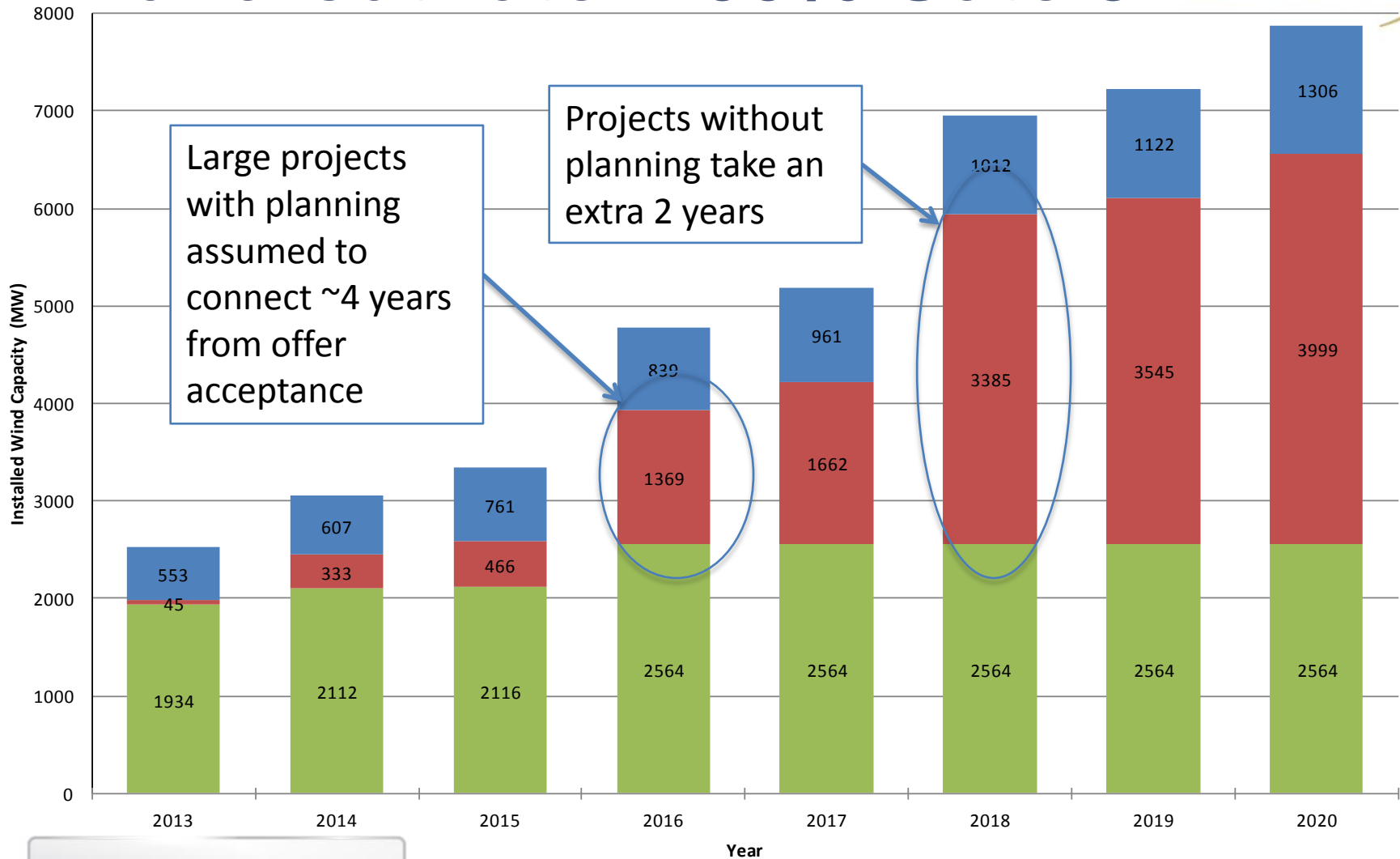
Build-out rate



- A methodology was developed in conjunction with IWEA to take account of factors other than shallow connection leadtimes.
- The data was based on survey responses from Gate 3 developers (70% response rate)
- Methodology takes account of:
 - planning permission status
 - location with respect to environmentally designated areas
 - project size
 - shallow connection leadtime
- Pre-Gate 3 is assumed to connect as per their target connection dates

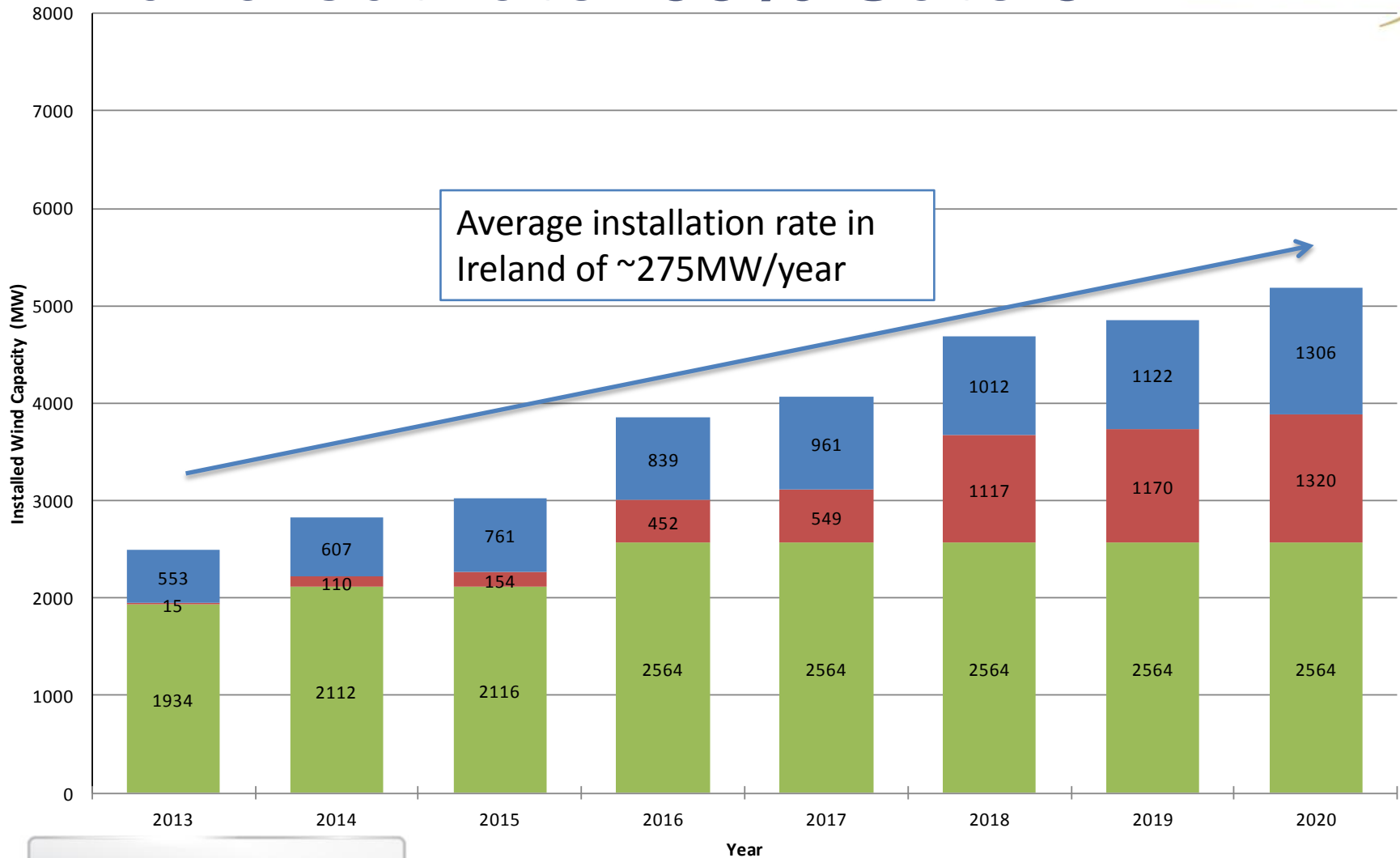


Build-out rate: 100% Gate 3



■ Pre Gate 3 ■ Gate 3 ■ Northern Ireland

Build-out rate: 33% Gate 3



■ Pre Gate 3 ■ Gate 3 ■ Northern Ireland

Northern Ireland



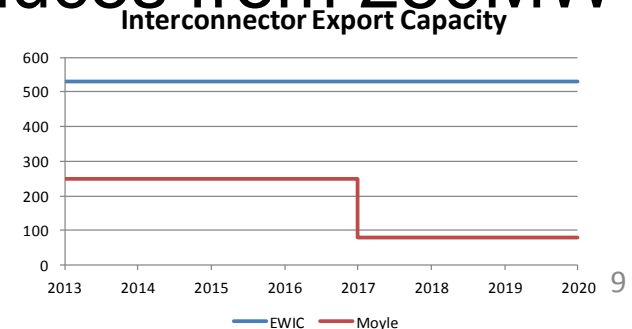
- We have an All-Island model based on SONI's wind and network build out data.
- There is a consultation in Northern Ireland on their connection process.
- Northern Ireland constraint reports are not being published at this stage.



Interconnection



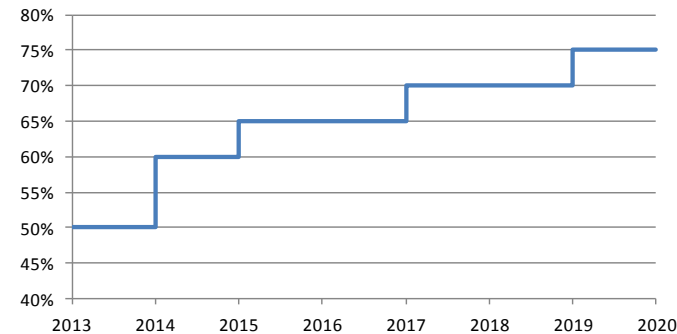
- We don't model imports.
- Both Moyle and EWIC export capacities are derated by 20% to account for trading imperfections etc.
- The model will export to avoid curtailment up to 80% of the interconnectors' capacity. This will be included in the reports.
- The Moyle export capacity reduces from 250MW to 80MW in 2017.



Operational rules



SNSP Limit

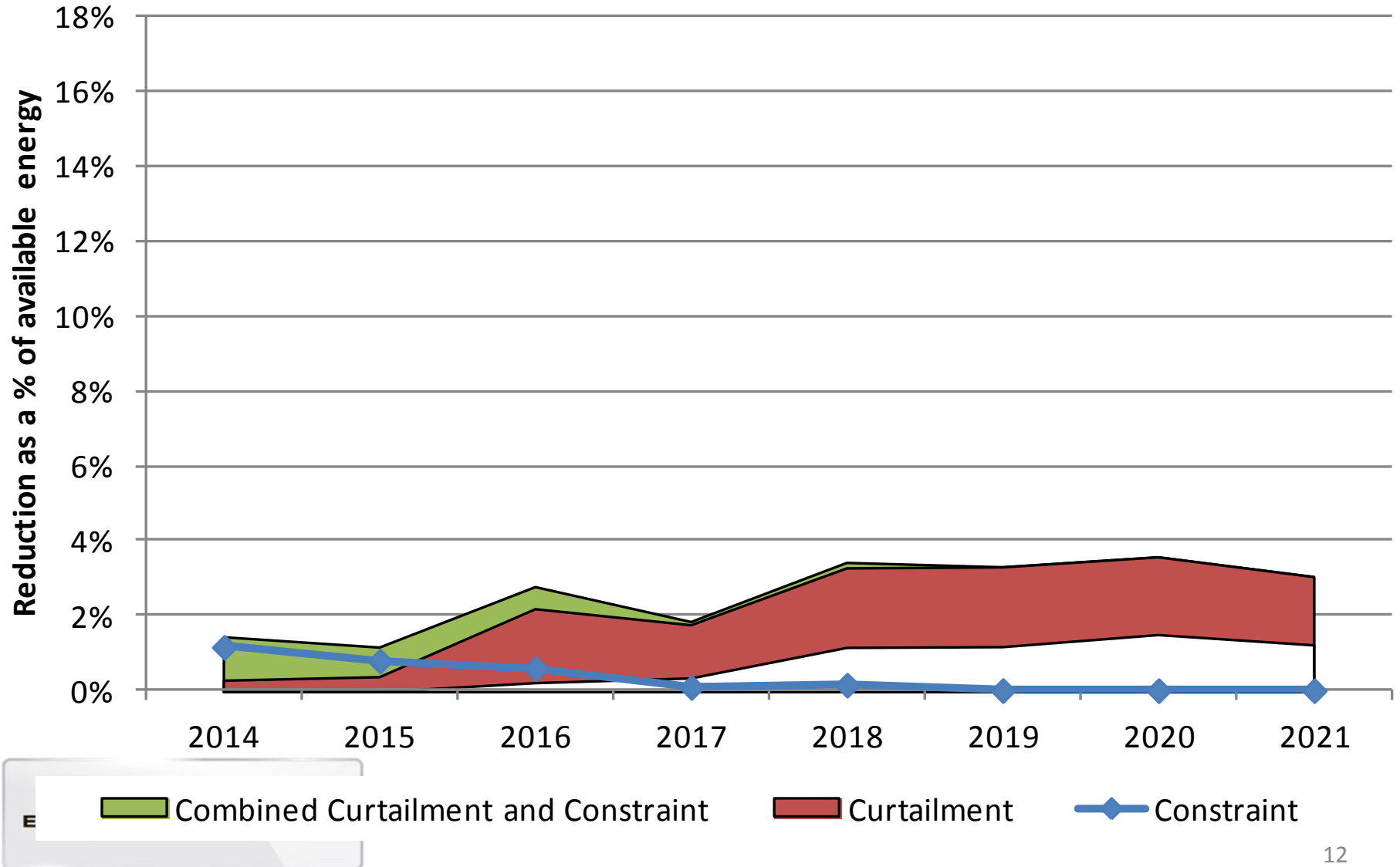


- SNSP limit increases from 50% to 75% over study period.
- Reserve (POR) is modelled.
- Regional constraints modelled:
 - At least 2 sets in Dublin until 2016 (inclusive)
 - At least one set on in Cork during the daytime until 2018 (inclusive)
- System constraints modelled:
 - 5 set rule in Ireland at all times + Sealrock and Peats
 - 3 sets in Northern Ireland before NS2, 2 sets afterwards

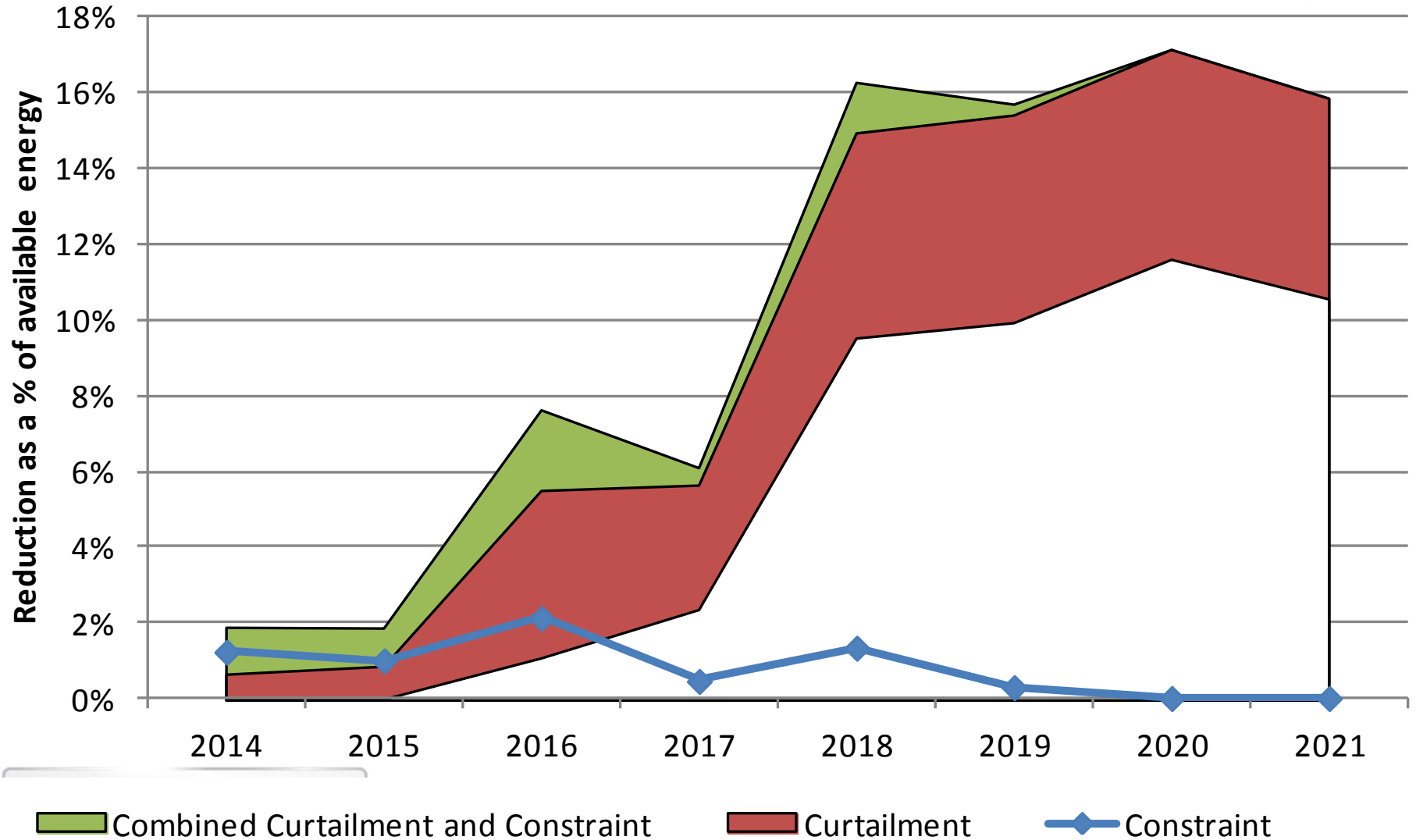


High level results

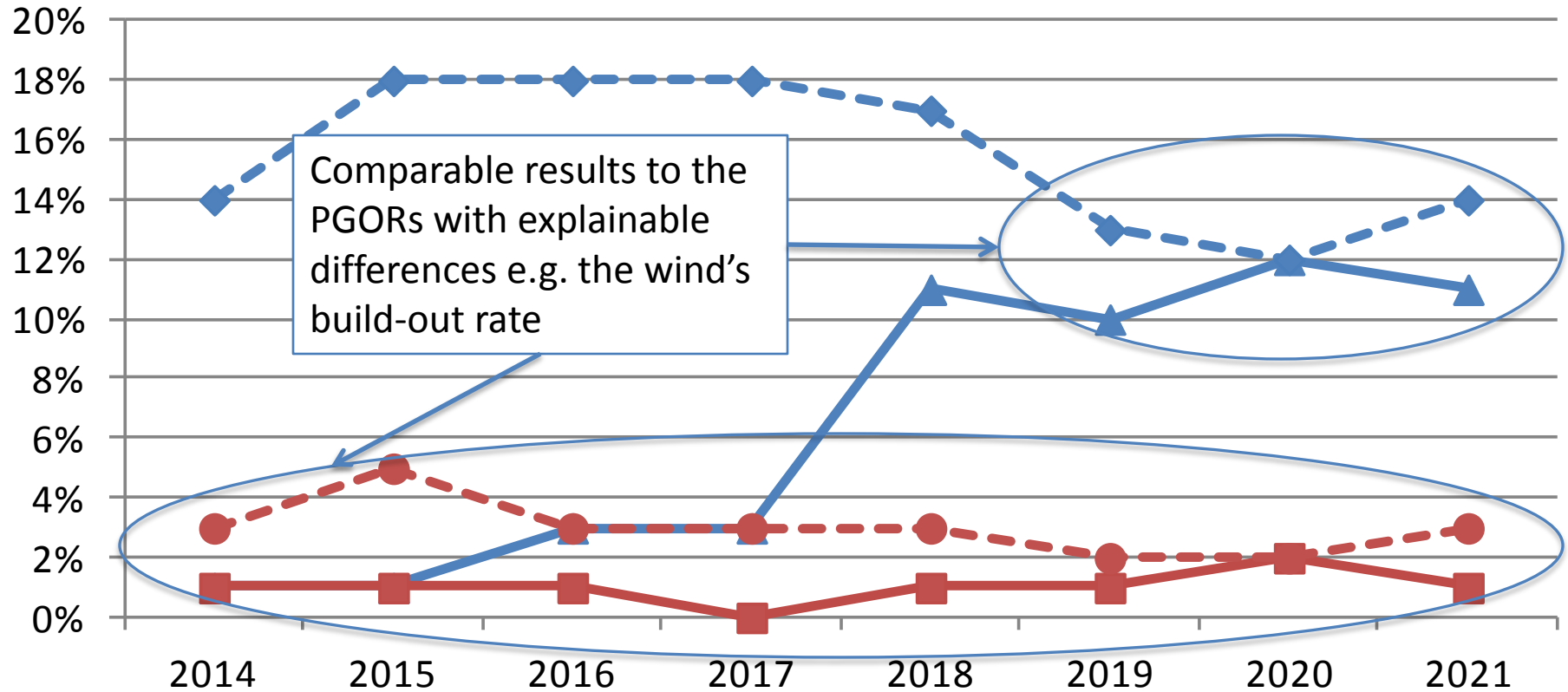
Overall 33% Gate 3 results



Overall 100% Gate 3 results



Comparison with PGOR results



—▲— 100% Gate 3: G3CR -◆- 100% Gate 3: PGOR
—■— 33% Gate 3: G3CR -●- 33% Gate 3: PGOR



Detailed results

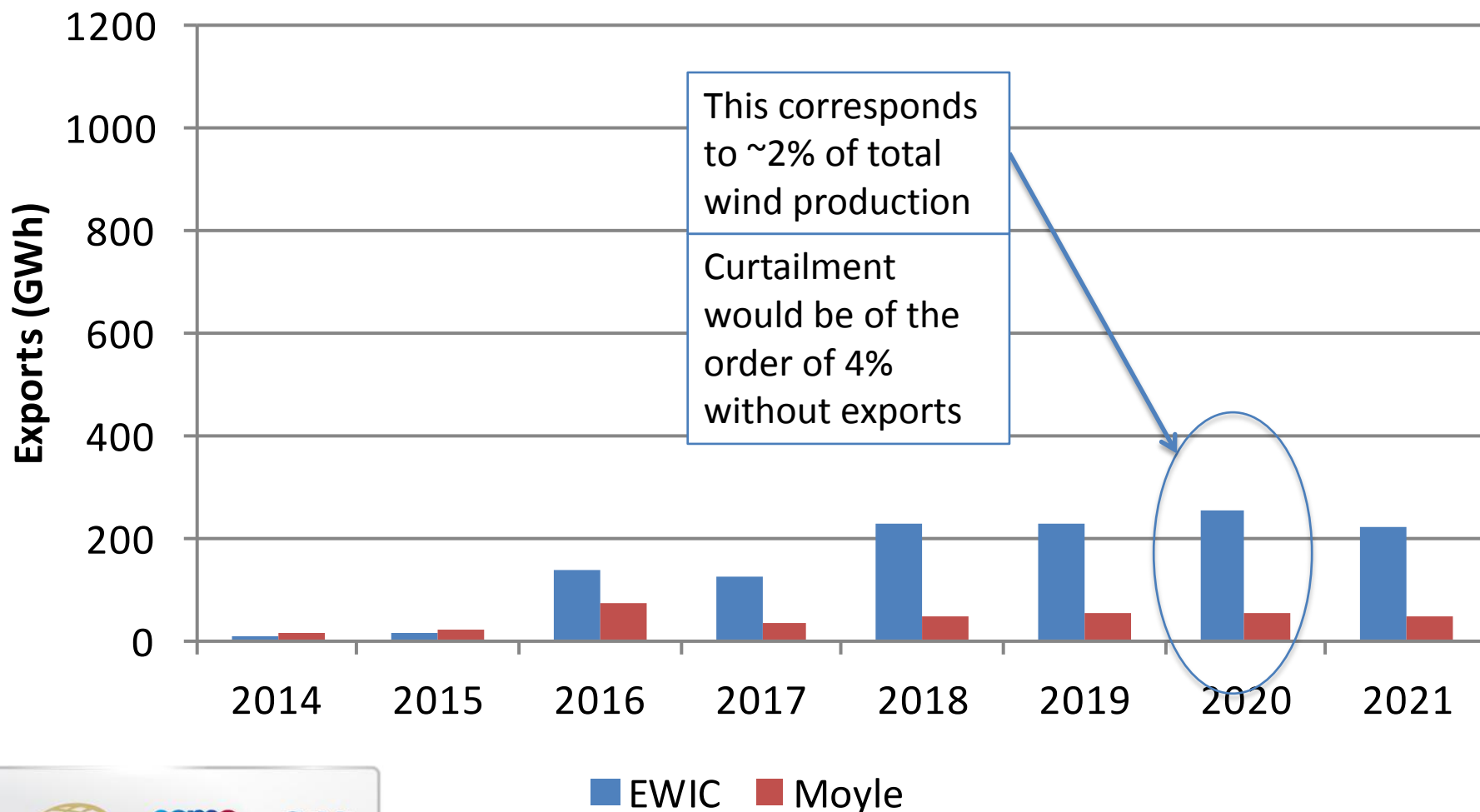
Interconnection results



- The model assumes that the interconnectors can be used to export wind up to the interconnector's derated capacity.
- This wind would otherwise be curtailed.
- The following slides provide some perspective on how the interconnector exports are influencing results.



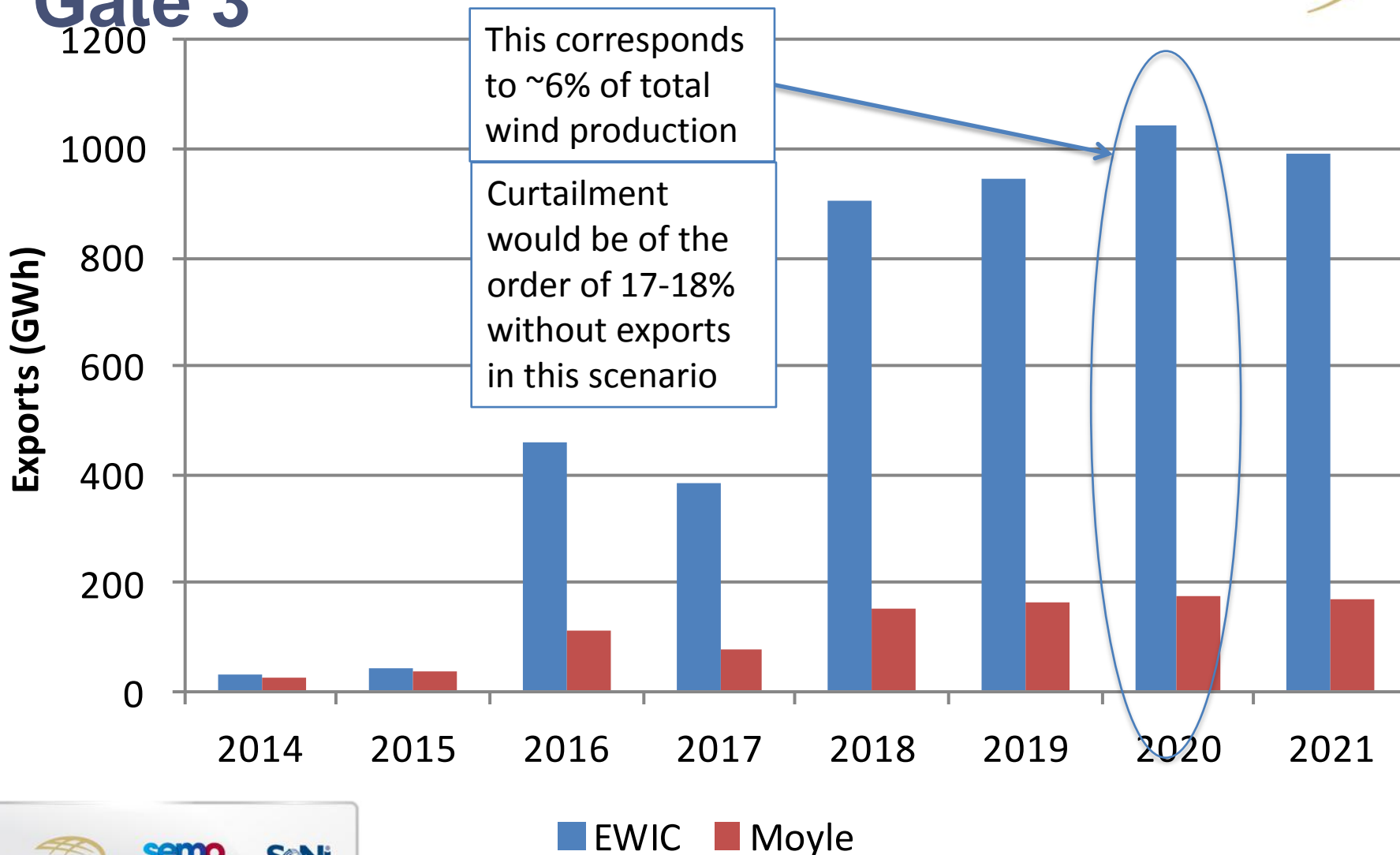
Interconnection results: 33% Gate 3



Interconnection results: 100%



Gate 3



Detailed results



- The following slides focus on parts of the network that have high levels of constraints for some individual windfarms.
- Individual windfarms with high constraints are mainly located in:
 - Donegal
 - Southwest (110kV and 220kV)
 - Mayo

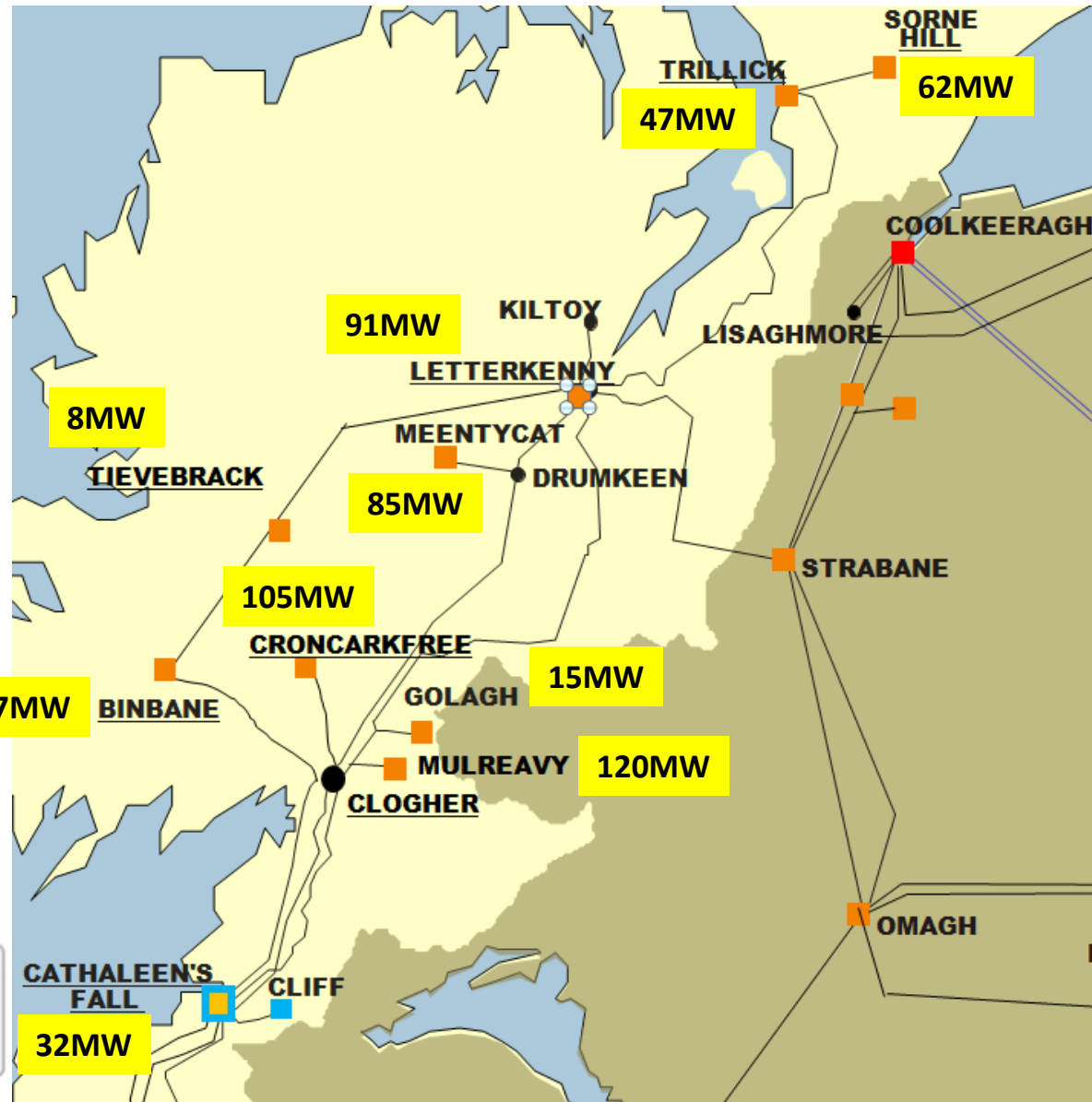


Donegal constraints



- Donegal is a constraint group today.
- Contingencies on lines south of Cathaleen's Fall affect all nodes in Donegal.
- It was assumed that these constraints would migrate northward as uprates were completed.

Donegal constraints



Pre-RIDP	1-5%
660MW in total	



Donegal constraints



- Our studies indicate that the constraint group may not get smaller.
- We believe curtailment may be binding before constraints bind.
- For example, it may take 450MW of Donegal wind to trigger constraints but curtailment could bind at 400MW.
- The constraints are relieved when RIDP is implemented (assumed to be 2020).



110kV Southwest constraints



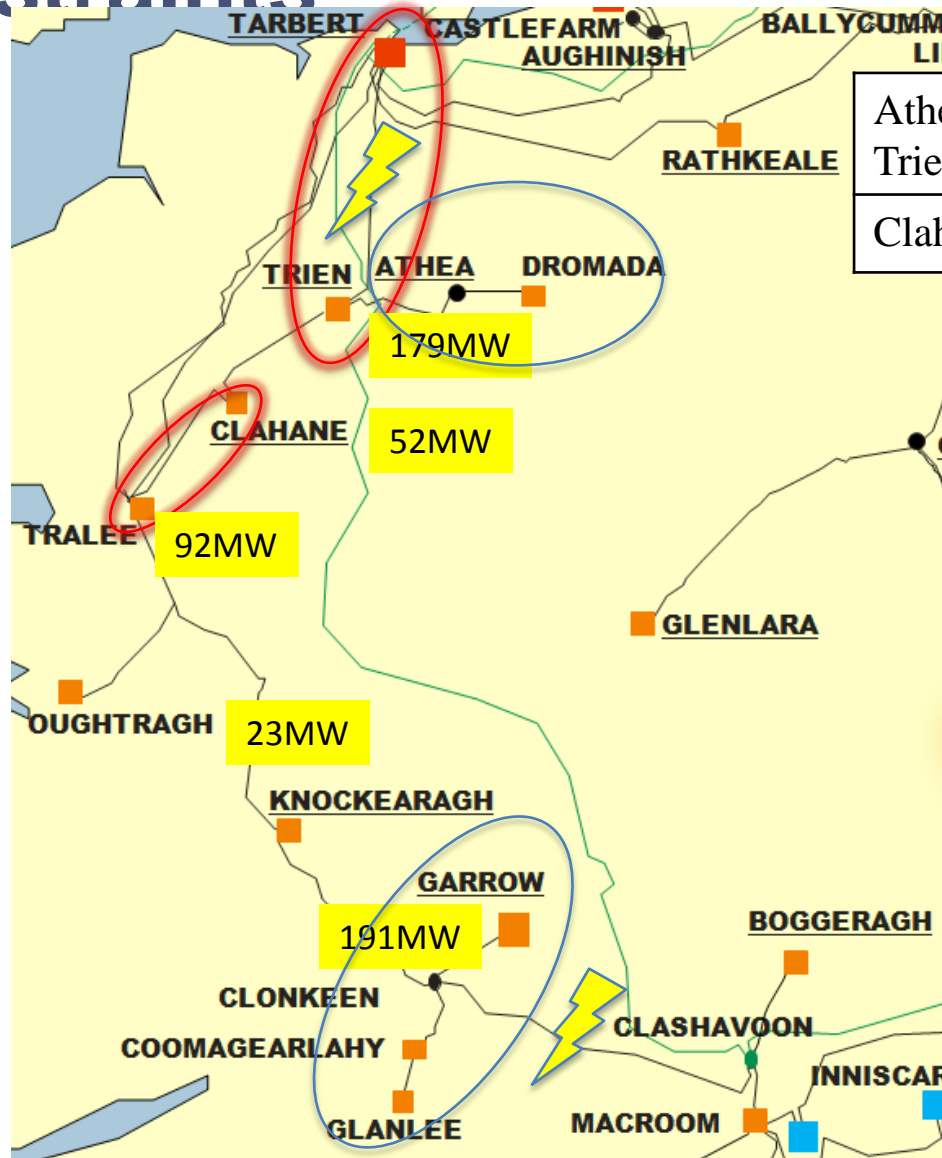
- Some constraints appear in the Southwest 110kV system in 2013/14 coinciding with wind connecting in North Kerry / West Limerick.
- These constraints are relieved when the wind on temporary connections transition to the 220kV system for their permanent connection in 2015.
- We didn't see this as a constraint group based on the Constraint Group criteria.



North Kerry/West Limerick 110kV constraints



The biggest constraint is Tarbert-Triem 110kV line their overloading for the loss of Clashavoon-220kV system 110kV alleviates these Clahane-Tralee 110kV constraints can also overload for the loss of Tarbert-Trien 110kV but this happens less often



Athea, Dromada, Triem	8-12%
Clahane	6-8%

537MW in total on this section of 110kV



220kV Southwest constraints



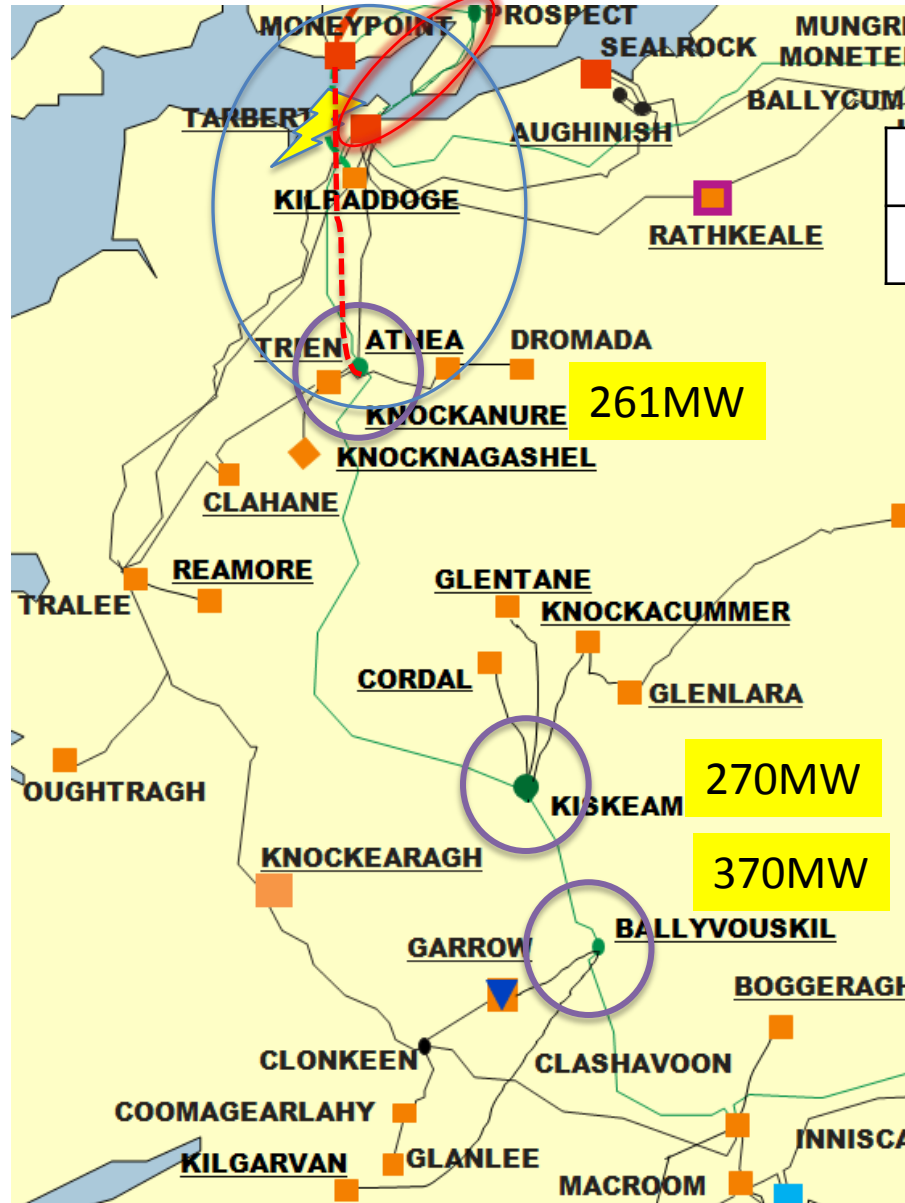
- The Southwest becomes a constraint group when the 220kV stations are built.
- Non-firm wind is constrained before other wind.
- Constraints become relatively high once all the Gate 3 wind connects in 2018 and before the Southwest reinforcements are completed in 2019.



Southwest 220kV constraints



The loss of Moneypoint
 The completion of an additional HV line in Kilpaddoge 220kV
 the Southwest is overloads Tarbert-Prospect 220kV.
 required to alleviate this constraint group.



G3 Non-firm	4-14%
G3 Partially-firm	8%

900 MW in total

•Indicative route for the purposes of this presentation



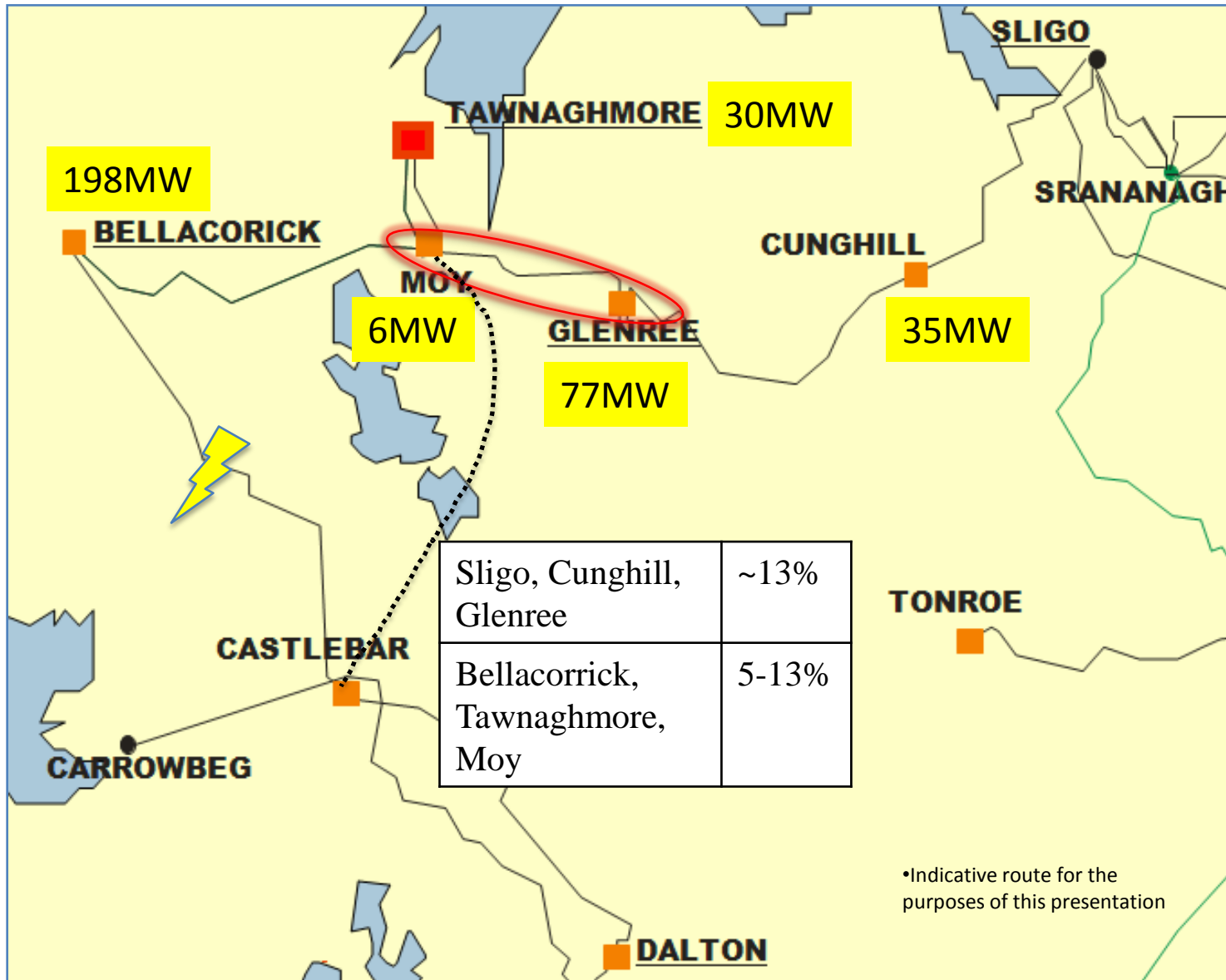
Mayo constraints



- Relatively high constraints begin appearing in 2016 when a large amount of wind is assumed to connect on the 110kV system.
- The constraints are relieved in 2018 when it is assumed that the Castlebar-Moy 110kV line is completed.
- Constraints appear to be largely driven by uprate outages.



West 110kV constraints



As a result of the increase in capacity of the Moy-Glenree 110kV line, the loss of Bellacorrick-Castlebar 110kV line is the most common constraint in this area.

The loss of Bellacorrick-Castlebar 110kV overloading Moy-Glenree 110kV line is the most common constraint.

Sensitivity studies



- We carried out some sensitivity studies to try and answer some questions that we anticipated might be asked:
 - What are the underlying constraints if curtailment is removed?
 - Discrepancy between study results and curtailment that is currently experienced
 - Impact of restricted coal running (Moneypoint has a min gen of 99MW per set)



How would imports effect curtailment?



- We modelled a 2013 case with flat-out imports on both interconnectors.
- There is ~340MW more wind in the 2013 case compared to today's wind but the results should give some insight into how imports could effect curtailment and go some way toward explaining how curtailment levels today compare to results from our base case.
- The results indicate curtailment in the order of 4-5% compared to <0.5% in the 2013 base case.



Effect of Moneypoint not running



- A sensitivity case was studied to investigate the effect that not running Moneypoint would have on curtailment.
- Bearing in mind that there are minimum generation requirements on the system, not running Moneypoint can act to increase curtailment since its sets have relatively low min gens.
- Results indicate if CCGTs are ran in place of Moneypoint, overall curtailment increases by~1% in the 2020 33% Gate 3 case.



Minimised curtailment



- Another sensitivity case was studied to investigate the underlying constraints on the system if curtailment was minimised.
- Curtailment was minimised by artificially increasing interconnection
- Results indicate overall constraints in this case are $<1\%$ for the 100% Gate scenario in 2020



Observations on constraint results



- Average levels are low for all years.
- There are some nodes that will have high constraints:
 - During uprate outages
 - Until uprates or new builds are delivered
 - Inside a constraint group



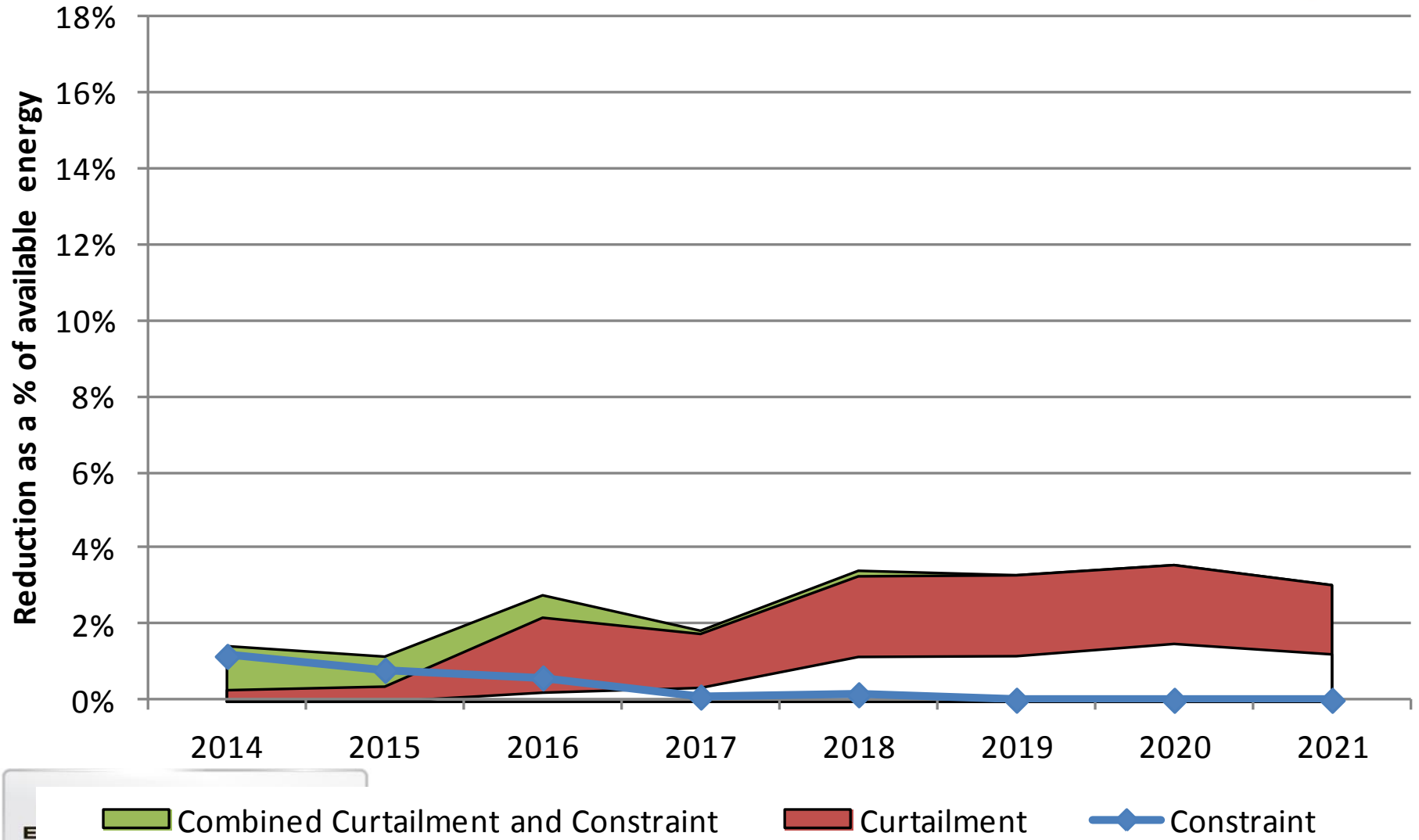
Observations on curtailment results



- High levels of curtailment if all of Gate 3 connects.
- Low levels of curtailment in the 33% Gate 3 case assuming:
 - Exporting of excess wind on the EWIC and Moyle
 - DS3 can deliver 75% SNSP
 - No additional operational constraints to those modelled in the study



Overall 33% Gate 3 results



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Overall 100% Gate 3 results

