Wind Dispatch Down Reports

User guide

31 May 2016

EIRGRID GROUP

1. PURPOSE OF DOCUMENT

The purpose of this document is to provide information on the data inputs, the calculation methodology and the outputs for the wind dispatch down reports which use information from the Wind Dispatch Tool in use in the Belfast and Ireland and Northern Ireland control rooms.

2. BACKGROUND

The EU Renewable Energy Directive (2009/28/EC) requires TSOs to prioritise renewable energy generation. Sometimes measures are taken to turn-off or dispatch-down renewable energy for system security reasons. In these circumstances TSOs must report this to the regulatory authorities.

In 2011 the TSOs began publishing an annual renewable dispatch down report to satisfy the requirements set out in the EU Renewable Energy Directive. This report used data available from the Single Electricity Market (SEM) for a certain type[1] of controllable windfarm in Ireland and Northern Ireland. The data in SEM did not define whether dispatch down was due to curtailment or constraint, therefore this was estimated by the TSOs based on an agreed set of assumptions with industry, as outlined in the annual reports.

Since 2013 the TSOs have issued quarterly reports to a certain type[1] of controllable windfarm in Ireland and Northern Ireland. The reports and the assumptions were developed in conjunction with industry through the DS3 Advisory Council in order to aid transparency on the level of curtailment and constraint applied to windfarms. Similar to the annual reports, the differentiation of the level of curtailment and constraint is estimated based on available data. These reports were issued one quarter in arrears as the full data set was not available until then.

In late 2014 a new all-island wind dispatch tool went operational in both control centres in Ireland and Northern Ireland. This new wind dispatch tool introduced a number of improvements over the existing systems which were in use to dispatch down-wind as follows:

1. Improved distribution of curtailment levels for controllable windfarms was achievable;
2. Clear categorisation between curtailment or constraint;
3. Clear reasons for why a curtailment or constraint was applied called a ‘reason code’ was now available;
4. Easier access to dispatch instructions and windfarm data;
5. Each instruction is timestamped with instruction time.

[1] The data obtained was for windfarms which were registered in the SEM as Variable Price Taking Generators (VPTGs). The level of constraint and curtailment for Autonomous Price Taking Generators (APTGs) was estimated based on the level of constraint and curtailment applied to VPTGs.

Due to these improvements the TSOs committed to investigating whether a more accurate report could be issued to all controllable windfarms, therefore removing the need to estimate the level of curtailment and constraint applied. Over the last nine months the TSOs have engaged with Industry on developing a new report template and calculation methodology using more accurate data from the Wind Dispatch Tool used by the control centres in Ireland and Northern Ireland.

3. OVERVIEW OF WIND DISPATCH DOWN REPORTS

3.1. Data Inputs

Active Power Output: The one minute SCADA MW signal of the active power output received from the windfarm will be used in the calculation as this real-time signal received from the windfarm is used by the Wind Dispatch Tool when calculating the level of pro-rata dispatch down to be applied to an individual windfarm. This one minute value is then averaged to a 30 minute value which will be made available in the excel report due to the volume of data. Note that this 30 minute aggregated value will differ from the metered active power output as it is based on the windfarms own SCADA value;

Available Active Power: The one minute SCADA MW signal of the available active power received from the windfarm will be used in the calculation as this real-time signal received from the windfarm is used by the Wind Dispatch Tool when calculating the level of pro-rata dispatch up to be applied to an individual windfarm. This one minute value is then averaged to a 30 minute value which will be made available in the report due to the volume of data. For the avoidance of doubt this signal is subject to minimum quality standards as set out by the TSOs. If the windfarm signal is outside of the minimum quality standards as reported by the TSOs for any one month period during a reporting period then this could result in the level of curtailments and/or constraints applied to this windfarm being disproportional when compared to other windfarms, due to the inaccuracies in the signal sent by the windfarm to the TSOs. This windfarm should cross check the signal accuracy reports in the first instance if there are any queries in relation to the level of dispatch down applied;

Dispatch Instruction: The instructed curtailment or constraint MW value, with the exact date and time, will be used in the calculation as per that issued by the Wind Dispatch Tool. Each curtailment and constraint also has a corresponding reason code applied by the control rooms which will also be included in the report. Dispatch Down by the TSOs is considered applicable if the following reason codes are used:

- Curtailment
    - System Non-Synchronous Penetration (SNSP) Issue
    - Rate of Change of Frequency (RoCoF)/Inertia
    - High Frequency/Minimum Generation
- Constraint
    - TSO Constraints
- TSO Testing

If the following reason codes are utilised the dispatch down is considered to be outside of the control of the TSOs:

- Developer Testing
- Developer Outage
- DSO Constraints

Windfarm Capacity: The minimum of the installed capacity (MW) and Maximum Export Capacity (MW) will also be used in the reports;

Region: The geographical region in which the windfarm is located will be reported as follows:

- Ireland: North West (NW), West (W), South West (SW), South East (SE), North East (NE) and Midlands (M).
- Northern Ireland

A list of the windfarms and the corresponding categories can be found in Appendix A.

Contact Details: The reports will be issued by email to all controllable distribution and transmission windfarms in Ireland and Northern Ireland. The TSOs will keep a contact list for each windfarm and it will be the responsibility of the windfarm to ensure their contact details are kept up to date. Any changes should be notified to RenewableReports@EirGrid.com.

3.2. Calculation

The dispatch down energy level of a windfarm is generally defined as the difference between its Available Active Power and Dispatch Instruction. In the case of simultaneous constraint and curtailment Dispatch Instructions the TSOs propose using a methodology called fixed horizontal slicing for dispatch down and dispatch up, with a minor difference for removing an active curtailment.

3.2.1. Dispatch Down

The wind dispatch tool issues Dispatch Down Instructions to windfarms on a pro-rata basis according to their Active Power output at that point in time. The type of dispatch down, either curtailment or constraint, therefore applies to the Active Power values only below this point and down to the new Dispatch Instruction and hence the fixed horizontal slicing approach. The fixed horizontal slicing is shown in Figure 1 and a worked example of this is included in Table 1. In Figure 1 the curtailment layers are coloured green and constraints blue. The Dispatch Instructions are listed along with every Dispatch Instruction (layer), e.g. “CURL 20” indicates a curtailment Dispatch Instruction issued to the windfarm down to 20 MW and LOCL 15 indicates a local constraint Dispatch Instruction issued to the windfarm down to 15 MW. In the case of reduction of the Active Power Output, the layers above the new Dispatch Instruction remain categorised as they were initially i.e. colour on the way down.

3.2.1. Dispatch Up

When an active Dispatch Instruction is relaxed then the horizontal slicing cuts through the layers. As shown in Figure 1 when a constraint Dispatch Instruction to 27 MW (LOCL 27) is issued i.e. do not colour on the way up. Note that if a curtailment is relaxed then this is limited by the lowest active constraint if applicable.

There is however an exception to this approach when there was both curtailment and constraint on a windfarm and the active curtailment is fully removed. In this instance it would not be appropriate to continue to categorise some of the dispatch down volume as curtailment. In this instance the volume of dispatch down will be categorised as constraint. An example of this is shown in Figure 2.

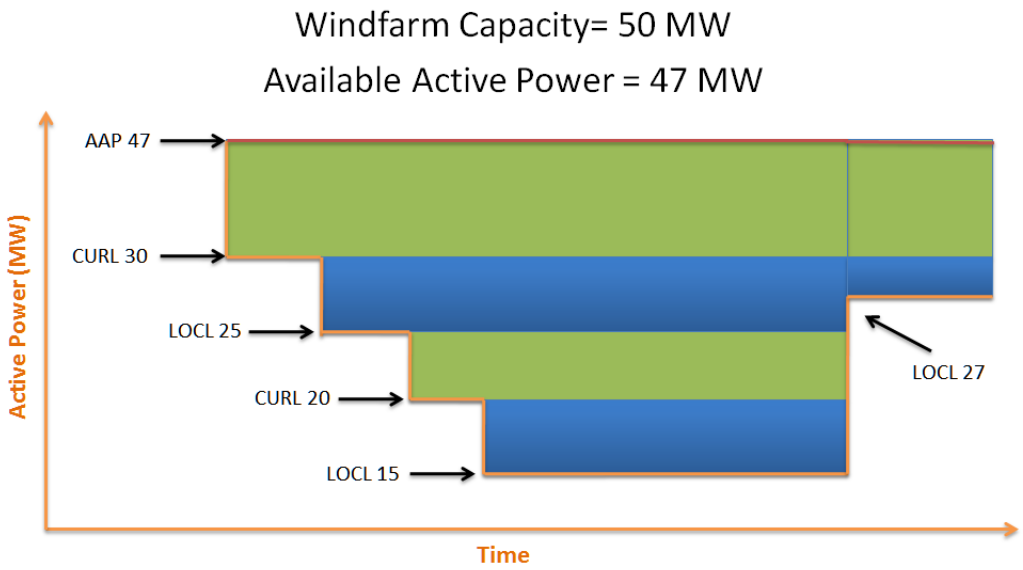


Figure 1 – Horizontal Slicing Methodology

Time	Available Active Power (MW)	Dispatch Instruction	Total Constraint (MW)	Total Curtailment (MW)
15:00	47	NA	0	0
15:30	47	CURL 30	0	(47 – 30) = 17
16:00	47	LOCL 25	(30 – 25) = 5	(47 – 30) = 17
16:30	47	CURL 20	(30 – 25) = 5	(47 – 30) + (25-20) = 22
17:00	47	LOCL 15	(30 – 25) + (20 -15) = 10	(47 – 30) + (25-20) = 22
20:30	47	LOCL 27	(30-27) = 3	(47 – 30) = 17

Table 1: Worked example of Horizontal Slide example in Figure 1

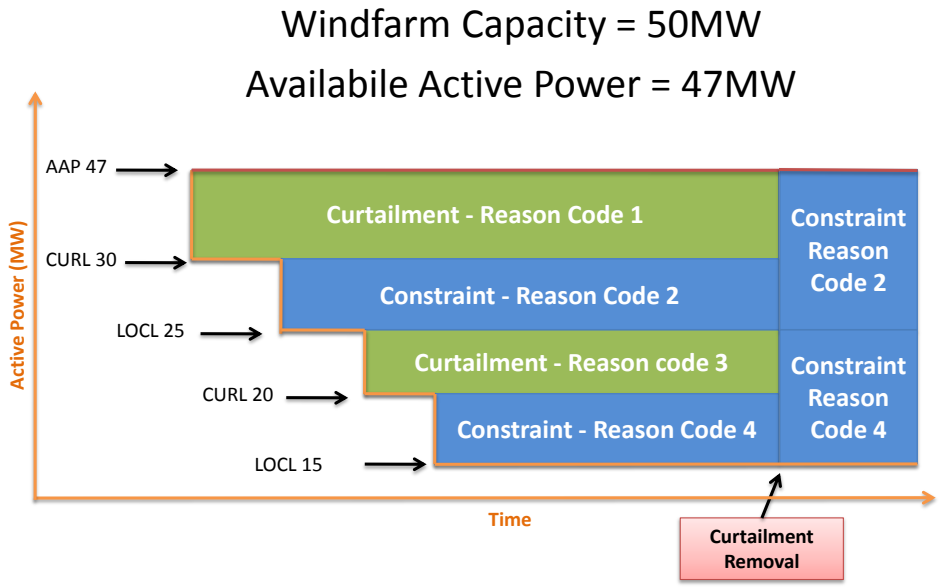


Figure 2 – Horizontal Slicing Methodology during Curtailment removal

The following calculations are carried out for each minute in the reporting period:

Where

DD is the Dispatched Down Volume in MWh
AO is the Actual Output in MW
AV is the Available Active Power in MW
M_X: Variables used to store intermediate DD levels for each layer in MW.

DD is initially calculated in MW for each minute and these values are aggregated at the end and converted to MWh.

If there is no active dispatch instruction then:

Available Active Power is reset to Active Power Output and DD = 0 MW.

If there are n active setpoints, denoted by M_1, M_2… M_n then:

$$\textbf{Total DD} = \textbf{Max}[\textbf{AV} - \textbf{Max}[\textbf{AO}, M_n], 0]$$

The DD amount of each layer is aggregated into its own category as well depending on type (Curtailments / constraints) and reason (SNSP issue, transmission constraint, inertia, etc.)

These DD layers are calculated individually every minute as follows:

$$DD_{\text{Layer X}} = \text{Max}[\ \text{Min}[M_{X-1}, AV] - \text{Max}[AO, M_X], 0]$$

Where M_0 = Available Active Power

Finally, all DD values are converted to energy equivalents (MWh) and aggregated for the duration of the reporting period. This is achieved by dividing the total one-minute MW values by 60 in order to convert to MWh.

3.3. Reporting

The reports will be issued quarterly to each controllable windfarm on the distribution and transmission system. The quarterly reports will be issued from 2016 and will be issued one month following the end of each quarter[2].

The reports will consist of three aspects as follows:

A. **Individual Windfarm Report (PDF)**
- This will be a .pdf containing a monthly breakdown of the dispatch down of the windfarm and also the quarterly average. A sample is included in Appendix B;
- A comparison to the previous quarter will also be shown (from Q1 2016);
- A comparison to the overall all-island dispatch down of controllable windfarms. Note that this figure does not contain uncontrollable wind, therefore this figure is not the definitive all-island dispatch down figure and is included here for comparison purposes only. The overall all-island dispatch down is included in the Overall Wind Dispatch Down Report;

B. **Individual Windfarm Report (Excel .xls)**
- This contains the aggregated 30 minute Available Active Power, Active Power Output and breakdown of the dispatch down reason codes;
- The individual dispatch instructions with the effective time, broken down into curtailment and constraints, are also included;
- Note that periods in which there were no active Dispatch Instructions will be adjusted so that Available Active Power is set equal to the Active Power Output so to avoid the calculation of incorrect dispatch down volumes.

C. **Overall Wind Dispatch Down Report (PDF)**
- This contains the aggregated dispatch down figures for Ireland, Northern Ireland and all-island. A sample is included in Appendix B;
- The figures include all wind i.e. it includes non-controllable wind;
- Contains the definitive dispatch down percentages.

[2] The first reports for Q1 2016 were issued two months following the end of the quarter to allow the TSOs further time to test the new system being used to prepare these reports.

4. QUERIES

The TSOs will be freezing the calculation methodology and reporting templates for 12 months following the publication of the first batch of reports in May 2016.

If you have any questions on the calculation methodology or report template which is not covered within this user guide please contact RenewableReports@EirGrid.com.

APPENDIX A

Windfarm	Region
Bruckana	M
Garracummer	M
Glenough	M
Gortahile	M
Hollyford	M
Kill Hill	M
Lisheen 1	M
Lisheen 2	M
Monaincha Bog	M
Mountlucas	M
Mountain Lodge	NE
Mullananalt	NE
Ratrussan	NE
Beam Hill	NW
Binbane 1	NW
Corkermore	NW
Drumlough Hill	NW
Flughland	NW
Golagh 1	NW
Loughderryduff	NW
Meenachullalan	NW
Meentycat	NW
Sorne Hill	NW
Spaddan	NW
Altagowlan	W
Black Banks 2	W
Booltiagh 1	W
Booltiagh 2	W
Carrickheeney	W
Carrowleagh	W
Derrybrien	W
Faughary	W
Garvagh 1	W
Garvagh 2	W
Kingsmountain 1	W
Kingsmountain 2	W
Knockastanna	W
Lackan	W
Leitir Guingaid	W
Raheen Barr 2	W
Spion Kop	W
Tullynamoyle	W

Windfarm	Region
Athea	SW
Ballincollig Hill	SW
Ballybane 1	SW
Ballybane 2	SW
Bawnmore	SW
Boggeragh 1	SW
Boggeragh 2	SW
Caherdowney	SW
Carraigcannon	SW
Clahane	SW
Cloghboola	SW
Coomacheo	SW
Coomagearlahy 1	SW
Coomagearlahy 2	SW
Coomagearlahy 3	SW
Coomatallin	SW
Dromada	SW
Dromdeeveen	SW
Garranereagh	SW
Glanlee	SW
Gneeves	SW
Grouse Lodge	SW
Kealkil	SW
Knockacummer	SW
Knockaneden	SW
Knockawarriga	SW
Knocknagoum	SW
Muingnaminnane	SW
Rathcahill West	SW
Taurbeg	SW
Tournafulla 1	SW
Tournafulla 2	SW
Arklow 1	SE
Ballycadden 1	SE
Ballycadden 2	SE
Ballymartin 1	SE
Ballymartin 2	SE
Ballywater	SE
Barranafaddock	SE
Castledockrell	SE
Cronelea 1	SE
Cronelea 2	SE
Gibbet Hill	SE
Knocknalour	SE
Richfield	SE
Woodhouse	SE

Windfarm	Region
Altahullion 1	NI
Altahullion 2	NI
Bessey Bell 1	NI
Bessey Bell 2	NI
Bin Mountain	NI
Callagheen	NI
Carn Hill	NI
Carrickatane	NI
Churchill	NI
Corkey	NI
Crighshane	NI
Crockagarran	NI
Curryfree	NI
Dunbeg	NI
Dunmore NI	NI
Elliots Hill	NI
Garves	NI
Gruig	NI
Hunters Hill	NI
Lendrums Bridge	NI
Lough Hill	NI
Molly Mountain	NI
Monnaboy	NI
Owenreagh 1	NI
Owenreagh 2	NI
Rigged Hill	NI
Screggagh	NI
Seegronan	NI
Slieve Divena	NI
Slieve Kirk	NI
Slieve Rushen	NI
Snugborough	NI
Tappaghan	NI
Thornog	NI
Wolf Bog	NI

APPENDIX B

Individual Windfarm Report Template

EIRGRID GROUP

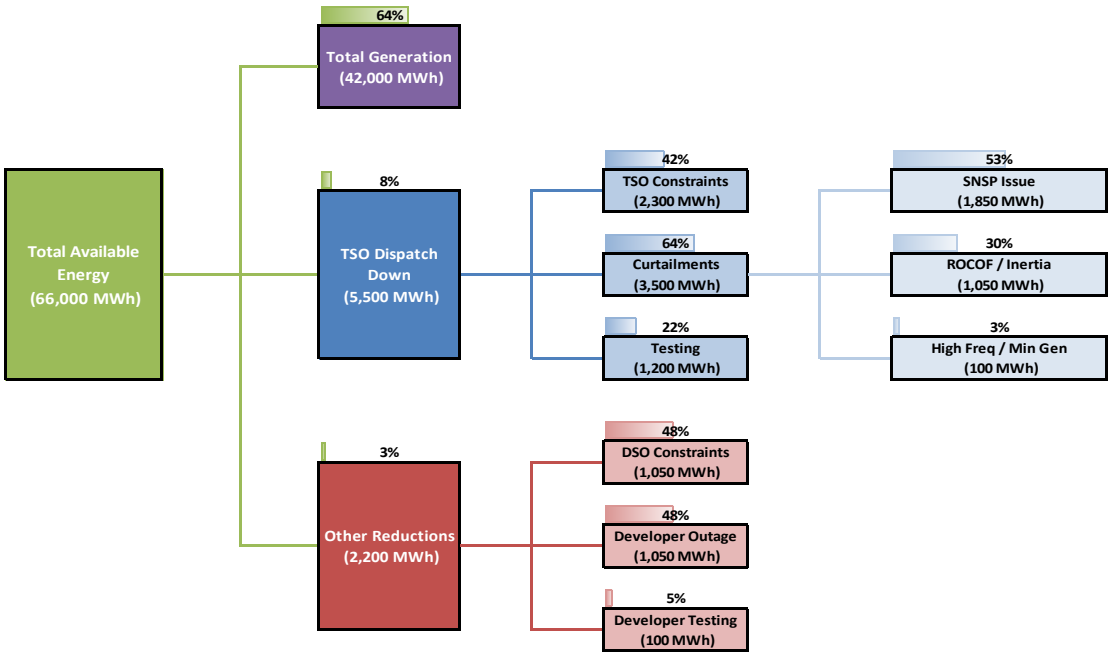
Windfarm A Quarterly Dispatch Down Report

DRAFT

Qtr1, 2016

Windfarm	Connection	Size (MW)	Jurisdiction	Region
Windfarm A	TSO	100	Ireland	SW

Year	2016		2016		2016		2016			
Month / Quarter	Jan		Feb		Mar		Qtr1			
Total Available Energy (MWh)	25,000		20,000		21,000		66,000			
Total Generation (MWh)	23,500		17,800		58,300		42,000			
	MWh	%	MWh	%	MWh	%	MWh	%		
Total Energy Reduction from Availability:	1,500	6.0%	2,200	11.0%	4,000	19.0%	7,700	11.7%		
TSO Dispatch Down	1,000	4.0%	1,500	7.5%	3,000	14.3%	5,500	8.3%		
Other Reductions	500	2.0%	700	3.5%	1,000	4.8%	2,200	3.3%		
	MWh	%	MWh	%	MWh	%	MWh	%		
TSO Dispatch Down:										
TSO Constraints	300	30.0%	1,000	66.7%	1,000	33.3%	2,300	41.8%		
Curtailments	500	50.0%	1,500	100.0%	1,500	50.0%	3,500	63.6%		
TSO Testing	200	20.0%	500	33.3%	500	16.7%	1,200	21.8%		
Other Reductions:										
DSO Constraints	200	40.0%	400	57.1%	450	45.0%	1,050	47.7%		
Developer Outage	300	60.0%	200	28.6%	550	55.0%	1,050	47.7%		
Developer Testing	0	0.0%	100	14.3%	0	0.0%	100	4.5%		
	MWh	%	MWh	%	MWh	%	MWh	%		
Curtailments:										
SNSP Issue	200	40.0%	150	10.0%	1,500	100.0%	1,850	52.9%		
ROCOF / Inertia	200	40.0%	350	23.3%	500	33.3%	1,050	30.0%		
High Freq / Min Gen	100	20.0%	0	0.0%	0	0.0%	100	2.9%		
All Island and Regional Comparison:										
TSO Dispatch Down - All Island Controllable Wind	4.1%		3.7%		2.4%		3.5%			
TSO Dispatch Down - Same Region (SW) Controllable Wind	7.1%		6.8%		3.7%		6.1%			



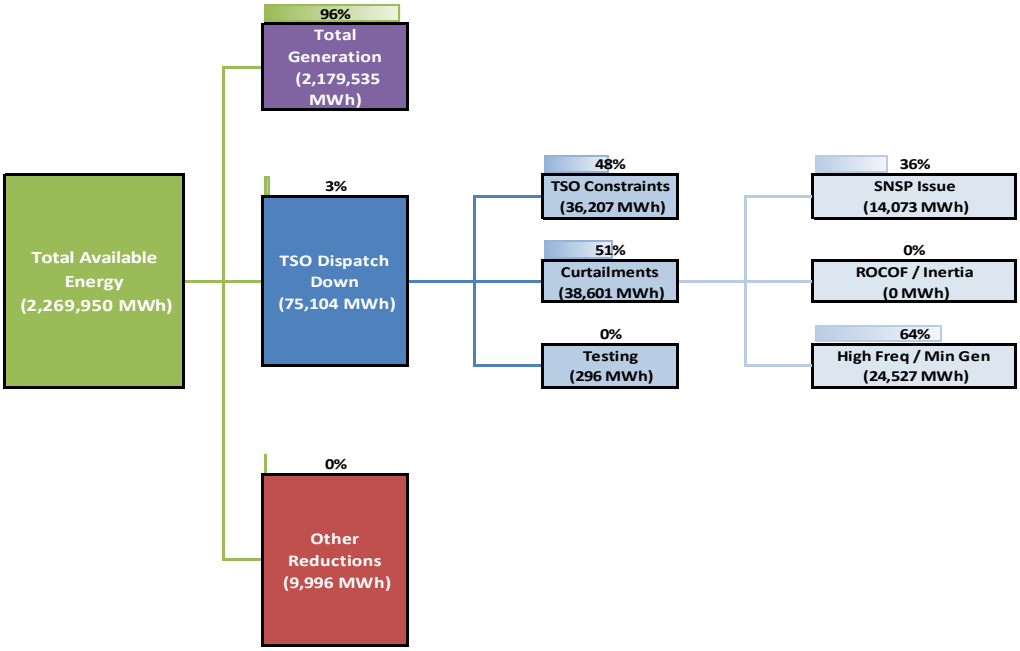
EIRGRID GROUP

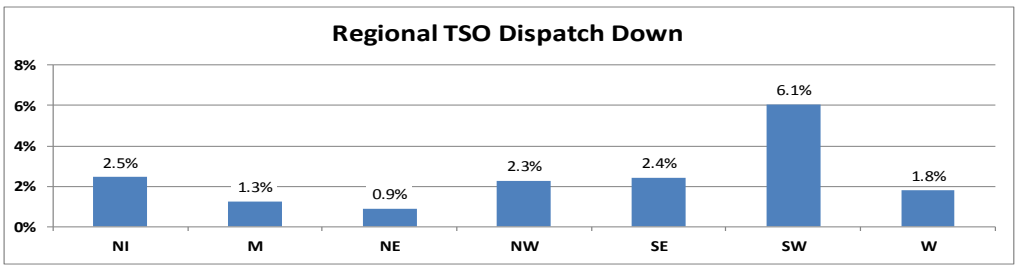
All Island Quarterly Wind Dispatch Down Report

DRAFT

Qtr1, 2016

Year	2016		2016		2016		2016			
Month / Quarter	Jan		Feb		Mar		Qtr1			
Total Available Energy (MWh)	928,971		756,383		584,596		2,269,950			
Total Generation (MWh)	886,834		725,050		567,650		2,179,535			
	MWh	%	MWh	%	MWh	%	MWh	%		
Total Energy Reduction from Availability:	39,844	4.3%	29,554	3.9%	15,702	2.7%	85,100	3.7%		
TSO Dispatch Down	35,754	3.8%	26,022	3.4%	13,328	2.3%	75,104	3.3%		
Other Reductions	4,090	0.4%	3,532	0.5%	2,374	0.4%	9,996	0.4%		
	MWh	%	MWh	%	MWh	%	MWh	%		
TSO Dispatch Down:										
TSO Constraints	15,155	42.4%	12,754	49.0%	8,299	62.3%	36,207	48.2%		
Curtailments	20,576	57.5%	13,024	50.1%	5,001	37.5%	38,601	51.4%		
TSO Testing	23	0.1%	244	0.9%	29	0.2%	296	0.4%		
	MWh	%	MWh	%	MWh	%	MWh	%		
Curtailments:										
SNSP Issue	5,795	28.2%	6,329	48.6%	1,950	39.0%	14,073	36.5%		
ROCOF / Inertia	0	0.0%	0	0.0%	0	0.0%	0	0.0%		
High Freq / Min Gen	14,781	71.8%	6,695	51.4%	3,051	61.0%	24,527	63.5%		





Page 1

ABBREVIATIONS

TSO	Transmission System Operator
SEM	Single Electricity Market
VPTG	Variable Price Taking Generator
APTG	Autonomous Price Taking Generator
SCADA	Supervisory Control and Data Acquisition
MW	Megawatt
MWh	Megawatt Hour
CURL	Curtailment
LOCL	Constraint
AAP	Available Active Power
DD	Dispatch Down
AO	Actual Output
AV	Available Active Power
M_X	Variables used to store intermediate DD levels for each layer in MW