# Operational Constraints Update 27/10/2017



#### **Key Updates**

- Dublin Generation and System Stability For clarification, PBA and PBB represent operation of Poolbeg in combined cycle mode. If combined cycle mode is not available then PPA and PBB will not be considered as constraint resources if other resources are available. Reason is for provision of available reactive capability for Dublin and inertia for system stability.
- Operation Limit for RoCoF Certain windfarms in NI with relays set to trip at 0.4 Hz/s RoCoF require management to maintain system security. This can result in redispatch of generation on the island in order to maximise priority dispatch generation while maintaining system security. This is anticipated to last until these relay settings are changed which is forecast for the end of 2017.
- Appendix A List of Dispatchable Units
- Removal of DB1 max limit of 245MW (overnight from 06:00 to 22:00 and weekends).
   as hot spot issue is being resolved.
- Removal of Moyle Interconnector restriction of -254< MW <257.

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#### 1. Introduction

To enable the efficient and secure operation of the system, generation is dispatched to certain levels to prevent equipment overloading, voltages outside limits or system instability.

The software used to model the system is the Reserve Constrained Unit Commitment (RCUC).

### 1.1 Document Objective

The objective of the Operational Constraints Update is to present the key system and generator constraints which are included in the scheduling process (i.e. in the RCUC software). The most common operational constraints that are modelled are:

- North South tie-line export / import constraint: MWR type
- Moyle import / export constraint: MW type
- Requirement to keep a minimum number of units on in an area: NB type
- Requirement to limit the output of the generators in an area to limit short circuit levels or overloads: MW type or NB type
- Requirement for a minimum output from the generators in an area to support the voltage or to avoid overloads: MW type or NB type
- Requirement to limit the output of stations due to fish spawning: MW type

This document comprises of: (i) **Operational Reserve Requirements**, and (ii) **System Constraints**.

#### 1.2 List of Terms

	TCG Type								
MW	Limit MW output of unit or units assigned to a TCG								
	Limits (the total MW + Primary Reserve - the area demand) from assigned								
MWR	resources								
NB	Limit to the status (On/Off) of the unit or units assigned to a TCG								

	Limit Flag						
E	Equality Constraint (generation = load)						
X	Export Constraint - limit output of a group of units <= max limit						
N	Import Constraint - limit output of a group of units >= min limit						
В	In-between Constraint; >= min and <= max						

# 2. Operating Reserve Requirements

The following tables show the operating reserve requirements on an all-island basis and in each jurisdiction.

Category	All Island Requirement % Largest In-Feed	Ireland Minimum¹ (MW)	Northern Ireland Minimum (MW)
POR <sup>2</sup>	75%	130 / 95	50
SOR	75%	130 / 95	50
TOR <sup>1</sup>	100%	130 / 95	50
TOR <sup>2</sup>	100%	130 / 95	50

<sup>1.</sup> Ireland Lower values apply from 00:00 - 07:00 inclusive

Note: Minimum operating reserve in Ireland increased from 110 MW to 130 MW from 07:00 to 00:00 and from 75 MW to 95 MW from 00:00 to 07:00 due to ongoing outage of Turlough Hill station.

# **2.1 Operating Reserve Definitions**

Category	Delivered By	Maintained Until
Primary (POR)	5 seconds	15 seconds
Secondary (SOR)	15 seconds	90 seconds
Tertiary 1 (TOR1)	90 seconds	5 minutes
Tertiary 2 (TOR2)	5 minutes	20 minutes

#### 2.2 Source of Reserve

	Ireland	Northern Ireland
Dynamic Reserve	Synchronised Generating Units	Synchronised Generating Units and Moyle Interconnector (up to 50 MW)
Static Reserve	Turlough Hill Units when in pumping mode  Interruptible Load: Standard provision: 54MW (07:00 – 00:00)  EWIC Interconnector (up to 100MW)	Moyle Interconnector (up to 50MW)
Negative Reserve  (Defined as the MW output of a conventional generator above its minimum load)	100MW	50MW

<sup>2.</sup> Minimum values of POR in each jurisdiction must be supplied by dynamic sources

# 3. System Constraints

#### 3.1 Tie Line Limits

Tie line flows in both directions have physical limits, the maximum flow that can be sustained without breaching system security rules (line overloads, voltage limits etc.) after a credible transmission or generation event. The limits are referred to as the Total Transfer Capacity (TTC) comprising of two values: N-S and S-N. When determining minimum system cost, RCUC respects the TTC values by not allowing the sum of a) the tie line flow into a jurisdiction and b) the reserve requirement of the largest single infeed in that jurisdiction and c) a percentage of the reserve holding in that jurisdiction to exceed the TTC i.e. TTC > a + b + c.

#### 3.2 Non-Synchronous Generation

To ensure the secure, stable operation of the power system, it is necessary to limit the level of non-synchronous generation of the system. The System Non-Synchronous Penetration (SNSP) is a measure of the non-synchronous generation on the system at an instant in time i.e. the non-synchronous generation and net interconnector imports as a percentage of the demand and net interconnector exports (where "Demand" includes pump storage consumption when in pumping mode).

#### **3.3 Permanent System Constraint Tables**

The following tables set out the system constraints:

- Active System Wide Constraints:
- Active Northern Ireland Constraints, and
- Active Ireland Constraints.

Note that the limits specified in each table represent the normal intact transmission network limit. These limits may vary from time to time due to changing system conditions.

# **3.3.1 Active System Wide Constraints**

Name	TCG	Limit	Limit	Resources	Description
	Type	Type			
Inter-Area Flow	MWR	X:<=	400 MW (There is a margin of 20MW on this limit for system safety)	Ireland and Northern Ireland Power Systems	Ensures that the total MW transferred between Ireland and Northern Ireland does not exceed the limitations of the North-South tie line. It takes into account the rescue/reserve flows that could occur immediately post fault inclusive of operating reserve requirements.  This is required to ensure the limits of the existing North South tie line are respected.
Inter-Area Flow	MWR	X:<=	450 MW (There is a margin of 20MW on this limit for system safety)	Ireland and Northern Ireland Power Systems	Ensures that the total MW transferred between Northern Ireland and Ireland does not exceed the limitations of the North-South tie line. It takes into account the rescue/reserve flows that could occur immediately post fault inclusive of operating reserve requirements.  This is required to ensure the limits of the existing North South tie line are respected.
Non- Synchronous Generation		X:<=	60%	Wind, Moyle Interconnector EWIC Interconnector	Ensures that the SNSP is kept below 60%.
Operational Limit for RoCoF		X:<=	0.5 Hz/s*	Ireland and Northern Ireland Power Systems	Ensures that RoCoF does not exceed 0.5 Hz/s.  * Certain windfarms in NI with relays set to trip at 0.4 Hz/s RoCoF require management to maintain system

				security. This can result in re-dispatch of generation on the island in order to maximise priority dispatch generation while maintaining system security. This is anticipated to last until these relay settings are changed which is forecast for the end of 2017.
Operational Limit for Inertia	N:>=	20,000MWs	Ireland and Northern Ireland Power Systems	Ensures that all island Inertia does not fall below 20,000 MWs.

# **3.3.2 Active Northern Ireland Constraints**

Name	TCG Type	Limit Type	Limit	Resources	Description
System Stability	NB	N:>=	3 Units at all times	B4, B5, B10, B31, B32, C30, K1, K2	There must be at least 3 machines on-load at all times in Northern Ireland. Required for dynamic stability.
Replacement Reserve	MW	X:<=	275 MW	BGT1, BGT2, CGA, CGT8, EMPOWER, iPOWER, KGT1, KGT2, KGT3, KGT4	Combined MW output of OCGTs and AGUs must be less than 275 MW (out of a total of 400 MW) in Northern Ireland at all times. 125 MW Required for replacement reserve
North West Generation	NB	N:>=	0 or 1 Unit depending on NI system demand	C30	Coolkeeragh must be on load when the NI system demand is at or above 1260 MW. This operational constraint is required to ensure voltage stability in the northwest of Northern Ireland and to prevent possible system voltage collapse above the indicated system demand.
Kilroot Generation	NB	N:>=	1 or 2 Units depending on NI system demand	K1, K2	There must be at least one Kilroot unit on load when the NI system demand exceeds 1400 MW and 2 units are required above 1550 MW. This operational constraint is required to ensure voltage stability in the Belfast area and to prevent the requirement for an inter area flow reduction in a post fault scenario.
Moyle Interconnecto	MW	В	-300 <mw &lt;442</mw 	Moyle Interconnector	This applies to all units registered as Moyle Interconnector units. It ensures that all flows do not exceed an import of 442MW to Northern Ireland and an export of 300MW to Scotland (values taken from NI). This is required to ensure that the limits are respected.

Negative Reserve	NB	>50 MW	Varies	B10, B31, B32, BGT1, BGT2, B4, B5, C30, CGT8, K1, K2, KGT1, KGT2, KGT3, KGT4	Number of units on above minimum load for negative reserve.

#### **3.3.3** Active Ireland Constraints

\* Note A: PBA and PBB represent operation of Poolbeg in combined cycle mode. If combined cycle mode is not available then PPA and PBB will not be considered as constraint resouces if other resources are available.

Name	TCG	Limit	Limit	Resources	Description
System Stability	NB	Type N:>=	5 Units	AD1, AD2, DB1, GI4, HNC, HN2, MP1, MP2, MP3, PBA*, PBB*, TB3, TB4, TYC, WG1	There must be at least 5 machines on-load at all times in Ireland. Required for dynamic stability.  * See Note A
Replacement Reserve	MW	X:<=	473 MW	AT1, AT2, AT4, ED3, ED5, MRC, NW5, RP1, RP2, TP1, TP3	Combined MW output of OCGTs must be less than 473MW (out of a total of 798MW) in Ireland at all times. Required for replacement reserve. The MW values are subject to change as availability of the units change.
Dublin Generation	NB	N:>=	1 Units	DB1, HNC, HN2	There must be at least 1 large generator on-load at all times in the Dublin area. Required for voltage control.
Dublin Generation	NB	N:>=	2 Units	DB1, HNC, HN2, PBA*, PBB*	There must be at least 2 large generators on-load at all times in the Dublin area. Required for voltage control. This assumes EWIC is operational.  * See Note A  Note that during an outage of EWIC there must be at least 3 large generators on-load at all times in the Dublin area.
Dublin Generation	NB	N:>=	1 Unit if Ireland System Demand >4200 MW	HNC, PBA*, PBB*,	Requirement for HNC, PBA, or PBB to be on load when Ireland System Demand is greater than 4200 MW. This operational constraint is required for load flow control in the Dublin area.  * See Note A

NB	N:>=	1 Unit if Ireland System Demand > 4600 MW	PBA*, PBB*	Requirement for PBA or PBB to be on load when Ireland System Demand is greater than 4600 MW. This operational constraint is required for load flow control in the Dublin area.  * See Note A
NB	N:>=	1 Unit	HNC, HN2, PBA*, PBB*	Requirement for generation in North Dublin (for load flow and voltage control).  * See Note A
NB	N:>=	1 Unit	DB1, PBA*, PBB*	Requirement for generation in South Dublin (for load flow and voltage control).  * See Note A
NB	N:>=	1 Unit if Ireland System Demand > 1500 MW	AD1, AD2, AT1, AT2, AT4, MRC, SK3, SK4, WG1	Requirement for at least one Unit to be on load when Ireland System Demand is greater than 1500 MW. This operational constraint is required for voltage stability in the South.
NB	N:>=	2 Units if Ireland System Demand > 2500 MW	AD1, AD2, AT1, AT2, AT4, GI4, MRC, SK3, SK4, WG1	Requirement for at least two Units to be on load when Ireland System Demand is greater than 2500 MW. This operational constraint is required for voltage stability in the South.
NB	N:>=	3 Units if Ireland System Demand > 3500 MW	AD1, AD2, AT1, AT2, AT4, GI4, MRC, SK3, SK4, WG1	Requirement for at least three Units to be on load when Ireland System Demand is greater than 3500 MW. This operational constraint is required for voltage stability in the South.  Note that when Ireland wind is less than 500 MW one of these Units must be AD1, AD2, AT11, AT12, AT14, MRC, WG1.
	NB NB	NB N:>=  NB N:>=  NB N:>=	Ireland System Demand > 4600 MW  NB  N:>=  1 Unit  NB  N:>=  1 Unit if Ireland System Demand > 1500 MW  NB  N:>=  2 Units if Ireland System Demand > 2500 MW  NB  N:>=  3 Units if Ireland System Demand > 2500 MW  NB  N:>=  3 Units if Ireland System Demand > 3500	Ireland   System   Demand   > 4600   MW

	NB	N:>=	3 Units if Ireland System Demand > 4200 MW	AD1, AD2, AT1, AT2, AT4, GI4, MRC, SK3, SK4, WG1	Requirement for at least three Units to be on load when Ireland System Demand is greater than 4200 MW. This operational constraint is required for voltage stability in the South.  Note that when Ireland wind is less than 500 MW one of these Units must be AD1, AD2, AT11, AT12, AT14, MRC, WG1.  When Ireland System Demand is greater than 4200 MW one of these Units must be AD1, AD2, GI4, WG1.
Cork Generation	MW	В	0 MW <mw< 1100 MW</mw< 	AD1, AD2, AT1, AT2, AT4, WG1	Generation restriction in the Cork area determined week ahead by Grid Operations NearTime.
South Generation	MW	В	0 MW <mw< 1800 MW</mw< 	AD1, AD2, AT1, AT2, AT4, GI4, MRC, WG1	Generation restriction in the Southern Region. This will be determined week ahead by Grid Operations NearTime.
Moneypoint	NB	N:>=	1 Unit	MP1, MP2, MP3	There must be at least one Moneypoint unit on load at all times. Required to support the 400kV network.
Hydro Smolt Protocol	NB	N/A	Varies	ER1, ER2, ER3, ER4, LE1, LE2, LE3	Over the spring and early summer period as the water temperature in the rivers and lakes change, the hydro stations have to be dispatched in a very specific way to allow fish to move safely. This affects the generators in Erne and Lee.

EWIC Interconnector	MW	В	-526 <mw< 504 Current restriction is -300* &lt; MW &lt; 504</mw< 	EWIC Interconnector	This applies to all units registered as EWIC Interconnector units. It ensures that all flows do not exceed an import of 504MW to Ireland and an export of 526MW to GB (values taken from Portan). This is required to ensure that the limits are respected. Current restriction is to mitigate against impact of a high frequency event on the island in the event of a trip on EWIC.  * The trial to remove the operational export limit on EWIC for all system conditions is ongoing.
Turlough Hill Generation	MW	В	>0 MW by day, <0 MW by night	TH1, TH2, TH3, TH4	To ensure required MW running of Turlough Hill.
Negative Reserve	NB	>100 MW	Varies	AD1, AD2, AT1, AT2, AT4, DB1, ED3, ED5, GI4, HN2, HNC, MP1, MP2, MP3, MRC, NW5, PBA*, PBB*, RP1, RP2, SK3, SK4, TP1, TP3, TYC, WG1	Number of units on above minimum load for negative reserve.  * See Note A

# **Appendix A – List of Dispatchable Units**

Aghada Aghada AT1 AD2 AT2 AT4  Dublin Bay Edenderry ED1 Edenderry OCGT ED3 Great Island CCGT Huntstown HNC HNC HNC HN2 Indaver Waste Lough Ree Marina CC MRC MP1 Moneypoint MP2 MP3 North Wall CT Poolbeg CC PBB Rhode RP1 AF4 Sealrock Scalrock Scalrock Tarbert Tarbert Tarbert Tarbert Tarbert Tarbanaghmore Tynagh Tynagh Tynagh Tynagh Tynagh AD1 AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey Litt With Mill CT AT4 AT5 AT4 AT4 AD2 AT4 AT4 AT5 AT5 AT5 AT6 AT6 AT7	Fully Dispatchable Units (Ireland)					
Aghada       AT1         AT2       AT4         Dublin Bay       DB1         Edenderry       ED1         Edenderry OCGT       ED3         Edenderry OCGT       ED5         Great Island CCGT       GI4         Huntstown       HNC         HN2       Indaver Waste         Lough Ree       LR4         Marina CC       MRC         MP1       MP2         MP3       North Wall CT         North Wall CT       NW5         PBA       PBA         RP1       RP2         Sk3       Sk3         Sealrock       Sk3         Sk4       TB1         Tabert       TB2         TB3       TB4         TP1       TB3         TB4       TYC         West Offaly       WO4         Whitegate       WG1         Ardnacrusha       AA1, AA2, AA3, AA4         Erne       ER1, ER2, ER3, ER4         Lee       LE1, LE2, LE3         Liffey       LI1, LI2, LI4, LI5         Turlough Hill       TH1, TH2, TH3, TH4         EWIC Interconnector		AD1				
AT2		AD2				
AT4	Aghada	AT1				
Dublin Bay Edenderry Edenderry OCGT EDS Great Island CCGT Huntstown HNC Huntstown HN2 Indaver Waste Lough Ree Marina CC MRC MP1 Moneypoint MP2 MP3 North Wall CT Poolbeg CC PBB Rhode RP1 Rep2 Sealrock Scalrock  Tarbert Tarbert Tawnaghmore Tynagh Tynagh Wo4 Whitegate Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TEDS GIA ED3		AT2				
Edenderry         ED1           Edenderry OCGT         ED3           Great Island CCGT         GI4           Huntstown         HNC           Huntstown         HNC           Huntstown         HNC           Huntstown         HNC           Huntstown         HNC           HNC         HND           Lough Ree         LR4           MAC         MP1           MP3         MP4           MP4         MP2           MP3         North Wall CT           NW5         PBA           PBA         RP1           RPA         RP2           SK3         SK3           Scalrock         SK3           SK4         TB1           TB2         TB3           TB4         TP1           TB3         TB4           TP1         TP3           Tynagh         TYC           West Offaly         WO4           Whitegate         WG1           Ardnacrusha         AA1, AA2, AA3, AA4           Erne         ER1, ER2, ER3, ER4           Lee         LE1, LE2, LE3           Liffey         LI1, LI2, LI4, LI5 <td></td> <td>AT4</td>		AT4				
Edenderry OCGT  Great Island CCGT Huntstown HNC HNC HUNZ Indaver Waste Lough Ree LR4 Marina CC MRC MP1 Moneypoint MP2 MP3 North Wall CT Poolbeg CC PBB Rhode RP1 Sealrock SK3 Scalrock Tarbert Tarbert Tarbert Tawnaghmore Tynagh Tynagh Whitegate Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill THNC HNC HNC HNC HNC HNC HNC HNC HNC HNC	Dublin Bay	DB1				
Edenderry OCGT Great Island CCGT Huntstown HNC HNC HND2 Indaver Waste Lough Ree LR4 Marina CC MRC MP1 Moneypoint MP2 MP3 North Wall CT Poolbeg CC PBB Rhode RP1 Sealrock SK4 TB1 Tarbert TB2 TB3 Tynagh Tynagh Tynagh Tynagh Whitegate Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector	Edenderry	ED1				
Great Island CCGT  Huntstown  HNC  HN2  Indaver Waste  Lough Ree  Marina CC  MRC  MP1  Moneypoint  MP2  MP3  North Wall CT  Poolbeg CC  PBB  Rhode  RP1  RP2  Sealrock  Sealrock  Tarbert  Tawnaghmore  Tawnaghmore  Tynagh  Tynagh  Whitegate  Ardnacrusha  AA1, AA2, AA3, AA4  Erne  ER1, ER2, ER3, ER4  Lee  Left, LE2, LE3  Liffey  Liffey  Lift, Lif2, Lif4, Lif5  Turlough Hill  TH1  TH2  TH3  TH1  TH2  TH3  TH1  TH2  TH3, TH4  TH1, TH2, TH3, TH4  EWIC Interconnector	Edondows OCCT	ED3				
Huntstown HNC HN2 Indaver Waste Lough Ree LR4 Marina CC MRC MP1 Moneypoint MP2 MP3 North Wall CT Poolbeg CC PBB Rhode RP1 Rep2 Sealrock SK4 TB1 Tarbert Tarbert Tawnaghmore TP3 Tynagh Tynagh Whitegate Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee Liffey LI1, LI2, LI4, LI5 Turlough Hill THI	Edenderry OCG1	ED5				
Huntstown  Indaver Waste  Lough Ree  LR4  Marina CC  MRC  MP1  Moneypoint  MP2  MP3  North Wall CT  Poolbeg CC  PBA  Rhode  RP1  Rep2  Sealrock  Sealrock  Tarbert  Tarbert  Tarbert  Tawnaghmore  Tynagh  West Offaly  Whitegate  Ardnacrusha  AA1, AA2, AA3, AA4  Erne  ER1, ER2, ER3, ER4  Lee  Liffey  Liff, Li2, Li4, Li5  Turlough Hill  TH1, TH2, TH3, TH4  EWIC Interconnector	Great Island CCGT	GI4				
Indaver Waste Lough Ree LR4  Marina CC  MRC  MP1  Moneypoint  MP2  MP3  North Wall CT  Poolbeg CC  PBB  Rhode  RP1  Rep2  Sealrock  Sk4  TB1  Tarbert  Tarbert  Tawnaghmore  Tynagh  West Offaly Whitegate  Ardnacrusha  Lee  Liffey  Liffey  Turlough Hill  TH, TH2, TH3, TH4  EWIC Interconnector		HNC				
Lough Ree Marina CC MRC  MP1  Moneypoint MP2  MP3  North Wall CT  Poolbeg CC  PBB  Rhode RP1  RP2  Sealrock SK3 SK4  TB1  Tarbert TB2  TB2  TB3  TB4  TP1  Tynagh Tynagh Tyc West Offaly Whitegate Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector	Huntstown	HN2				
Marina CC  MRC  MP1  Moneypoint  MP2  MP3  North Wall CT  Poolbeg CC  PBB  Rhode  RP1  RP2  Scalrock  SK3  SK4  TB1  Tarbert  TB2  TB3  TB4  TP1  Tynagh  Tynagh  Tynagh  Wo4  Whitegate  Ardnacrusha  Ardnacrusha  Erne  ER1, ER2, ER3, ER4  Lee  Leffey  Liffey  Liffey  Lil, Li2, Li4, Li5  Turlough Hill  TH1, TH2, TH3, TH4  EWIC Interconnector	Indaver Waste	IW1				
Marina CC  MP1  Moneypoint  MP2  MP3  North Wall CT  Poolbeg CC  PBB  Rhode  RP1  RP2  Sealrock  SK3  SK4  TB1  Tarbert  Tarbert  Tawnaghmore  Tynagh  Tynagh  Wo4  Whitegate  Ardnacrusha  Ardnacrusha  Erne  ER1, ER2, ER3, ER4  Lee  Leffey  Liffey  Lil, Li2, Li4, Li5  Turlough Hill  TH1, TH2, TH3, TH4  EWIC Interconnector		LR4				
Moneypoint MP2  MP3  North Wall CT  Poolbeg CC  PBA  RP1  Rhode  RP2  Sealrock  SK3  SK4  TB1  TB2  TB3  TB4  TP1  Tynagh  Tynagh  Tynagh  Wo4  Whitegate  Ardnacrusha  AA1, AA2, AA3, AA4  Erne  ER1, ER2, ER3, ER4  Lee  Liffey  Liffey  Lift, Lif2, Lif4, Lif5  Turlough Hill  THO  NW5  PBA  RP1  RP4  RP2  SK3  SK4  TB1  TB2  TB3  TP1  TP2  TP3  TYC  WO4  WO4  WO4  Lift, ER2, ER3, ER4  Lee  Let		MRC				
North Wall CT  NW5  Poolbeg CC  PBB  Rhode  RP1  Rhode  RP2  Sealrock  SK3  SK4  TB1  TB2  TB2  TB3  TB4  TP1  TP1  Tynagh  Tynagh  Tyc  West Offaly  Whitegate  Ardnacrusha  Ardnacrusha  Erne  ER1, ER2, ER3, ER4  Lee  Liffey  Lift, Li2, Li4, Li5  Turlough Hill  TH1, TH2, TH3, TH4  EWIC Interconnector		MP1				
North Wall CT PBA Poolbeg CC PBB RP1 Rhode RP2 Sealrock SK3 SK4 TB1 TB2 TB2 TB3 TB4 TP1 Tynagh Tynagh Tynagh Wo4 Whitegate WG1 Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee Left, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector	Moneypoint	MP2				
North Wall CT PBA Poolbeg CC PBB RP1 Rhode RP2 Sealrock SK3 SK4 TB1 TB2 TB2 TB3 TB4 TP1 Tynagh Tynagh Tynagh Wo4 Whitegate WG1 Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee Left, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector	,,	MP3				
Poolbeg CC	North Wall CT					
Rhode		PBA				
Rhode         RP2           SK3         SK4           TB1         TB2           TB3         TB4           Tp1         TP3           Tynagh         TYC           West Offaly         WO4           Whitegate         WG1           Ardnacrusha         AA1, AA2, AA3, AA4           Erne         ER1, ER2, ER3, ER4           Lee         LE1, LE2, LE3           Liffey         LI1, LI2, LI4, LI5           Turlough Hill         TH1, TH2, TH3, TH4           EWIC Interconnector         EWIC Interconnector	Poolbeg CC	PBB				
RP2           SK3           SK4           TB1           TB2           TB3           TP1           TP3           Tynagh         TYC           West Offaly         WO4           Whitegate         WG1           Ardnacrusha         AA1, AA2, AA3, AA4           Erne         ER1, ER2, ER3, ER4           Lee         LE1, LE2, LE3           Liffey         LI1, LI2, LI4, LI5           Turlough Hill         TH1, TH2, TH3, TH4           EWIC Interconnector         EWIC Interconnector		RP1				
Sealrock         SK4           TB1           TB2           TB3           TP1           TP3           Tynagh         TYC           West Offaly         WO4           Whitegate         WG1           Ardnacrusha         AA1, AA2, AA3, AA4           Erne         ER1, ER2, ER3, ER4           Lee         LE1, LE2, LE3           Liffey         LI1, LI2, LI4, LI5           Turlough Hill         TH1, TH2, TH3, TH4           EWIC Interconnector	Rhode	RP2				
SK4           TB1           TB2           TB3           TB4           TP1           TP3           Tynagh         TYC           West Offaly         WO4           Whitegate         WG1           Ardnacrusha         AA1, AA2, AA3, AA4           Erne         ER1, ER2, ER3, ER4           Lee         LE1, LE2, LE3           Liffey         LI1, LI2, LI4, LI5           Turlough Hill         TH1, TH2, TH3, TH4           EWIC Interconnector         EWIC Interconnector		SK3				
TB2           TB3           TB4           TP1           TP3           Tynagh         TYC           West Offaly         WO4           Whitegate         WG1           Ardnacrusha         AA1, AA2, AA3, AA4           Erne         ER1, ER2, ER3, ER4           Lee         LE1, LE2, LE3           Liffey         LI1, LI2, LI4, LI5           Turlough Hill         TH1, TH2, TH3, TH4           EWIC Interconnector         EWIC Interconnector	Sealrock	SK4				
Tarbert         TB3           TB4           TP1           TP3           Tynagh         TYC           West Offaly         W04           Whitegate         WG1           Ardnacrusha         AA1, AA2, AA3, AA4           Erne         ER1, ER2, ER3, ER4           Lee         LE1, LE2, LE3           Liffey         LI1, LI2, LI4, LI5           Turlough Hill         TH1, TH2, TH3, TH4           EWIC Interconnector         EWIC Interconnector						
TB3 TB4  TB4  TP1  Tawnaghmore  TP3  Tynagh  TYC  West Offaly  Whitegate  WG1  Ardnacrusha  Erne  ER1, ER2, ER3, ER4  Lee  LE1, LE2, LE3  Liffey  LI1, LI2, LI4, LI5  Turlough Hill  TH1, TH2, TH3, TH4  EWIC Interconnector						
Tawnaghmore         TP1           Tynagh         TYC           West Offaly         W04           Whitegate         WG1           Ardnacrusha         AA1, AA2, AA3, AA4           Erne         ER1, ER2, ER3, ER4           Lee         LE1, LE2, LE3           Liffey         LI1, LI2, LI4, LI5           Turlough Hill         TH1, TH2, TH3, TH4           EWIC Interconnector         EWIC Interconnector	Tarbert	TB3				
Tawnaghmore Tynagh Tynagh TyC West Offaly Whitegate WG1 Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector						
Tynagh Tynagh TyC West Offaly Whitegate WG1 Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector		TP1				
West Offaly Whitegate WG1 Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector EWIC Interconnector	Tawnaghmore	TP3				
West Offaly Whitegate WG1 Ardnacrusha AA1, AA2, AA3, AA4 Erne ER1, ER2, ER3, ER4 Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector EWIC Interconnector	Tynagh					
Whitegate WG1  Ardnacrusha AA1, AA2, AA3, AA4  Erne ER1, ER2, ER3, ER4  Lee LE1, LE2, LE3  Liffey LI1, LI2, LI4, LI5  Turlough Hill TH1, TH2, TH3, TH4  EWIC Interconnector EWIC Interconnector						
Ardnacrusha AA1, AA2, AA3, AA4  Erne ER1, ER2, ER3, ER4  Lee LE1, LE2, LE3  Liffey LI1, LI2, LI4, LI5  Turlough Hill TH1, TH2, TH3, TH4  EWIC Interconnector EWIC Interconnector						
Erne ER1, ER2, ER3, ER4  Lee LE1, LE2, LE3  Liffey LI1, LI2, LI4, LI5  Turlough Hill TH1, TH2, TH3, TH4  EWIC Interconnector EWIC Interconnector	_					
Lee LE1, LE2, LE3 Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector EWIC Interconnector	Erne	ER1, ER2, ER3, ER4				
Liffey LI1, LI2, LI4, LI5 Turlough Hill TH1, TH2, TH3, TH4 EWIC Interconnector EWIC Interconnector	Lee	LE1, LE2, LE3				
Turlough Hill TH1, TH2, TH3, TH4  EWIC Interconnector EWIC Interconnector						
EWIC Interconnector EWIC Interconnector						
Dublin Waste Dublin Waste	Dublin Waste	Dublin Waste				

Fully Dispatchable Units (Northern Ireland)				
	B4			
	B5			
	B10			
Ballylumford	B31			
	B32			
	BGT1			
	BGT2			
	K1			
	K2			
Kilroot	KGT1			
KIIIOUL	KGT2			
	KGT3			
	KGT4			
Coolkooroab	CGT8			
Coolkeeragh	C30			
Moyle Interconnector	Moyle Interconnector			
Lisahally	Lisahally			
Bombardier	Bombardier			
Contour Global (AGU)	CGA			
iPower (AGU)	iPower			
Empower (AGU)	Empower			