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Hybrid STATCOM / SVC Workgroup 26th January 2015

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National Grid – TNS Technical Policy

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Agenda

- Actions from Previous Meeting
- Recap of Objectives
- Applications and Generation Types covered
- Types of Event / Data
- Questionnaire Responses
- Draft Grid Code Legal Text
- Working Group Report
- Grid Code Process

Actions from Previous Meeting

- **34 - ACTION: AJ and RI to produce a view on what would be a reasonable number of repeatable events.**
- **55 - ACTION: RI and AJ to go through more data and establish an appropriate sequence of faults that can be used as a requirement on repeatability.**
- **61 - ACTION: RI to establish the likelihood of this type of event occurring in the same area more than once a year**
- **62 - ACTION: LP to circulate the slides**
- **63 - ACTION: RPS / RI / AJ to come up with a criteria (e.g. 4 events repeatable per minute) to be presented at the next meeting.**
- **72 - ACTION: NGET to develop draft legal text to specify the performance and repeatability requirements.**

Recap of Objectives – 1 of 2

- Terms of Reference - The Workgroup Shall Consider:
  - The performance of Hybrid Static Compensators and comparable equipment with respect to repeatability and the supply of reactive current during a fault
  - The performance required from voltage control equipment within Power Park Modules to control voltage on the networks in the steady state, during and after secured events, and in the event of a wider system disturbance.
- Key Objectives:
  - Prevent Post Fault Voltage Collapse or Over Voltage
    - Switched Reactive elements must Have Fault Ride Through capability
    - Reactive sources must be capable of repeated operations
  - Strike an Economic Balance
    - Consider the needs of the Transmission System
    - Consider Manufacturer Capability
    - Consider Costs
    - Reasonable Design Criteria
- Further Considerations:
  - Solution must not be site specific
  - Solution must not favour one type of generation or technology

Applications and Generation Types Covered

- Universal Requirement:
  - Park Modules:
    - Wind Power
    - Tidal Power
    - Solar Power
    - Others
  - OFTO's
  - Contracted Reactive Services

Types of Events Covered

Event: Any perturbation or switching action which results in a deviation of system voltage. This would include any balanced or unbalanced fault.

- Events Covered:
  - High Winds
  - Lightning
  - Debris on the Line
  - Operator Error
  - Voltage Instability
  - Ice Forming on the Conductors
  - Cascade Tripping Events
- Events which may not be covered:
  - Angular Instability
  - Interaction Between Controllers

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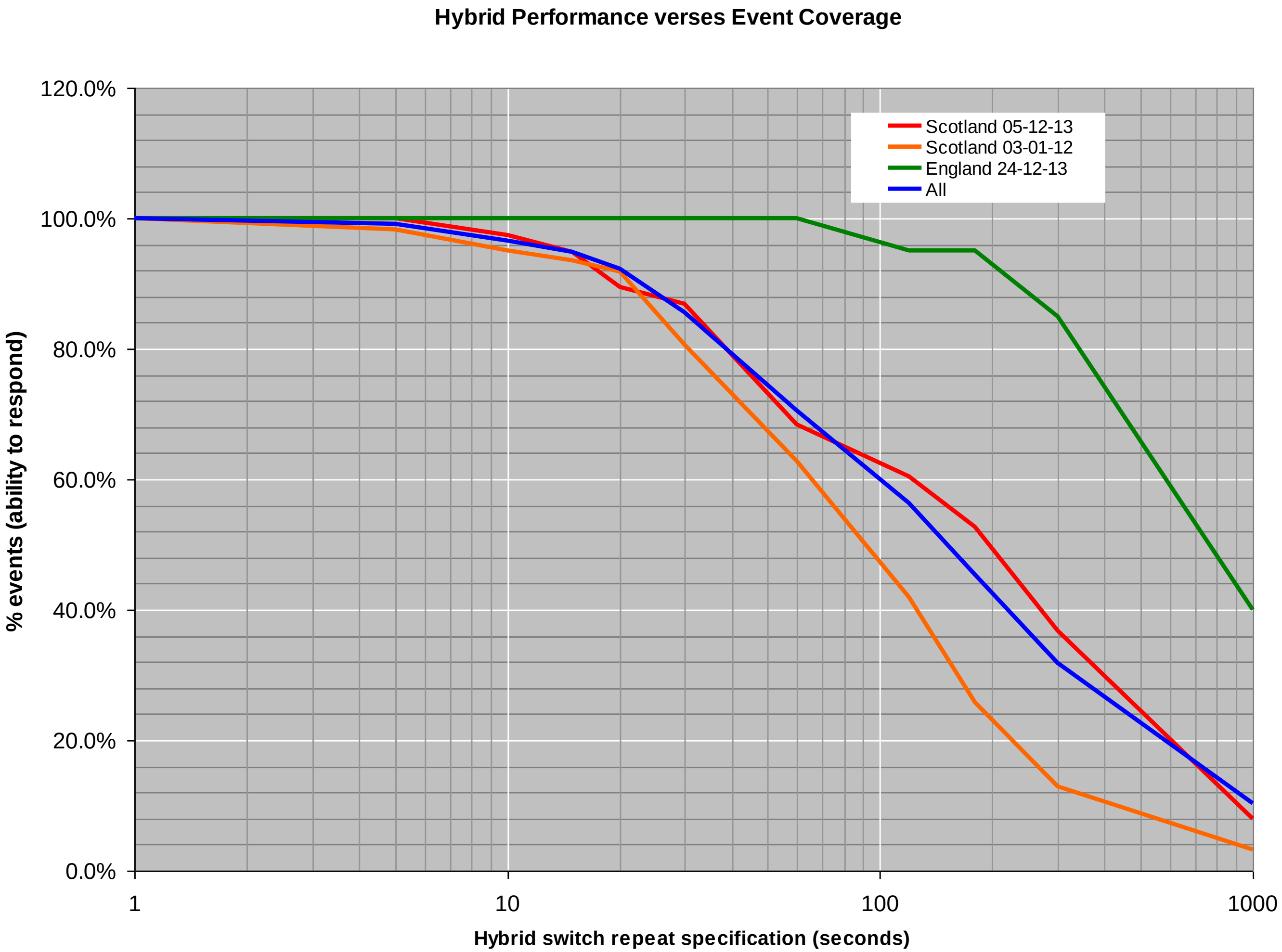
Storm Data Summary

- Total Number of Events from H/04 Consultation Data
- Typical Storm Statistics from SPT & NG

YEAR	Phase-E	2-Phase	2-Phase-E	3 & 3-Phase-E	Total
1990	746	732	53	39	1571
1991	153	22	4	20	198
1992	178	0	4	22	204
1993	134	19	6	26	185
1994	212	4	8	36	260
1995	110	37	8	5	160
1996	175	87	4	5	272
1997	183	14	0	7	204
1998	204	24	3	3	235
1999	174	14	4	8	200
2000	121	28	1	7	158
2001	86	78	4	1	169
2002	103	2	0	3	108
Ave. pa	198	82	8	14	302

Table 5.1

Analysis of Fault Data



Notes:

- Graphs which show the % readiness for the events which occurred verses repeat response ability of the device.

- The time on x axis, is the elapsed time in seconds before the STATCOM is ready to respond i.e. the time we are trying to determine. The % on y axis is the proportion switching events the STATCOM would have been ready to respond to for the examples.

- The above assumes that events less than 1 second apart are part of the same event and require a single response.

- The English data appears more favourable but this is simply due to the lack of time resolution as events are recorded to the nearest minute

Example of Events & Timings

Event	Time	Notes	Events <1 min	Time Diff.	Elapsed Seconds
Dounreay – Thurso – Mybster – Dunbeath – Brora – Shin (UTS) 132kV cct	05:14:00		1	00:00:00	0
Dounreay – Thurso – Mybster Shin (UTN)	05:14:00		2	00:00:00	0
Fort Augustus – Broadford 132 kV cct	05:58:00		1	00:44:00	0
Sloy – Inveraray (ISW)	06:06:34	Red	1	00:08:34	0
Peterhead – Blackhillock 275kV cct (VH)	06:14:00		1	00:07:26	0
Blackhillock – Keith 275kV cct (HK1)	06:14:00		2	00:00:00	0
Keith – Kintore 276kV cct (XK)	06:14:15	R-Y	3	00:00:15	15
Inverary – Ardkinglas – Sloy – Inverarnan 132kV cct (SN1/KS1/IK1)	06:14:32	Yellow	4	00:00:17	32
Inverary – Ardkinglas – Sloy – Inverarnan 132kV cct (SN1/KS1/IK1)	07:03:03	Blue	1	00:48:31	0
Inverary – Ardkinglas – Sloy – Inverarnan 132kV cct (SN1/KS1/IK1)	07:17:21	Yellow	1	00:14:18	0
Sloy – Windyhill – Dunoon – Whistlefield East 1 132kV cct (SWE1/GL1)	07:27:11	Red then R-Y	1	00:09:50	0
Hunterston – Kilmarnock South 400kV cct	07:28:42	Yellow	1	00:01:31	0
Kilwinning – Meadowhead 2 132kV	07:28:53	Red	2	00:00:11	11
Sloy – Windyhill – Dunoon – Whistlefield East 1 132kV cct (SWE1/GL1)	07:29:24	Yellow	3	00:00:31	42
Sloy – Windyhill – Dunoon – Whistlefield East 1 132kV cct (SWE1/GL1)	07:29:50	Yellow	4	00:00:26	68
Kilwinning – Meadowhead 2 132kV	07:33:30	Red	1	00:03:40	0
Inverkip - Strathaven 400kV cct	07:38:01	Blue	1	00:04:31	0
Coalburn Strarhaven 400kV cct	07:40:04	Red	1	00:02:03	0
Hunterston – Kilmarnock South 400kV cct	07:43:01	Yellow	1	00:02:57	0

Summary of Storm Data

Example 1		
Total Events	41	Quantity
Total Duration	4	Hours
Average Interval	5.85	Minutes
Total event clusters where events are less than one minute apart	8	Clusters
Total event clusters where 4 or more events occur are less than one minute apart	4	Clusters
Maximum Length of Cluster	4	Events
Average Duration of 4 Event Cluster	79	Seconds
Shortest time between events	11	Seconds
Example 2		
Total Events	67	Quantity
Total Duration all Events	3	Hours
Average Interval	2.69	Minutes
Total event clusters where events are less than one minute apart	14	Clusters
Total event clusters where 4 or more events occur are less than one minute apart	5	Clusters
Maximum Length of Cluster	5	Events
Average Duration of 4 Event Cluster	66.4	Seconds
Shortest time between events	4	Seconds
Example 3		
Total Events	20	Quantity
Total Duration	4.5	Hours
Average Interval	13.50	Minutes
Total event clusters where events are less than one minute apart	1	Clusters
Total event clusters where 4 or more events occur are less than one minute apart	0	Clusters
Maximum Length of Cluster	2	Events
Average Duration of 4 Event Cluster	N/A	Seconds
Shortest time between events	60	Seconds

Multiple Circuit Trip Examples (Storms)

Burns Day Storm 1990 (paper records prior to 97 – only example used) – **261 trips 80 faulted circuits in 24hours**.

Wednesday/Thursday 24th/25th Dec 1997 – **33 circuits tripped in 5 Hours**.

Saturday 26th Dec 1998 – High Winds – **Approx 20 trips, including 4 DAR restorations on same line in 4mins**.

Tuesday 27th Feb 2001 – Snow & High Winds - **Multiple trips on Scot. Interconnector. 600MW generation lost**.

Saturday 8th Jan 2005 – Gales - **32 faults on the NG System including 6 in 18, 7 in 21, 5 in 22 and 5 in 24mins**, most of which were restored by DAR

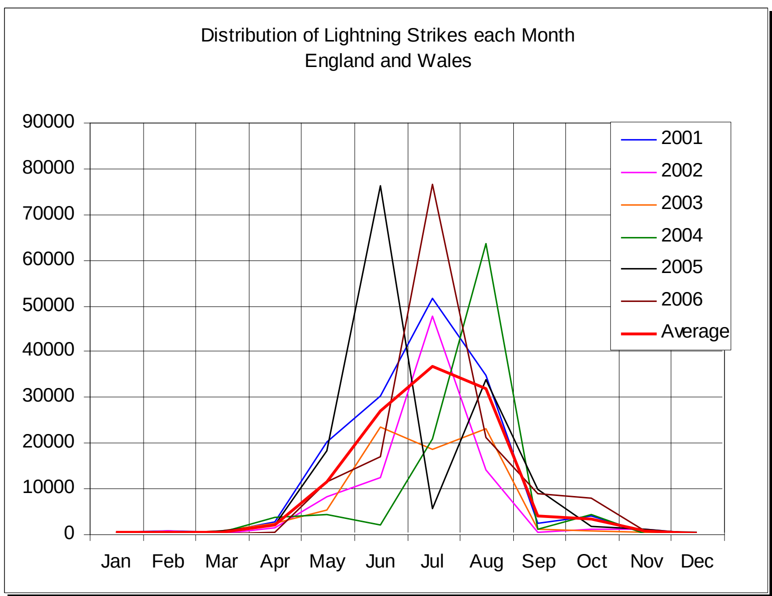
Thursday 18th Jan 2007 – 137 Protection operations – 51 DAR Sequences – 3 Conductor Failures resulting in permanent loss of circuits. A further 14 trips in 4 hours including sequences of **4 trips in 40mins, 4 trips in 8mins, and 3 trips in 10mins**. Most restored by DAR.

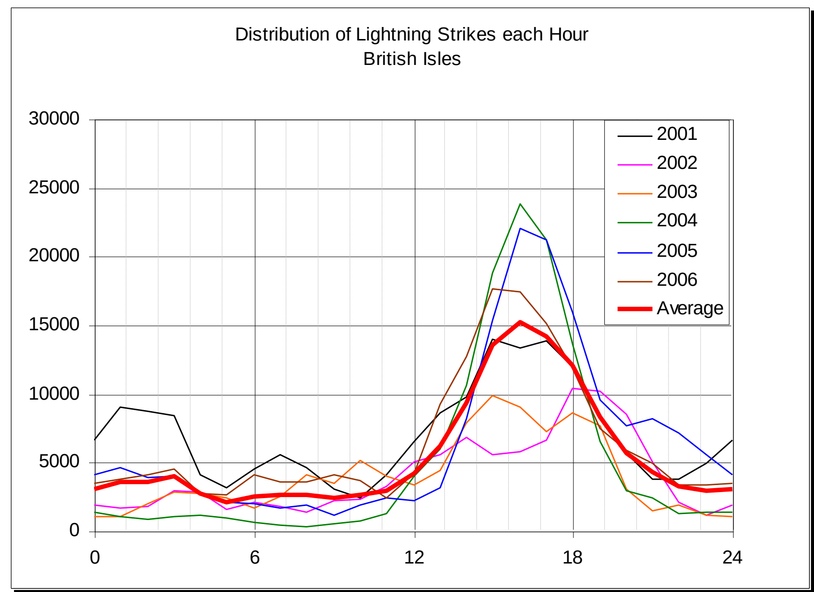
When do Lightning Strikes Typically Occur?

Total number of lightning strikes per annum (2001 - 2006)

	2001	2002	2003	2004	2005	2006
England & Wales	146880	86702	74753	100095	148806	143618
UK & Ireland	168708	98482	98332	122497	158321	157796

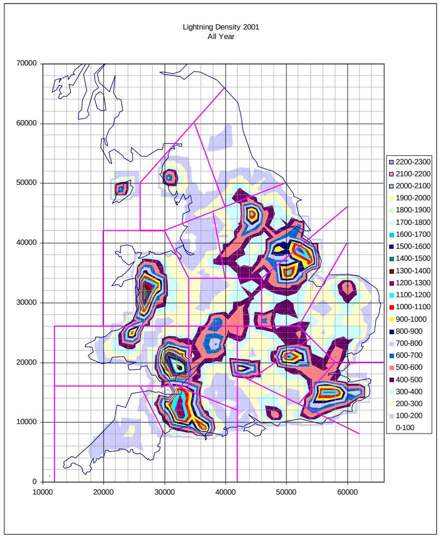
Lightning strikes vs Month of Year and Time of Day (2001 - 2006)

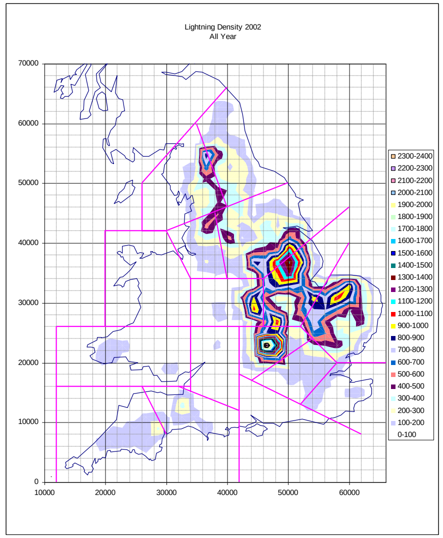


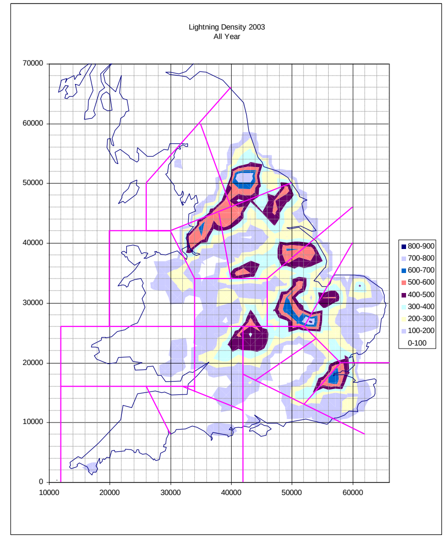


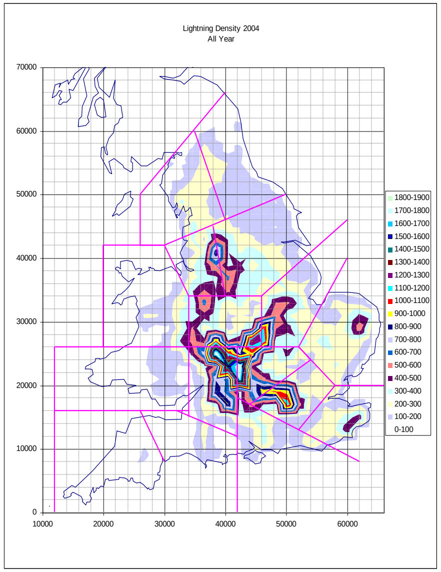
Where Do Strikes Typically Lightning Occur?

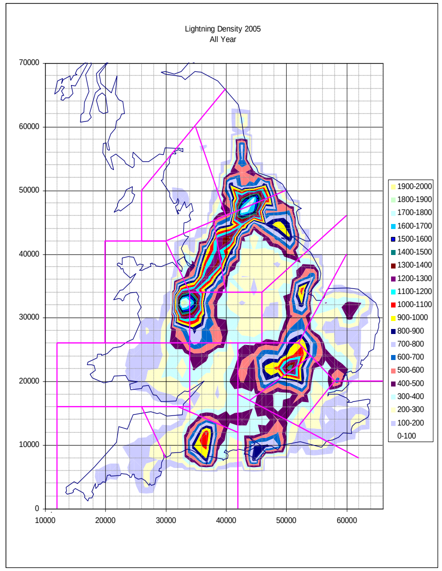
England and Wales Strikes 2001 - 2006

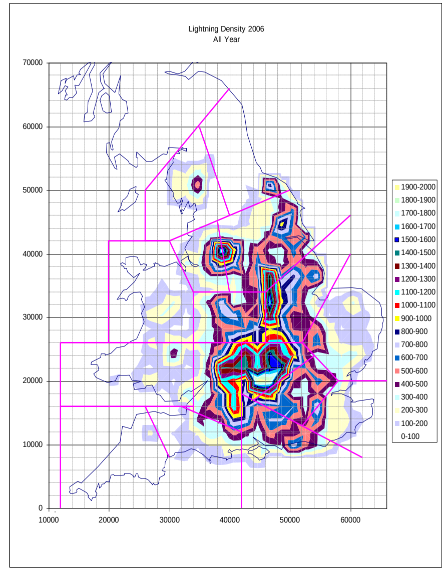




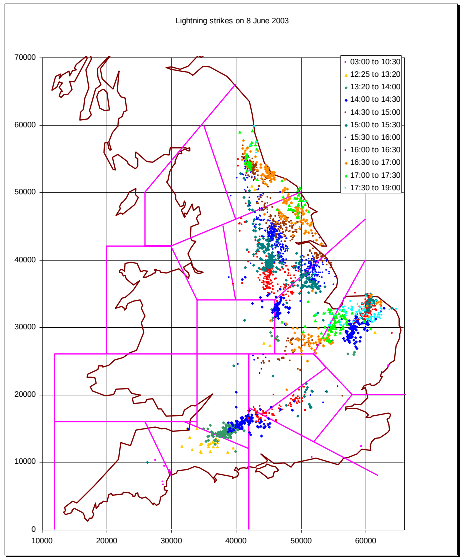


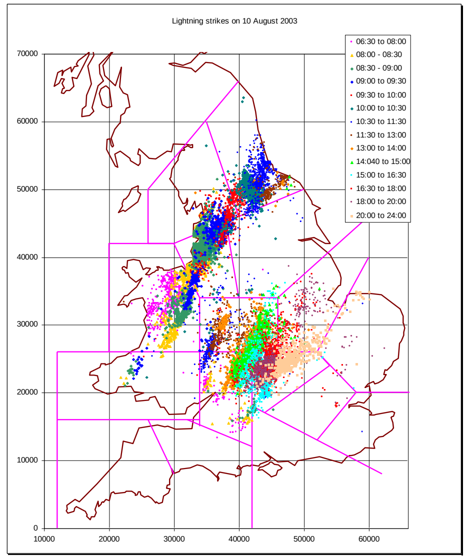


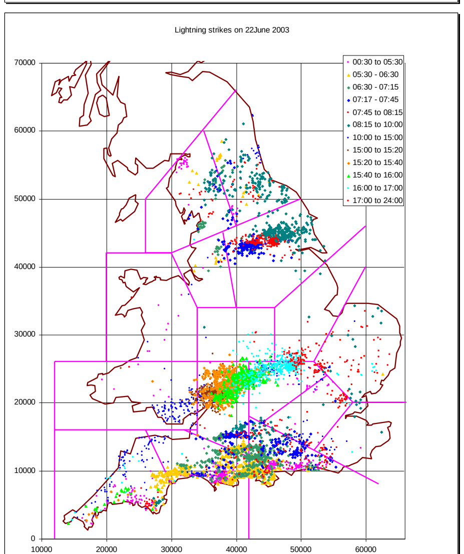


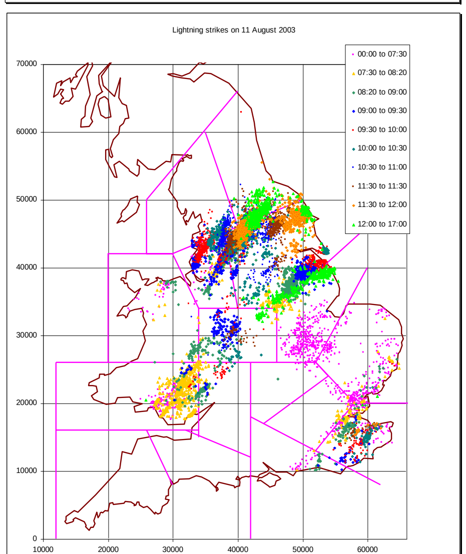


Examples of Lightning (2001)









Future Operating Scenario Data – ETYS 2014

Figure 2.7
Gone Green (transmission) generation mix

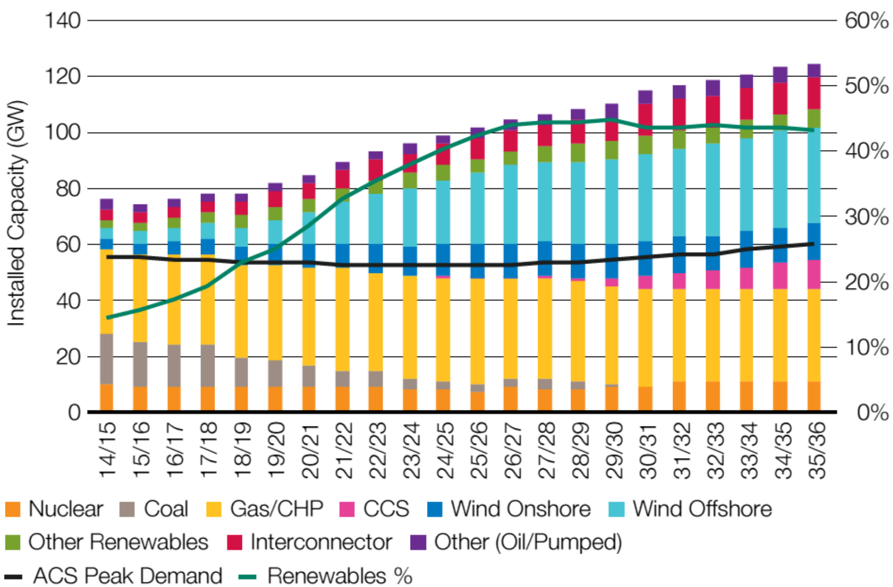


Figure 2.8
Slow Progression (transmission) generation mix

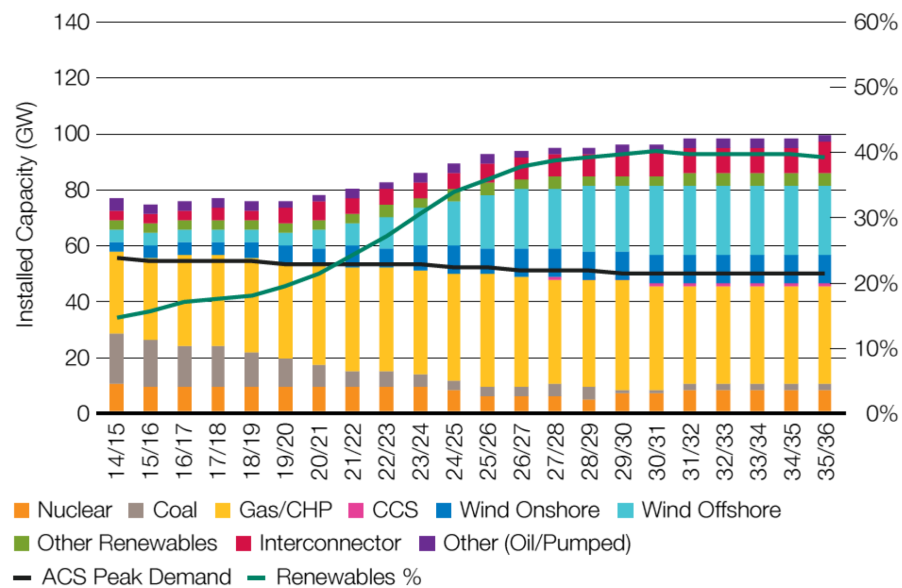
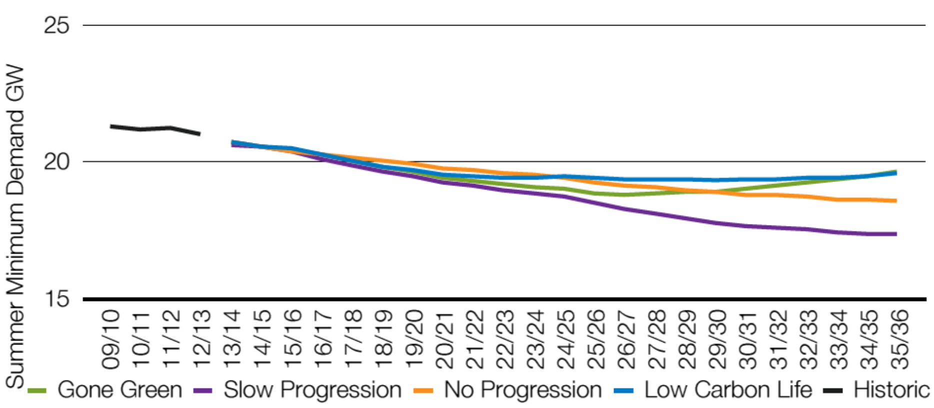


Figure 2.4
National historic Q/P ratios



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Multiple Circuit Trip Examples

Tuesday 3rd Aug 2004 – Lightning – 6 Circuit Trips (5 DAR Restoration's) in 3.25Hrs

Wednesday 18th Aug 2004 – Lightning - 10 Circuit Trips in 5 Hours including **3 DAR restorations in 3mins.**

Wednesday 31st Aug 2005 – Lightning – 11 Trips in 2hrs 21mins including **6 in 27minutes** in the same area. All recovered by DAR.

Friday 15th Jun 2006 – Lightning – 9 trips in 3 hours, several within a few minutes of each other.

Sunday 2nd Jul 2006 – Lightning - 8 trips in approx. 1.5 hours including **4 trips in 17minutes and 2 trips in 2mins**.

Wednesday 11th Oct 2006 – Lightning - 6 trips in approx. 6 hours in the Taunton area.

Sunday 1st Jul 2007 – Lightning – **5 trips in a localised area in 1/2 hour 4 of which auto reclosed or where restored manually**.

Wednesday 1st Jul 2009 – Lightning – **4 trips/events over a period of 25 minutes**

Monday 15th Jun 2009 – Lightning – 8 trips and restorations (i.e. 16 in total) in 3 hours including **4 in London area in 27 minutes**.

Thursday 28th Jun 2012 – Lightning – 9 trips at various places in UK and Scotland. At about 1 hour or half hour intervals.

Control Rooms Response to GC Change

- Control room will require notification of any restrictions in reactive reserve
- Control room will require notification of restoration of full reactive reserve
- Therefore requires change to BC2 in the Grid Code to reflect commercial arrangements

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Survey Results – 19 Jan 2015

- One response:
  - Stated do not fit Hybrid STATCOM currently
  - Currently not intending to fit Hybrid devices
  - Will meet repeatability requirement

New Draft Legal Text – 1 of 7

CC.A.7.2.3.1 For an on-load step change in **Onshore Grid Entry Point** or **Onshore User System Entry Point** voltage, the continuously acting automatic control system shall respond according to the following minimum criteria

i. the **Reactive Power** output response of the **Onshore Non-Synchronous Generating Unit**, **Onshore DC Converter** or **Onshore Power Park Module** shall commence within 0.2 seconds of the application of the step. It shall progress linearly although variations from a linear characteristic shall be acceptable provided that the MVAr seconds delivered at any time up to 1 second are at least those that would result from the response shown in figure CC.A.7.2.3.1a.

ii. the response shall be such that, for a sufficiently large step, 90% of the full reactive capability of the **Onshore Non-Synchronous Generating Unit**, **Onshore DC Converter** or **Onshore Power Park Module**, as required by **CC.6.3.2** (or, if appropriate, **CC.A.7.2.2.6** or **CC.A.7.2.2.7**), will be produced within 1 second

iii. the magnitude of the **Reactive Power** output response produced within 1 second shall vary linearly in proportion to the magnitude of the step change

iv. the settling time shall be no greater than 2 seconds from the application of the step change in voltage and the peak to peak magnitude of any oscillations shall be less than 5% of the change in steady state **Reactive Power** within this time.

v. **Onshore Non-Synchronous Generating Units**, **Onshore DC Converters, OTSDUW Plant and Apparatus** or **Onshore Power Park Modules** with a **Completion Date** on or after 1 April 2016, should be capable of repeated transient response performance, in accordance with CC.A.7.2.3.1(i),(ii), (iii), (iv), (vi) and across the reactive range (0.95PF leading to 0.95PF lagging) at 15 second intervals. **NGET** would consider a reasonable sequence to be 5 repetitions in 2 minutes which under worst case conditions would each be 15 seconds apart. A maximum of 5 such sequences may occur in any 24 hour period, after which the **Generator** should declare to **NGET** any restriction to reactive capability. For the avoidance of doubt, **NGET** would expect the full reactive capability as defined under CC.6.3.2 of the Grid Code to be fully restored as soon as possible and within 6 hours of the final event unless otherwise agreed with **NGET**.

vi. following the transient response, the conditions of CC.A.7.2.2 apply.

Notes:

- Existing Grid Code text is shown in Black and new text in Red.
- Legal Text Subject to Legal Review

New Draft Legal Text – 2 of 7

CC.6.3.15 Fault Ride Through

This section sets out the fault ride through requirements on **Generating Units**, **Power Park Modules**, **DC Converters** and **OTSDUW Plant and Apparatus**. **Onshore Generating Units**, **Onshore Power Park Modules**, **Onshore DC Converters** (including **Embedded Medium Power Stations** and **Embedded DC Converter Stations** not subject to a **Bilateral Agreement** and with an **Onshore User System Entry Point** (irrespective of whether they are located **Onshore** or **Offshore**)) and **OTSDUW Plant and Apparatus** are required to operate through **System** faults and disturbances as defined in CC.6.3.15.1 (a), CC.6.3.15.1 (b) and CC.6.3.15.3. **Offshore Generating Units** at a **Large Power Station**, **Offshore Power Park Modules** at a **Large Power Station** and **Offshore DC Converters** at a **Large Power Station** shall have the option of meeting either:

i. CC.6.3.15.1 (a), CC.6.3.15.1 (b) and CC.6.3.15.3, or:

ii. CC.6.3.15.2 (a), CC.6.3.15.2 (b) and CC.6.3.15.3

Offshore Generators and **Offshore DC Converter** owners, should notify **NGET** which option they wish to select within 28 days (or such longer period as **NGET** may agree, in any event this being no later than 3 months before the **Completion Date** of the offer for a final **CUSC Contract** which would be made following the appointment of the **Offshore Transmission Licensee**).

CC.6.3.15.1 Fault Ride through applicable to Generating Units, Power Park Modules and DC Converters and **OTSDUW Plant and Apparatus**

a) Short circuit faults on the **Onshore Transmission System** (which may include an **Interface Point**) at **Supergrid Voltage** up to 140ms in duration.

i. Each **Generating Unit**, **DC Converter**, or **Power Park Module** and any constituent **Power Park Unit** thereof and **OTSDUW Plant and Apparatus** shall remain transiently stable and connected to the **System** without tripping of any **Generating Unit**, **DC Converter** or **Power Park Module** and / or any constituent **Power Park Unit** or reactive compensation equipment and **OTSDUW Plant and Apparatus**, for a close-up solid three-phase short circuit fault or any unbalanced short circuit fault on the **Onshore Transmission System** (including in respect of **OTSDUW Plant and Apparatus**, the **Interface Point**) operating at **Supergrid Voltages** for a total fault clearance time of up to 140 ms. A solid three-phase or unbalanced earthed fault results in zero voltage on the faulted phase(s) at the point of fault. The duration of zero voltage is dependent on local **Protection** and circuit breaker operating times. This duration and the fault clearance times will be specified in the **Bilateral Agreement**. Following fault clearance, recovery of the **Supergrid Voltage** on the **Onshore Transmission System** to 90% may take longer than 140ms as illustrated in Appendix 4A Figures CC.A.4A.1 (a) and (b). It should be noted that in the case of an **Offshore Generating Unit**, **Offshore DC Converter** or **Offshore Power Park Module** (including any **Offshore Power Park Unit** thereof) which is connected to an **Offshore Transmission System** which includes a **Transmission DC Converter** as part of that **Offshore Transmission System**, the **Offshore Grid Entry Point** voltage may not indicate the presence of a fault on the **Onshore Transmission System**. …

New Draft Legal Text – 3 of 7

i. … The fault will affect the level of **Active Power** that can be transferred to the **Onshore Transmission System** and therefore subject the **Offshore Generating Unit**, **Offshore DC Converter** or **Offshore Power Park Module** (including any **Offshore Power Park Unit** thereof) to a load rejection.

ii. Each **Generating Unit**, **Power Park Module** and **OTSDUW Plant and Apparatus**, shall be designed such that upon both clearance of the fault on the **Onshore Transmission System** as detailed in CC.6.3.15.1 (a) (i) and within 0.5 seconds of the restoration of the voltage at the **Onshore Grid Entry Point** (for **Onshore Generating Units** or **Onshore Power Park Modules**) or **Interface Point** (for **Offshore Generating Units**, **Offshore Power Park Modules** or **OTSDUW Plant and Apparatus**) to the minimum levels specified in CC.6.1.4 (or within 0.5 seconds of restoration of the voltage at the **User System Entry Point** to 90% of nominal or greater if **Embedded**), **Active Power** output or in the case of **OTSDUW Plant and Apparatus**, **Active Power** transfer capability, shall be restored to at least 90% of the level available immediately before the fault. Once the **Active Power** output, or in the case of **OTSDUW Plant and Apparatus**, **Active Power** transfer capability, has been restored to the required level, **Active Power** oscillations shall be acceptable provided that:

- the total **Active Energy** delivered during the period of the oscillations is at least that which would have been delivered if the **Active Power** was constant
- the oscillations are adequately damped

During the period of the fault as detailed in CC.6.3.15.1 (a) (i) for which the voltage at the **Grid Entry Point** (or **Interface Point** in the case of **OTSDUW Plant and Apparatus**) is outside the limits specified in CC.6.1.4, each **Generating Unit** or **Power Park Module** or **OTSDUW Plant and Apparatus** shall generate maximum reactive current without exceeding the transient rating limit of the **Generating Unit**, **OTSDUW Plant and Apparatus** or **Power Park Module** and / or any constituent **Power Park Unit** or reactive compensation equipment. For the avoidance of doubt, switched reactive compensation equipment that is connected prior to the fault will remain connected.

iii. Each **DC Converter** shall be designed to meet the **Active Power** recovery characteristics (and **OTSDUW DC Converter** shall be designed to meet the **Active Power** transfer capability at the **Interface Point**) as specified in the **Bilateral Agreement** upon clearance of the fault on the **Onshore Transmission System** as detailed in CC.6.3.15.1 (a) (i).

b. Supergrid Voltage dips on the **Onshore Transmission System** greater than 140ms in duration

In addition to the requirements of CC.6.3.15.1 (a) each **Generating Unit**, **OTSDUW Plant and Apparatus**, or each **Power Park Module** and / or any constituent **Power Park Unit**, each with a **Completion Date** on or after the 1 April 2005 shall:

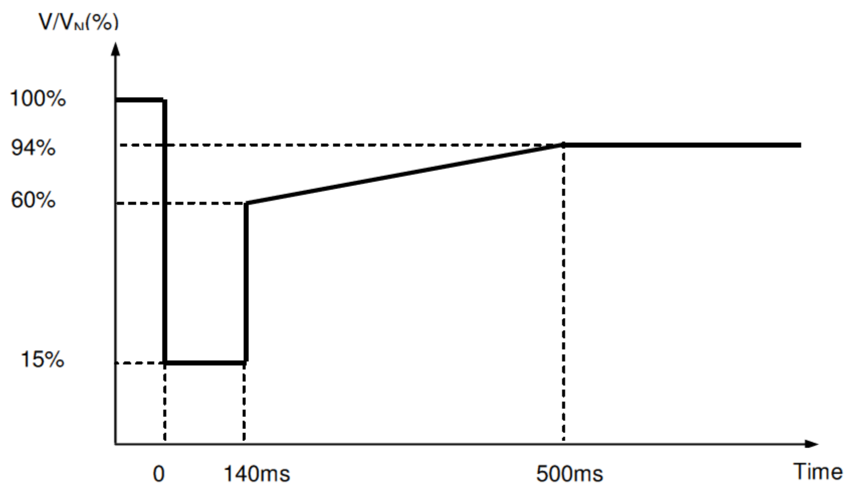
i. remain transiently stable and connected …

New Draft Legal Text – 4 of 7

CC.6.3.15.2 Fault Ride Through applicable to Offshore Generating Units at a Large Power Station, Offshore Power Park Modules at a Large Power Station and Offshore DC Converters at a Large Power Station who choose to meet the fault ride through requirements at the LV side of the Offshore Platform

a) Requirements on **Offshore Generating Units**, **Offshore Power Park Modules** and **Offshore DC Converters** to withstand voltage dips on the **LV Side of the Offshore Platform** for up to 140ms in duration as a result of faults and / or voltage dips on the **Onshore Transmission System** operating at **Supergrid Voltage**

i. Each **Offshore Generating Unit**, **Offshore DC Converter**, or **Offshore Power Park Module** and any constituent **Power Park Unit** thereof shall remain transiently stable and connected to the **System** without tripping of any **Offshore Generating Unit**, or **Offshore DC Converter** or **Offshore Power Park Module** and / or any constituent **Power Park Unit** or reactive compensation equipment, for any balanced or unbalanced voltage dips on the **LV Side of the Offshore Platform** whose profile is anywhere on or above the heavy black line shown in Figure 6. For the avoidance of doubt, the profile beyond 140ms in Figure 6 shows the minimum recovery in voltage that will be seen by the generator following clearance of the fault at 140ms. Appendix 4B and Figures CC.A.4B.2 (a) and (b) provide further illustration of the voltage recovery profile that may be seen. It should be noted that in the case of an **Offshore Generating Unit**, **Offshore DC Converter** or **Offshore Power Park Module** (including any **Offshore Power Park Unit** thereof) which is connected to an **Offshore Transmission System** which includes a **Transmission DC Converter** as part of that **Offshore Transmission System**, the **Offshore Grid Entry Point** voltage may not indicate the presence of a fault on the **Onshore Transmission System**.



The voltage dip will affect the level of **Active Power** that can be transferred to the **Onshore Transmission System** and therefore subject the **Offshore Generating Unit, Offshore DC Converter** or **Offshore Power Park Module** (including any **Offshore Power Park Unit** thereof) to a load rejection.

V/VN is the ratio of the actual voltage on one or more phases at the **LV Side of the Offshore Platform** to the nominal voltage of the **LV Side of the Offshore Platform**.

Figure 6

New Draft Legal Text – 5 of 7

ii. Each **Offshore Generating Unit**, or **Offshore Power Park Module** and any constituent **Power Park Unit** thereof shall provide **Active Power** output, during voltage dips on the **LV Side of the Offshore Platform** as described in Figure 6, at least in proportion to the retained voltage at the **LV Side of the Offshore Platform** except in the case of an **Offshore Non-Synchronous Generating Unit** or **Offshore Power Park Module** where there has been a reduction in the **Intermittent Power Source** in the time range in Figure 6 that restricts the **Active Power** output below this level and shall generate maximum reactive current without exceeding the transient rating limits of the **Offshore Generating Unit** or **Offshore Power Park Module** and any constituent **Power Park Unit** or reactive compensation equipment. Once the **Active Power** output has been restored to the required level, **Active Power** oscillations shall be acceptable provided that:

- the total **Active Energy** delivered during the period of the oscillations is at least that which would have been delivered if the **Active Power** was constant
- the oscillations are adequately damped

and;

iii. Each **Offshore DC Converter** shall be designed to meet the **Active Power** recovery characteristics as specified in the **Bilateral Agreement** upon restoration of the voltage at the **LV Side of the Offshore Platform**.

b. Requirements of **Offshore Generating Units**, **Offshore Power Park Modules** to withstand voltage dips on the **LV Side of the Offshore Platform** greater than 140ms in duration.

In addition to the requirements of CC.6.3.15.2. (a) each **Offshore Generating Unit** or **Offshore Power Park Module** and / or any constituent **Power Park Unit**, shall:

i. remain transiently stable and connected to the **System** without tripping of any **Offshore Generating Unit** or **Offshore Power Park Module** and / or any constituent **Power Park Unit**, for any balanced voltage dips on the **LV side of the Offshore Platform** and associated durations anywhere on or above the heavy black line shown in Figure 7. Appendix 4B and Figures CC.A.4B.3. (a), (b) and (c) provide an explanation and illustrations of Figure 7. It should be noted that in the case of an **Offshore Generating Unit**, or **Offshore Power Park Module** (including any **Offshore Power Park Unit** thereof) which is connected to an **Offshore Transmission System** which includes a **Transmission DC Converter** as part of that **Offshore Transmission System**, the **Offshore Grid Entry Point** voltage may not indicate the presence of a voltage dip on the **Onshore Transmission System**. The voltage dip will affect the level of **Active Power** that can be transferred to the **Onshore Transmission System** and therefore subject the **Offshore Generating Unit**, or **Offshore Power Park Module** (including any **Offshore Power Park Unit** thereof) to a load rejection.

New Draft Legal Text – 6 of 7

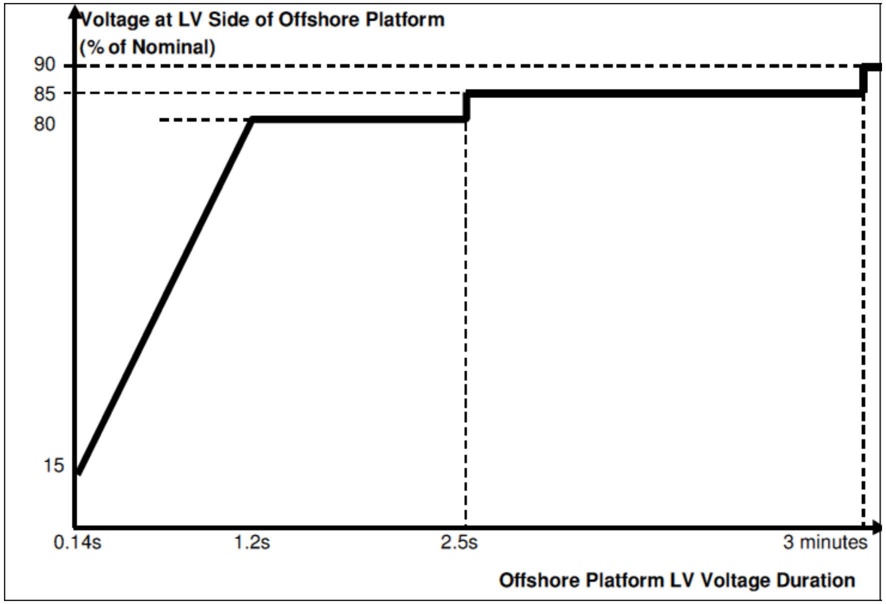


Figure 7

ii. provide **Active Power** output, during voltage dips on the **LV Side of the Offshore Platform** as described in Figure 7, at least in proportion to the retained balanced or unbalanced voltage at the **LV Side of the Offshore Platform** except in the case of an **Offshore Non-Synchronous Generating Unit** or **Offshore Power Park** Module where there has been a reduction in the Intermittent Power Source in the time range in Figure 7 that restricts the Active Power output below this level and shall generate maximum reactive current (where the voltage at the Offshore Grid Entry Point is outside the limits specified in CC.6.1.4) without exceeding the transient rating limits of the Offshore Generating Unit or Offshore Power Park Module and any constituent Power Park Unit or reactive compensation equipment. For the avoidance of doubt switched reactive compensation equipment that is connected prior to the fault will remain connected; and,

iii. within 1 second of the restoration of the voltage at the LV Side of the Offshore Platform (to the minimum levels specified in CC.6.1.4) restore Active Power to at least 90% of the Offshore Generating Unit's or Offshore Power Park Module's immediate pre-disturbed value …

New Draft Legal Text – 7 of 7

BC2.11.4

Each **Generator** and / or **DC Converter** shall operate its dynamically controlled **OTSDUW Plant and Apparatus**, **Power Park Module** and / or **DC Converter** (as applicable) to ensure that the reactive capability and voltage control performance requirements as specified in CC.6.3.2, CC.6.3.8, CC.A.7 and the **Bilateral Agreement** can be satisfied in response to the **Setpoint Voltage** and **Slope** as instructed by **NGET** at the **Transmission Interface Point** or **Grid Entry Point** or **User System Entry Point** (where **Embedded**). Where a **Power Park Module**, **DC Converter** or **OTSDUW Plant and Apparatus** has been subject to more than the events as defined in CC.A.7.2.3.1(v), each **Generator** or **DC Converter** must notify **NGET** of any reduction in reactive capability and subsequently when full reactive capability is restored, which shall be not greater than 6 hours following the last event.

Working Group Report and Grid Code Process

- Agree / Draft Legal Text
- Prepare Draft Working Group Report
- Seek Views and Update Report from Working Group Members
- Submit to GCRP May 2015
- Industry Consultation
- Report to Authority
- Grid Code Text Accepted / Rejected

Summary and Discussion

- Discuss Legal Text and Way Forward