

# Requirements for Generators RFG

Generator Banding Thresholds 3 – January 2015

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An additional slide pack reviewing...

- ❑ Type D scale generation (100MW+)
  - ❑ Data tables based on an alternate assumption on connection voltages in Scotland
    - ❑ Interconnector capacities
- ...is contained at the back of the presentation  
(slide 14 onwards)

## RfG – background on Generator banding

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- RfG introduces the concept of generator banding, to ensure a proportionate level of response dependent on a station's installed capacity and/or connection voltage
- Banding thresholds in each synchronous area need to be agreed via public consultation and are ratified by NRA approval. Generators are required to support this activity
- Once banding thresholds become active, they cannot be adjusted for three years and do not apply retrospectively
- SOs seeking to make a change must follow the same process as agreeing the initial band thresholds

# Banding Analysis

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- This presentation is a follow up to a previous set of scenario analysis (Nov '14) on a fit for the GB banding thresholds
- It presents data based on:
  - a GB banding proposal from the current draft of RfG (January 2014);
  - a Central European (CE) view which may be recommended for adoption in GB (also from January '14);
  - and a banding proposal put forward by the NGET SO
- Data tables are compiled using expected trends on future users of the Distribution and Transmission system

## Data Sources

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- All data submissions now received (6/6 DNO organisations) – many thanks for your help!
- RIIO ED1 Price Control submissions have been used by *majority* of DNOs for Distributed Generation analysis
  - This means MW granularity to technology level is available. ***Should this be analysed too?***
- ED1 submissions present an aggregated view of projects and MW. Therefore the true deviation of project capacities is not clear:
  - ***Is a 'total' average (per technology) too simplistic?***
- 29/12/14 version TEC and Embedded Register used

## Data Assumptions

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- An arbitrary average project MW has been formed to allow the analysis, based on Total MW/No. of Projects
- Projects >100MW in capacity have been excluded from analysis (inevitably Type D by default)
- Connection data in all sources is limited, therefore:
  - *Projects below 100MW connecting to a Scottish TO are assumed to be at 33kV*
  - *England & Wales BEGA projects are also assumed to be connected 33kV*
- Projects which are operational or in construction are excluded – ***should this also be analysed for info?***

## Reminder on banding proposals

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|                          | Type A    | Type B   | Type C  | Type D |
|--------------------------|-----------|----------|---------|--------|
| GB: Jan '14<br>draft RfG | 0.8KW-1MW | 1MW-10MW | 10-30MW | 30MW+  |
| CE: Jan '14<br>draft RfG | 0.8KW-1MW | 1MW-50MW | 50-75MW | 75MW+  |
| GB: NGET<br>proposal     | 0.8KW-1MW | 1MW-30MW | 30-50MW | 50MW+  |

# Project/MW summary 2015-2023: All

| GB (Jan 14)  | Type A: 0.8kW-1MW |                   | Type B: 1-9.9MW |                  | Type C: 10-29.9MW |                  | Type D: 30MW+ |                  |
|--------------|-------------------|-------------------|-----------------|------------------|-------------------|------------------|---------------|------------------|
|              | Projects          | MW                | Projects        | MW               | Projects          | MW               | Projects      | MW               |
| DNO TOTAL    | 2,287,025         | 22,182.403        | 3,792           | 5,924.960        | 50                | 868.326          | 14            | 750              |
| TEC Reg      |                   |                   | 1               | 4.000            | 23                | 507.850          | 66            | 3,922            |
| Embedded Reg |                   |                   | 73              | 300.510          | 12                | 279.750          | 3             | 131              |
| <b>TOTAL</b> | <b>2,287,025</b>  | <b>22,182.403</b> | <b>3,866</b>    | <b>6,229.470</b> | <b>85</b>         | <b>1,655.926</b> | <b>83</b>     | <b>4,803.200</b> |

  

| CE (Jan 14)  | Type A: 0.8kW-1MW |                   | Type B: 1-49.9MW |                  | Type C: 50-74.9MW |                  | Type D: 75MW+ |                  |
|--------------|-------------------|-------------------|------------------|------------------|-------------------|------------------|---------------|------------------|
|              | Projects          | MW                | Projects         | MW               | Projects          | MW               | Projects      | MW               |
| DNO TOTAL    | 2,287,025         | 22,182.403        | 3,842            | 6,793.285        | 0                 | 0.000            | 14            | 750              |
| TEC Reg      |                   |                   | 51               | 1,577.450        | 22                | 1,345.200        | 17            | 1,511            |
| Embedded Reg |                   |                   | 87               | 646.360          | 1                 | 65.000           | 0             | 0                |
| <b>TOTAL</b> | <b>2,287,025</b>  | <b>22,182.403</b> | <b>3,980</b>     | <b>9,017.095</b> | <b>23</b>         | <b>1,410.200</b> | <b>31</b>     | <b>2,261.300</b> |

  

| GB (NGET Proposal) | Type A: 0.8kW-1MW |                   | Type B: 1-29.9MW |                  | Type C: 30-49.9MW |                  | Type D: 50MW+ |                  |
|--------------------|-------------------|-------------------|------------------|------------------|-------------------|------------------|---------------|------------------|
|                    | Projects          | MW                | Projects         | MW               | Projects          | MW               | Projects      | MW               |
| DNO TOTAL          | 2,287,025         | 22,182.403        | 3,842            | 6,793.285        | 0                 | 0.000            | 14            | 750              |
| TEC Reg            |                   |                   | 24               | 511.850          | 27                | 1,065.600        | 39            | 2,857            |
| Embedded Reg       |                   |                   | 85               | 580.260          | 2                 | 66.100           | 1             | 65               |
| <b>TOTAL</b>       | <b>2,287,025</b>  | <b>22,182.403</b> | <b>3,951</b>     | <b>7,885.395</b> | <b>29</b>         | <b>1,131.700</b> | <b>54</b>     | <b>3,671.500</b> |

- No. of schemes = 2,291,058; Total MW = 34,870.998
- Types A-B make up the majority of the position under all proposals.  
**Therefore is the lack of Type C a concern?**



# Comparison of 'All' tables: Jan '15 to Nov '14

| GB (Jan 14)           |     | Type A: 0.8kW-1MW |                   | Type B: 1MW-10MW |                  | Type C: 10-30MW |                  | Type D: 30MW+ |                  |
|-----------------------|-----|-------------------|-------------------|------------------|------------------|-----------------|------------------|---------------|------------------|
| TEC / Emb Reg         | DNO | Projects          | MW                | Projects         | MW               | Projects        | MW               | Projects      | MW               |
|                       |     | 0                 | 0.000             | 58               | 237.810          | 52              | 1,052.720        | 86            | 5,025.600        |
|                       |     | 1,146,932         | 5,869.923         | 1,595            | 3,676.567        | 88              | 1,352.696        | 9             | 450.000          |
| <b>TOTAL</b>          |     | <b>1,146,932</b>  | <b>5,869.923</b>  | <b>1,653</b>     | <b>3,914.377</b> | <b>140</b>      | <b>2,405.416</b> | <b>95</b>     | <b>5,475.600</b> |
| <i>Diff to Jan 15</i> |     | <i>1,140,092</i>  | <i>16,312.480</i> | <i>2,212</i>     | <i>2,315.093</i> | <i>-55</i>      | <i>-749.491</i>  | <i>-12</i>    | <i>-672.400</i>  |

  

| CE (Jan 14)           |     | Type A: 0.8kW-1MW |                   | Type B: 1MW-50MW |                  | Type C: 50-75MW |                  | Type D: 75MW+ |                  |
|-----------------------|-----|-------------------|-------------------|------------------|------------------|-----------------|------------------|---------------|------------------|
| TEC / Emb Reg         | DNO | Projects          | MW                | Projects         | MW               | Projects        | MW               | Projects      | MW               |
|                       |     | 0                 | 0.000             | 146              | 2,696.230        | 31              | 1,913.600        | 19            | 1,706.300        |
|                       |     | 1,146,932         | 5,869.923         | 1,683            | 5,029.263        | 9               | 450.000          | 0             | 0.000            |
| <b>TOTAL</b>          |     | <b>1,146,932</b>  | <b>5,869.923</b>  | <b>1,829</b>     | <b>7,725.493</b> | <b>40</b>       | <b>2,363.600</b> | <b>19</b>     | <b>1,706.300</b> |
| <i>Diff to Jan 15</i> |     | <i>1,140,092</i>  | <i>16,312.480</i> | <i>2,150</i>     | <i>1,291.602</i> | <i>-17</i>      | <i>-953.400</i>  | <i>12</i>     | <i>555.000</i>   |

  

| GB (NGET Proposal)    |     | Type A: 0.8kW-1MW |                   | Type B: 1MW-30MW |                  | Type C: 30-50MW |                  | Type D: 50MW+ |                  |
|-----------------------|-----|-------------------|-------------------|------------------|------------------|-----------------|------------------|---------------|------------------|
| TEC / Emb Reg         | DNO | Projects          | MW                | Projects         | MW               | Projects        | MW               | Projects      | MW               |
|                       |     | 0                 | 0.000             | 110              | 1,290.530        | 36              | 1,405.700        | 50            | 3,619.900        |
|                       |     | 1,146,932         | 5,869.923         | 1,683            | 5,029.263        | 0               | 0.000            | 9             | 450.000          |
| <b>TOTAL</b>          |     | <b>1,146,932</b>  | <b>5,869.923</b>  | <b>1,793</b>     | <b>6,319.793</b> | <b>36</b>       | <b>1,405.700</b> | <b>59</b>     | <b>4,069.900</b> |
| <i>Diff to Jan 15</i> |     | <i>1,140,092</i>  | <i>16,312.480</i> | <i>2,157</i>     | <i>1,565.602</i> | <i>-7</i>       | <i>-274.000</i>  | <i>-5</i>     | <i>-398.400</i>  |

- Significant increase in number of Type A-B schemes under all banding proposals in second submission
- Moderate decrease of schemes in the C-D bands

## Summary of findings

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- Data is a forecast and has been aggregated (as before)
  - it cannot therefore be deemed as 100% accurate
- However it provides a fair reflection on anticipated trends for future connections:
  - Substantial volume of ‘Type A’ photovoltaic projects
  - Count of Type’s C-D largely consistent from previous analysis
  - Majority of schemes that could make up Type C would be Scottish-based
  - Data does not capture the nature of connection voltages; assumptions on whether 50-100MW schemes could fall as Type D is a particularly important next step (for schemes currently ‘B’ or ‘C’)

## Next Steps

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- Position on Type D is largely out of scope in this analysis. Do we need to capture 100MW+ schemes to understand full picture?
- Is a split by project technology important (synchronous vs non-)?
- Is the existing profile of generators important for our consideration in setting the thresholds? If so, what data sources for Distributed generation?
- Should we consider market/political developments as well?
  - Capacity Mechanism
  - Closure of RO/commencement of CFD regime
  - Others?
- Finally - how far do we need to continue our analysis? Could we draw conclusions from the two data analysis activities now carried out? If not, why?

# Requirements for Generators RFG Type D Sub-Presentation

Generator Banding Thresholds 3a – January 2015

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## Data Assumptions/Sources

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- Same analysis process as main slide pack, however...
  - Projects >100MW in capacity are now included (Type D by default)
  - Connection data in all sources is limited, therefore (and unlike previously): *Projects between  $\geq 50$  MW connecting to a Scottish TO are assumed to be at 132kV (and therefore Type D by default)*
  - >100MW project technology breakdown for TEC projects included for info
  - TEC register spans 2015-2026 (unlike ED1 data which is 2015-2023)

## Reminder on banding proposals

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|                          | Type A    | Type B   | Type C  | Type D |
|--------------------------|-----------|----------|---------|--------|
| GB: Jan '14<br>draft RfG | 0.8KW-1MW | 1MW-10MW | 10-30MW | 30MW+  |
| CE: Jan '14<br>draft RfG | 0.8KW-1MW | 1MW-50MW | 50-75MW | 75MW+  |
| GB: NGET<br>proposal     | 0.8KW-1MW | 1MW-30MW | 30-50MW | 50MW+  |

# Project/MW summary 2015-2023/6: nationalgrid

## Distributed Generation + TEC & Embedded

| GB (Jan 14)  | Type A: 0.8kW-1MW |                   | Type B: 1-9.9MW |                  | Type C: 10-29.9MW |                  | Type D: 30MW+ |                   |
|--------------|-------------------|-------------------|-----------------|------------------|-------------------|------------------|---------------|-------------------|
|              | Projects          | MW                | Projects        | MW               | Projects          | MW               | Projects      | MW                |
| DNO TOTAL    | 2,287,025         | 22,182.403        | 3,792           | 5,924.960        | 50                | 868.326          | 14            | 750               |
| TEC Reg      |                   |                   | 1               | 4.000            | 23                | 507.850          | 165           | 81,548            |
| Embedded Reg |                   |                   | 73              | 300.510          | 12                | 279.750          | 3             | 131               |
| <b>TOTAL</b> | <b>2,287,025</b>  | <b>22,182.403</b> | <b>3,866</b>    | <b>6,229.470</b> | <b>85</b>         | <b>1,655.926</b> | <b>182</b>    | <b>82,429.000</b> |

  

| CE (Jan 14)  | Type A: 0.8kW-1MW |                   | Type B: 1-49.9MW |                  | Type C: 50-74.9MW |              | Type D: 75MW+ |                   |
|--------------|-------------------|-------------------|------------------|------------------|-------------------|--------------|---------------|-------------------|
|              | Projects          | MW                | Projects         | MW               | Projects          | MW           | Projects      | MW                |
| DNO TOTAL    | 2,287,025         | 22,182.403        | 3,842            | 6,793.285        | 0                 | 0.000        | 14            | 750               |
| TEC Reg      |                   |                   | 51               | 1,577.450        | 0                 | 0.000        | 138           | 80,482            |
| Embedded Reg |                   |                   | 87               | 646.360          | 0                 | 0.000        | 1             | 65                |
| <b>TOTAL</b> | <b>2,287,025</b>  | <b>22,182.403</b> | <b>3,980</b>     | <b>9,017.095</b> | <b>0</b>          | <b>0.000</b> | <b>153</b>    | <b>81,297.300</b> |

  

| GB (NGET Proposal) | Type A: 0.8kW-1MW |                   | Type B: 1-29.9MW |                  | Type C: 30-49.9MW |                  | Type D: 50MW+ |                   |
|--------------------|-------------------|-------------------|------------------|------------------|-------------------|------------------|---------------|-------------------|
|                    | Projects          | MW                | Projects         | MW               | Projects          | MW               | Projects      | MW                |
| DNO TOTAL          | 2,287,025         | 22,182.403        | 3,842            | 6,793.285        | 0                 | 0.000            | 14            | 750               |
| TEC Reg            |                   |                   | 24               | 511.850          | 27                | 1,065.600        | 138           | 80,482            |
| Embedded Reg       |                   |                   | 85               | 580.260          | 2                 | 66.100           | 1             | 65                |
| <b>TOTAL</b>       | <b>2,287,025</b>  | <b>22,182.403</b> | <b>3,951</b>     | <b>7,885.395</b> | <b>29</b>         | <b>1,131.700</b> | <b>153</b>    | <b>81,297.300</b> |

- **99.82%** of all projects = **Type A**; approx. **0.17%\*** = **Type B**
- **Approx. 73%\*** of total capacity = **Type D**; **19.78%** = **Type A**
- In this scenario, **no Type C** schemes under Jan '15 GB draft banding proposals

\*Actual figure dependent on banding proposal

## TEC Only – Technology Profile

| Plant Type    | Total MW         | Total Projects | Capacity Share | Average Proj MW |
|---------------|------------------|----------------|----------------|-----------------|
| CCGT          | 17923.000        | 17             | 23.19%         | 1054.294        |
| Wind Onshore  | 3005.800         | 16             | 3.89%          | 187.863         |
| Wind Offshore | 32911.000        | 48             | 42.58%         | 685.646         |
| Nuclear       | 19407.000        | 8              | 25.11%         | 2425.875        |
| Tidal         | 867.000          | 4              | 1.12%          | 216.750         |
| Pump Storage  | 2112.000         | 2              | 2.73%          | 1056.000        |
| Wave          | 300.000          | 1              | 0.39%          | 300.000         |
| CHP           | 490.000          | 1              | 0.63%          | 490.000         |
| Biomass       | 280.000          | 1              | 0.36%          | 280.000         |
| <b>TOTAL</b>  | <b>77295.800</b> | <b>98.000</b>  |                | <b>6696.427</b> |

- Offshore Wind, Nuclear and CCGT make up the majority technologies with TEC from 2015 onwards
- **Offshore wind** makes up **43%** of the total sample alone
- Sizeable amount of **CCGT** (nearly **18GW**) which will be particularly important in assisting the SO in managing the system



# Interconnectors

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- Interconnectors are required to support the SO in managing the system, but at this stage there is no guarantee on the direction of flow, or that the ‘future projects’ will be constructed...
  
- **Existing**
  - 2GW to France (IFA)
  - 1GW to the Netherlands (BritNed)
  - 500MW to Northern Ireland (Moyle)
  - 500MW to the Republic of Ireland (East West)
  
- **Future Projects**
  - 1GW to France (ElecLink)
  - 1GW to Belgium (Nemo)
  - 1.4GW to France (FAB)
  - 1GW to France (IFA2)
  - 1.4GW to Norway (NSN)
  - 1-1.4GW to Denmark (Viking Link)
  - [?GW to Ireland (Greenlink)]