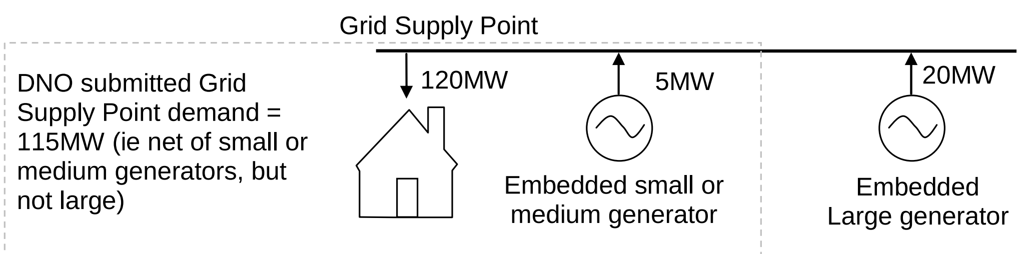
LOAD FACTORS FOR EMBEDDED GENERATORS IN SCOTLAND LESS THAN 100MW
Paper by National Grid

Summary
1. Every year, when setting Transmission Network Use of System (TNUoS) tariffs, National Grid request data from the Scottish DNOs. The requirement to supply this necessary data is not set out in the industry codes. The aim of this paper is to codify the current adhoc arrangements and then include the data submission within the current week 24 data submission process.

Background
2. The locational element of TNUoS charges is calculated using the DCLF ICRP Transport Model. The transport model is a DC load flow based on the data from the Seven Year Statement (SYS). However there is an additional data requirement for the load factors for large embedded generators less than 100MW that is not contained in the SYS. This is explained below.

3. Within the transport model chargeable[1] generation is modelled discreetly. Embedded generators that are licensable (>100MW) and have a Bilateral Embedded Generation Agreement with National Grid are chargeable. Therefore embedded generators, greater than 100MW are modelled discreetly.

4. Within the transport model demand data comes from the SYS[2]. The SYS demand data is submitted by the DNOs in calendar week 24. Within the data submission the generation output of small and medium power stations is netted from the grid supply point demand (see diagram below). However the output from embedded large generation stations are specifically excluded. See diagram below



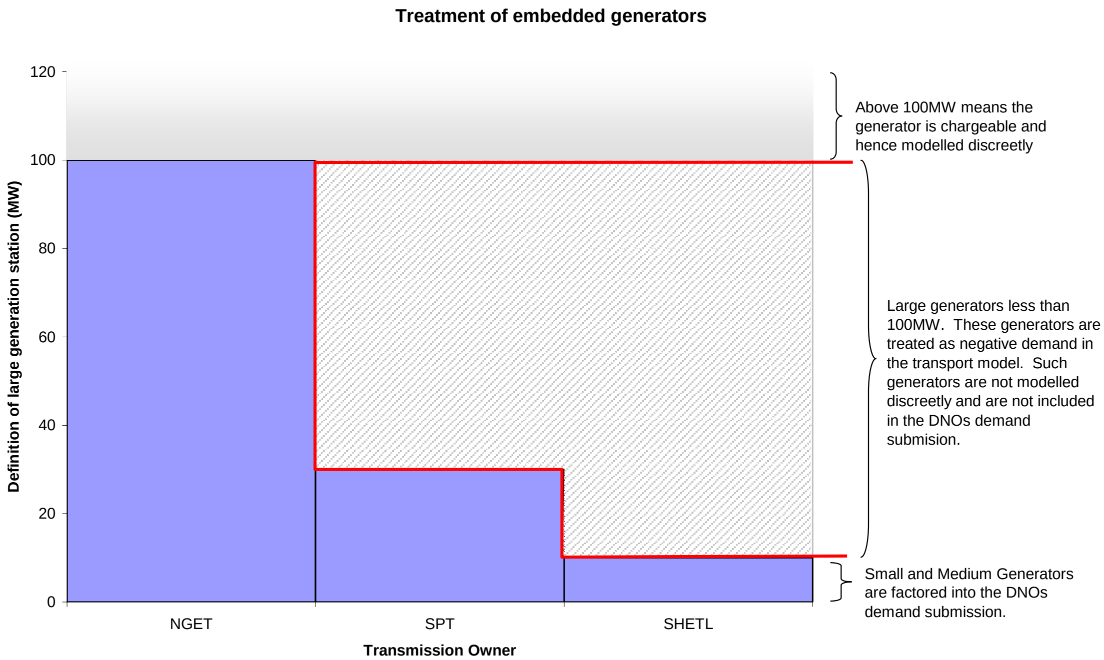
5. The issue that this paper seeks to address arises because of the different definitions of large generating stations.

6. In England and Wales the definition of large is greater than 100MW. Therefore all embedded generators greater than 100MW are chargeable and modelled discreetly. Embedded generators under this threshold are netted off by the DNO from their embedded demand submission. Therefore all generation is modelled.

7. In Scotland the definition of a large generator is different from England and Wales and is regionally defined[3]. Large embedded generators greater than 100MW are modelled explicitly as they are chargeable. Small generators will be netted off from the DNO demand submission. However large embedded generators less than 100MW are neither modelled explicitly nor included in the demand data. Therefore to ensure consistency, this generation is added back in as negative demand. This ensures that all generators across Great Britain

[1] Chargeable generation is generation parties liable for generation charges.
[2] SYS Demand data is taken from the SYS Appendix E
[3] The definition for large generation is greater than 10MW in SHETL and 30MW in SPTL.

are treated consistently, both in the transport model and within the charging rules. See diagram following.



8. As is evident from the table below, there is significant generation capacity that is treated as negative demand. Therefore the treatment of such generation will impact the final spread of TNUoS tariffs. Given the potential impact on TNUoS tariffs it is important that the data used is accurate.

Demand Zone	Zonal Demand[4] (MW)	Total registered capacity (MW)[5]
SHEPD	1,249	1,068
SPD	4,392	331

Proposed Solution

9. Since the implementation of BETTA National Grid has requested a forecast load factor for these generators at time of system peak demand. The DNOs have previously supplied the data and have recently requested that National Grid formalise the arrangement for the submission of this data. The aim of this paper is to formalise existing arrangements.

10. The DNOs are best placed to provide the data as it will be readily available, consistent with current data provisions and are financially neutral to TNUoS tariffs. It is suggested that the manner of data provision is the same as for embedded small and medium power stations. This provides the most consistent and efficient method for the collection of such data.

11. The extra data request would only be required from the Scottish DNOs. It is proposed that the data request forms part of the existing week 24 demand data submission, the provisions of which would be reflected in the Data Registration Code Schedule 11.

12. The proposed legal changes to the Grid Code are outlined in Appendix A (Planning Code) and Appendix B (Data Registration Code Schedule 11).

[4] The zonal demand listed is from the final zonal demand used in the transport model 2008/9.
[5] The total registered capacity is the from the transport model 2008/9

Recommendations

13. Members of the Grid Code Review Panel are invited to:

- note that the forecast load factor data is important for the purposes of calculating accurate TNUoS charges.
- note that this data requirement is only applicable for Embedded Exemptable Large Power Station in Scotland.
- note that this data is not currently provided via a formal process.
- agree that the proposed changes should proceed for industry consultation.

Appendix A – Proposed changes to the Planning Code (PC)

Insert new PC.A.4.3.6

PC.A.4.3.6 Forecast generation output for each **Financial Year** in respect of **Embedded Exemptable Large Power Stations** within the **User's User System** on a **Grid Supply Point** basis are required at the time of peak **GB Transmission System Demand (Active Power)** as notified by **NGET** pursuant to PC.A.4.2.2.

Appendix B – Proposed changes to the Data Registration Code (DRC)

Amend DRC Schedule 11 to include forecast generation infeed for connection point data for large generating stations less than 100MW at System Peak

DATA REGISTRATION CODE SCHEDULE 11

CONNECTION POINT DATA Page 1 of 4

The following information is required from each **Network Operator** and from each **Non-Embedded Customer**. The data should be provided in calendar week 24 each year (although **Network Operators** may delay the submission until calendar week 28).

DATA DESCRIPTION		F.Yr 0	F.Yr 1	F.Yr 2	F.Yr. 3	F.Yr. 4	F.Yr. 5	F.Yr 6	F.Yr 7	UPDATE TIME	DATA CAT
SPECIFIC HALF HOUR **DEMANDS** AND **POWER FACTORS** (see Notes 2, 3 and 5)											
Individual **Connection Point Demands** and **Power Factor** at : (name of GSP)											
The annual peak half Hour at the **Connection Point** at **Annual ACS Conditions**	MW	- -	- -	- -	- -	- -	- -	- -	- -	Wk.24	**SPD**
	p.f.	- -	- -	- -	- -	- -	- -	- -	- -	Wk.24	**SPD**
Lumped Susceptance (See Note 6. This data item is not required if a **Single Line Diagram** associated with the **Connection Point** has been provided)		- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	Wk.24	**SPD**
Deduction made for **Small Power Stations, Medium Power Stations** and **Customer Generating Plant** (MW)		- -	- -	- -	- -	- -	- -	- -	- -	Wk.24	**SPD**
Forecast generation output of **Large Exemptable Power Stations** (MW) at the specified time of the annual peak half hour of **GB Transmission System Demand**		-	-	-	-	-	-	-	-	Wk.24	**SPD**
The specified time of the annual peak half hour of **GB Transmission System Demand** at **Annual ACS Conditions**	MW	- -	- -	- -	- -	- -	- -	- -	- -	Wk.24	**SPD**
	p.f.	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	Wk.24	**SPD**
Deduction made for **Small Power Stations, Medium Power Stations** and **Customer Generating Plant** (MW)		- -	- -	- -	- -	- -	- -	- -	- -	Wk.24	**SPD**
The specified time of the annual minimum half hour of the **GB Transmission System Demand**	MW	- -	- -	- -	- -	- -	- -	- -	- -	Wk.24	**SPD**
	p.f.	- -	- -	- -	- -	- -	- -	- -	- -	Wk.24	**SPD**
Deduction made for **Small Power Stations, Medium Power Stations** and **Customer Generating** Plant		- -	- -	- -	- -	- -	- -	- -	- -	Wk.24	**SPD**
For such other times as **NGET** may specify	MW	- -	- -	- -	- -	- -	- -	- -	- -	Once p.a. max.	**SPD**
	p.f.	- -	- -	- -	- -	- -	- -	- -	- -		**SPD**
Deduction made for **Small Power Stations, Medium Power Stations** and **Customer Generating Plant**		- -	- -	- -	- -	- -	- -	- -	- -	Once p.a. Max.	**SPD**

DATA DESCRIPTION		F.Yr 1	F.Yr 2	F.Yr 3	F.Yr 4	F.Yr 5	F.Yr 6	F.Yr 7	UPDATE TIME	DATA CAT
DEMAND TRANSFER CAPABILITY (PRIMARY SYSTEM)										
Where a **User's Demand**, or group of **Demands**, may be fed from alternative **Connection Point(s)** the following information should be provided										
First circuit outage (fault outage) condition										
Name of the alternative **Connection Point(s)**									Wk.24	**SPD**
Demand transferred (MW) (Mvar)									Wk.24 Wk.24	**SPD** **SPD**
Transfer arrangement i.e Manual (M) Interconnection (I) Automatic (A)									Wk.24	**SPD**
Time to effect transfer (hrs)									Wk.24	**SPD**
Second Circuit outage (planned outage) condition										
Name of the alternative **Connection Point(s)**									Wk.24	**SPD**
Demand transferred (MW) (Mvar)									Wk.24 Wk.24	**SPD** **SPD**
Transfer arrangement i.e Manual (M) Interconnection (I) Automatic (A)									Wk.24	**SPD**
Time to effect transfer (hrs)									Wk.24	**SPD**

The above demand transfer capability information for specific **Grid Supply Points** is to be updated during the current year - see Schedule 6.

SCHEDULE 11
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DATA DESCRIPTION	F.Yr 0	F.Yr 1	F.Yr. 2	F.Yr. 3	F.Yr 4	F.Yr. 5	F.Yr. 6	F.Yr 7	UPDATE TIME	DATA CAT
SMALL POWER STATION, MEDIUM POWER STATION AND **CUSTOMER** GENERATION SUMMARY										
For each **Connection Point** where there are **Embedded Small Power Stations, Medium Power Stations** or **Customer Generating Stations** the following information is required:										
No. of **Small Power Stations, Medium Power Stations** or **Customer Power Stations**									Wk.24	**SPD**
Number of **Generating Units** within these stations									Wk.24	**SPD**
Summated Capacity of all these **Generating Units**									Wk.24	**SPD**
Where the **Network Operator's System** places a constraint on the capacity of an **Embedded Large Power Station**										
Station Name									Wk.24	**SPD**
Generating Unit									Wk.24	**SPD**
System Constrained Capacity									Wk.24	**SPD**
For each **Single Line Diagram** provided under Schedule 5, nodal **Demands, Power Factors** and lumped susceptances are to be provided for the specified time of the annual peak half hour of **GB Transmission System Demand** at **Annual ACS Conditions:**	**Connection Point**				Year				Wk.24	**SPD**
	Node		**Demand**		**Power Factor**		Lumped Susceptance			

NOTES:

1. 'F.Yr.' means '**Financial Year**'. F.Yr. 1 refers to the current financial year.

2. **Demand** Data (General)

   All **Demand** data should be net of the output (as reasonably considered appropriate by the **User**) of all **Embedded Small Power Stations, Medium Power Stations** and **Customer Generating Plant**. **Demand** met by **Suppliers** supplying **Customers** within the **User System** should be included. Auxiliary demand of **Embedded Power Stations** should not be included in the demand data submitted by the **User**. **Users** should refer to the **PC** for a full definition of the **Demand** to be included.

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3. Peak **Demands** should relate to each **Connection Point** individually and should give the maximum demand that in the **User's** opinion could reasonably be imposed on the **GB Transmission System**. Where the busbars on a **Connection Point** are expected to be run in separate sections separate **Demand** data should be supplied for each such section of busbar.

   In deriving **Demands** any deduction made by the **User** (as detailed in note 2 above) to allow for **Embedded Small Power Stations, Medium Power Stations** and **Customer Generating Plant** is to be specifically stated as indicated on the Schedule.

4. **NGET** may at its discretion require details of any **Embedded Small Power Stations** or **Embedded Medium Power Stations** whose output can be expected to vary in a random manner (eg. wind power) or according to some other pattern (eg. tidal power)

5. Where more than 95% of the total **Demand** at a **Connection Point** is taken by synchronous motors, values of the **Power Factor** at maximum and minimum continuous excitation may be given instead.

6. **Power Factor** data should allow for series reactive losses on the **User's System** but exclude reactive compensation specified separately in Schedule 5, and any network susceptance provided under
   Schedule 11.