Appendix I

Chapter Specific Terminology – Plant Margin

This appendix is designed to be an overview of the terminology used within Chapter 5 (Plant Margin) of the 2011 NETS SYS. It is strongly recommended that users of the NETS SYS who may be unfamiliar with industry terminology relating to Plant Margins read this appendix before studying the chapter itself.

Plant Margin | Wind Farm Generation Availability | Use of TEC, CEC or RC | Station Demand

Plant Margin

In simple terms, the 'plant margin' is the amount by which the installed generation capacity exceeds the peak demand. Thus a system with a peak demand of 100MW and 120MW of installed generation has a 20MW plant margin, which represents 20 per cent of the peak demand.

Some commentators assume that the plant margin is surplus or excess generation, which is not necessary to the power system. This is incorrect since generating units are subject to breakdown and need to be taken out of service from time to time for maintenance and repair. Generating units are not available to generate 100 per cent of the time.

If it is assumed that only 85 per cent of the total stock of generating plant could be predicted to be available at the time of winter peak demands several years ahead, then it would be necessary to plan to meet that peak demand (100 per cent) with only 85 per cent of the generation. This would mean that an installed generating capacity equivalent to about 118 per cent of the peak demand (i.e. 100 ÷ 0.85) would be needed in order to meet the peak. Further allowances would also have to be made for other factors such as the risk that the weather might be colder than the Average Cold Spell (ACS) conditions on which demand forecasts are based.

It was for reasons such as these that, in the past, large integrated power system utilities (e.g. the Central Electricity Generating Board in England and Wales) sought to achieve a plant margin of some 24 per cent several years ahead of the event. This margin was referred to as the 'planning margin' rather than 'plant margin' (i.e. the planning margin was the value of plant margin used for planning the need for future generation).

An appropriate minimum value of 'plant margin' is therefore necessary for the security of electricity supply and does not represent surplus or excess generation. The actual required value of plant margin will be a function of the characteristics of the power system to which it applies.
The higher certainty associated with short term forecasts of say demand and generating unit availabilities means that the same level of security of electricity supply can be achieved with lower plant margins. Accordingly, the required margin for the earlier years would be much lower and the operational planning margin requirement for real time generation is generally around 10 per cent depending on prevailing circumstances.

Chapter 5 focuses on the planning time phase and relates to the security of supply provided by the generation capacity that is either already installed or is planned to be installed. The operational time phase, which relates, amongst other things, to the actual availability of the installed generation on the day, has not been specifically addressed.

In the privatised electricity supply industry within England and Wales and Scotland, there is no set standard for the planning margin and the need for new plant is determined by market forces.

The term "Plant Margin" is used in the License Standard, National Electricity Transmission System Security and Quality of Supply Standard (SQSS). In Appendix C of that document, its value is used to determine whether the Straight Scaling and/or the Ranking Order technique should be used in the evaluation of the Planned Transfer Condition. The definition of Plant Margin is:

> "The amount by which the total installed capacity of directly connected Power Stations and embedded Large Power Stations exceeds the net amount of the ACS Peak Demand minus the total imports from External Systems. This is often expressed as a percentage (e.g. 20 per cent) or as a decimal fraction (e.g. 0.2) of the net amount of the ACS Peak Demand minus the total imports from External Systems".

Basic Plant Margins presented in the NETS SYS have been calculated on the basis of:

- the forecast ACS peak demand given in row 3 of Table 2.1 of Chapter 2 (Electricity Demand) which includes the assumed 400MW export at peak across the External Interconnection between Scotland and Northern Ireland, and the assumed 400MW export from 2011/12 onwards at peak across the External Interconnection between Wales and the Republic of Ireland as negative generation on the national electricity transmission system; and

- flows across External Interconnections to Europe are being treated as float

Wind Farm Generation Availability

The question arises as to whether the installed generation capacity used for the purpose of the plant margin calculations in this Statement should be reduced in recognition of the high levels of future renewable generation which have inherently low availability (e.g. wind farms).

It has already been explained that the plant margin relates to the security of supply provided by the level of generation installed on the system to meet the demand. The "planning margin" is the value of plant margin calculated to be required several years ahead of the event to achieve the desired level of security at the time of the forecast winter peak demand. The chosen value of "planning margin" stochastically takes account of: the average winter peak availability of all generation; variations in the assumed average generation availability; variations in forecast peak demand due to weather; and basic forecasting error.

The selected value of the planning margin does not influence the definition or the calculation of the plant margin but rather the level of security it provides (derived from stochastic calculations). In view of this,

for the purposes of this Statement, the installed generation capacity has not been reduced to compensate for low availability of renewable generation when calculating the basic plant margins.

However, to enhance transparency and promote greater understanding within this chapter, additional plant margins have been calculated for a range of assumptions on the availability of wind generation capacity at the time of the winter peak.

Use of TEC, CEC or RC

It may be argued that the "total installed capacity of a power station" is the aggregate of the Registered Capacities (or CEC) of all the individual Generating Units at that Power Station. However:

TEC reflects the maximum power the Generator can export across the system from a Grid Entry Point or a User System Entry Point;

The level of use of system rights for a Power Station is expressed in terms of the amount of TEC; and

Transmission infrastructure is designed on the basis of TEC.

Although TEC of a power station does not strictly fall within the definition of "total installed capacity", to the intents and purposes of the NETS SYS it is reasonable to take TEC as being equal to the "total installed capacity" of a power station. Accordingly, the plant margin has been calculated on the basis of TEC.

Station Demand

By definition, TEC is a gross-net-net quantity. That is it is net of power supplied through the Generating Unit's unit transformer and net of the auxiliary demand supplied through the station transformers. However, the "ACS Peak Demand" includes station transformer demand.

Accordingly, to avoid double counting in the calculation of plant margin, the demand to be used should be "ACS Peak Demand" less "station demand" at peak.

Accordingly, for the purposes of this Statement, the plant margin has been calculated on the basis of:

summated TEC of directly connected power stations, embedded Large power stations and imports to the national electricity transmission system from External Systems: and

"ACS Peak Demand" less "station demand" at peak since TEC is also net of "station demand".