



SEM TRADING AND SETTLEMENT CODE

**Proposed
Uninstructed Imbalances Parameters
for the
First Trading Year**

CONSULTATION PAPER

9 August 2007

AIP/SEM/07/430

Background

The SEM Trading and Settlement Code (TSC) was commenced on 3rd July 2007, when the Framework Agreement was signed by the original signatories.

The TSC specifies that the System Operators shall make a report to the Regulatory Authorities proposing five parameters relating to the calculation of Uninstructed Imbalances at least 90 days before the start of the First Trading Year¹. The specific parameters concerned are:

1. Engineering Tolerance ENGTOl (where $0 \leq \text{ENGTOl} \leq 1$);
2. MW Tolerance MWTOLt (where $0 \leq \text{MWTOLt}$) for each Trading Day t;
3. System per Unit Regulation parameter (UREG);
4. The Discount for Over Generation (DOGuh) for each Generator Unit u in each Trading Period h, such that $0 \leq \text{DOGuh} \leq 1$;
5. The Premium for Under Generation (PUGuh) for each Generator Unit u in each Trading Period h, such that $0 \leq \text{PUGuh} \leq 1$.

The Regulatory Authorities have now received the System Operators' report which is included in this paper as appendix 1. The purpose of this consultation is to seek views from participants on the System Operators' proposals.

The Regulatory Authorities welcome all comments on the proposals set out in Appendix 1 of this paper. Comments should be sent, preferably in electronic form, to:

Philip Newsome,
Commission for Energy Regulation,
The Exchange,
Belgard Square North,
Dublin 24
pnewsome@cer.ie

The closing date for comments is Thursday 6th September 2007.

¹ See TSC paragraph 8.58.

Next Steps

The Regulatory Authorities will provide all comments received to the System Operators and will seek from them their responses to those comments. On the basis of that information and the comments on the consultation, the Regulatory Authorities will reach their decision on the values that should be used for the parameters concerned for the First Trading Year. It is intended that all comments and the System Operators' responses will be published and it is therefore preferred that any comments received are not indicated to be confidential. Any party that wishes any part of its comments to be kept confidential should clearly indicate which parts of the comments are confidential. Once the Regulatory Authorities have provided their decisions to the System Operators, the approved values will be provided to the Market Operator and published in accordance with paragraphs 4.144 and 4.145 of the TSC.

Appendix 1



Proposed Values for Uninstructed Imbalances

25 July 2007

CONTENTS

TSC Obligations6

Uninstructed Imbalance Parameters6

 Proposed values 6

Background to Proposed Values6

 Overview 6

 MW Tolerance (MWTOLt) and Engineering Tolerance (ENGTOL)..... 6

 Comparison with Northern Ireland Market Interim Settlement Code..... 7

 Proposed Values for MWTOL and ENGTOL..... 7

 System per Unit Regulation parameter (UREG);..... 7

 Discount for Over Generation (DOGuH) 7

 Premium for Under Generation (PUGuH) 8

 Comparison with the Current Markets in Ireland and Northern Ireland..... 8

 Proposed Values for DOGuH and PUGuH 9

Appendix A – DOG/PUG Analysis of Loop 2 Data 10

 Loop 2 Price Affecting Unit Data 10

 Chart of Costs and SMP 11

 DOG/PUG Calculations 11

Appendix B – Comparison of Northern Ireland Dispatch Tolerances..... 12

TSC Obligations

Under Paragraph 8.58 of the Single Electricity Market (SEM) Trading and Settlement Code, the System Operators are required make a report to the Regulatory Authorities at least 90 days before the First Trading Year proposing values for the following parameters used in the calculation of Uninstructed Imbalances for the First Trading Year. This document is the System Operators' joint submission under Paragraph 8.58.

Uninstructed Imbalance Parameters

The System Operators propose the following values for the parameters used in the calculation of Uninstructed Imbalances:

Proposed values

Parameter	Proposed Value
1. Engineering Tolerance ENG_{TOL} (where $0 \leq ENG_{TOL} \leq 1$);	0.01
2. MW Tolerance MW_{TOLt} (where $0 \leq MW_{TOLt}$) for each Trading Day t ;	1
3. System per Unit Regulation parameter (UREG);	0.04
4. the Discount for Over Generation (DOG_{uh}) for each Generator Unit u in each Trading Period h , such that $0 \leq DOG_{uh} \leq 1$; and	0.20
5. the Premium for Under Generation (PUG_{uh}) for each Generator Unit u in each Trading Period h , such that $0 \leq PUG_{uh} \leq 1$.	0.20

Background to Proposed Values

Overview

To ensure the safe and secure operation of the power system, dispatchable generation is required to precisely follow instructions from the control centre within practical limits. Failure to do so could at best lead to increased constraint costs for the transmission system operator as it re-dispatches other generation at short notice to account for the mismatch in actual and instructed generation or at worst lead to system blackout. Thus, dispatchable generation should receive economic signals to follow its instructions within acceptable practical limits. The uninstructed imbalance mechanism under the SEM Trading and Settlement code is a form of signal to generators to follow their instruction.

It is essential that the uninstructed imbalance mechanism provide economic signals that:

- are sufficient to cause generators to follow dispatch instructions
- are cost related – where possible
- are not unreasonably punitive
- avoid perverse incentives

The System Operators are proposing values that meet these criteria and are suitable for application for the start of SEM trading.

MW Tolerance (MW_{TOLt}) and Engineering Tolerance (ENG_{TOL})

A MW Tolerance value of 1 MW is proposed by the System Operators. This value is currently used for settlement of the existing market in Ireland by EirGrid. The value has been in place since 01-Jan-2000 and is accepted and understood by participants in Ireland. When coupled with the application of ENG_{TOL} , it provides a reasonable tolerance of the greater of 1% of dispatched quantity or 1 MW. For a 400MW unit this results in a 4MW tolerance and for a 40MW unit, a 1 MW tolerance.

The ENG_{TOL} parameter and value of 1% was introduced to the imbalance calculation in the market in Ireland as part of Modification PM 153 approved and implemented in 2004. Before ENG_{TOL} was

added the previous MW tolerance allowed for regulation based on the instructed quantity level of the machine, however the response of a unit is primarily affected by its governor droop and rated capacity. As a result, two units rated 1,000 MW and 200 MW that are instructed to 100 MW will respond differently to a given frequency event. This was not reflected in the uninstructed imbalance calculation and was added in 2004 to reflect engineering limitations.

Comparison with Northern Ireland Market Interim Settlement Code

The Northern Ireland Interim Settlement Code (ISC) provisions for imbalance tolerances are asymmetrical and linked to fixed prices in the ISC for spill and to the Bulk Supply Tariff (BST) for top-up. Any assessment of the appropriateness of the tolerance levels needs to also consider the prices associated with those levels.

The tolerance proposed for the SEM is slightly more narrow than the ISC spill tolerance, however the spill payment levels within tolerance and outside of tolerance are quite small – 1.0 p/kWh (€15/MWh) and 0.8 p/kWh (€12/MWh) respectively.

The tolerance proposed for the SEM is much narrower than the ISC top-up tolerance of 15% of dispatched output level, however top-up charges are linked to the BST unit rate with additional multipliers (Make-Up Adjustment Factors, MAF) that increase the BST rate for imbalances outside of tolerance. Within tolerance imbalances are charged at BST. BST unit rates and MAFs vary seasonally and by time of day resulting top-up base rates² that vary from 3.2p/kWh (€48/MWh) to 15p/kWh (€226/MWh).

The tolerances proposed, when considered together with SEM pricing provisions for imbalances, appear reasonable to SONI for application to Northern Ireland participants in the first year of the SEM. Comparisons of ISC tolerances with the proposed SEM tolerances are included in Appendix B.

Proposed Values for MWTOL and ENGTOL

EirGrid and SONI have reviewed the values for MWTOL and ENGTOL and their application in Ireland and SONI agree that these values are appropriate for Northern Ireland participants in the SEM. The System Operators have assessed the need to have a MWTOL value that varies by Trading Day and at present can find no reason to vary the value. The System Operators propose values for MWTOL of 1 MW and ENGTOL of 0.01.

System per Unit Regulation parameter (UREG);

The System Operators propose that UREG be set at 0.04 based on an assumption that all generating units typically have a 4% speed droop.

Discount for Over Generation (DOGuh)

Over generation outside of tolerance by a market participant results in the need to instruct other market participants from their dispatched levels to lower levels in order to balance system resources. The participants dispatched downward will be at generation cost that is lower than the SMP. Generally, a market participant that over generates should only be entitled to the average costs of the resources dispatched down to displace the over generated volumes. In addition, from a system security standpoint over generation is undesirable as it can result in ramping, and stopping units unnecessarily increasing the potential for possible for unit trips and or wear on units. When units start, stop and ramp, the potential for wear, damage and unit trips increases significantly over steady state operation.

An analysis of Loop 2 Modelling results has been performed to ascertain potential costs arising from over generation. The Loop 2 load-weighted average SMP was €81/MWh. The average unconstrained generation cost for price affecting units that are below the Loop 2 average SMP is €52/MWh (SMP less 36%). Compensation for over generation outside of tolerance in relation to the average cost of generation below SMP appears to the System Operators to be reflective of costs and reasonable from a response incentivisation standpoint and from a system security standpoint. In using an approach to deriving DOG based on Loop 2 data and average costs we believe a single value of DOG is robust enough and appropriate instead of further deriving values that vary by Unit or Trading Period and a single DOG value of 0.36 would appear to be an appropriate cost reflective value.

² Unit rates only, not including carbon adjustments or other BST charges

The System Operators note that similar values to DOG in other electricity markets vary greatly. The NYISO offers the location based marginal price for over generation within tolerance and no compensation (DOG of 1) outside of tolerance. ERCOT uses graduated charges of up to 100% of marginal price (DOG up to 1) for over generated volumes. ISO New England employs administrative sanctions for over generation incidents.

Premium for Under Generation (PUGuh)

Under generation outside of tolerance by a market participant results in the need to instruct other market participants from their dispatched levels to higher levels or may even result in starting additional units in order to balance system resources. The participants dispatched upwards or on will be at generation cost that is higher than the SMP. Generally, a market participant that under generates should be entitled to the average costs of the resources dispatched up and on to replace the under generated volumes. In addition, from a system security standpoint under generation is also undesirable as it can result in ramping, and starting units unnecessarily increasing the potential for possible for unit trips and or wear on units. When units start, stop and ramp, the potential for wear, damage and unit trips increases significantly over steady state operation.

An analysis of Loop 2 Modelling results has been performed to ascertain potential costs arising from under generation. The Loop 2 average SMP was €81/MWh. The average unconstrained generation cost for price affecting units that are above the Loop 2 average SMP is €108/MWh (SMP plus 33%). Compensation for under generation outside of tolerance in relation to the average cost of generation above SMP appears to the System Operators to be reflective of costs and reasonable from a response incentivisation standpoint and from a system security standpoint. In using an approach to deriving DOG based on Loop 2 data and average costs we believe a single value of PUG is robust enough and appropriate instead of further deriving values that vary by Unit or Trading Period and a single PUG value of 0.33 would appear to be an appropriate cost reflective value.

The System Operators note that similar values to PUG in other electricity markets vary greatly. The NYISO offers the location based marginal price for under generation within tolerance and charges all under generated volumes at location based marginal price outside of tolerance (PUG of 1). ERCOT uses graduated charges up to 100% of marginal price for under generated volumes (PUG up to 1). ISO New England employs sanctions of forfeiture of payments for operating reserve payments for under generation incidents.

Comparison with the Current Markets in Ireland and Northern Ireland

The current market in Ireland (TESS) does not have a price that is directly analogous to the SMP in SEM and hence uses a slightly different mechanism for calculating prices to apply for uninstructed imbalances. However, since the principles are the same, if the current Spill price is taken to be a proxy for the SMP, equivalent values for DOG and PUG can be calculated.

For illustrative purposes, analysis of 2006 has been carried out. The average values for DOG and PUG are shown in the following table:

TESS DOG/PUG Equivalent Values

TESS Market Calculations (2006 data)	
Average Spill price (€/MWh)	54
Average DOG	0.35
Average PUG	0.73

The current market in Northern Ireland (ISC) does not have a price that is directly analogous to the SMP in SEM and uses a different mechanism for calculating prices to apply for uninstructed imbalances.

ISC spill prices for out of tolerance spill is a fixed values 0.8 p/kWh (€12/MWh). ISC top-up prices for out of tolerance top-up are linked to the BST unit rate with additional multipliers (Make-Up Adjustment Factors, MAF) that increase the BST rate. MAFs vary from 0 to 1.5.

For illustrative purposes, a comparison of ISC values using BST as a reference price for spill in DOG calculations and the MAF values as reference for PUG. The range of values for DOG and PUG are shown in the following table:

ISC Market Calculations	From	To
Spill		
BST Price Range (€/MWh)	48	151
Out of Tolerance Spill Rate	12	12
DOG range	0.8	0.9
Top-up		
MAF Range	1	1.5
PUG Range	0	0.5

Proposed Values for DOGuh and PUGuh

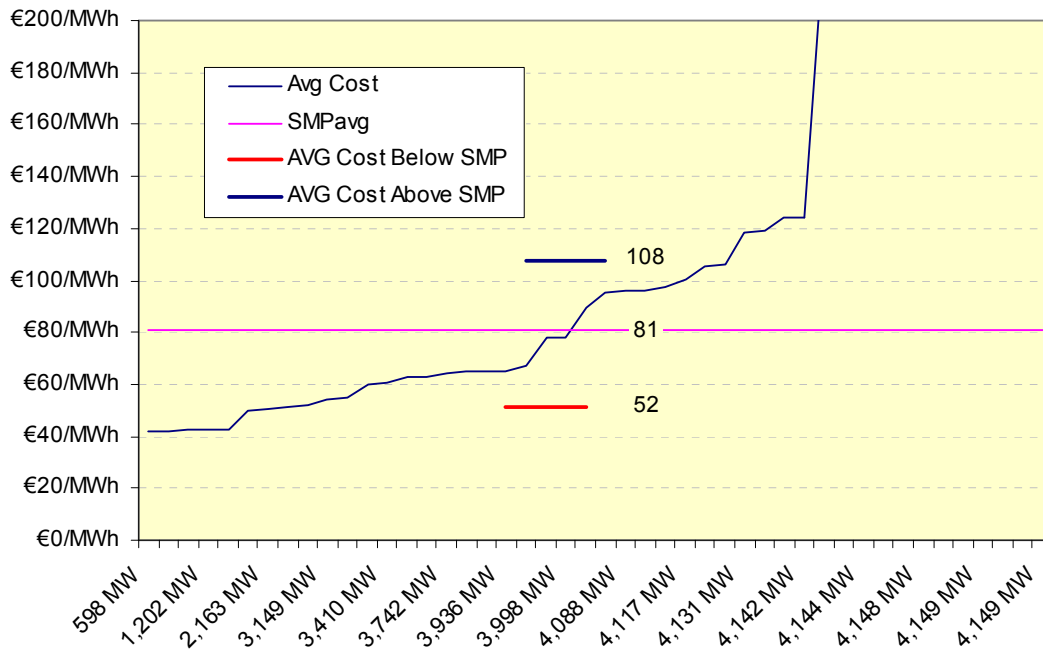
The cost based analysis illustrates that the most appropriate values for DOG and PUG are 0.36 and 0.33 respectively and analysis based on the current market in Ireland suggests that an even higher value for PUG may be warranted. However, at this time, the System Operators believe that an adequate incentive to comply with dispatch instructions for the first year of the SEM will be provided by using the values applied in market trial – 0.20 for each of DOG and PUG. The cost based analysis demonstrates that these values are less than the full cost reflective values and if non compliance with dispatch instructions becomes a common issue we will propose reverting to full cost reflective values in subsequent years.

Appendix A – DOG/PUG Analysis of Loop 2 Data

Loop 2 Price Affecting Unit Data

Unit	Avg Cost	Avg MW	Cumulative Avg MW	SMPavg
<i>102 Units from Loop 2 with €0/MWh cost</i>			428.91	
K2 Coal 220	42.11	169.39	598.30	Below SMP
K1 Coal 220	42.15	191.73	790.03	
MP3	42.71	173.83	963.86	
MP2	42.72	238.25	1,202.11	
MP1	42.74	246.34	1,448.45	
DB1	49.73	349.48	1,797.93	
TY	50.60	364.85	2,162.78	
HNC	51.01	300.58	2,463.36	
CPS CCGT	52.30	318.33	2,781.70	
PBC	54.00	367.31	3,149.00	
B10	55.01	54.63	3,203.63	
SK1	60.15	142.51	3,346.15	
ED1	60.52	63.46	3,409.61	
B32	62.79	140.75	3,550.36	
AD1	63.17	63.77	3,614.13	
B31	64.32	127.72	3,741.85	
MRC	64.78	52.23	3,794.08	
NW4	64.92	71.25	3,865.33	
WO4	64.97	70.50	3,935.84	
LR4	67.01	40.36	3,976.20	
HN2	77.82	7.23	3,983.43	
AT4	78.29	14.83	3,998.26	81
B4	89.80	22.34	4,020.60	Above SMP
TB4	95.57	32.26	4,052.86	
TB3	95.91	34.90	4,087.77	
B6	96.07	15.90	4,103.66	
PB1	97.59	8.91	4,112.57	
PB2	100.01	4.35	4,116.92	
GI3	105.71	6.00	4,122.92	
PB3	106.28	6.52	4,129.44	
GI2	118.53	1.19	4,130.63	
GI1	119.03	1.27	4,131.91	
TB2	124.06	5.08	4,136.98	
TB1	124.07	4.88	4,141.87	
AT1	235.82	0.38	4,142.25	
AT2	249.28	0.33	4,142.58	
RH1	263.68	1.46	4,144.04	
TP1	267.57	1.53	4,145.57	
AP5	272.95	0.95	4,146.52	
RH2	278.95	1.48	4,148.01	
KGT1	372.24	0.17	4,148.18	
KGT2	375.99	0.16	4,148.34	
CGT8	395.43	0.36	4,148.70	
BGT1	401.53	0.17	4,148.87	
BGT2	404.18	0.22	4,149.09	
NW5	897.06	0.03	4,149.12	

Chart of Costs and SMP



DOG/PUG Calculations

DOG Calculations			
SMP (Loop 2 Weighted Average)	81		
Average Cost Below SMP	52		
Average Constrained Down Cost	-29	-36%	
DOG (cost reflective)	0.36		

PUG Calculations			
SMP (Loop 2 Weighted Average)	81		
Average Cost Above SMP	108		
Average Constrained Up Cost	27	33%	
PUG (cost reflective)	0.33		

Appendix B – Comparison of Northern Ireland Dispatch Tolerances

