Generation Unit Specific Start Up Times

A Draft Decision by the Commission for Energy Regulation

31st July 2003

CER/03/183

Introduction

This document contains a decision by the Commission for Energy Regulation under Regulation 3(4) of SI No. 49 of 2000 – Electricity Regulation Act, 1999 (Trading Arrangements in Electricity) Regulations, 2000.

COMMISSION'S DECISION

The Commission hereby decides that the Trading and Settlement Code ("the Code") will be amended to reflect the following:-

1. That the use of global start up time variables of 2 hours for Hot Start Up Times (HSUT) and 8 hours for Warm Start Up Times (WSUT) for the calculation of synchronisation payments and rebates shall be replaced by the use of unit specific values for Hot Cooling Down Times (HCDT) and Warm Cooling Down Times (WCDT). The Commission hereby approves the attached marked up version of the Trading and Settlement Code Rules as set out in Appendix One.

2. All participants shall submit these values for all generating stations on an individual generating unit basis to the SSA by September 5th, 2003.

3. The Commission shall approve the values to be used prior to the coming into effect of this decision and any subsequent changes to these values shall be submitted to the SSA for approval by the Commission.

This decision will take effect from October 1st, 2003.

BACKGROUND TO DECISION

Currently, global variables are applied to HSUT and WSUT by the SSA in the calculation of synchronisation payments and rebates for settlement purposes. Under the Trading and Settlement Code Rules dispatchable generators receive synchronisation payments each time the Transmission System Operator (TSO) instructs them on and the generator pays the TSO a synchronisation rebate every time a unit is started in the Ex-Post Unconstrained Schedule (EPUS). The level of these payments is determined by comparing the time off load of a unit to the two global variables as above.

The use of such global variables, i.e., 2 hours for Hot Start Up Times (HSUT) and 8 hours for Warm Start Up Times (WSUT), assumes that all units take the same time to transition from hot to warm to cold states. The practice of using global variables for the calculation of such payments was initially agreed as a

transitional arrangement under Section 1.5 of the Code and implemented as such. In the aforementioned Section, these transitional arrangements are recognised as incomplete and imperfect and therefore, the Code provides for modification of same (see Section 5 of the Code).

In April of 2002 a Proposed Modification (PM147) was submitted to the Trading and Settlement Code Modification Panel by the SSA, which proposed the introduction of unit specific start up times. This was prompted by the recognition of the use of global variables in this instance as a simplification by the Market Audit, 22nd February 2001. This Proposed Modification stated that the introduction of the use of unit specific values here would facilitate calculation of payments and rebates that are more reflective of actual costs. However, no formal recommendation was made regarding this at this point. At the next meeting of the Trading and Settlement Code Modification Panel on June 7th this Proposed Modification was recommended for deferral. A formal dispute as defined under Section 39.1 of the Code was raised by ESB Power Generation on June 6th, 2002. ESB Power Generation claimed that unit specific variables ought to be used in determining the stated of a unit coming off-load as the use of global variables did not reflect the cooling down times of any unit on the system or planned to come on the system at that time. ESB Power Generation claimed that this resulted in units which were in a hot state being declared warm and units in a warm stated being declared cold.

In its determination of this dispute (March 19th, 2003) the Commission, while recognising that the use of global variables was initially agreed as a transitional arrangement under Section 1.5 of the Code and implemented as such, accepted that the values as above are inappropriate in that they do not reflect the cooling down times of all power plants currently on the system or planned to come on the system. Therefore, the Commission accepted that the use of global variables should be replaced by the use of unit specific variables with respect to HSUT and WSUT as presently defined in the Standard Variables Table in Section 5.1 of Appendix 7 of the Code and used in settlement. The Commission also requested that the SSA re-submit Proposed Modification 147 (PM147) to the Modification Panel.

In addition the Commission considered that the terms HSUT and WSUT are potentially confusing, referring as they do to cooling down times, and requested that in re-submitting PM147, the SSA review the terminology employed and use terms that convey a clear understanding of the meaning to industry participants. A revised PM147 incorporating said nomenclature was submitted to the Modification Panel meeting of April 25th, 2003 and was referred to an ad hoc generator's meeting (20th May, 2003) for discussion and review. At the next Modification Panel Meeting of June 20th, 2003 PM147 (revised) was referred to the Commission for decision.

REASONING BEHIND COMMISSION'S DECISION

The Commission is of the opinion that the use of global variables may not reflect the operational characteristics of all individual generating units and that unit specific variables are more appropriate. In this respect, the Commission concurs with the findings of the Market Audit as above. The use of unit specific variables will facilitate calculation of payments and rebates that are more reflective of actual costs.

Tom Reeves

Commission for Energy Regulation

31st July 2003

APPENDIX ONE

5 Variables

5.1 Standard Variables Table

The Standard Variables Table contains only the major Variables that are used in the core Settlement calculations. Additional Variables are listed in Section 5.2: "INC and DEC Prices Variables Table" and Section 5.3: "Instructions Profiling OCID Table and Variables Table".

Some Variables are listed as Source = Temp. This means that the Variable has been defined only to assist in the definition of the calculations and will not be either stored or output.

Finally, some Variables have been listed with subscripts given as "s≠PES" (any Supplier s that is not ESB PES) and "s=PES" (Supplier s is ESB PES). This has been done to differentiate between the different sources of these Variables. For instance, $IMPC_{sit}$ is an *input* Variable where s≠PES, but is a *calculated* Variable where s=PES.

HFFLAG	h	Flag	High Frequency Flag	Input (SSA)
HFTOL	t	%	High Frequency Tolerance %	Input (SSA)
HID	t or d	number	Hours in Day	Input (SSA)
HSUP	gut	€/MWh	Hot Start Up Price	Input (Trader)
~~HSUT~~ HCDT	guh	Hours	Hot ~~Start Up~~Cooling Down Time	Input (~~SSA~~Trader)
TOL	guh	Hours	Time Off Load	~~PSDM~~Calc
TPD	h	Hours	Trading Period Duration	Input (SSA)
~~TSG~~	~~h~~	~~MWh~~	~~Total System Generation~~	~~Calc.~~
~~TSI~~	~~h~~	~~MWh~~	~~Total Spill Imbalances~~	~~Calc.~~
~~TU~~	~~h~~	~~€/MWh~~	~~Top Up Price~~	~~Input (CER)~~
~~TUD~~	~~h~~	~~MWh~~	~~Total Unadjusted Demand~~	~~Calc.~~
~~TUM~~	~~h~~	~~number~~	~~Top Up Price Multiplier~~	~~Input (CER)~~
~~TUTQ~~	~~gh~~	~~MWh~~	~~Total Unit Tradable Quantity~~	~~Calc.~~
~~UI~~	~~guh~~	~~MWh~~	~~Uninstructed Imbalance~~	~~Calc.~~
~~UIP~~	~~guh~~	~~€~~	~~Uninstructed Imbalance Payment~~	~~Calc.~~

~~UPTOL~~	~~guh~~	~~MWh~~	~~Up Tolerance~~	~~Calc.~~
~~UTQ~~	~~guh~~	~~MWh~~	~~Unit Tradable Quantity~~	~~Calc.~~
WSUP	gut	€/Start	Warm Start Up Price	Input (Trader)
~~WSUT~~ WCDT	guh	hours~~H ours~~	Warm ~~Start Up~~ Cooling Down Time	Input (~~SSA~~Trader)
XLF	h	number	Export Loss Factor	Input (SSA)
XNOM	guh	MW	Ex-Post Unit Nomination	EPUS
XTU	h	€/MWh	Ex-Ante Top Up Price	Input (CER)
XXFER	h	MWh	Total Export Transfer (Net)	Input (SSA)

~~4.7~~5.2 INC and DEC Prices Variables Table

The INC and DEC Prices Variables Table lists the prices that do not appear in the Standard Variables Table, (other than the INC and DEC prices that are derived within the Trading and Settlement system, which appear in both tables).

7 EX-POST UNCONSTRAINED SCHEDULE (EPUS)

7.3 EPUS DATA

7.3.1 Data Transfer

The SSA will transfer data for the EPUS runs to HESI and HESI will transfer EPUS results back to the SSA using a dedicated, secure FTP ("File Transmission Protocol") server.

7.3.2 EPUS Inputs

Inputs to the EPUS run will include, but not be limited to, the following.

7.3.2.3 Generating Unit Operating Characteristics

The following Generating Unit Operating Characteristics will be included in the EPUS input files in respect of each Unit u that has submitted a valid Nomination under the terms of the Electricity Trading and Settlement Rules.

1) Availability (given as a time and a MW level that applies from that time until the time for declared for the next MW change and without any reference to fuel).

2) Minimum Up and Down Times.

3) A single combined Loading and Ramping Up Rate and a single combined Deloading and Ramping Down Rate. The SSA shall prepare such combined rates based upon the full set of Loading, Deloading, Ramping Up and Ramping Down rates and Soak and Dwell Times. Such combined rates shall, in the SSA's reasonable opinion, reflect the full set of the relevant characteristics. Investigations are being undertaken to find the feasibility and cost impact of using the full set of Loading, Deloading, Ramping Up and Ramping Down rates and Soak and Dwell Times.

4) Min Gen.

5) Notice to Sync (warmth varying).

7.3.2.4 *Generating Unit Operating Characteristics – EPUS Use*

OCID Name	Description	Used in EPUS?	EPUS Use - Comments
Round Trip Efficiency	Overall Efficiency of Pumped Storage Pumping/Generating Cycle	No	Pumped Storage output not altered by EPUS
Loss of MW Efficiency at MINGEN	Loss of Efficiency for Pumped Storage Generating at MINGEN	No	Pumped Storage output not altered by EPUS
Pumping Load	Pumped Storage Pumping Load	No	Pumped Storage output not altered by EPUS
Sync 1	~~Warmth Varying Time to Synchronise for Unit in "Cold" Condition~~Time taken for a unit to synchronise when instructed while in a "Cold" state	No	EPUS assumes that sufficient notice given
Sync 2	~~Warmth Varying Time to Synchronise for Unit in "Warm" Condition~~Time taken for a unit to synchronise when instructed while in a "Warm" state	No	EPUS assumes that sufficient notice given
Sync 3	~~Warmth Varying Time to Synchronise for Unit in "Hot" Condition~~Time taken for a unit to synchronise when instructed while in a "Hot" state	No	EPUS assumes that sufficient notice given
Block Load H	Block Load on Synchronisation (Hot Start)	No	

OCID Name	Description	Used in EPUS?	EPUS Use - Comments
Block Load W	Block Load on Synchronisation (Warm Start)	No	
Block Load C	Block Load on Synchronisation (Cold Start)	No	
Loading Rate H1	The Hot Load up rate from 0 MW to Load Up Break Point W1	No	Ramp Up Rate used
Loading Rate H2	The Hot Load up rate from Load Up Break Point W1 to Load Up Break Point W2	No	Ramp Up Rate used
Loading Rate H3	The Hot Load up rate from Load Up Break Point W2 to End Point of Start Up Period	No	Ramp Up Rate used
Loading Rate W1	The Warm Load up rate from 0 MW to Load Up Break Point W1	No	Ramp Up Rate used
Loading Rate W2	The Warm Load up rate from Load Up Break Point W1 to Load Up Break Point W2	No	Ramp Up Rate used
Loading Rate W3	The Warm Load up rate from Load Up Break Point W2 to End Point of Start Up Period	No	Ramp Up Rate used
Loading Rate C1	The Cold Load up rate from 0 MW to Load Up Break Point C1	No	Ramp Up Rate used
Loading Rate C2	The Cold Load up rate from Load Up Break Point C1 to Load Up Break Point C2	No	Ramp Up Rate used
Loading Rate C3	The Cold Load up rate from Load Up Break Point C2 to End Point of Start Up Period	No	Ramp Up Rate used
Load Up Break Point H1	Load Up Break Point H1	No	Loading Rates not used
Load Up Break Point H2	Load Up Break Point H2	No	Loading Rates not used
Load Up Break Point W1	Load Up Break Point W1	No	Loading Rates not used
Load Up Break Point W2	Load Up Break Point W2	No	Loading Rates not used

OCID Name	Description	Used in EPUS?	EPUS Use - Comments
Load Up Break Point C1	Load Up Break Point C1	No	Loading Rates not used
Load Up Break Point C2	Load Up Break Point C2	No	Loading Rates not used
End Point of Start Up Period	End Point of Start Up Period	No	
Deloading Rate 1	Deload rate from MINGEN to Deload Break Point	No	EPUS assumes infinitely fast Deloading Rate
Deloading Rate 2	Deload rate from Deload Break Point to zero MW	No	EPUS assumes infinitely fast Deloading Rate
Deload Break Point	Deload Break Point H	No	Deloading rate not used
Ramp Up Rate 1	Ramp up rate from MINGEN to from Ramp up Break Point 1	Single Rate used	Only largest Ramp Up Rate used
Ramp Up Rate 2	Ramp up rate from Ramp up Break Point 1 to Ramp up Break Point 2	Single Rate used	Only largest Ramp Up Rate used
Ramp Up Rate 3	Ramp up rate from Ramp up Break Point 2 to Ramp up Break Point 3	Single Rate used	Only largest Ramp Up Rate used
Ramp Up Rate 4	Ramp up rate from Ramp up Break Point 3 to Ramp up Break Point 4	Single Rate used	Only largest Ramp Up Rate used
Ramp Up Rate 5	Ramp up rate from Ramp up Break Point 4 upwards	Single Rate used	Only largest Ramp Up Rate used
Ramp up Break Point 1	Ramp up Break Point 1	No	Single Ramp Up Rate used
Ramp up Break Point 2	Ramp up Break Point 2	No	Single Ramp Up Rate used
Ramp up Break Point 3	Ramp up Break Point 3	No	Single Ramp Up Rate used
Ramp up Break Point 4	Ramp up Break Point 4	No	Single Ramp Up Rate used

OCID Name	Description	Used in EPUS?	EPUS Use - Comments
Ramp Down Rate 1	Ramp down rate to Ramp down Break Point 4	Single Rate used	Only largest Ramp Down Rate used
Ramp Down Rate 2	Ramp down rate from Ramp down Break Point 4 to Ramp down Break Point 3	Single Rate used	Only largest Ramp Down Rate used
Ramp Down Rate 3	Ramp down rate from Ramp down Break Point 3 to Ramp down Break Point 2	Single Rate used	Only largest Ramp Down Rate used
Ramp Down Rate 4	Ramp down rate from Ramp down Break Point 2 to Ramp down Break Point 1	Single Rate used	Only largest Ramp Down Rate used
Ramp Down Rate 5	Ramp down rate from Ramp down Break Point 1 to MIN GEN	Single Rate used	Only largest Ramp Down Rate used
Ramp down Break Point 1	Ramp down Break Point 1	No	Single Ramp Down Rate used
Ramp down Break Point 2	Ramp down Break Point 2	No	Single Ramp Down Rate used
Ramp down Break Point 3	Ramp down Break Point 3	No	Single Ramp Down Rate used
Ramp down Break Point 4	Ramp down Break Point 4	No	Single Ramp Down Rate used
Soak Time H1	Soak Time associated with Soak Time Trigger Point H1	No	
Soak Time H2	Soak Time associated with Soak Time Trigger Point H2	No	
Soak Time W1	Soak Time associated with Soak Time Trigger Point W1	No	
Soak Time W2	Soak Time associated with Soak Time Trigger Point W2	No	
Soak Time C1	Soak Time associated with Soak Time Trigger Point C1	No	
Soak Time C2	Soak Time associated with Soak Time Trigger Point C2	No	

OCID Name	Description	Used in EPUS?	EPUS Use - Comments
Trigger point for Soak Time H1	Soak Time Trigger Point H1	No	
Trigger point for Soak Time H2	Soak Time Trigger Point H2	No	
Trigger point for Soak Time W1	Soak Time Trigger Point W1. Expressed in MWs	No	
Trigger point for Soak Time W2	Soak Time Trigger Point W2. Expressed in MWs	No	
Trigger point for Soak Time C1	Soak Time Trigger Point C1. Expressed in MWs	No	
Trigger point for Soak Time C2	Soak Time Trigger Point C2. Expressed in MWs	No	
Dwell Time 1	Dwell Time associated with Trigger Point for Dwell Time 1	No	
Dwell Time 2	Dwell Time associated with Trigger Point for Dwell Time 2	No	
Dwell Time 3	Dwell Time associated with Trigger Point for Dwell Time 3	No	
Dwell Time trigger point 1	Trigger Point for Dwell Time 1	No	
Dwell Time trigger point 2	Trigger Point for Dwell Time 2	No	
Dwell Time trigger point 3	Trigger Point for Dwell Time 3	No	
MIN GEN	Minimum Generation level of Generating Unit	Yes	Used 1 : 1
MAX GEN	Maximum Generation level of Generating Unit	Yes	Used 1 : 1
Minimum Up Time	Minimum Time a Unit must stay Synchronized after Synchronization	Yes	Used 1 : 1

OCID Name	Description	Used in EPUS?	EPUS Use - Comments
Minimum Down Time	Minimum Time a Unit must stay De-Synchronized after De-Synchronization	Yes	Used 1 : 1
Start of Restricted Loading Range A	Start of MW band "A" within which there are Restrictions on Unit Dispatch	No	No obvious way to include in EPUS
Start of Restricted Loading Range B	Start of MW band "B" within which there are Restrictions on Unit Dispatch	No	No obvious way to include in EPUS
End of Restricted Loading Range A	End of MW band "A" within which there are Restrictions on Unit Dispatch	No	No obvious way to include in EPUS
End of Restricted Loading Range B	End of MW band "B" within which there are Restrictions on Unit Dispatch	No	No obvious way to include in EPUS
Export Adjustment Factor 1	Export Adjustment Factor used to convert "Generated" to "Exported"	No	Not necessary. EPUS gives Exported Values
Export Adjustment Factor 2	Export Adjustment Factor used to convert "Generated" to "Exported"	No	Not necessary. EPUS gives Exported Values

7.4 EPUS Results

7.4.1 Introduction

The values of XNOM and Spill Price required for the operation of these Electricity Trading and Settlement Rules will be produced from the results of the EPUS runs.

10 OTHER GENCO PAYMENTS

10.1 Sync Payments and Rebates

10.1.1 Pumped Storage

This Section 10.1 does not apply to any Pumped Storage Unit.

10.1.2 Sync Payment

~~If PSDM has a record of a Sync Instruction (and PSDM records a successful sync) for this Trading Period then~~If a Sync Instruction has been recorded for this generation unit for this Trading Period then:

If $TOL_{guh} \leq$ ~~HSUT~~$HCDT_{guh}$ then $SYNCP_{guh} = HSUP_{gut}$; or

If ~~HSUT~~$HCDT_{guh} < TOL_{guh} \leq$ ~~WSUT~~$WCDT_{guh}$ then $SYNCP_{guh} = WSUP_{gut}$; but in all other cases

$SYNCP_{guh} = CSUP_{gut}$

Where TOL_{guh} is the Time Off Load, ~~(from PSDM), HSUT~~ $HCDT_{guh}$ is the Hot ~~Start Up~~ Cooling Down Time, $HSUP_{gut}$ is the Hot Start Up Price, ~~WSUT~~ $WCDT_{guh}$ is the Warm ~~Start Up~~ Cooling Down Time, $WSUP_{gut}$ is the Warm Start Up Price and $CSUP_{gut}$ is the Cold Start Up Price.

10.1.3 Sync Rebates

10.1.3.1 Nominal Time Off Load

The Nominal Time Off Load ($NTOL_{guh}$) is determined as follows.

If $XNOM_{guh} = 0$ then $NTOL_{guh} = NTOL_{gu(h-1)} + TPD_h$ or

If $XNOM_{guh} > 0$ then $NTOL_{guh} = 0$.

10.1.3.2 Sync Rebate

If $XNOM_{guh} = 0$ or

If $XNOM_{guh} > 0$ and $XNOM_{gu(h-1)} > 0$ then

$SYNCR_{guh} = 0$

But if $XNOM_{guh} > 0$ and $XNOM_{gu(h-1)} = 0$ then

If $NTOL_{gu(h-1)} \leq HCDT_{guh}$ then $SYNCR_{guh} = -1 \times HSUP_{gut}$; or

If ~~HSUT~~ HCDT $_{guh}$ < $NTOL_{gu(h-1)}$ ≤ ~~WSUT~~ WCDT $_{guh}$ then $SYNCR_{guh} = -1 \times WSUP_{gut}$; but in all other cases

$SYNCR_{guh} = -1 \times CSUP_{gut}$

Where $NTOL_{gu(h-1)}$ is the Nominal Time Off Load for the Trading Period immediately preceding the nominal sync, ~~HSUT~~ HCDT $_{guh}$ is the Hot ~~Start Up~~Cooling Down Time, $HSUP_{gut}$ is the Hot Start Up Price, ~~WSUT~~ WCDT $_{guh}$ is the Warm ~~Start Up~~Cooling Down Time, $WSUP_{gut}$ is the Warm Start Up Price and $CSUP_{gut}$ is the Cold Start Up Price.

~~1.1~~10.2 Pumped Storage Mode Change

~~*1.1.1*~~*10.2.1 Pumped Storage Mode Change Payment*

For each Trading Period h the number of Pumped Storage Instructed Mode Changes shall be recorded as follows:

For each Trading Period in the Trading Day, the following settings shall be made: Pumped Storage Instructed Mode Change (Gen) $(PSIM(GG)_{guh})$ shall be set to the number of Instructions to switch to Generating mode, Pumped Storage Instructed Mode Change (Pump) $(PSIM(PP)_{guh})$ shall be set to the number of Instructions to switch to Pumping mode, Pumped Storage Instructed Mode Change (Spin Gen) $(PSIM(SG)_{guh})$ shall be set to the number of Instructions to switch to Spin Gen mode and Pumped Storage Instructed Mode Change (Spin Pump) $(PSIM(SP)_{guh})$ shall be set to the number of Instructions to switch to Spin Pump mode.

The Pumped Storage Mode Change Payment $(PSMP_{guh})$ is determined as follows:

$PSMP_{guh} = (PSIM(GG)_{guh} \times PSMP(GG)_{gut}) + (PSIM(PP)_{guh} \times PSMP(PP)_{gut}) + (PSIM(SG)_{guh} \times PSMP(SG)_{gut}) + (PSIM(SP)_{guh} \times PSMP(SP)_{gut})$

Where $PSMP(GG)_{gut}$, $PSMP(PP)_{gut}$, $PSMP(SG)_{gut}$ and $PSMP(SP)_{gut}$ are respectively the Pumped Storage Mode Change Price (Gen), Pumped Storage Mode Change Price (Pump), Pumped Storage Mode Change Price (Spin Gen) and Pumped Storage Mode Change Price (Spin Pump).