



## **Constructing Aggregation Rules – Central Volume Allocation**

This guidance describes what [Aggregation Rules](#) are, how to construct them and how they are used in the [BSC](#).

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## What is an Aggregation Rule?

An Aggregation Rule is an algebraic equation which the Central Data Collection Agent (CDCA) uses in its system to determine the Metered Volume for a Volume Allocation Unit (VAU). The Metered Volume is the net aggregate volume of Active Energy to or from the VAU in a particular Settlement Period, determined at the Transmission System Boundary Point or as if it was at the Transmission System Boundary Point.

A VAU is one of the following:

- A Primary Balancing Mechanism Unit (Primary BM Unit) – either directly connected to the Transmission System or embedded within a Distribution System;
- A Grid Supply Point (GSP);
- A Distribution Systems Connection Point (DSCP) – also known as an Internal Interconnector;
- A GSP Group; or
- An External Interconnector (an interconnector to another country e.g. the Interconnector between England and France)

Each VAU requires metering at each CVA Boundary Point<sup>1</sup> and Systems Connection Point<sup>2</sup>. These can be complex with many CVA Metering Systems<sup>3</sup> and Meter registers<sup>4</sup>.

CVA Metering Systems measure and record Active (Energy) Export (AE) and Active (Energy) Import (AI) in Megawatt-hours (MWh) and Reactive (Energy) Export (RE) and Reactive (Energy) Import (RI) in Megavolt-ampere reactive hours (Mvarh), for each Settlement Period.

Aggregation Rules define how the CDCA to aggregates the Active Export and Active Import Meter Energy to determine the Metered Volume associated with the Active Energy for every VAU (see [Figure 1 - Simplified Transmission/Distribution System](#)).

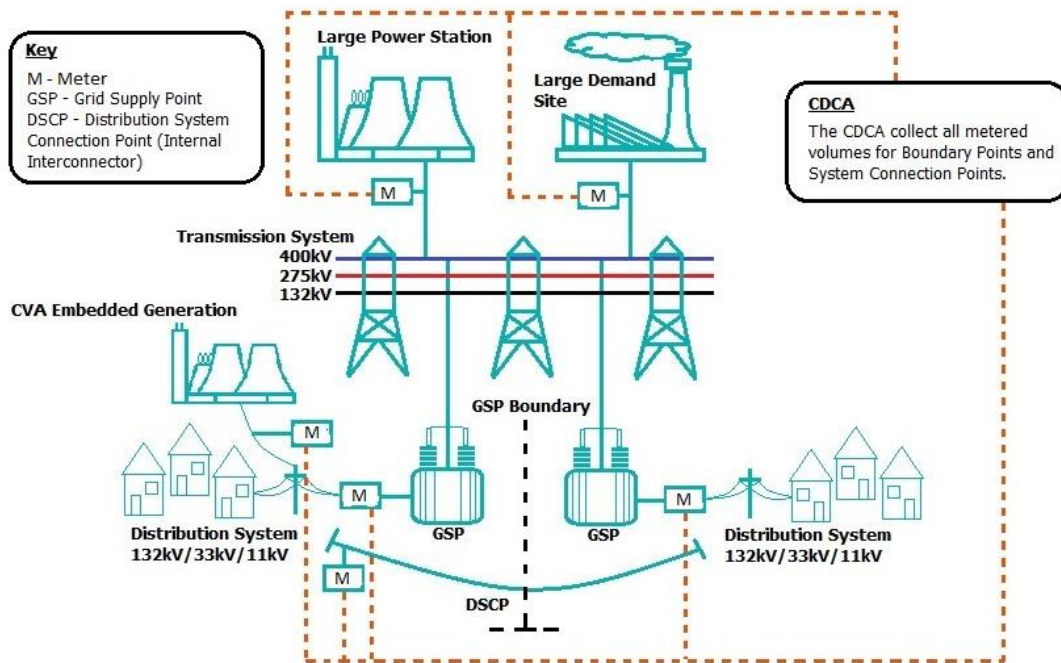
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<sup>1</sup> A CVA Boundary Point is a Boundary Point where Imports and Exports are measured by CVA Meters System(s). Often this connection between the Transmission System and a Generation or Demand Primary BM Unit but can also be Generation measured by a CVA Metering System which is connected to the Distribution System.

<sup>2</sup> A Systems Connection Point is a connection between the Transmission System and a Distribution System or between two Distribution Systems.

<sup>3</sup> A Metering System is a set of particular commissioned Metering Equipment installed for the purposes of measuring the quantities of Imports/Exports at Boundary Points to the Total System or flows of electricity at Systems Connection Points.

<sup>4</sup> A Meter Register means a device, normally associated with a Meter, from which it is possible to obtain a reading of the amount of Active Energy, or the amount of Reactive Energy that has been supplied by a circuit.



**Figure 1 - Simplified Transmission/Distribution System**

All Meter readings received by the CDCA are positive values, whether reported as AE or AI. In Settlements terms, Exports are treated as positive, and Imports as negative. This means that if the Plant/Apparatus is exporting, the aggregated Metered Volume will be positive, and if the Plant/Apparatus is importing, the aggregated Metered Volume will be negative.

- Export:  $AE > AI$ , therefore  $AE - AI$  is positive.
- Import:  $AI > AE$ , therefore  $AE - AI$  is negative.

Under the Balancing and Settlement Code (BSC), the CDCA is not required to aggregate Reactive Energy Meter readings.

Where the VAU is not at the Transmission System Boundary (e.g. an Embedded Primary BM Unit (primary BM Unit connected to a Distribution System) or a DSCP) Line Loss Factors (LLFs) are required. LLFs are multipliers used to scale energy consumed or generated by an Embedded Primary BM Unit, or flows of electricity between two Distribution Systems, to an equivalent value at the Transmission System Boundary, so the LLFs account for the losses on the Distribution System. CVA LLFs are applied at a Metering System Identifier (MSID<sup>5</sup>) level via the Aggregation Rules.

Licensed Distribution System Operators (LDSOs) submit all LLFs in accordance with [BSC128 'Production, Submission, Audit and Approval of Line Loss Factors'](#). The Lead Party of an Embedded Primary BM Unit should contact the relevant LDSO during the initial registration of the Embedded Primary BM Unit process to request LLFs in accordance with [BSC15 'BM Unit Registration and BSC128'](#).

Aggregation Rules must be submitted for every new VAU and any change to a VAU that affects the way the Metered Volume is calculated (e.g. if a new circuit is added to a Grid Supply Point).

<sup>5</sup> An MSID is a unique number for a Metering System supplied by the CRA.

## How to construct Aggregation Rules

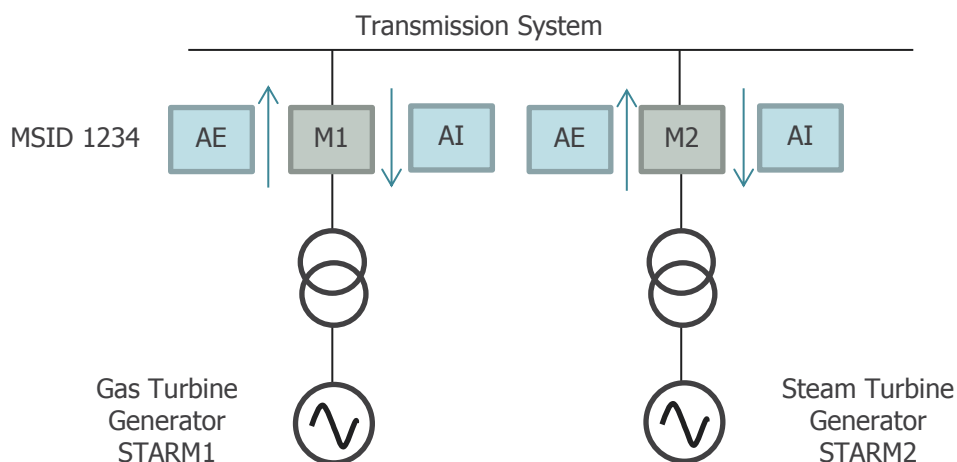
To be able to construct Aggregation Rules you need an electrical single line diagram of the VAU and the Meter Technical Details.

### Electrical single line diagram(s)

Your electrical single line diagram of the VAU needs to show the complete VAU.

- For a Primary BM Unit the electrical single line diagram needs to show:
  - all of its proposed Boundary Point(s) to the Transmission and / or Distribution System;
  - all existing Boundary Points and any System Connection Points at or near the proposed Boundary Point(s); and
  - the location of the Metering Equipment<sup>6</sup>, in particular the Settlement current and voltage transformers (CTs/VTs).
- For a GSP or DSCP the electrical single line diagram needs to show:
  - the proposed Systems Connection Points;
  - all existing or any other proposed Boundary Points and / or Systems Connection Points at or near the proposed Systems Connection Points; and
  - the location of the Metering Equipment<sup>6</sup>, in particular the Settlement current and voltage transformers (CTs/VTs).

From this you can identify all the Boundary Point or Systems Connection Point metering and ensure that it is captured in the Aggregation Rule. A sample electrical single line diagram of a Closed Circuit Gas Turbine (CCGT) Primary BM Unit is shown in Figure 2.



**Figure 2 – Electrical Single Line Diagram of a CCGT Primary BM Unit**

<sup>6</sup> Metering Equipment means Meters, measurement transformers (voltage, current or combination units), metering protection equipment including alarms, circuitry, associated Communications Equipment and Outstations and wiring.

In Figure 2, the Closed Circuit Gas Turbine (CCGT) is a single Primary BM Unit, T\_STAR-1. The Transmission System Boundary Point Meters are M1 and M2. The net energy flow per Settlement Period<sup>7</sup> (i.e. Metered Volume) at the Transmission System Boundary flowing to/from the Primary BM Unit is the value derived by taking the net energy readings for Generator STARM1 (AE<sub>M1</sub>-AI<sub>M1</sub>) and adding them to the net energy reading for Generator STARM2 (AE<sub>M2</sub>-AI<sub>M2</sub>).

$$\text{BM Unit Metered Volume} = (\text{AE}_{M1} - \text{AI}_{M1}) + (\text{AE}_{M2} - \text{AI}_{M2})$$

**Meter Technical Details (MTDs)**

To identify the Metering System(s) associated with the VAU, Metering System(s) are allocated a MSID by the CDCA. This is a four digit identifier used in the Central Meter Registration Service (CMRS).

MTDs are submitted to the CDCA on the BSCP20/4.3 form. These are normally submitted by the CVA MOA but can be submitted by the Registrant.

**BSCP20/4.3b**

The form [BSCP20/4.3](#) section b defines the physical Meter details and the Meter Register ID<sup>8</sup> details. Metering Subsystem IDs<sup>9</sup> are included under the Meter register details as shown in Figure 3.

Metering Subsystem IDs can be defined by either the Registrant or the Central Volume Allocation (CVA) Meter Operator Agent (MOA). The Aggregation Rule uses the Metering Subsystem ID, along with the MSID and the Measurement Quantity ID<sup>10</sup>, to define how the Meter readings need to be combined. Therefore the Metering Subsystem IDs need to be the same in the MTDs and the Aggregation Rules.

Note that for the purposes of this guidance check Meters (where required by the relevant metering Code of Practice), Meter Register Multipliers, Associated Meter IDs and Associated Meter Register IDs are not included in BSCP20/4.3 example forms.

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter '*' if data has changed	MSID:	1234							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARM1	CR097457	Main	T1	AI	9			
*	STARM1	CR097457	Main	T2	AE	9			
*	STARM2	CR097458	Main	T1	AI	9			
*	STARM2	CR097458	Main	T2	AE	9			

**Figure 3 – Sample Meter Technical Details BSCP20 Section 4.3b**

<sup>7</sup> Settlement Period means a period of 30 minutes beginning on the hour or the half-hour and in accordance with BSC Annex X-2 paragraph 4.3.

<sup>8</sup> A Meter Register ID is limited in the BSCP20/4.3 form to two characters in length and must be unique within a Meter.

<sup>9</sup> A Metering Subsystem ID should have some reference to the actual VAU for example the VAU name abbreviation (e.g. VAU: STAR Generation, Metering Subsystem ID: STAR. It is limited to 10 alphanumeric characters.

<sup>10</sup> Measurement Qualities are Active Export (AE), Active Import (AI), Reactive Export (RE), Reactive Import (RI) or Undefined (UN).

In the sample BSCP20/4.3b above the highlighted sections indicate the information which will be essential in completing the Aggregation Rules:

- The MSID is 1234.
- The VAU is STAR Generation and so the Metering Subsystem ID uses STAR and M1 representing Meter One or M2 representing Meter Two.
- The Measurement Quantity IDs relevant to the Aggregation Rules are Active Export (AE) and Active Import (AI).

### **Aggregation Rules - BSCP75/4.2**

Using the electrical single line diagram and the MTDs, you can write the Aggregation Rules.

Firstly, identify all the Boundary Points and / or Systems Connection Points on the electrical single line diagram, and the associated Metering Equipment. Aggregation Rules are of the form Active Export through the Meter at a Boundary Point minus Active Import. Where there is more than one Boundary Point associated with the VAU the net Energy is summed.

Then write out the algebraic expression to calculate the Energy through all Boundary Point(s) feeding into the Primary BM Unit. Star Generation would be as follows:

$$\text{Total Volume} = (\text{Active Export through STAR Meter 1} - \text{Active Import through STAR Meter 1}) + (\text{Active Export through STAR Meter 2} - \text{Active Import through STAR Meter 2})$$

In an Aggregation Rule, the identifier for a specific line consists of the MSID, the Metering Subsystem ID (MSSID) and the Measurement Quantity (MQ) ID, i.e. MSID.MSSID.MQ

E.g. 1234.STARM1.AE

For Star Generation, the total volume in an algebraic expression would be

$$\text{Total Metered Volume} = (1234.STARM1.AE - 1234.STARM1.AI) + (1234.STARM2.AE - 1234.STARM2.AI)$$

Aggregation Rules are submitted on a BSCP75/4.2 form. The BSCP75/4.2 form requires the algebraic expression for your Aggregation Rule to be split out into single lines with one operation on each line. This is how the Aggregation Rule is entered into the CDCA System.

When the Aggregation Rule consists of more than one expression, the first line(s) of an Aggregation Rule should use the Expression Reference numbers of the following lines to highlight which lines are going to be used, so for Star generation, the BSCP75/4.2 form would be completed shown in figure 4:

<b>BSCP75/4.2</b>									
Primary BM Unit (B)	√	External Interconnector (I)		Internal Interconnector (D)		Grid Supply Point (P)		Grid Supply Point Group Take (G)	
Aggregation Unit ID <sup>11</sup>				T_STAR-1					
Aggregation Unit Name (optional)				STAR Generation					
Effective From Date				28/02/19					
Effective To Date (optional)									
Expression Reference (ER)		MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference			
1		ER	2	+	ER	3			
2		MSQ	1234.STARM1.AE	-	MSQ	1234.STARM1.AI			
3		MSQ	1234.STARM2.AE	-	MSQ	1234.STARM2.AI			

**Figure 4 – Sample Aggregation Rules BSCP75/4.2**

BSCP75/4.2 above should read as follows:

Expression Reference (ER) (Line) 1 = ER 2 (Net metered data) + ER 3 (Net metered data)

ER 2 = (Active Export – Active Import) for Meter M1.

ER 3 = (Active Export – Active Import) for Meter M2.

Replacing E2 and E3 in the first line we get

ER 1 = (Active Export – Active Import) for Meter 1 + (Active Export – Active Import) for Meter M2.

Using the following values as:

Settlement Period x	M1	M2
<b>AE</b>	200MWh	0MWh
<b>AI</b>	0MWh	10MWh

<sup>11</sup> The Aggregation Unit ID is the VAU ID, i.e the Primary BM Unit ID, the Interconnector Name, the DSCP ID, the GSP ID or the GSP Group ID.

We get:

$$ER\ 2 = 200 - 0 = 200$$

$$ER\ 3 = 0 - 10 = -10$$

$$ER\ 1 = ER2 + ER3 = 200 + (-10) = 190\text{MWh.}$$

Comparing this to the algebraic expression we get:

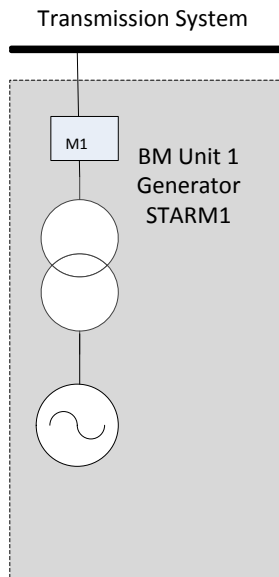
$$\text{Total Metered Volume} = (\text{Active Export through STAR Meter 1} - \text{Active Import through STAR Meter 1}) + (\text{Active Export through STAR Meter 2} - \text{Active Import through STAR Meter 2})$$

$$= (200 - 0) + (0 - 10) = (200) + (-10) = 190\ \text{MWh}$$

Note that you need a separate form for each VAU.



## Worked Example - Single Transmission Connected Generation or Demand Primary BM Unit (T\_Primary BM Unit)



The above example shows a single generation Primary BM Unit (VAU) registered as a power station that is directly connected to the Transmission System. This example applies equally to a single demand Primary BM Unit direct connected to the Transmission System that has both an Import and an Export Meter register. The power station in this instance is operated by Star Power.

The Meter Technical Details are as follows:

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter ** if data has changed	MSID:	1234							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
	*	STARM1	CR097457	Main	T1	AI	9		
*	STARM1	CR097457	Main	T2	AE	9			

To calculate the Metered Volume for the Primary BM Unit we subtract the Import from the Export

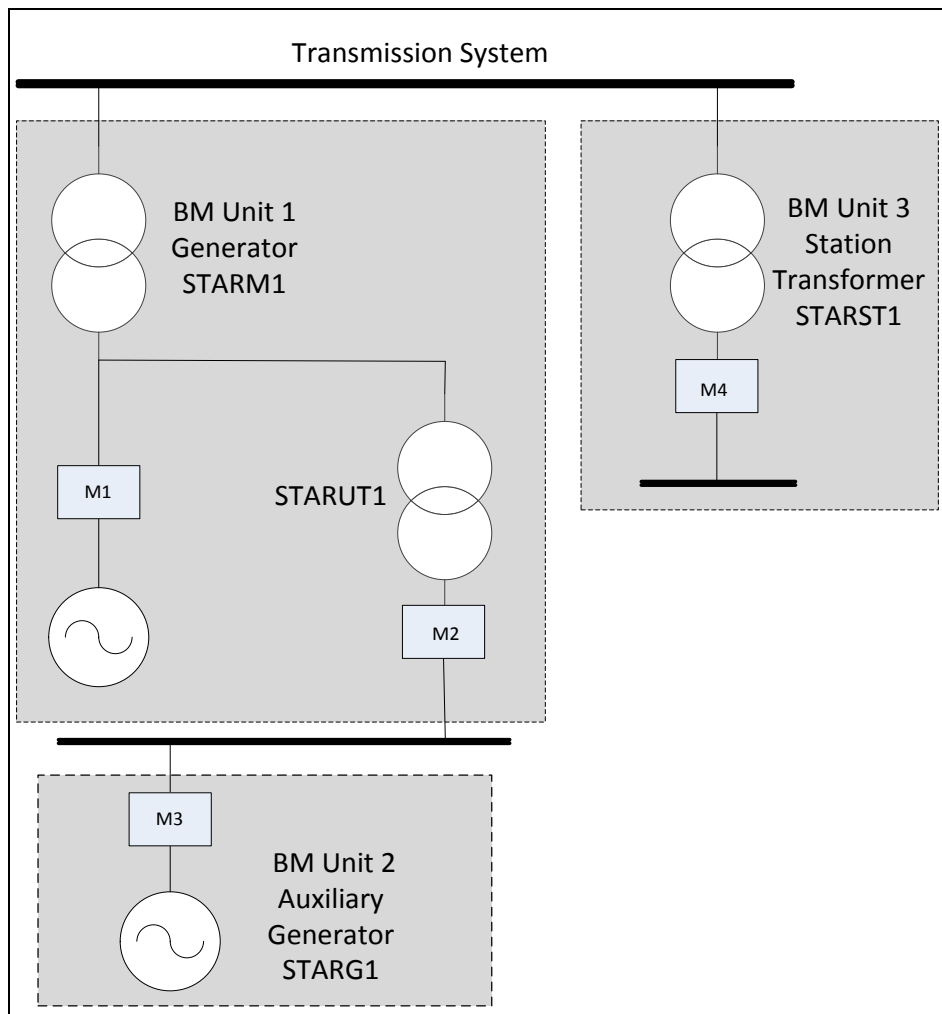
The algebraic Aggregation Rule would be:

$$\begin{aligned}
 \text{Primary BM Unit Metered Volume} &= \text{Active Export} - \text{Active Import} \\
 &= 1234.STARM1.AE - 1234.STARM1.AI
 \end{aligned}$$

In the BSCP75 form this would be written as:

<b>BSCP75/4.2</b>					
<b>Expression Reference (ER)</b>	<b>MSQ, ER, BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>	<b>+, -, /, x</b>	<b>MSQ, ER BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>
1	MSQ	1234.STARTM1.AE	-	MSQ	1234.STARTM1.AI

## Worked Example – Transmission Connected Power Station with auxiliary Generation



The above example shows three Primary BM Units (VAUs) registered as a power station that is directly connected to the Transmission System. The power station in this instance is operated by Star Power.

Primary BM Unit 1 – Consists of the main Generating Unit with its Meter (M1) and associated demand for that Generating Unit (Unit transformer UT1) with its Meter (M2)

Primary BM Unit 2 – Consists of an auxiliary Generating Unit (G1) and associated meter (M3) and has different costs in comparison to the main Generating Unit. Registering it separately means that the Party can submit Bids and Offers for each generator independently.

Primary BM Unit 3 – Is the station demand for the power station (Station Load ST1) and is associated with meter (M4).

The four Metering Systems are registered under a single MSID, MSID 1234:

The Meter Technical Details are as follows:

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter ** if data has changed	MSID:	1234							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARM1	CR097457	Main	T1	AI	9			
*	STARM1	CR097457	Main	T2	AE	9			
*	STARUT1	CR097458	Main	T1	AI	9			
*	STARUT1	CR097458	Main	T2	AE	9			
*	STARG1	CR097459	Main	T1	AI	9			
*	STARG1	CR097459	Main	T2	AE	9			
*	STARST1	CR097460	Main	T1	AI	9			
*	STARST1	CR097460	Main	T2	AE	9			

To calculate the Metered Volume for Primary BM Unit 1, the volumes (i.e. net active energy metered data) recorded by Meter M1 and M2 are added together. However, because Primary BM Unit 2 (auxiliary Generating Unit) volumes flow via Primary BM Unit 1 through Meter 2 to the Transmission System, the volumes from the auxiliary Generating Unit (G1) via its associated Meter 3 (STARG1), must be subtracted from that sum.

### Primary BM Unit 1

The algebraic Aggregation Rule would be:

$$\begin{aligned} \text{Primary BM Unit 1} &= (\text{Active Export} - \text{Active Import through Meter One}) + (\text{Active} \\ &\text{Export} - \text{Active Import through Meter Two}) - (\text{Active Export} - \\ &\text{Active Import through Meter Three}) \\ &= (1234.STARM1.AE - 1234.STARM1.AI) + (1234.STARUT1.AE \\ &- 1234.STARUT1.AI) - (1234.STARG1.AE - 1234.STARG1.AI) \end{aligned}$$

In the BSCP75 form this would be written as:

BSCP75/4.2					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER BMU, GSP, DSCP, LLF or CST	Reference
1	ER	2	-	ER	5
2	ER	3	+	ER	4
3	MSQ	1234.STARM1.AE	-	MSQ	1234.STARM1.AI
4	MSQ	1234.STARUT1.AE	-	MSQ	1234.STARUT1.AI
5	MSQ	1234.STARG1.AE	-	MSQ	1234.STARG1.AI

## Primary BM Unit 2

The algebraic Aggregation Rule would be:

$$\begin{aligned} \text{Primary BM Unit 2} &= (\text{Active Export} - \text{Active Import through Meter Three}) \\ &= (1234.STARG1.AE - 1234.STARG1.AI) \end{aligned}$$

In the BSCP75 form this would be written as:

BSCP75/4.2					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER BMU, GSP, DSCP, LLF or CST	Reference
1	MSQ	1234.STARG1.AE	-	MSQ	1234.STARG1.AI

## Primary BM Unit 3

The algebraic Aggregation Rule would be:

$$\begin{aligned} \text{Primary BM Unit 3} &= (\text{Active Export} - \text{Active Import through Meter Four}) \\ &= (1234.STARST1.AE - 1234.STARST1.AI) \end{aligned}$$

In the BSCP75 form this would be written as:

BSCP75/4.2					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER BMU, GSP, DSCP, LLF or CST	Reference
1	MSQ	1234.STARST1.AE	-	MSQ	1234.STARST1.AI

## Example 1

Primary BM Unit 1 Main Generator generates 200 MWh (in a Settlement Period), demand taken from the Unit Transformer board for the main generator is 10 MWh. Primary BM Unit 2 Auxiliary Generator G1 is NOT generating or importing. Primary BM Unit 3 Station Transformer is NOT taking Station Load.

$$\begin{aligned} \text{Primary BM Unit 1} &= (1234.STARM1.AE - 1234.STAR1M1.AI) \\ &+ (1234.STARUT1.AE - 1234.STARUT1.AI) \\ &- (1234.STARG1.AE - 1234.STARG1.AI) \\ &= (200 - 0) + (0 - 10) - (0 - 0) \\ &= (200) + (-10) - (0) \\ &= 190 \text{ MWh} \end{aligned}$$

$$\begin{aligned}
\text{Primary BM Unit 2} &= (1234.\text{STARG1.AE} - 1234.\text{STARG1.AI}) \\
&= (0 - 0) \\
&= 0 \text{ MWh}
\end{aligned}$$

$$\begin{aligned}
\text{Primary BM Unit 3} &= (1234.\text{STARST1.AE} - 1234.\text{STARST1.AI}) \\
&= (0 - 0) \\
&= 0 \text{ MWh}
\end{aligned}$$

## Example 2

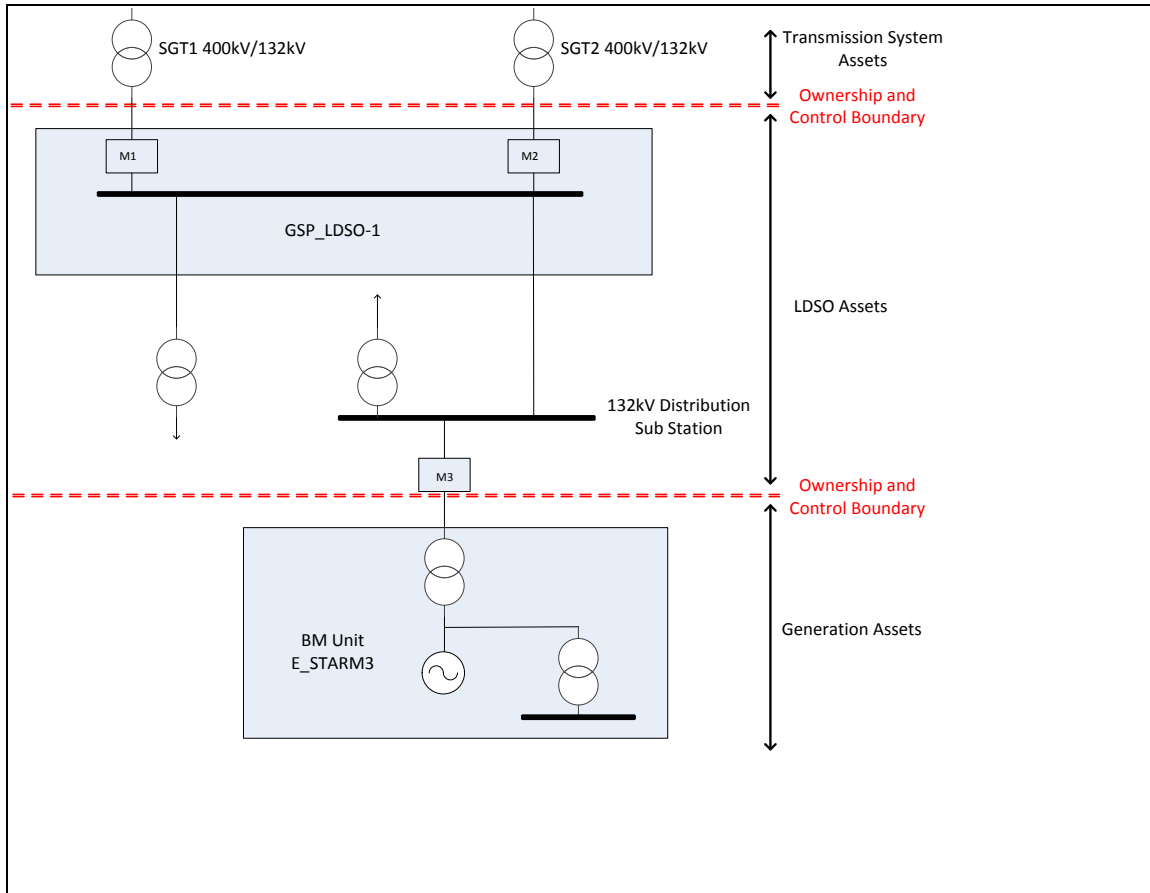
Primary BM Unit 1 Main Generator generates 200 MWh, Unit Transformer board is taking 10 MWh demand for the main generator. Primary BM Unit 2 Auxiliary Generator G1 is generating 100 MWh, which flows through Unit Transformer M2 meter, so Meter M2 will record 100 Export -10 Import = 90 Export. Primary BM Unit 3 Station Transformer is NOT taking Station Load.

$$\begin{aligned}
\text{Primary BM Unit 1} &= (1234.\text{STARM1.AE} - 1234.\text{STAR1M1.AI}) \\
&\quad + (1234.\text{STARUT1.AE} - 1234.\text{STARUT1.AI}) \\
&\quad - (1234.\text{STARG1.AE} - 1234.\text{STARG1.AI}) \\
&= (200 - 0) + (90 - 0) - (100 - 0) \\
&= (200) + (90) - (100) \\
&= 190 \text{ MWh}
\end{aligned}$$

$$\begin{aligned}
\text{Primary BM Unit 2} &= (1234.\text{STARG1.AE} - 1234.\text{STARG1.AI}) \\
&= (100 - 0) \\
&= 100 \text{ MWh}
\end{aligned}$$

$$\begin{aligned}
\text{Primary BM Unit 3} &= (1234.\text{STARST1.AE} - 1234.\text{STARST1.AI}) \\
&= (0 - 0) \\
&= 0 \text{ MWh}
\end{aligned}$$

## Worked Example – Distribution Connected Primary BM Unit (E\_Primary BM Unit)



The above example shows a single Primary BM Unit (VAU) registered as a power station that is connected to a Distribution System. The diagram shows the GSP Meters (M1 and M2) and the LDSO Distribution System between the Transmission System and Primary BM Unit E\_STARM3. The power station in this instance is operated by Star Power.

The GSP Meters (M1 and M2) do not need to be included in the Aggregation Rule for Primary BM Unit E\_STARM3 as they are included in the Aggregation Rule for the GSP. Embedded Primary BM Units require Line Loss Factors (LLFs), to scale energy consumed or generated to an equivalent value at the Transmission System Boundary. These are accounted for within the Aggregation Rules.

The Meter Technical Details are as follows:

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter '*' if data has changed	MSID:	1234							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARM3	CR097459	Main	T1	AI	9			
*	STARM3	CR097459	Main	T2	AE	9			

To calculate the Metered Volume for the Primary BM Unit we multiply the Import by the LLF and the Export by the LLF and then subtract the adjusted Import from the adjusted Export.

The algebraic Aggregation Rule would be:

$$\begin{aligned} \text{Primary BM Unit volume} &= (\text{Active Export} \times \text{LLF}) - (\text{Active Import} \times \text{LLF}) \\ &= (1234.\text{STARM1.AE} \times \text{LLF}) - (1234.\text{STARM1.AI} \times \text{LLF}) \end{aligned}$$

Note that the BSC requires LLFs to be applied to the Import and Export before aggregation.

In the BSCP75 form this would be written as:

BSCP75/4.2					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER BMU, GSP, DSCP, LLF or CST	Reference
1	ER	2	-	ER	3
2	MSQ	1234.STARM3.AE	x	LLF	
3	MSQ	1234.STARM3.AI	x	LLF	

### Separate MSIDs for Import and Export

Should the LSDO wish to apply different LLFs to the Import and Export, due to system constraints separate MSIDs are required for the Import and Export. There would be two sets of MTDs as follows:

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter '**' if data has changed	MSID:	<b>1234</b>							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARM3	CR097459	Main	T1	AI	9			

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter '**' if data has changed	MSID:	<b>1235</b>							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARM3	CR097459	Main	T2	AE	9			



There would still only be one set of Aggregation Rules as this is still a single Primary BM Unit. The algebraic Aggregation Rule would be:

$$\begin{aligned} \text{Primary BM Unit volume} &= (\text{Active Export} \times \text{LLF}) - (\text{Active Import} \times \text{LLF}) \\ &= (1235.\text{STARM3.AE} \times \text{LLF}) - (1234.\text{STARM3.AI} \times \text{LLF}) \end{aligned}$$

In the BSCP75 form this would be written as:

<b>BSCP75/4.2</b>					
<b>Expression Reference (ER)</b>	<b>MSQ, ER, BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>	<b>+, -, /, x</b>	<b>MSQ, ER BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>
1	ER	2	-	ER	3
2	MSQ	1235.STARM3.AE	x	LLF	
3	MSQ	1234.STARM3.AI	x	LLF	

LLF can be used in both lines (as opposed to LLF1 and LLF2) as the value to be used is linked to the MSID, which is different for the Import and Export.

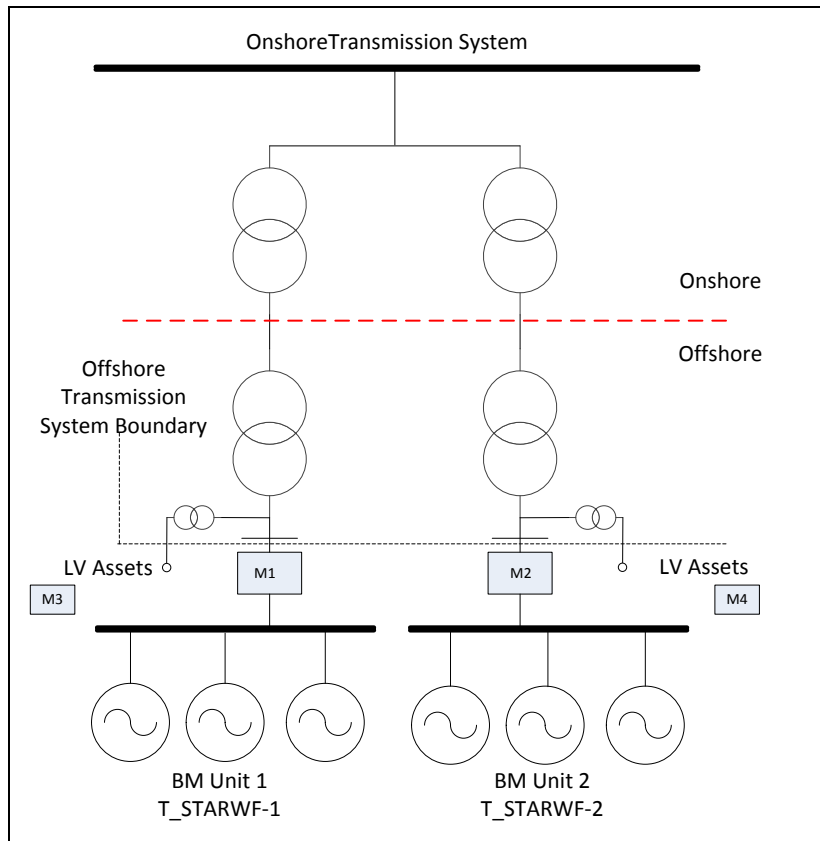
### Example

An embedded generator with a CVA registered Metering System has losses between the generating plant and the Transmission System Boundary. The LDSO wishes to apply different LLFs to the Import and Export. The Generating Unit generates 100MW Export and does not Import (in a Settlement Period.)

In this example the Registrant requires two different LLFs, for one for Import and Export. This requires two MSIDs from the CDCA (1234 and 1235).

$$\begin{aligned} \text{Primary BM Unit Volume} &= ((1235.\text{STARM3.AE} \times \text{LLF}) - (1234.\text{STARM3.AI} \times \text{LLF})) \\ &= (100 * 0.996) - (0 * 1.004) \\ &= (99.6) - (0) \\ &= 99.6 \text{ MWh} \end{aligned}$$

## Worked Example - Offshore Wind Farm



The above offshore windfarm has two separated electrical busbars, which constitutes two Power Park Modules (PPM) and two Primary BM Units. The example above has the additional factors of low voltage (LV) metered assets for the generator, which will need to be accounted for within an Aggregation Rules. The generator has applied for two non-standard Primary BM Units in order to add in the LV assets to the respective PPM Primary BM Units and the application has been approved by the BSC Panel.

All the Meter Equipment is registered under the same MSID, MSID 1234.

The Meter Technical Details are as follows:

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter '*' if data has changed	MSID:	1234							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARWFM1	CR097457	Main	T1	AI	9			
*	STARWFM1	CR097457	Main	T2	AE	9			
*	STARWFM2	CR097458	Main	T1	AI	9			
*	STARWFM2	CR097458	Main	T2	AE	9			
*	STARLVM3	CR097459	Main	T1	AI	9			
*	STARLVM3	CR097459	Main	T2	AE	9			

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter ** if data has changed	MSID:	1234							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARLVM4	CR097460	Main	T1	AI	9			
*	STARLVM4	CR097460	Main	T2	AE	9			

### Primary BM Unit 1

To calculate the Metered Volume for Primary BM Unit 1, the volumes (i.e. net active energy metered data) recorded by Meter M1 (measuring the PPMs) and M3 (measuring the LV Assets) are added together.

The algebraic Aggregation Rule would be:

$$\begin{aligned}
 \text{Primary BM Unit 1} &= (\text{Active Export} - \text{Active Import through Meter One}) + (\text{Active Export} - \text{Active Import through Meter Three}) \\
 &= (1234.\text{STARWFM1.AE} - 1234.\text{STARWFM1.AI}) + \\
 &\quad (1234.\text{STARLVM3.AE} - 1234.\text{STARLVM3.AI})
 \end{aligned}$$

In the BSCP75 form this would be written as:

Aggregation ID (Primary BM Unit ID): T\_STARWF-1

BSCP75/4.2					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER BMU, GSP, DSCP, LLF or CST	Reference
1	ER	2	+	ER	3
2	MSQ	1234.STARWFM1.AE	-	MSQ	1234.STARWFM1.AI
3	MSQ	1234.STARLVM3.AE	-	MSQ	1234.STARMLVM3.AI

### Primary BM Unit 2

To calculate the Metered Volume for Primary BM Unit 2, the volumes (i.e. net active energy metered data) recorded by Meter M2 (measuring the PPMs) and M3 (measuring the LV Assets) are added together.

The algebraic Aggregation Rule would be:

$$\begin{aligned}
 \text{Primary BM Unit 2} &= (\text{Active Export} - \text{Active Import through Meter Two}) + (\text{Active Export} - \text{Active Import through Meter Four}) \\
 &= (1234.\text{STARWFM2.AE} - 1234.\text{STARWFM2.AI}) + \\
 &\quad (1234.\text{STARLVM4.AE} - 1234.\text{STARLVM4.AI})
 \end{aligned}$$

In the BSCP75 form this would be written as:

Aggregation ID (Primary BM Unit ID): T\_STARWF-2

<b>BSCP75/4.2</b>					
<b>Expression Reference (ER)</b>	<b>MSQ, ER, BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>	<b>+, -, /, x</b>	<b>MSQ, ER BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>
1	ER	2	+	ER	3
2	MSQ	1234.STARWFM2.AE	-	MSQ	1234.STARWFM2.AI
3	MSQ	1234.STARLVM4.AE	-	MSQ	1234.STARMLVM4.AI

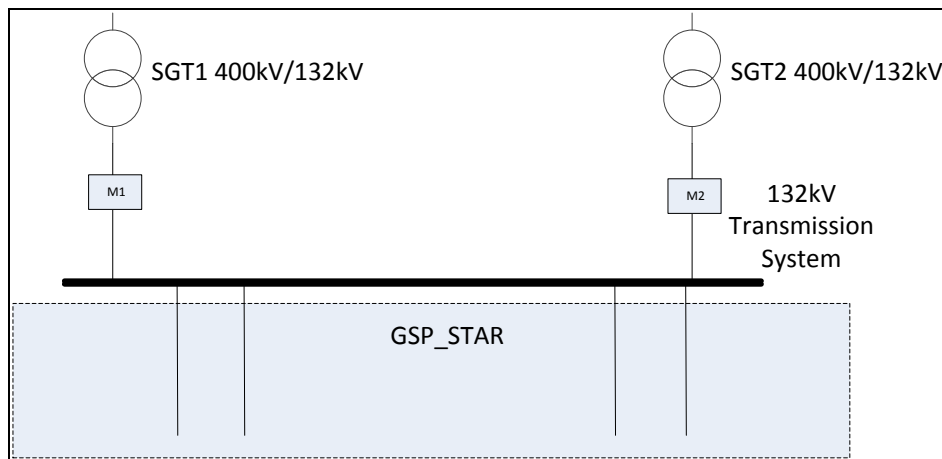
### Example

The two Primary BM Units consist of multiple Generating Units (wind turbines) and associated generator LV assets. Each Primary BM Unit is generating 100 MWh of energy, and each has LV assets taking 0.1 MWh. So within each Aggregation Rule these LV assets are subtracted from the generation.

$$\begin{aligned}
 \text{Primary BM Unit 1} &= (1234.STARWFM1.AE - 1234.STARWFM1.AI) \\
 &+ (1234.STARLVM3.AE - 1234.STARLVM3.AI) \\
 &= (100 - 0) + (0 - 0.1) \\
 &= (100 - 0.1) \\
 &= 99.9 \text{ MWh}
 \end{aligned}$$

$$\begin{aligned}
 \text{Primary BM Unit 2} &= (1234.STARWFM2.AE - 1234.STARWFM2.AI) \\
 &+ (1234.STARLVM4.AE - 1234.STARLVM4.AI) \\
 &= (100 - 0) + (0 - 0.1) \\
 &= (100 - 0.1) \\
 &= 99.9 \text{ MWh}
 \end{aligned}$$

## Worked Example - GSP – Grid Supply Point Single LDSO



A GSP is a connection between the Transmission System and a Distribution System and can often contain one or more circuits. In this example the LDSO's circuits connect to a Transmission System busbar and constitute a single GSP made up of four circuits. The Codes of Practice (CoPs) allow the metering to be located on the SGT circuits.

The submission of the Aggregation Rules for GSPs is the responsibility of the Distribution System Operator.

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter '*' if data has changed	MSID:	1234							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARSGT1	CR097459	Main	T1	AI	9			
*	STARSGT1	CR097459	Main	T2	AE	9			
*	STARSGT2	CR097460	Main	T1	AI	9			
*	STARSGT2	CR097460	Main	T2	AE	9			

To calculate the Metered Volume for GSP\_STAR the volumes (i.e. net active energy metered data) recorded by Meter M1 and M2 are added together.

The algebraic Aggregation Rule would be:

$$\begin{aligned}
 \text{GSP\_STAR} &= (\text{Active Export} - \text{Active Import through Meter One}) \\
 &+ (\text{Active Export} - \text{Active Import through Meter Two}) \\
 &= (1234.\text{STARSGT1.AE} - 1234.\text{STARSGT1.AI}) \\
 &+ (1234.\text{STARSGT2.AE} - 1234.\text{STARSGT2.AI})
 \end{aligned}$$

In the BSCP75 form this would be written as:

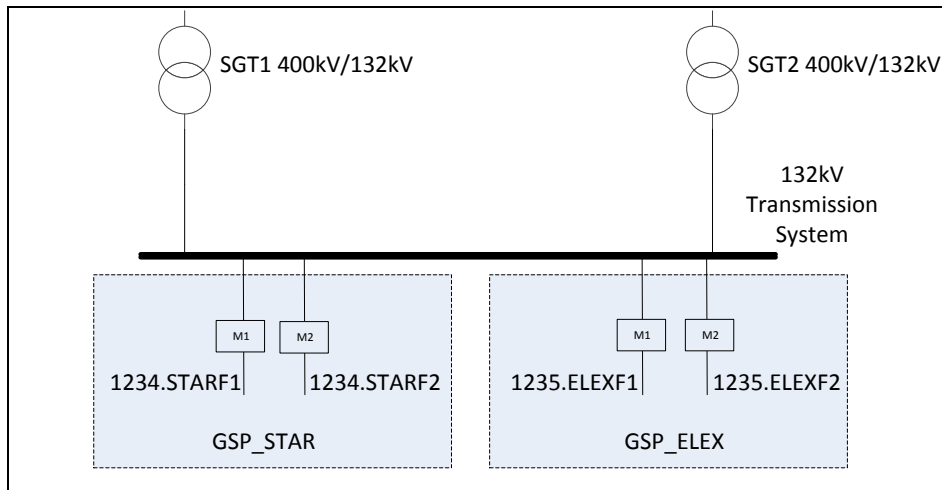
<b>BSCP75/4.2</b>					
<b>Expression Reference (ER)</b>	<b>MSQ, ER, BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>	<b>+, -, /, x</b>	<b>MSQ, ER BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>
1	ER	2	+	ER	3
2	MSQ	1234.STARSGT1.AE	-	MSQ	1234.STARSGT1.AI
3	MSQ	1234.STARSGT2.AE	-	MSQ	1234.STARSGT2.AI

### Example

GSP\_STAR is importing 100MW through SGT1 and 100MW through SGT2 (in a Settlement Period).

$$\begin{aligned}
 \text{GSP\_STAR} &= (1234.STARSGT1.AE - 1234.STARSGT1.AI) \\
 &+ (1234.STARSGT2.AE - 1234.STARSGT2.AI) \\
 &= (0 - 100) + (0 - 100) \\
 &= - 200 \text{ MWh (i.e. Importing 200 MWh)}
 \end{aligned}$$

## Worked Example - GSP – Shared Grid Supply Point



In this example there are four LDSO circuits connected to a Transmission System busbar. Two circuits feed one GSP Group (GSP\_STAR) and two circuits feed a second GSP Group (GSP\_ELEX). At a shared GSP<sup>12</sup> the CoPs requires metering on the feeders to each LDSO. The two GSP Groups are registered by two different LDSOs. This means that each set of Metering Equipment will have different MSIDs. Two Aggregation Rules are required, one for each GSP.

The submission of the Aggregation Rule for each GSP is the responsibility of the relevant Licensed Distribution System Operator.

The Meter Technical Details are as follows:

The GSP\_STAR Meter Technical Details are as follows:

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter ** if data has changed	MSID:	1234							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	STARF1	CR097459	Main	T1	AI	9			
*	STARF1	CR097459	Main	T2	AE	9			
*	STARF2	CR097460	Main	T1	AI	9			
*	STARF2	CR097460	Main	T2	AE	9			

<sup>12</sup> In this example, the GSP is 'shared' between two LDSOs, but a shared GSP can also be one where there is a GSP and directly connected generator or demand connected to the same busbar.

The GSP\_ELEX Meter Technical Details are as follows:

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter ** if data has changed	MSID:	1235							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	ELEXF1	CR097461	Main	T1	AI	9			
*	ELEXF1	CR097461	Main	T2	AE	9			
*	ELEXF2	CR097462	Main	T1	AI	9			
*	ELEXF2	CR097462	Main	T2	AE	9			

To calculate the Metered Volume for GSP\_STAR the volumes (i.e. net active energy metered data) recorded by Meter M1 and M2 are added together.

The algebraic Aggregation Rule would be:

$$\begin{aligned}
 \text{GSP\_STAR} &= (\text{Active Export} - \text{Active Import through Meter One}) \\
 &+ (\text{Active Export} - \text{Active Import through Meter Two}) \\
 &= (1234.STARF1.AE - 1234.STARF1.AI) \\
 &+ (1234.STARF2.AE - 1234.STARF2.AI)
 \end{aligned}$$

To calculate the Metered Volume for GSP\_STAR the volumes (i.e. net active energy metered data) recorded by Meter M1 and M2 are added together.

The algebraic Aggregation Rule would be:

$$\begin{aligned}
 \text{GSP\_ELEX} &= (\text{Active Export} - \text{Active Import through Meter One}) \\
 &+ (\text{Active Export} - \text{Active Import through Meter Two}) \\
 &= (1235.ELEXF1.AE - 1235.ELEXF1.AI) \\
 &+ (1235.ELEXF2.AE - 1235.ELEXF2.AI)
 \end{aligned}$$

A separate BSCP form is required for each GSP, each form submitted by the relevant LDSO. The BSCP75/4.2 forms would be written as:

Aggregation ID: GSP\_STAR

BSCP75/4.2					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER BMU, GSP, DSCP, LLF or CST	Reference
1	ER	2	+	ER	3
2	MSQ	1234.STARF1.AE	-	MSQ	1234.STARF1.AI



BSCP75/4.2					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER BMU, GSP, DSCP, LLF or CST	Reference
3	MSQ	1234.STARF2.AE	-	MSQ	1234.STARF2.AI

Aggregation ID: GSP\_ELEX

BSCP75/4.2					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP, LLF or CST	Reference	+, -, /, x	MSQ, ER BMU, GSP, DSCP, LLF or CST	Reference
1	ER	2	+	ER	3
2	MSQ	1235.ELEXF1.AE	-	MSQ	1235.ELEXF1.AI
3	MSQ	1235.ELEXF2.AE	-	MSQ	1235.ELEXF2.AI

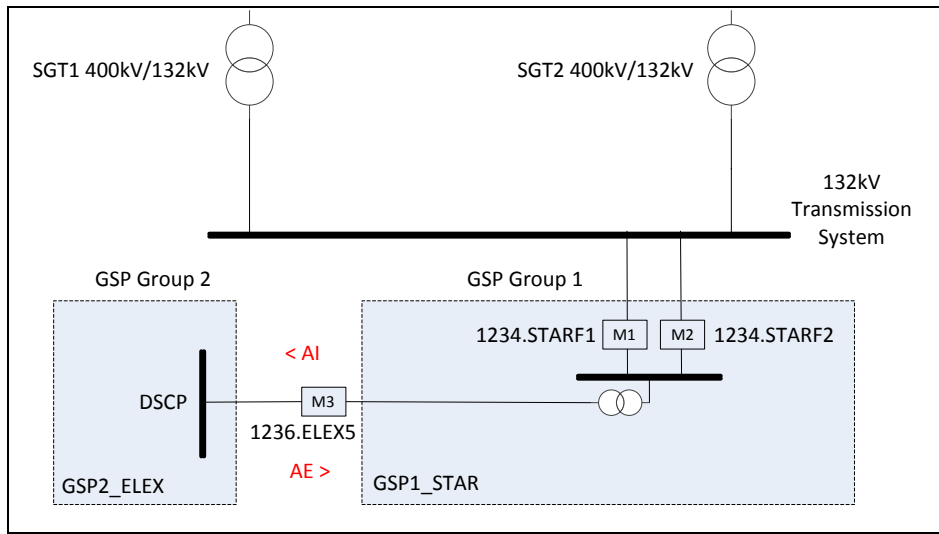
### Example

GSP\_STAR is importing 100MW through M1 and 100MW through M2 (in a Settlement Period).  
GSP\_ELEX is importing 100MW through M1 and 30MW through M2 (in a Settlement Period).

$$\begin{aligned}
\text{GSP\_STAR} &= (1234.STARF1.AE - 1234.STARF1.AI) \\
&+ (1234.STARF2.AE - 1234.STARF2.AI) \\
&= (0 - 100) + (0 - 100) \\
&= - 200 \text{ MWh (i.e. Importing 200 MWh)}
\end{aligned}$$

$$\begin{aligned}
\text{GSP\_ELEX} &= (1235.ELEXF1.AE - 1235.ELEXF1.AI) \\
&+ (1235.ELEXF2.AE - 1235.ELEXF2.AI) \\
&= (0 - 100) + (0 - 30) \\
&= - 130 \text{ MWh (i.e. Importing 130 MWh)}
\end{aligned}$$

## Worked Example - Distribution System Connection Point - DSCP



A DSCP is a connection between two Distribution Systems. In this example the DSCP is being metered at M3 (Metering System ID is 1236). The LDSOs are required to agree who registers the Metering System. The normal convention for DSCPs is that energy predominately flows into the Registrant's GSP. The LDSO of the GSP Group which is acting as Registrant would be required to assign a LLF to account for losses between Meter M3 and the Transmission System and submit the Aggregation Rules.

In this case ELEX registers the DSCP and is the Registrant of M3. Therefore AI is towards GSP Group 2. ELEX must submit the Aggregation Rule for the DSCP.

The Meter Technical Details are as follows:

BSCP20/4.3b									
Registration of Meter Technical Details									
Meter Register Details									
Enter '*' if data has changed	MSID:	1236							
	Metering Subsystem ID	Meter Serial No.	Main / Check	Meter Register ID	Measurement Quantity ID (AI, AE, RI, or RE)	No of Register Dials	Meter Register Multiplier	Associated Meter ID	Associated Meter Register ID
*	ELEX5	CR097460	Main	T1	AI	9			
*	ELEX5	CR097460	Main	T2	AE	9			

To calculate the Metered Volume for the DSCP we subtract the Import from the Export for the DSCP Meter

The algebraic Aggregation Rule would be:

$$\begin{aligned} \text{DSCP\_ELEX5} &= (\text{Active Export} - \text{Active Import through Meter Three}) \\ &= (1236.ELEX5.AE - 1236.ELEX5.AI) \end{aligned}$$

In the BSCP75 form this would be written as:

<b>BSCP75/4.2</b>					
<b>Expression Reference (ER)</b>	<b>MSQ, ER, BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>	<b>+, -, /, x</b>	<b>MSQ, ER BMU, GSP, DSCP, LLF or CST</b>	<b>Reference</b>
1	ER	2	+	ER	3
2	MSQ	1236.ELEX5.AE	x	LLF	
3	MSQ	1236.ELEX5.AE	x	LLF	

### Example

DSCP ELEX5 is importing 100MW (towards GSP Group 2) through M3 and exporting 0MW through M3 (in a Settlement Period). The Registrant has used the same LLF for both Export and Import and so only requires one MSID.

$$\begin{aligned}
 \text{DSCP\_ELEX5} &= ((1236.ELEX5.AE \times \text{LLF}) - (1236.ELEX5.AI \times \text{LLF})) \\
 &= (0 * 0.996) - (100 * 0.996) \\
 &= (0) - (99.6) \\
 &= - 99.6 \text{ MWh}
 \end{aligned}$$

The Registrant LDSO could decide that they want different LLFs for the Import and the Export flows. In which case there will need to be separate MSIDs due to CDCA System constraints and separate MTDs for each MSID.

## GSP Group Take Aggregation Rules

For every GSP Group, the GSP Group Take Aggregation Rule details the amount of energy going into (or out of) the Distribution System of that GSP Group, either from the Transmission System (via GSPs), from another connected Distribution System (via DSCPs) or from a Distribution System connected (embedded) Primary BM Unit with a CVA registered Metering System.

The GSP Group Take Metered Volume of a GSP Group is predominantly a large negative quantity, but this is not always the case.

Transmission connected Primary BM Units do not affect GSP Group Take because their Import and Export goes straight onto the Transmission System.

The CDCA is responsible for completing the [BSCP75/4.2](#) form for GSP Group Take Aggregation Rules, and the LDSO for authorising them.

Registration activities that can affect a GSP Group Take Aggregation Rule are:

- The registration or de-registration of a GSP (note that this does not include the registration or de-registration of individual circuits at the GSP)
- The registration or de-registration of an Embedded Primary BM Unit (or Distribution connected circuits that are part of an M\_ cascade hydro Primary BM Unit) with a CVA registered Metering System
- The registration or de-registration of a DSCP (note that this does not include the registration or de-registration of individual circuits at the DSCP). This will require changes to two sets of GSP Group Take Aggregation Rules for the two GSP Groups that the DSCP is connecting. The normal convention is that DSCP aggregated volumes (i.e. normal flow AI to the 'Host' LDSO's GSP Group) will be ADDED (+II) to the 'Host' LDSO's GSP Group Take Aggregation Rule, and SUBTRACTED (-II) from the 'Other' LDSO's GSP Group Take Aggregation Rule (i.e. normal flow AE from the 'Other' LDSO's GSP Group).

Below is an example of a GSP Group Take Aggregation Rule for GSP Group ELEXON.

BM Unit (B)	External Interconnector (I)	Internal Interconnector (D)	Grid Supply Point (P)	Grid Supply Point Group Take (G)	✓
Aggregation Unit ID		X			
Aggregation Unit Name (optional)		ELEXON GSP Group			
Effective From Date					
Expression Reference (ER)	MSQ, ER, BMU, GSP, DSCP or LLF	Reference	+, -, /, x	MSQ, ER, BMU, GSP, DSCP or LLF	Reference
GSPG X	ER	1	+	GSP	ELEX_8
1	ER	2	+	GSP	SARE_1
2	ER	3	+	GSP	STAR_6
3	ER	4	+	GSP	EELX_1
4	ER	5	+	GSP	STAR_1
5	ER	6	+	II	STAP_1
6	ER	7	-	II	STAR_ELEX
7	ER	8	-	II	STAR_POW
8	ER	9	-	BMU	E_STAR-WF
9	ER	10	-	BMU	E_STAR-1
10	ER	11	-	BMU	E_ELEXO1
11	CST	0	-	BMU	E_BSCELEX

## CDCA Constraints & System Parameters for Aggregation Rules

The CDCA system has a finite set of rules for how the data from the [BSCP75/4.2](#) Form is entered.

Below is a list of set requirements which the end user should consider when completing forms/documents associated to Aggregation Rules and Meter Technical Details.

- CDCA system rounds all Metered Volumes in the CDCA database to 4 decimal places only (i.e. 0.00009 or smaller will not be output as a result of a mathematical calculation), using the normal rounding rules. Constants (CST) can be up to 5 decimal places, but are still subject to the above rounding.
- Do not leave blank rows in the middle of the Aggregation Rule table.
- Make the Expression References (ER) as sequential as **possible** (for example, **DO NOT** use ER 1 + ER 9, ER 2 + ER 8 etc. instead use sequential numbering ER 1 + ER 2, ER 3 + ER 4 etc.) This allows the Aggregation Rule to be entered into CDCA more logically.
- CDCA does not support the expression of a negative first term in an Aggregation Rule, so where IMPORT ONLY is being aggregated, it should be written as either as CST 0 – MSQ 1234.STARSGT1.AI, or MSQ 1234.STARSGT1.AI \* CST -1. CST represents a constant.
- A LLF can only be applied in CDCA at the MSID level, NOT at the channel level. Because of this, the same LLF would be applied to both the AE & AI metered data. If this is not correct, then an additional LLF is required, which would require an additional MSID.
- Parameters for Aggregation Rules:

GSP Id	Character(10)	Identifier of a GSP	
Expression Reference (ER)	N/A	<p>A unique identifier for each row of data.</p> <p>A second ER may be stated to point to a discrete row of data.</p> <p>A second and third ER may be stated, each to point to a discrete row of data, in combination with operators + or -.</p>	
Metering System Id	Character(13)	e.g. 1234 – allocated by NETA Service Provider	Collectively these are known as the Metering Subsystem Quantity or "MSQ". Each element of the MSQ must be separated by a full stop.
Metering Subsystem Id	Character(10)	Matches the value included within the MTD	
Measurement Quantity Id	Character(2)	AE, AI	
Operator	Character(1)	One of +, -, *	
LLF	N/A	Value "LLF" if a line loss factor is to be applied (in combination with operator * ) to a single MSQ value or expression, otherwise null. LLF values are not to be provided as part of this flow.	

## Need more information?

For more information please contact the **BSC Service Desk** at [bscservicedesk@cgi.com](mailto:bscservicedesk@cgi.com) or call **0370 010 6950**.

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