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Standardisation of Power Flow Metering Polarity to NESO

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1. Introduction

NESO needs to operate the GB electricity network securely and safely in real-time using the Supervisory Control and Data Acquisition (SCADA) tool. The NESO SCADA system constantly receives power flow measurement data from external parties including Generators, Transmission Owners (TOs) and Distribution Network Operators (DNOs) to show NESO Control Room engineers the most up-to-date network status and assist them to take operational actions if necessary.

The power flow measurement data received by NESO, needs to be consistent with the convention used by the NESO SCADA system. This Electrical Standard specifies the meter polarity for the power flow data sent to NESO.

Stakeholders including TOs, Generators and Elexon have been consulted to ensure this polarity standard is consistent with their conventions and minimise ambiguity.

2. Acronyms and Definitions

CT	Current Transformer
DNO	Distribution Network Operator
GB	Great Britain
HVDC	High Voltage Direct Current
IEMS	Integrated Energy Management System which is NESO's SCADA system
NESO	National Energy System Operator
OFTO	Offshore Transmission Owner
S/S	Substation
SCADA	Supervisory Control and Data Acquisition
The Company	NESO
TO	Transmission Owner
VT	Voltage Transformer

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3. Explanation of Meter Polarity Standard

Power flow polarity (assigning positive or negative direction) is of critical importance to ensure all parties can understand and interpret the direction of flow reported by the metering. Therefore, extreme care must be taken when configuring power flow meters.

The polarity of the power flow on NESO's IEMS should align with that of the user's systems sending the data, to ensure there is no confusion when comparing power flow values at the two locations.

Where it is required to assign directional flow to a quantity (e.g. MW and MVAR), "positive" (+) and "negative" (-) signs should be used in accordance with the diagram in Section 4. The diagram details the application of this sign convention for most types of Feeders, Transformers, Shunt Connected Reactive Compensation, Series Connected Reactive Compensation and Generator Connections. The arrows denote the direction of active and reactive power flow at the CT and VT.

The operational metering shown in the diagram is asset specific and does not include the bay metering in the TO and DNO network. Bay metering in these areas is considered to always follow the convention of:

- "positive" (+) assigned to power flow out of the bay
- "negative" (-) assigned to power flow into the bay

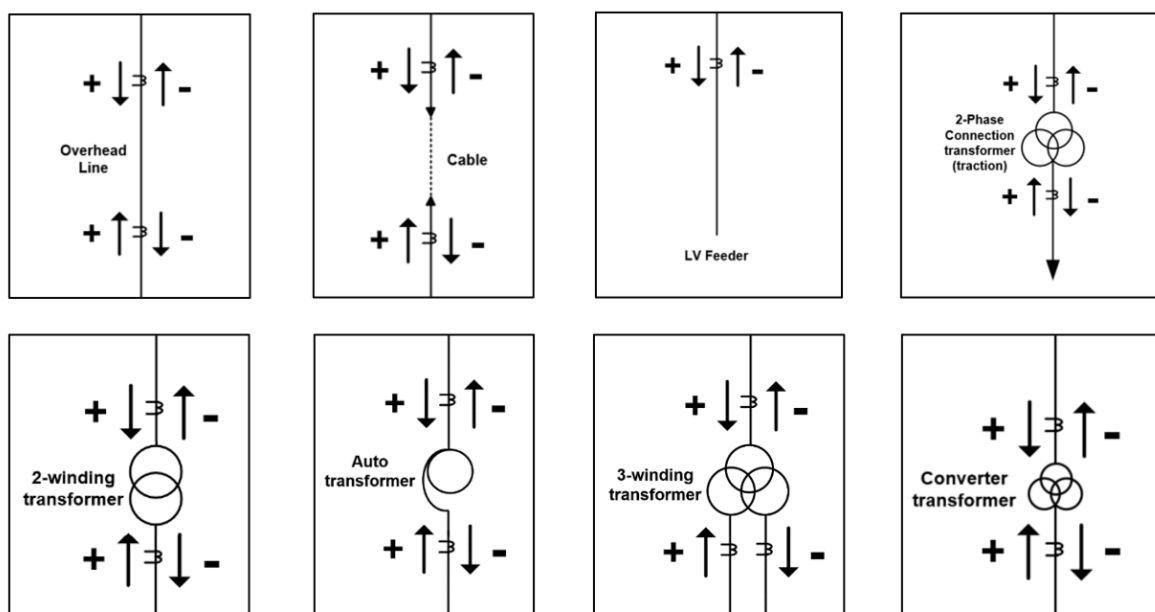
In order to more clearly distinguish the asset specific metering, virtual bus nodes (highlighted in red) have been denoted in the diagram. These virtual bus nodes represent the connection points between each individual asset, where there is no physical bus present.

Additionally, connection point nodes (highlighted in green) have been indicated in the diagram to clearly define the boundary between Generator operational metering and the Onshore/Offshore Transmission and Distribution operational metering.

Not all operational metering seen in the diagram is required to be provided to NESO, however, the operational metering that is provided will be required to follow the convention shown.

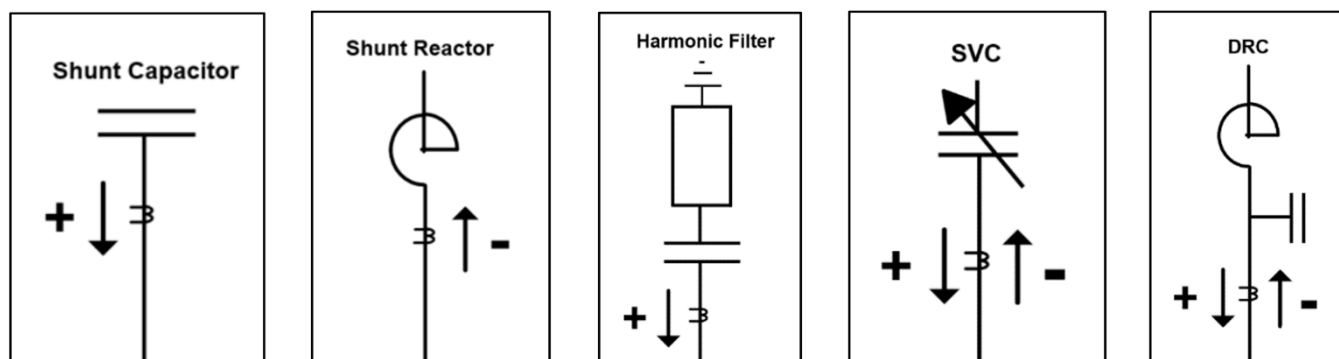
The diagram denotes the convention:

- Connections between GB substations are positive when leaving the substation and negative when entering the substation

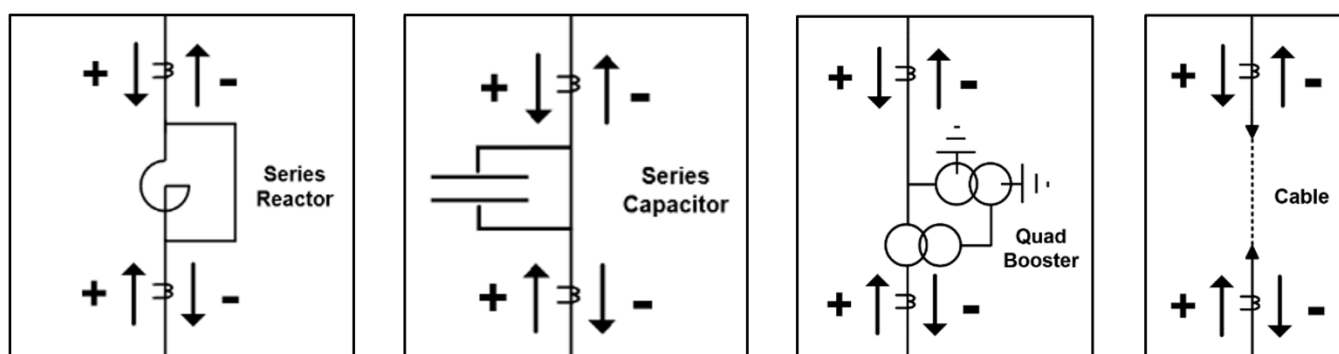


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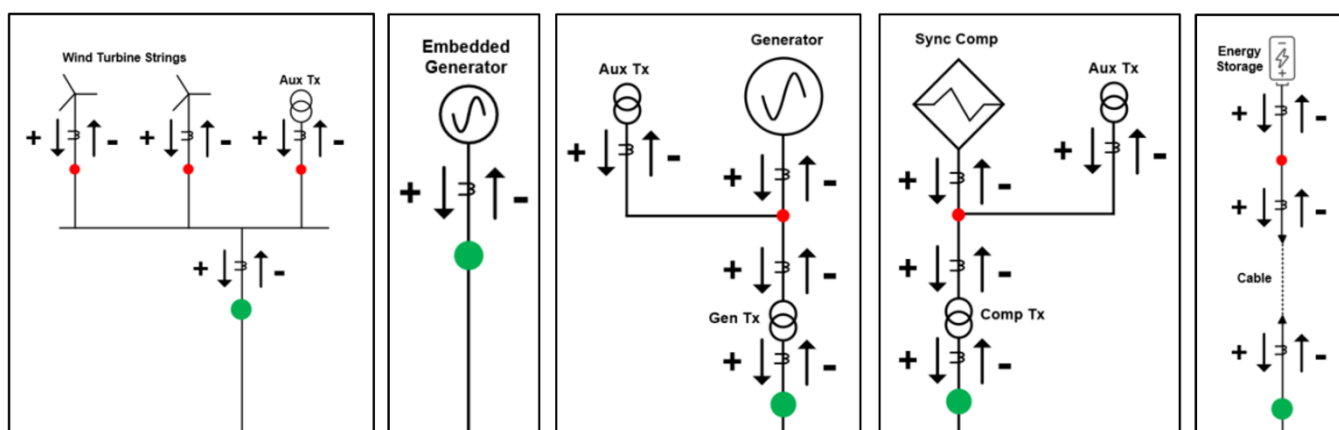
- Shunt Connected Reactive Compensation is positive when leaving the plant and negative when entering the plant



- Series Connected Reactive Compensation and connections within a substation (e.g. a cable section) are represented by positive flow into the device and negative flow out of the device, on both sides

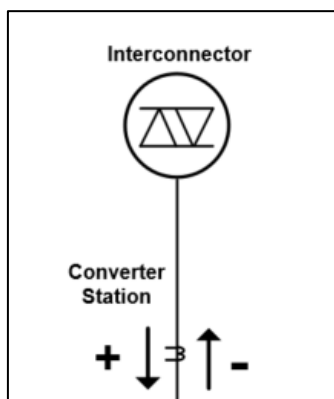


- Generator Connections include all assets from the Generator up to the connection point. All metering associated with Generator Connections is positive towards the Transmission/Distribution network and negative away from the Transmission/Distribution network



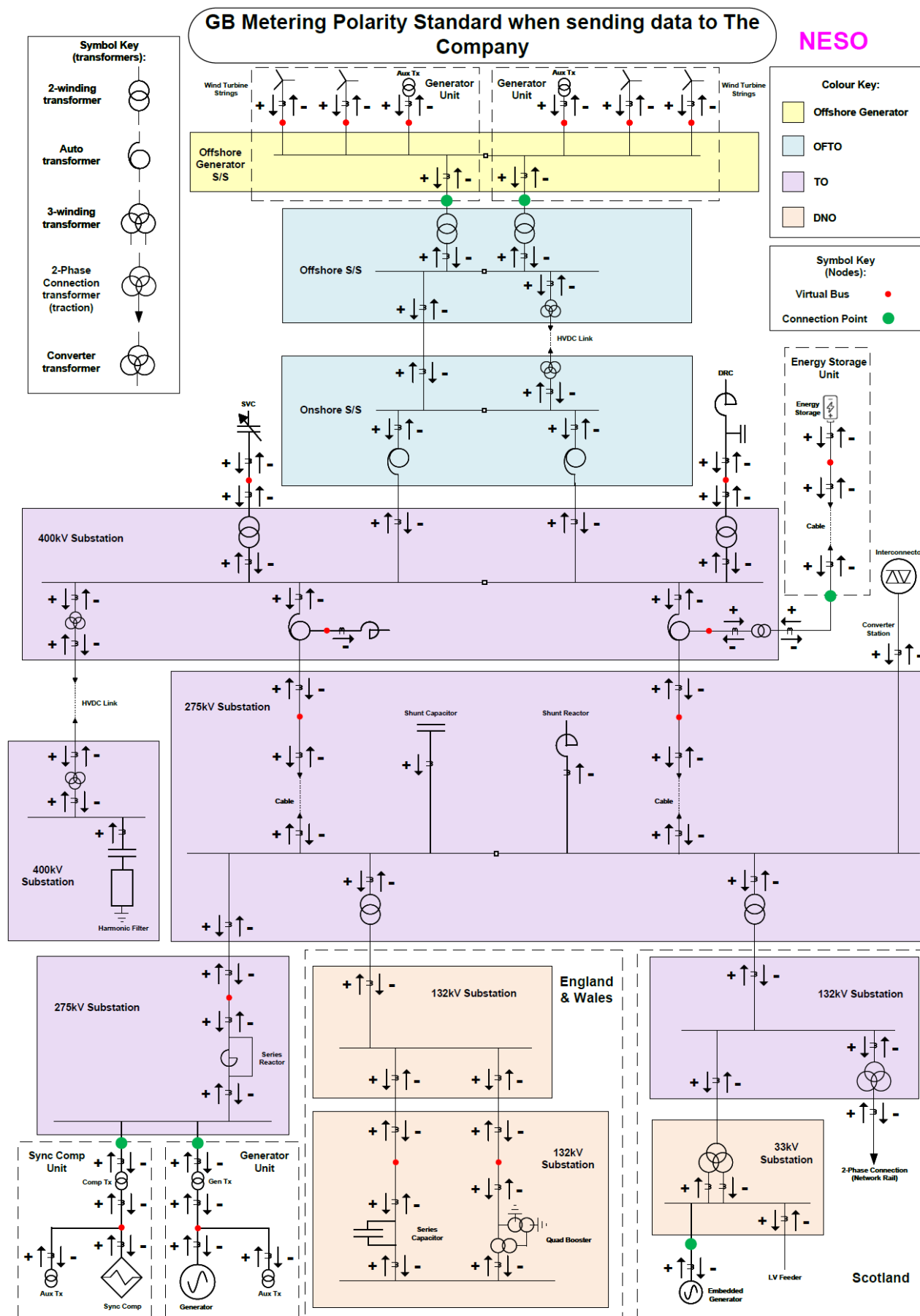
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- International Interconnectors are positive at the converter station when power is being supplied into a GB substation and negative at the converter station when power is being supplied from a GB substation (effectively they are treated like generators on the GB system)



It is important to note that the diagram is an example of the most common equipment found on the network and is not suggesting that each substation or voltage level be required to contain the equipment represented. Equally, it is not suggesting that each substation or voltage level be limited to the equipment represented.

4. Meter Polarity Standard for Power Flow Data sent to NESO



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Document Record

Issue	Draft	Date	Author	Description of changes
1		07/07/2025		First Issue.

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