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Operational Metering Polarity Convention for Power Flow Data

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Contents

1. Foreword	3
2. Acronyms and Definitions	4
3. Introduction	5
4. Operational Metering Polarity Convention for Power Flow Data	6
5. Explanation of Metering Polarity Convention	7
Document Record	9

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1. Foreword

NESO needs to operate the GB electricity network securely and safely in real-time using the Supervisory Control and Data Acquisition (SCADA) system. The NESO SCADA system constantly receives power flow measurement data from external parties including Generators, Transmission Owners (TOs) and Network Operators (NOs) 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 polarity convention used by the NESO SCADA system. This Electrical Standard specifies the operational metering polarity convention for the power flow data sent from GB Code Users and EU Code Users to NESO. Attaining consistency with the operational metering polarity convention can be achieved via the method the User deems most appropriate (e.g. software updates or wiring changes).

For any queries regarding this Electrical Standard, please contact the NESO Operational Metering team via opsmetering@neso.energy

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2. Acronyms and Definitions

Aux Tx	Auxiliary Transformer
CT	Current Transformer
DRC	Dynamic Reactive Compensation
GB	Great Britain
HVDC	High Voltage Direct Current
IEMS	Integrated Energy Management System (NESO's SCADA system)
kV	Kilo Volt
LV	Low Voltage
MVAR	Mega Volt Ampere Reactive
MW	Mega Watt
NESO	National Energy System Operator
NO	Network Operator
OFTO	Offshore Transmission Owner
S/S	Substation
SCADA	Supervisory Control and Data Acquisition
SVC	Static VAR Compensator
TO	Transmission Owner
VT	Voltage Transformer

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3. Introduction

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 operational metering equipment. Therefore, extreme care must be taken when configuring the operational metering signals sent to NESO.

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, for the operational metering signals sent to NESO. 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/demand connections. The arrows denote the direction of active and reactive power flow at the CT.

The operational metering signals associated with the bay have been omitted from the diagram because they are not associated with a single asset and should always follow the convention below, regardless of the assets within the substation:

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

In order to more clearly distinguish the operational metering signals associated with different types of assets, 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.

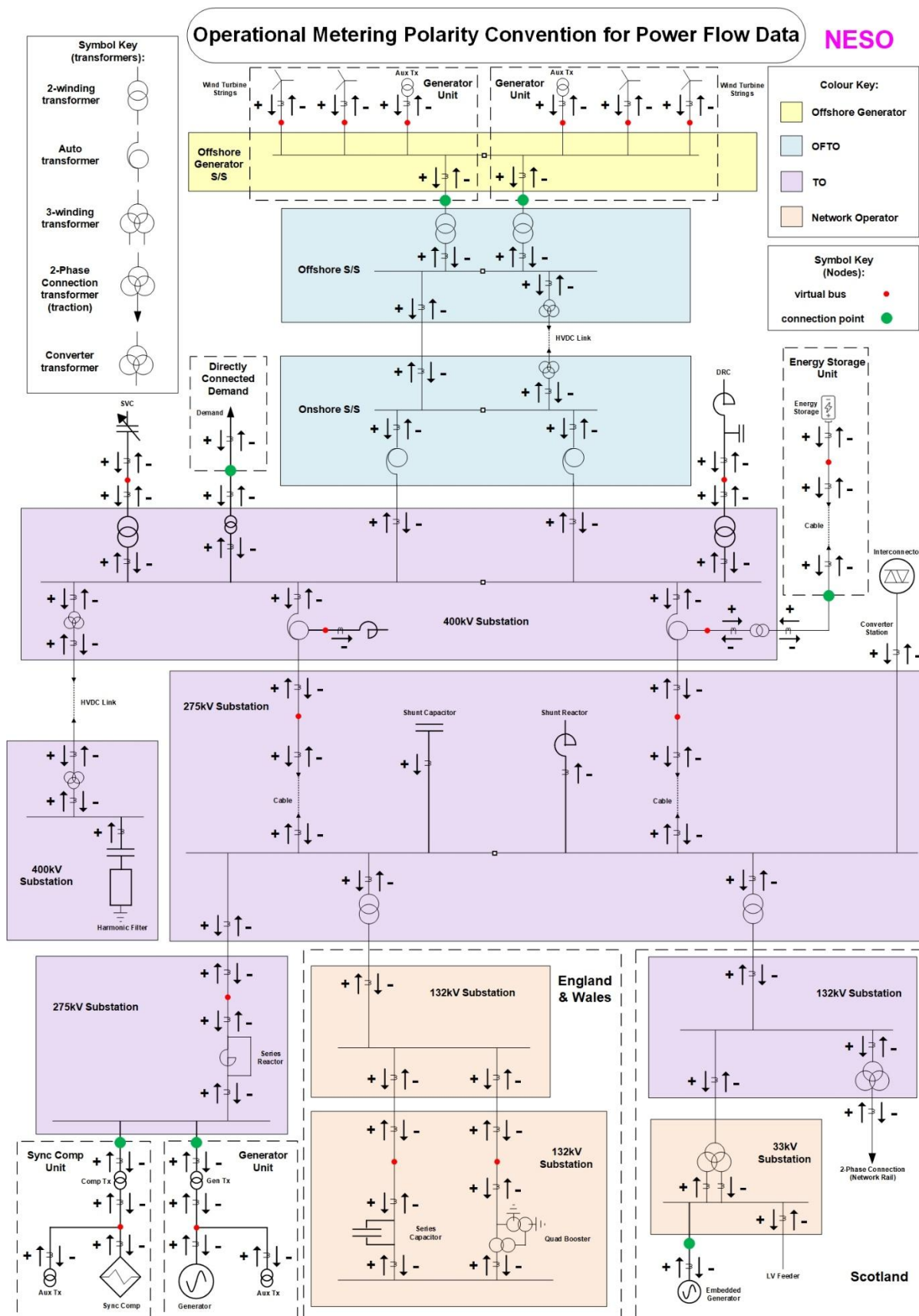
Additionally, connection point nodes (highlighted in green) have been denoted in the diagram to clearly define the boundary between Generator/Demand operational metering and the Onshore/Offshore Transmission and Distribution operational metering.

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

It is important to note that the diagram, in Section 4, illustrates 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.

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4. Operational Metering Polarity Convention for Power Flow Data

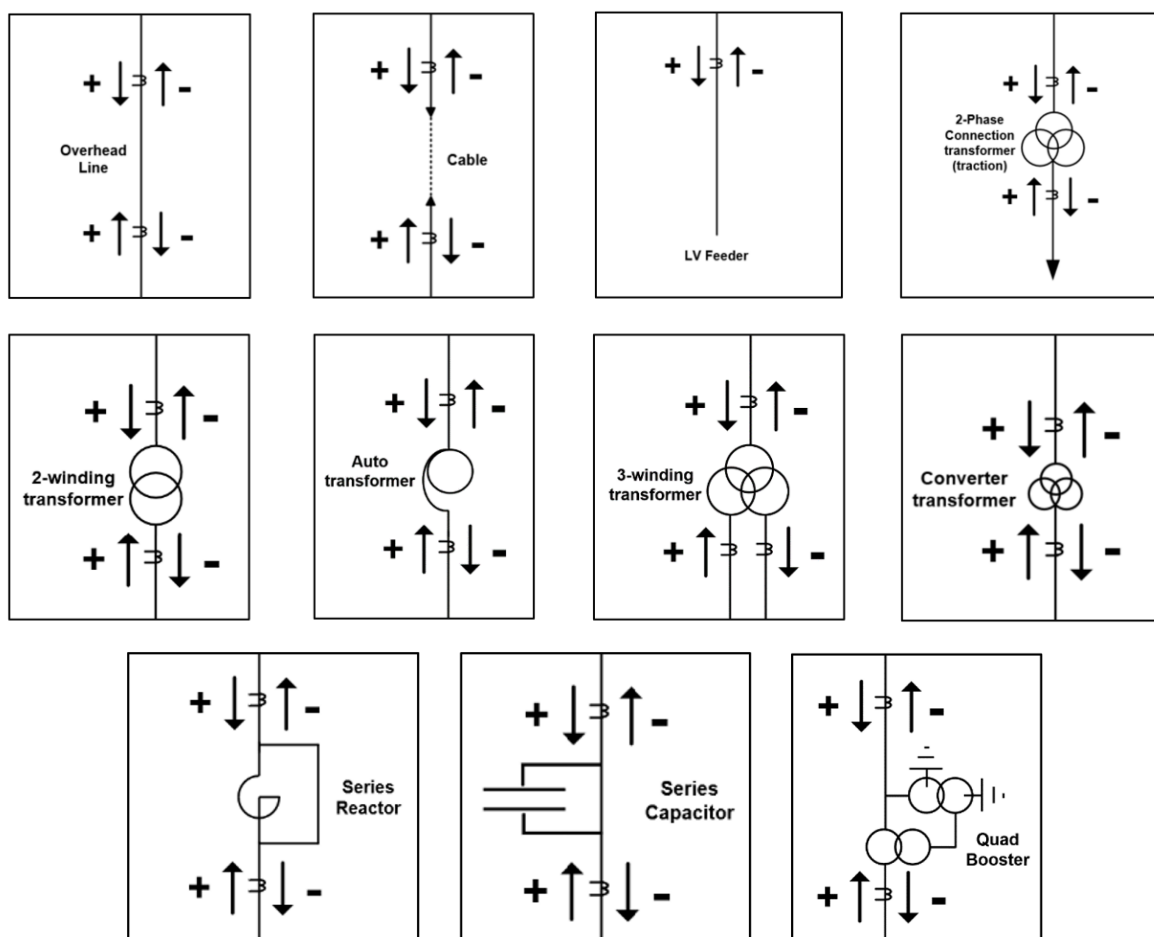


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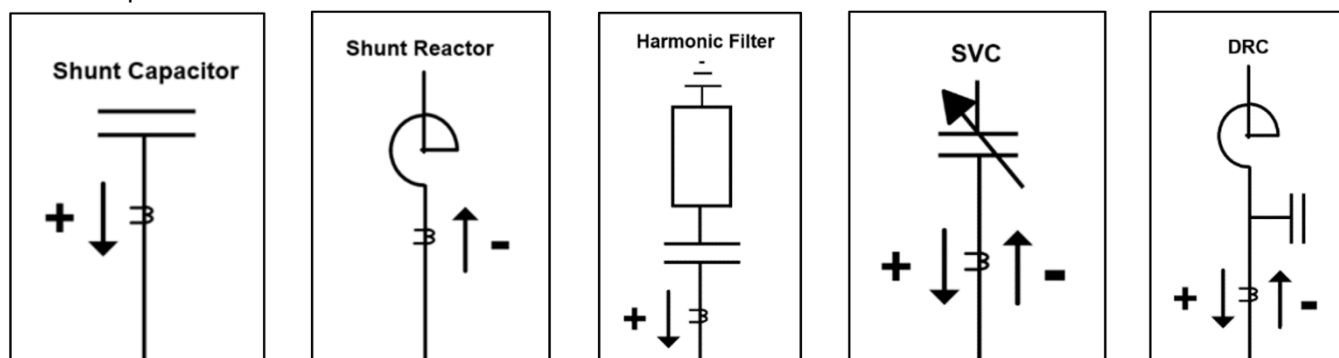
5. Explanation of Metering Polarity Convention

The diagram above, in Section 4, denotes the convention:

- Connections between GB substations and connections within GB substations (including series connected reactive compensation) are represented by positive flow into the device and negative flow out of the device, on both sides.

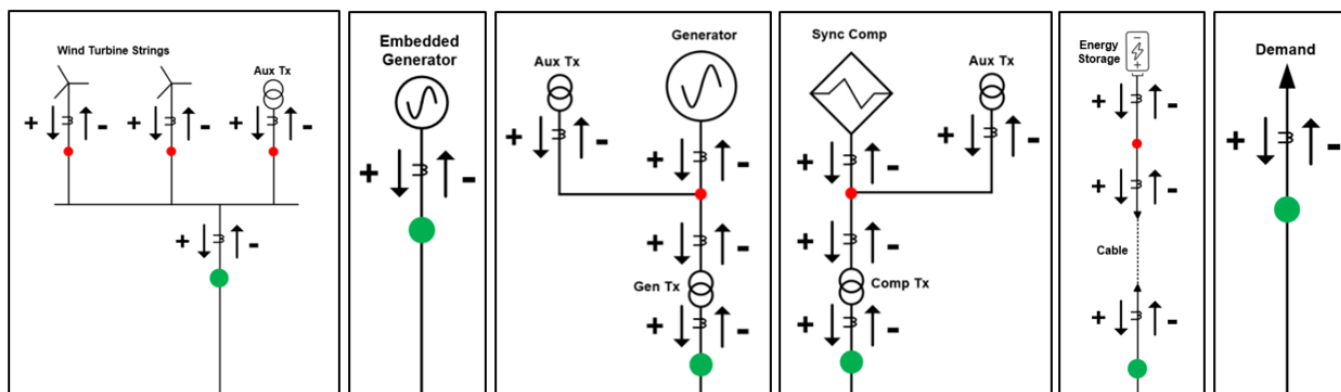


- Shunt connected reactive compensation is positive when leaving the plant and negative when entering the plant.

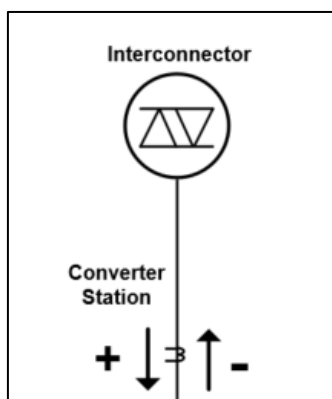


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- Generator and demand connections include all assets from the User up to the connection point. All metering associated with User connections is positive towards the connection point and negative away from the connection point.



- 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).



For any equipment not represented in the Section 4 diagram, the convention used should be that of the category to which the equipment belongs (as mentioned above):

- Connections between GB substations and connections within GB substations (including series connected reactive compensation):
 - positive into the device and negative out of the device (on both sides).
- Shunt connected reactive compensation:
 - positive when leaving the plant and negative when entering the plant .
- Generator and demand connections (including all assets from the User up to the connection point):
 - positive towards the connection point and negative away from the connection point.
- International Interconnectors:
 - 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 connection to the GB system).

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Document Record

Issue	Draft	Date	Author	Description of changes
1		XX/XX/202X		First Issue.

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