nationalgridESO

Operational Metering for Small (<100MW) BM & Non-BM Participants

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1. Introduction

This document aims to describe the operational metering architecture National Grid ESO has in place to enable the connection of small BMU's (≤100MW) to the National Grid ESO's BM Systems and facilitate participation in the GB Balancing Mechanism, participation in Pathfinder/ Dynamic Containment/ Dynamic Moderation/ Dynamic Regulation projects, or provision of other Balancing Services. This does not include any transmission connected assets.

This solution is part of the deliverables for the Wider Access programme and will be expandable to encompass the forthcoming TERRE programme. It can also be used to facilitate operational metering provisions for other National Grid ESO (e.g., Pathfinder) initiatives.

National Grid ESO currently offers three routes for providing operational metering to the balancing systems.

- Connect to an existing GB Transmission Owner's Real-time Telemetry Unit (RTU).
- Install a new RTU and provide dedicated telecommunication signals to that location.
- Connect to the SCADA Data Concentrator host.

National Grid ESO recognises the need for commensurate solutions dependent on the size of BM participant. The above options offer varying levels of resilience, delivery (connection) time, cost and are based on the size of the BM participant.

National Grid ESO has implemented a new Data Concentrator, which is hosted by a third party. The new environment (iHost™) provides limitless capacity, which is configurable and scalable, quicker to connect and offers a reduced end-consumer cost of making new connections. In future, a range of connection protocols will also be offered to the BM Participant.

This document is intended for a wide audience to understand the generic requirements for Small BM Participants. A more detailed specification will be provided as part of the existing processes for participating in the Balancing Mechanism or securing other Balancing Services from National Grid ESO.

All new Small BM Participants can expect to directly connect to the new data concentrator but may also opt to use an intermediate service host, provided by a preferred commercial vendor.

2. System Overview

The new operational metering system currently uses either:

The IEC 60870-5 104 protocol over a VPN, to connect to the National Grid ESO boundary, or

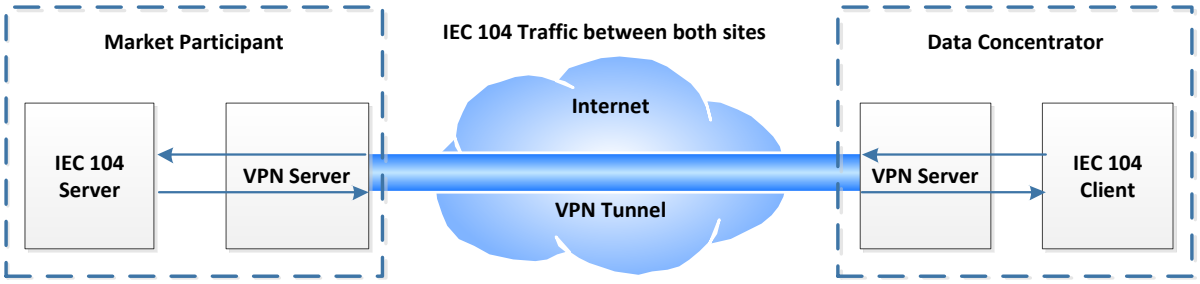
The MQTT protocol over an internet tunnel, to connect to the National Grid ESO boundary.

The Market Participant has the choice of using either protocol or methodology.

3. IEC104 Connection Overview

Direct Connection (Standard)

The new operational metering system currently uses the IEC 60870-5 104 protocol, over a VPN to connect to the National Grid ESO boundary.

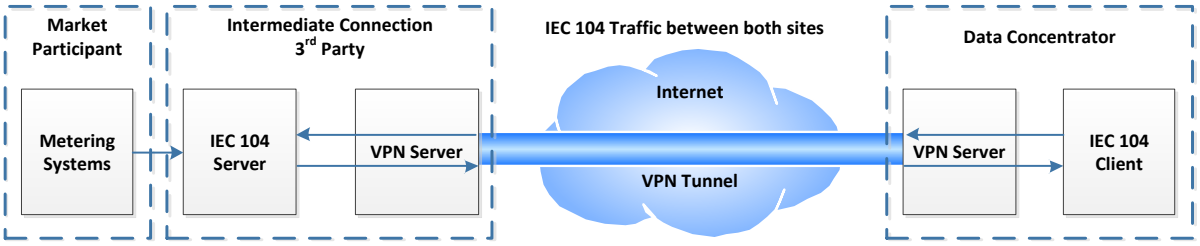


Once IEC 104 communication is established from National Grid's ESO IEC 104 client, the BM Participant will push the metering data to National Grid ESO.

Further technical information will be provided at a suitable time during the connection process. This is to ensure the security and integrity of the Data Concentrator.

Intermediate Connection

BM Participants may opt to use an intermediate data host, a service which is available from a number of commercial vendors. Such arrangements offer the benefit of using bespoke or legacy protocols on the BM Participants SCADA system.



Notes:

i. National Grid ESO assume no responsibility for the integrity of any operational metering connection between the BM Participant and any intermediate host.

ii. Any Intermediate Connection arrangements must adhere to National Grid ESO's data latency (≤5s) requirement.

Establishing BMU connections

On signature of any Connection Agreements and successful BMU Registration, National Grid ESO will discuss operational metering provision options with the BM Participant.

To establish a connection to the Data Concentrator (iHost™), the following high-level process will be observed.

1. National Grid ESO will provide a technical Pro-Forma to the BM Participant. The Pro-Forma requires details of the precise signals, signal-scaling, limits, etc.
2. The BM Participant will return the Pro-Forma back to National Grid ESO.
3. National Grid ESO will update its SCADA & BM Systems and forward the Pro-Forma to their Data Concentrator host.
4. The Data Concentrator host will contact the BM Participant and arrange a suitable time to establish the VPN connection and conduct preliminary metering signal tests.
5. National Grid ESO will contact the BM Participant, to arrange a suitable time to test the metering signals, in preparation for future BM Participation or other Balancing Service markets.

Notes:

i. The BM Participant should make available suitable technical staff, to establish the VPN connection.

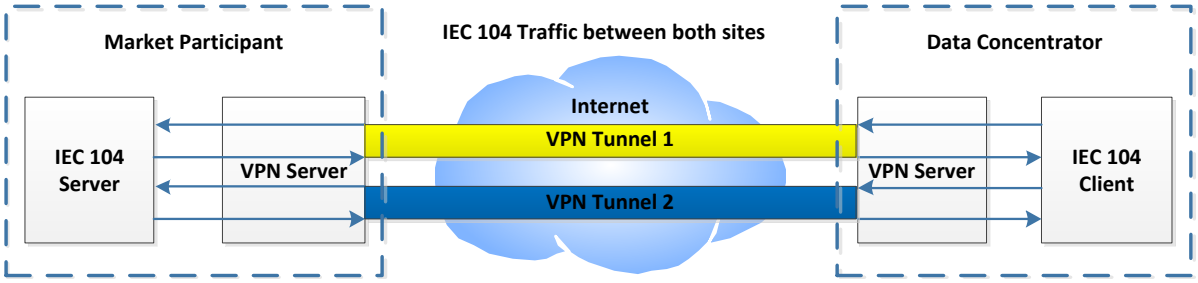
ii. The establishment of the VPN Connection requires simultaneous liaison between the BM Participant and Data Concentrator host provider.

iii. The BM Participant should make available suitable technical staff, to test the individual data signals.

iv. The Operational Metering test requires simultaneous liaison between the BM Participant and National Grid ESO. The test will involve the simulation (injection) of all data signals by the BM Participant.

Enhancements for BMU connections

Subject to customer requirements, National Grid ESO also offers dual-VPN connectivity between the BM Participant and Data Concentrator host.

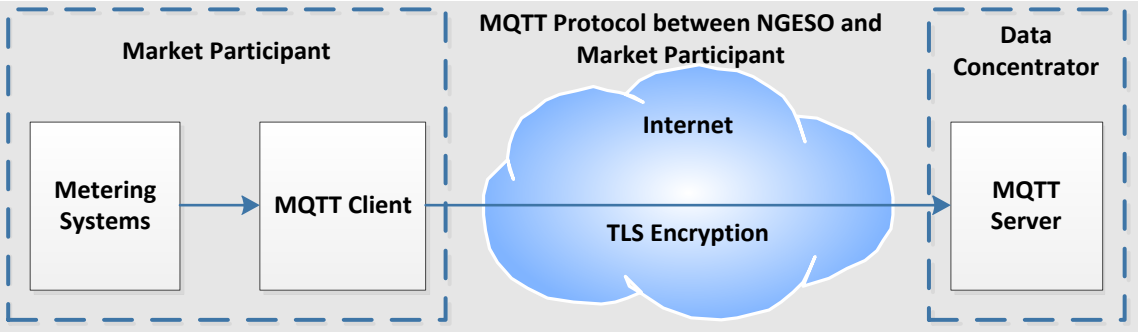


4. MQTT Connection Overview

Direct Connection (Standard)

This operational metering system uses the MQTT protocol, using TLS encryption to encrypt communications sent from the market participant to the National Grid ESO boundary.

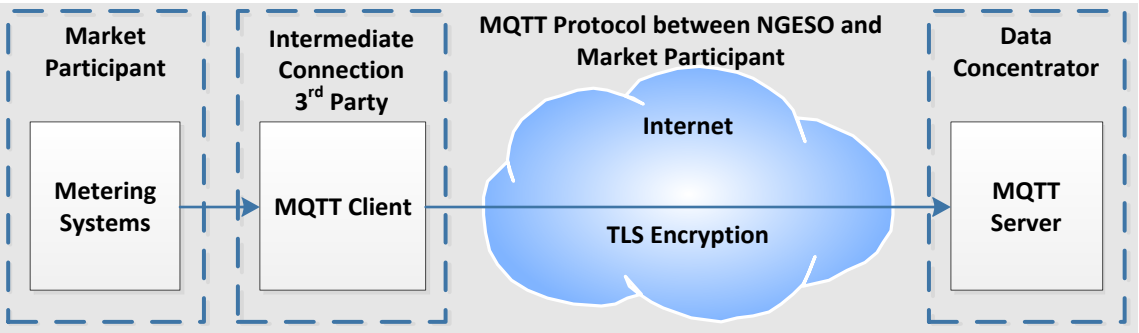
To do this, the market participant must set up an MQTT client which will send packets of data containing the metering values for the small BMU to the MQTT server within the Data Concentrator.



Further technical information will be provided at a suitable time during the connection process. This is to ensure the security and integrity of the Data Concentrator.

Intermediate Connection

BM Participants may opt to use an intermediate data host, a service which is available from a number of commercial vendors. Such arrangements offer the benefit of using bespoke or legacy protocols on the BM Participants SCADA system.



Notes:

i. National Grid ESO assume no responsibility for the integrity of any operational metering connection between the BM Participant and any intermediate host.

ii. Any Intermediate Connection arrangements must adhere to National Grid ESO's data latency (≤5s) requirement.

Establishing BMU connections

On signature of any Connection Agreements and successful BMU Registration, National Grid ESO will discuss operational metering provision options with the BM Participant.

To establish a connection to the Data Concentrator (iHost™), the following high-level process will be observed.

1. National Grid ESO will provide a technical Pro-Forma to the BM Participant. The Pro-Forma requires details of the precise signals, signal-scaling, limits, etc...
2. The BM Participant will return the Pro-Forma back to National Grid ESO.

3. National Grid ESO will update its SCADA & BM Systems and forward the Pro-Forma to their Data Concentrator host.
4. The Data Concentrator host will contact the BM Participant and arrange a suitable time to establish the MQTT connection and conduct preliminary metering signal tests.
5. National Grid ESO will contact the BM Participant, to arrange a suitable time to test the metering signals, in preparation for future BM Participation or other Balancing Service markets.

Notes:

i. The BM Participant should make available suitable technical staff, to develop a MQTT client solution to establish an MQTT connection.
ii. The establishment of the MQTT Connection requires simultaneous liaison between the BM Participant and Data Concentrator host provider.
iii. The BM Participant should make available suitable technical staff, to test the individual data signals.
iv. The Operational Metering test requires simultaneous liaison between the BM Participant and National Grid ESO. The test will involve the simulation (injection) of all data signals by the BM Participant.

5. IEC 104 Gateway Solution options

NGESO recommend the following list of potential IEC 104 Gateway solutions, determined through experience and liaison with Market Participants.

- Kenda Nebula (hardware appliance)
- Siemens SIMATIC RTU3030C (hardware appliance)
- Siemens SICAM PAS (hardware appliance)
- ABB RTU 560 (hardware appliance)
- IPComm ipConv (software run on industrial PC, server, or IPComm hardware products inc. IPC191V4 and MEC2)
- COPA-DATA straton Soft PLC (software run on industrial PC or server)
- Inaccess TELOS (software platform)
- MZ Automation IEC 60870-5-104 software library (source code library available in C and .NET, this is not a usable product alone and would need to be built into a custom-built software application)

Note: This list is by no means exhaustive and many other IEC 104 gateway solutions exist on the market.

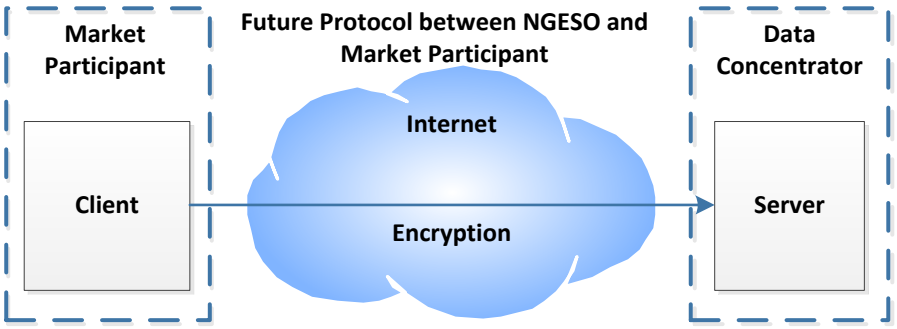
It is the Small BMU Participant's responsibility to configure, correctly, the IEC 104 gateway equipment (including integration with BMU metering systems) to be compliant with the technical specifications required for BM Participation, or involvement with other NGESO initiatives.

6. MQTT Client Libraries

Market Participants will need to make minor software modifications, to align to NGESO's technical specification. Further generic MQTT details can be found at https://mqtt.org/software/

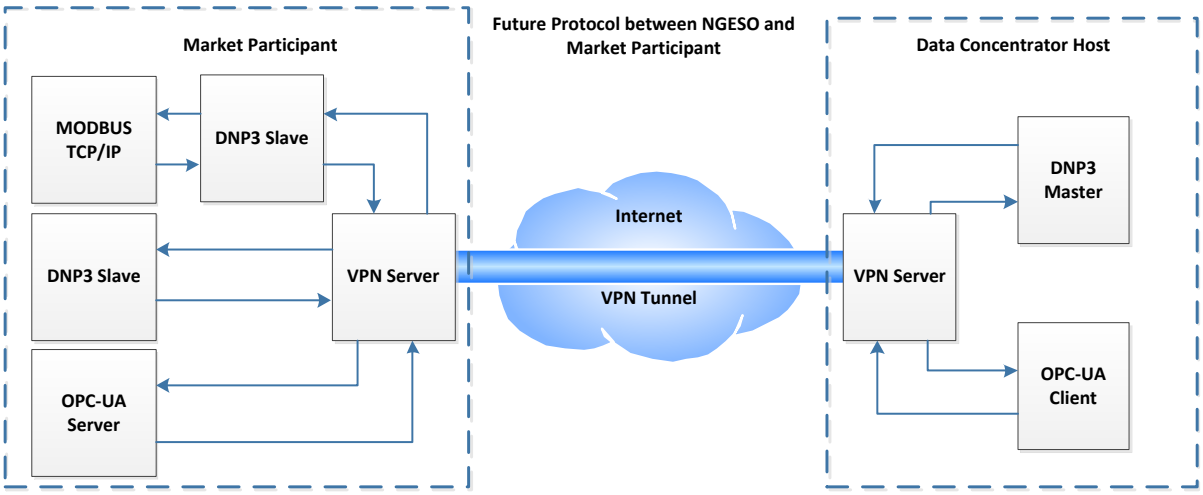
7. Future Protocols

National Grid ESO can offer additional protocols on request. Development of such protocols will be treated on a case-by-case basis and will be subject to wider market needs and potential take-up.



The new host platform is also capable of supporting additional protocols and each will be considered by National Grid ESO on a case-by-case basis.

Note: Certain protocols may require additional protocol-conversion equipment to be installed by the BM Participant. Such equipment can be provided by National Grid ESO's third-party provider.



8. Operational Metering Data

National Grid ESO will require a range of operational metering signals, dependant on the size and fuel-type (e.g., Wind, Batteries, Gas, etc.) of the Market Participant, or specific project (Pathfinder, Dynamic Containment, Dynamic Moderation, Dynamic Regulation, etc.) requirements. The precise requirements will be defined in any Connection Agreements, or via the transition to become a BM participant.

10. Non-BMU Connections

The above process for Operational Metering for BMU is applicable for Non-BMU Connections as well.

11. Further Information

Further information can be sought from National Grid ESO via your account manager or email commercial.operation@nationalgrideso.com

12. Definitions

Abbreviation	Meaning
BM	Balancing Mechanism
DNP3	Distributed Network Protocol
IEC	International Electrotechnical Commission
MQTT	Message Queuing Telemetry Transport
OPC-UA	Open Platform Communications - Unified Architecture
RTU	Real-time Telemetry Unit
SCADA	Supervisory Control and Data Acquisition
TERRE	Trans European Replacement Reserves Exchange