Confidential

Data Specification Document

STAR Project - Quick Reserve- Performance Metering Data File Specification

Version 0.1

NESO
National Energy System Operator

Table of Contents

1. Usage

1.1. Revision Information

Classification: External Use

Author	Version	Date	Comments
STAR Data Services	0.1	15/01/2025	Initial version

2. Document Purpose

This data specification document describes the proposed solution for National Energy System Operator (NESO) to accept and store Quick Reserve performance metering data from individual Service Provider (SPs).

The requirement for Performance Metering Data for both BM and NBM units is expected with a second-by-second granularity, so that the meter value provided can be used for the settlement purposes.

This document specifies the interface data and transmission requirements that Service Providers must meet. It describes the concept of operations for the interface, defines the message structure and protocols that govern the interchange of data, and identifies the communication paths from which NESO expects data to flow.

The intended audience of this document are external Service Providers and NESO internal teams associated with development and operations of the systems connected to the interface.

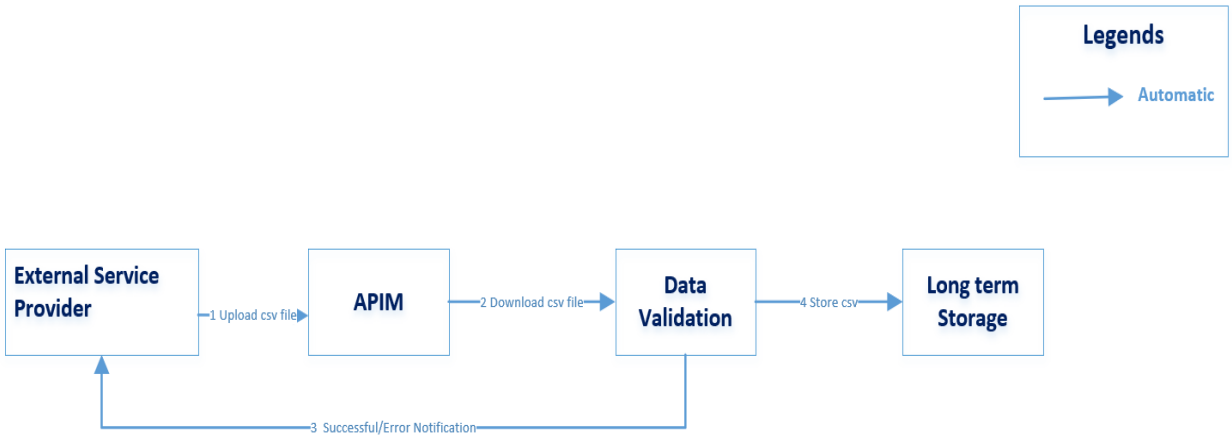
The data design specification provides the following information:

- a general description of the interface.
- data specifications including source, target and validation details, data formats and classification.
- a description of the transport characteristics including transfer, data exchange, interface processing requirements, flow control and security.
- assumptions and outstanding questions.

3. Overview

Service Providers will be required to upload daily Performance Metering data file in CSV format via the STAR API. The data will then be ingested, validated, stored and used for settlement purposes. NESO will send a status of the file, either as rejected or successful.

Data Flow overview:



The following are the high-level process steps:

1. Service Providers attach a .csv file for both BM and NBM per unit using NESO API.
2. NESO download file and performs data validations.
3. NESO will send success or a failure notification to Service Providers based on the data validation results.
4. If the file meets all data validation criteria, NESO will process the file and store the data.

4. Business Purpose and Specifications

4.1. Business Purpose

Performance Metering Data

All providers (both BM and NBM) will be required to submit data to NESO for real time monitoring of service availability and post-event performance monitoring. This data is required to ensure operational security of the network and to validate the performance where units are dispatched to deliver an instruction for the Firm and Optional Quick Reserve services.

Performance metering data should be submitted to NESO at the end of the operational day and no later than one calendar day (24 hours) after the end of the QR Service Day on which QR was provided. Where Performance Metering Data is not received within the specified time NESO will withhold Availability Payments and/or Energy Utilisation Payments in respect of the Operational Day, as no data will be available to derive energy delivery.

Where the Performance Metering file is unavailable for submission by the agreed IT interface, the Service Provider shall identify and agree an alternative method of submission of Performance Metering data which is satisfactory to NESO not later than five calendar days after the QR Service Day on which QR was provided. This is only where there has been a technical issue with submission with IT interface. Where no valid alternative metering data which is satisfactory to NESO has been received within the time specified NESO will withhold Availability Payments and/or Energy Utilisation Payments in respect of the period during which QR Dispatch is unavailable for the purposes of such monitoring and metering.

Please note that if an issue is identified within the file, NESO will send a real time notification with error code to you to resend the file. If file validation checks have passed, then NESO will send successful notification, and this will be in real time. Please refer to data validation section 4.4 (4.4. Data Validation).

4.2. File Specifications

Performance Metering Data

Filename: *UID*_YYYYMMDD(Contracted_DAY).csv

where *UID* is a unique unit identifier reference, and YYYYMMDD is contracted day

File Format: Comma delimited text file

File Size:< 10 MB

Frequency: Daily

File Contents : File will contain;

- Data for Unit per file per day
- comma delimited records in a text file format
- one header record followed by data records.

General Information

This represents 1 submission per unit per day, with 1 data point recorded per second. The calculation is based on a contract day, multiplied by 60 minutes per hour, multiplied by 60 seconds per minute, multiplied by 1 data point per second.

Thus, during Contracted days, NESO expect data will be provided from 23:00:00 to 22:59:59 and during BST the data will be provided from 22:00:00 to 21:59:59

The file will contain all previous day metering data and the expected amount of data per contract day per Unit for settlement period being 86,400(*24hrs*60 mins*60 seconds*) records.

Note: *During the March clock change we expect 82,800(23hrs*60 mins*60 seconds) records.*

***And** During the October Clock change, 90,000(25hrs*60 mins*60 seconds) records.*

4.3. Source Data

Performance Metering Data

Service Providers submit previous day performance metering data, within each file containing second-by-second records for a contract day. Please refer to the table below for the file structure.

Column Name	Column Description	Data Type	Mandatory/ Optional	Sample Value
NESO Unit ID	NESO Unit Code	String	Mandatory	ABCD-1
Effective Date and Time (GMT)	Datetime of the meter reading in format YYYY-MM-DDTHH24:mm:ss	Date	Mandatory	2024-10-17T23:00:00
Meter Value	Meter reading in MW	Numeric (up to 6 dec. places)	Mandatory	3.9

Please see an example of the csv delimited text file below.

```
NESOUnitID,DateTimeofMeterReading,MeterReading
ABCD-1,2024-10-17T23:00:00,3.3
ABCD-1,2024-10-17T23:00:01,3.3
ABCD-1,2024-10-17T23:00:02,3.3
ABCD-1,2024-10-17T23:00:03,3.5
ABCD-1,2024-10-17T23:00:04,3.7
ABCD-1,2024-10-17T23:00:05,3.9
ABCD-1,2024-10-17T23:00:06,4.1
ABCD-1,2024-10-17T23:00:07,4.3
ABCD-1,2024-10-17T23:00:08,4.5
ABCD-1,2024-10-17T23:00:09,4.7
ABCD-1,2024-10-17T23:00:10,4.9
ABCD-1,2024-10-17T23:00:11,5.1
ABCD-1,2024-10-17T23:00:12,5.3
ABCD-1,2024-10-17T23:00:13,5.5
ABCD-1,2024-10-17T23:00:14,5.7
```

Sample file:

UnitID_YYYYMMDD.csv

4.4. Data Validation

Performance Metering Data

The validations below will be made with the NESO Middleware on receipt of a file. Each field will be validated against the specifications, including field type, and where field is mandatory etc. Please refer below for file validation and error handling rules:

File and Data Validation: NESO will use an Azure middleware layer that will receive service provider files and validate their schema to ensure the data submitted adheres to the required structure.

Validations Carried Out

- General validation –
    - File was not uploaded after submission window has closed
- File & Size validation –
    - Filename is in correct format: UID_Timestamp.csv.
    - The timestamp in the filename is valid.
    - Timestamp in the filename is not in the future.
    - File size is not larger than 10MB.
- Header Validation –
    - Header line is included.
    - The header line includes all mandatory fields.
    - Header line does not include unknown fields.
- Data Row Validation –
    - The row is not empty.
    - Unit ID value is not missing.
    - Unit ID value matches Unit ID in the filename.
    - The first timestamp is at the exact start of the performance hour. It should be in GMT.
    - The first timestamp matches the timestamp included in the filename.
    - Timestamp value is not a duplicate.
    - Timestamp values are at uniform intervals based on capture rate.
    - There are no missing timestamps.
    - Value is included for all mandatory fields.
    - Value is within acceptable range for each field.
    - Number of records does not exceed the maximum number of records per contract day.
    - File does contain that data falls within the contracted day (no extra records for cross over!).

Validation Pass Response: As this is a synchronous REST API where all schema validations have passed the service will send a **200 OK** synchronously after the data has

reached the REST end point successfully. Example of the structure is shown on the next page

Error Handling and Response: Should any errors be detected during this schema validation, error messages will be sent back to service providers and providers will be required to correct the files where errors are identified.

Once corrected, the providers should resubmit the file which will then follow the validation process as stated above and where no errors are present, a successful response will be sent back to providers.

Validation Error Response: If any errors occur such as invalid timestamps or incorrect file formats, an a **4xx or 5xx error message** is synchronously generated and sent back to you. This will help you identify and address any issues that may arise. Please refer below tables for more details:

- **Response Structure**:

  The following will be the typical response object structure of API:

Field Name	Type	Description	Example
Status	String	Success / Failure status of API	Success
Message	String	Descriptive status message	Successfully uploaded the file
Errors	Object Array (Optional)	Error with issues	In case of multiple errors provide that in array

- **HTTP Status Code**

  The following table details the HTTP status code from the API response:

HTTP Code	Description
200	OK – for Successful Uploads
401	Unauthorized – For Unauthorized Request

415	Unsupported Media Type – If content type of file is invalid
500	Internal Server Error – Unexpected errors during processing

The following table elaborates the error response issued by the API in case of failure in file processing –

Category	Error Message
File Name & Size	Invalid file name. File name is not expected format
	File contains invalid timestamp
	Invalid File Size. Maximum allowable limit is 10MB
File Structure	Bad csv Data
Headers	[Line ?][Column ?] Invalid header count. Expected at least [X], actual [X]
	[Line ?][Column ?] Header [header name] is not supported
	[Line ?][Column ?] Missing header [header name]
	[Line ?][Column ?] Invalid heading. Expected [header name]
Data Row	File Contains No Data
	maximum number of records has been breached

5. API Specification

The below steps will provide a guide on how to use the API:

1. Service Provider will be registered in the Ping Identity (CIAM) as an application to access Settlement API using OAuth 2.0.

2. If providers haven't already done so in the past and link to detailed instructions for registering to CIAM. **Getting started - Authentication**

3. NESO Azure APIM platform will be used to expose the settlement API to the Service Provider. This will have API based policy to validate the JWT token (issued by Ping Identity Provider), which will be shared as HTTP "authorization" header bearer token as part of request. Scope based Authorization can be leveraged from APIM policy to validate the required permission for authenticated user. APIM will be configured with rate limit policy, number of requests for this policy will be number of service provider registered for API (approx. 100) at given time. In case if more than rate limit request come API will issue "429 error - too many request"

4. Post data validation system will issue 200 OK HTTP Code as part of successful response, however in case of invalid schema, it will issue appropriate error to the calling party.

Settlement metering API will be hosted by NESO APIM, following section detailed out the API Specification.

- **API Signature**: *https://nationgrideso.com/api/v1/star/stor/settlementmetering/uploadData* *(This is an example and actual will be TBD)*
- **Method**: POST
- **Contract Request Payload**: API will take csv File as attachment along with metadata information related to Service Provider.

  Payload Field: Request payload API will have following field:-

Field Name	Type	Description	Example
NESOUnitId	String	NESO Unit Code of SP	ABCD-1

SettlementDate	Date	Date for submitting settlement data	2024-10-17T23:00:00
FileName	String	Name of the File	ABDC-1_20241017.csv(*UID*_*YYYYMMDD*.csv where *UID* is a unique unit identifier reference, and YYYYMMDD is Contract day)
FileContent	File	csv File Data	

Authentication flow: To ensure secure access to the API, you will need to obtain a CIAM token for authentication. The token will have a default expiration period of 15 minutes for idle time, session expiration is 24 hours (i.e., if user is actively in session without idle period longer than 15 mins, then the max life 24 hours per token). The Settlement Performance Metering (Second x Second) API follows the widely adopted OAuth 2 framework for authentication. This flow allows to obtain access tokens, granting your application the ability to authenticate and authorize API requests.

For a system-to-system integration, use the OAuth 2 client credentials flow to acquire an access token from CIAM. Send a POST request to the token endpoint of CIAM. Use OpenID configuration URL and get the token_endpoint field. Use the scope "star-metering-api' (TBD). Service provider application client id and secret must be provided in the body (not as basic authorization header).

Name	**Endpoint (Non-Production)**
CIAM openID config	https://nonproduction-account.nationalenergyso.com/as/.well-known/openid-configuration
token_endpoint	https://nonproduction-account.nationalenergyso.com/as/token

6. Support

Please connect to settlement .box (.box.settlement.queries<box.settlement.queries@nationalenergyso.com>) for any queries and concerns.

7. Glossary

Abbreviation	Description
QR	Quick Reserve
BM	Balancing Mechanism
NBM	Non-Balancing Mechanism
APIM	Azure API Management
CSV	Comma Separated Value text file
DNO	Distribution Network Operator
HTTPS	Hyper Text Transfer Protocol Secured
SP	Service Provider
NESO	National Energy System Operator
SFTP	Secure File Transfer Protocol
APIM	Application Programming Interface Management
API	Application Programming Interface
JWT	JSON Web Token
EFA	Electricity Forward Agreement
CIAM	Customer identity and access management