

Network Opportunity Map

What is the Network Opportunity Map?

The [Network Opportunity Map](#) (NOM) is a new visualisation tool that will replace the existing [Network Capacity Map](#) (NCM) and [EV capacity map](#), which show information relating to our Primary and Secondary networks, respectively.

The new, unified map provides a single interface containing:

- The location of our Distribution, Primary and Bulk Supply Point (BSP) substations
- The geographic area these substations feed
- Key substation information (e.g. upstream substations)
- Indicative view on available headroom
- Location, licence area and local authority search functionality

Details on how the Secondary, Primary demand and Primary Generation headrooms are calculated, proposals on update frequency, and limitations are provided in the attached appendices.

Why has it been created?

The existing NCM has been out-of-date for a number of years due to a lack of ownership and absence of an update process. Stakeholders have raised their concerns over the NCM not being properly updated, and have expressed a clear desire for a single, unified map for viewing Primary and Secondary network information.

The NOM is built on the same foundations as the existing NCM, hosted on our website with the data stored on our Connected Data Portal (CDP). The reason a new map is getting created rather than just updating the existing NCM:

1. Ability to integrate both our existing capacity maps
2. The functionality of the existing NCM is heavily integrated into the website, meaning any updates/changes are challenging and require an extensive consultancy resource

Benefits that the new NOM will provide include:

1. More agile development and changes within the direct control of NGED IT&D
2. Better visibility of ongoing changes and ability to better automate map updates

PRIDE project relevance

- Both primary and secondary network headroom can be visualised in one layer on a digital tool such as LAEP+. This simplifies the user experience, facilitating the LAEP creation process for local authorities

- Increased headroom accuracy will provide a better indication to digital tool users on where they can connect to our network.
- NGED ownership of the NOM enables agile development, allowing any necessary updates that improves usability to be implemented.
- The NOM data is currently due to update annually as that is the update frequency of the secondary substation maximum demand source data used for headroom calculations within the DSO. With renewed ownership of the NOM, there is a potential for more frequent updates in the future. This would give digital users access to more regular updates in headroom capacity.

Appendix A - Secondary Headroom Methodology

Summary

This appendix details how the Secondary distribution substation headroom is calculated, the source data, processing, validation and displaying on the NOM.

Data source

The main data source for the Secondary headroom is the DSO Secondary System Planning Team’s maximum demand calculation spreadsheet.

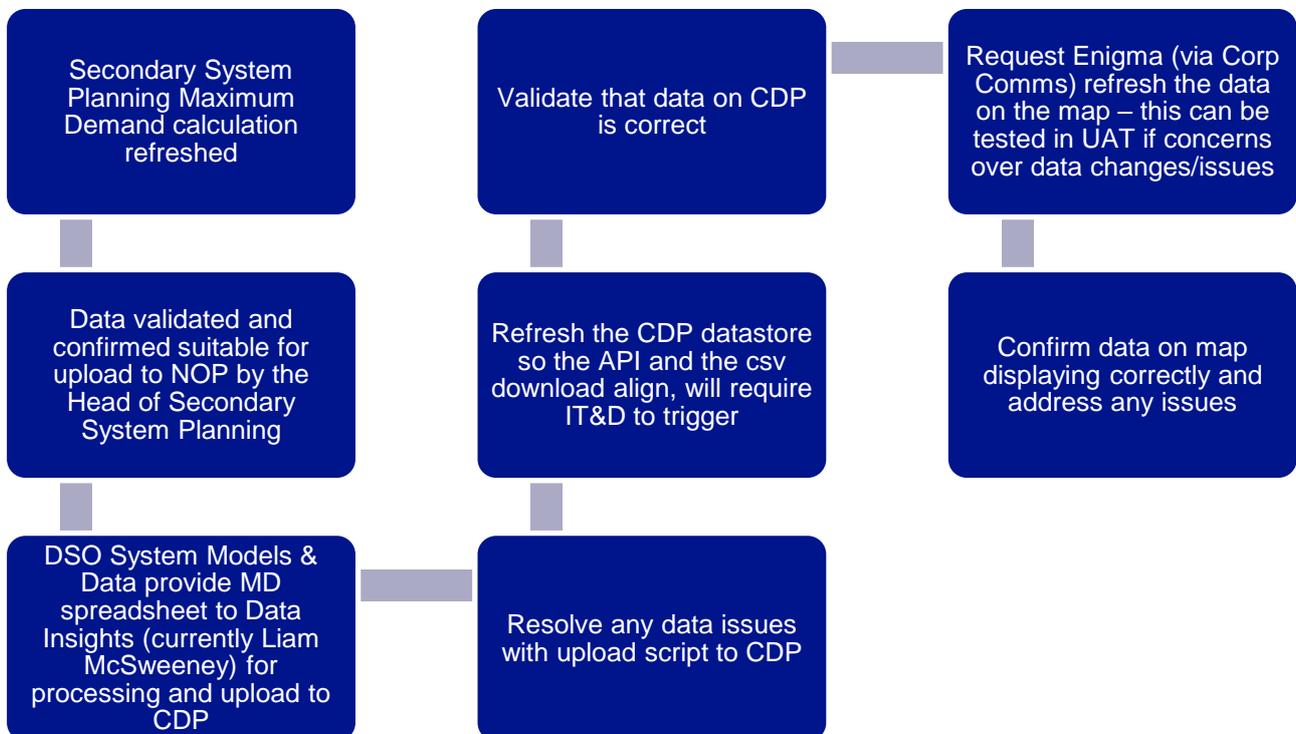
This spreadsheet pulls the available primary data sources for distribution substations. This includes:

- Crown calculated maximum demand
- Maximum demand calculated through old and new Elexon profiles
- Nameplate rating from Crown
- Number of customers and if a sole-use asset risk

Planned update frequency

Currently the process for updating the Secondary System Planning Team’s substation maximum demand spreadsheet is yearly. This analysis takes place in April, so data will be refreshed on the NOM on a yearly basis until such point that this process is undertaken more frequently or there is a more reliable way to calculate MD directly from Crown or through utilisation of smart meters/LV monitoring. It is anticipated that this data refresh will occur in May.

Update process



As part of the upload process the dataset is joined to the CDP (Crown) substation data tables to extract additional information on upstream network topology and key substation information (e.g., sub names).

Calculation Assumptions

The headroom calculation for Distribution substations utilises the following fields within the Secondary System MD spreadsheet:

- **AGG_NAMEPLATE** – substation aggregated nameplate rating, accounting for substation with multiple transformers
- **BEST_MD** - The best maximum demand as determined by Secondary System Planning for the purposes of assessing loading

The calculation to get the headroom that goes onto the map is:

$$\text{Headroom (MW)} = \frac{\text{AGG NAMEPLATE} - \text{BEST MD}}{1000}$$

Data Exclusions

The following substations are excluded from the upload script through IT&Ds process:

- Any **customer owned substation**
- Any **NGED owned substation with only one customer** – as defined by the TOTAL_MPAN count in the SSP upload dataset
- Any substation that is flagged as being either **Sole-use or a Sole-use risk** in the SSP upload dataset

For any substation with 2-5 customers, as per the Privacy Impact Assessment (PIA) it was agreed that only a RAG status would be displayed on the map, not the specific Maximum Demand (MD) due to an increased risk of inferring specific customer usage.

Speak to the Data Insights team for more information on how this is applied in the upload process.

Changes from EV Capacity Map

The main changes from the EV capacity map:

1. Better user interface and on single map
2. More up-to-date and reliable data – based on the latest SSP calculation that is informing our baseline for our strategic investment
3. Rather than just providing very broad banding on available capacity, we are now giving a connected demand headroom figure in MW for substations with more than 5 customers fed from it

Known limitations

Known limitations include:

- Almost all maximum demands are based on assumed figures from generic Elexon class profiles, limiting the accuracy of the headroom
- The quality of our distribution substation nameplate ratings

Future developments

Future developments that could be considered:

- Display future demand headroom, either contracted or DFES scenario-based headroom. This data is available in the SSP dataset, so could be integrated into model. Would need to understand value to customers of providing this dataset.
- Giving generation headroom at substations, not just demand
- Providing visibility of specific network constraints
- Give some visibility of upstream HV and Primary substation constraints

Appendix B - Primary Generation Headroom Methodology

Summary

This appendix details how the Primary Generation connected and contracted headroom's are being calculated.

Key points:

- The connected and contracted generation headroom is calculated based on available (N-1) network capacity of the upstream **distribution** network.
- This headroom **does not include transmission headroom**. We are currently directing customers to [National Grid - clearview](#) for more information on available transmission capacity for generation.
- The contribution to headroom calculations from contracted (accepted) generation is included based on the full export that is recorded against the relevant enquiry
- Where no headroom is identified this does not mean a connection may not be possible, but indicates that there may be curtailment under intact/normal running in anticipation of next fault.
- Where there is no headroom, this is capped at 0 MW, rather than providing a negative headroom.

Data source

There are a number of data sources that feed into the generation headroom:

Data Source	Description
Master Models	A snapshot of the Primary network master models connected position
Crown Pipeline Report	A snapshot of latest pipeline report

Calculation Methodology

Connected

The high-level process for calculating the connected generation headroom can be found in the below diagram:

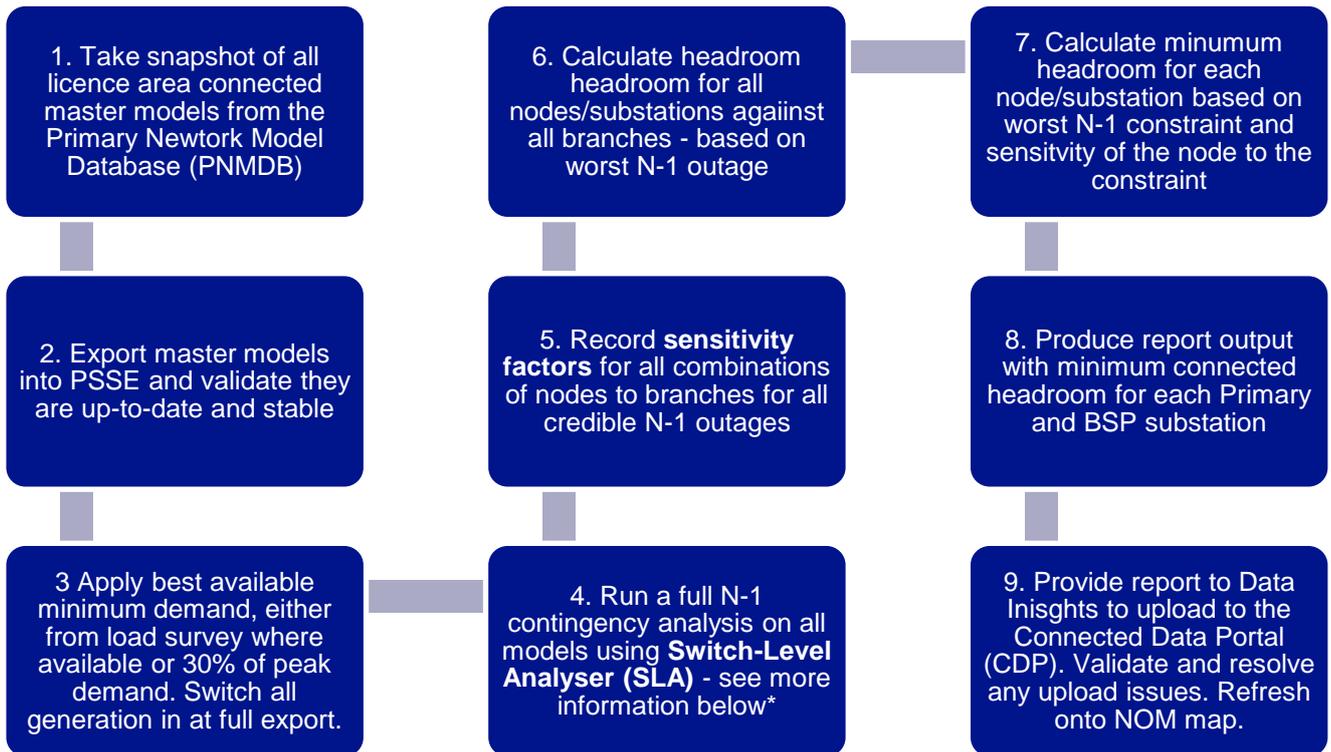


Figure 1: Primary connected generation headroom high-level process

*Note that licence area will need to be broken-down into smaller studies

Modelling Assumptions:

- Minimum demand from the load survey is applied where available, where it is not available 30% of substation peak demand is applied
- All connected generation is switched-in at full export, as recorded in the connected master model
- The rating set applied is the Primary Network Model Database (PNMDB) rating set 11 (VSUREV), which applies:
 - **Transformers** - Reverse power rating
 - **Lines** – Variable Load Pre-Fault – Summer
- Contingencies are calculated using the Switch-Level Analyser (SLA) engine, see below for more details
- The latest Operational Behaviour Schemes (OBS) replicating network behaviour are included within the contingency analysis

Contracted

The contracted position (connected + accepted generation) is calculated using the same first 5 steps detailed in the connected headroom approach (Figure 1).

The additional steps to infer the contracted position are shown in Figure 2 below.

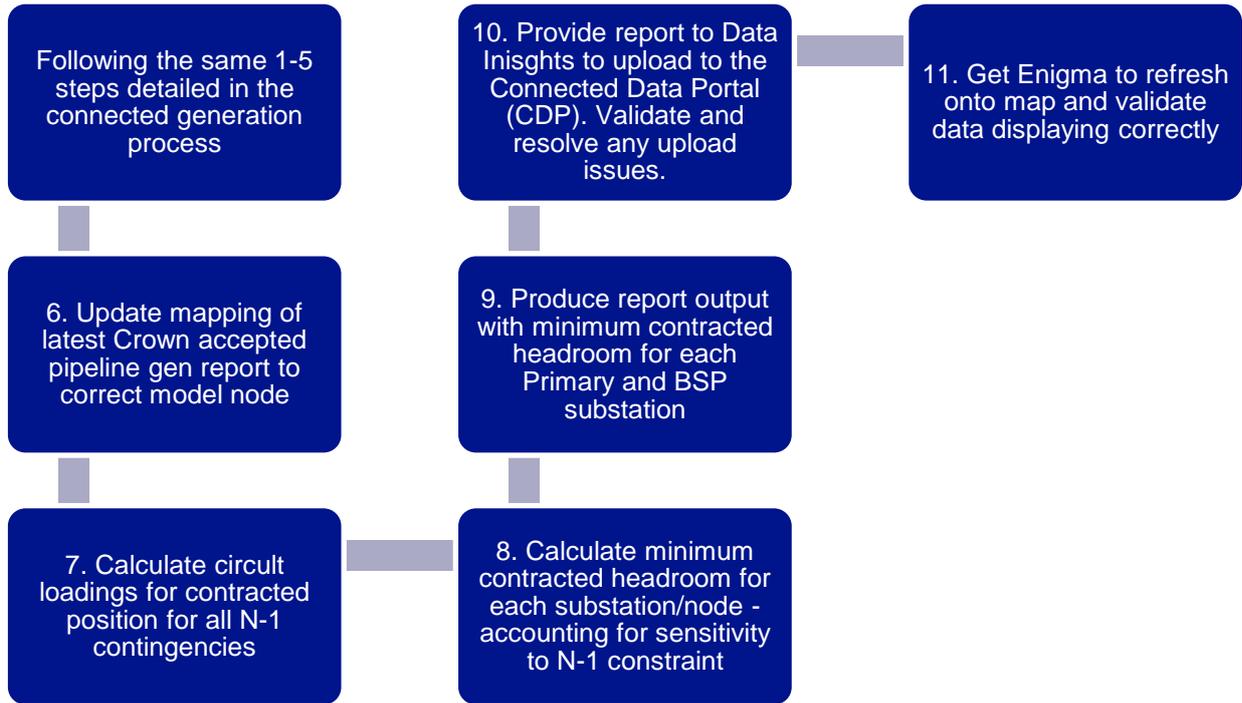


Figure 2: Primary contracted generation headroom high-level process

Contracted position clarifications:

- The contracted generation headroom is based on overlaying the contracted (accepted) position queue onto the connected position to calculate the inferred network loading for all circuits under all network constraints
- The inferred loading is based on the connected position loading as calculated through the full intact and N-1 analysis within the SLA. The loadings for the contracted positions are calculated by:
 1. Taking the baseline connected position loading for each branch for each N-1 outage
 2. Calculating the impact of the contracted generation on the circuit loading, accounting for the changing sensitivity factor to the constraint for each contingency. This accounts for all contracted generation across a network not just the substation where a headroom will be calculated.
- As per the connected position, all contracted generation is modelled at full export

Planned update frequency

Connected

It is currently planned that a full refresh on the connected generation position will be completed on a semi-annual basis. This full refresh frequency is based on:

- The load survey peak/minimum demand is only refreshed on a yearly basis
- There are relatively low volumes of generation connecting to the network

Where there is new generation that does energise onto the network, which can be tracked through updates to the connected position master model an updated connected headroom can be calculated.

Contracted

It is currently planned that the contracted position headroom will be updated on a regular basis, overlaying the latest enquires atop the connected position.

As part of automating the headroom calculation process, we are looking at the frequency of this refresh that gets the correct balance between easy to update, but non-representative headroom's and higher-accuracy headroom's at a lower refresh frequency.

Data Exclusions

Data excluded from the Primary demand headroom calculation process:

- Any single customer substations

Known limitations

Current limitations of this methodology:

- The current headroom provides a thermal headroom figure; it does not capture other network constraints (e.g. fault-level)
- It is based on the master offline PNMDB models and associated OBS to be updated to reflect latest known position
- Assessment is based on a 'worst-case' min demand and full generation export study, whilst onerous does align with the current approach to network design studies
- The contract position requires the mapping of accepted generation to the master model based on the information held within Crown. Whilst all reasonable efforts are made to map this generation accurately, where information is recorded incorrectly in Crown this may impact the accuracy of the headroom figure
- The inferred headroom methodology utilising sensitivity factors has been extensively tested and is shown to be representative for the vast majority of network positions. Where there is a highly interconnected network (mainly 132kV) with significant volumes of contracted generation, this does reduce the accuracy of the inferred headroom calculation

Future developments

Areas that will be considered for improvements following the UAT phase:

- Further automation to the contracted position generation headroom so the frequency of update can be increased whilst still retaining the technical accuracy of this headroom approach
- Separate inclusion of fault level headroom for both the connected and contracted position
 - For the connected position this could include providing the latest LTDS position
- Providing stakeholders with information on other network constraints that may limit the ability for them to connect

Appendix C - Primary Demand Headroom Calculation Methodology

Summary

This appendix details how the Primary demand connected and contracted headroom's are calculated for the data that is displayed on the UAT environment.

Data sources

Long Term Development Statement

The data used to calculate the substation demand headroom is based on the latest Long-Term Development Statement (LTDS) maximum demands and Firm Capacities (FC).

The latest LTDS can be found on our website: [National Grid - Long term development](#)

It is the **Table 3 – Load** table that provides the breakdown of substation maximum demand and details of Firm Capacities. An example of the Table 3 data can be seen below:

A	B	C	D	E	F	G	H	I	J	K	L	M	N
GSP Group	BSP Group	Primary Substation	Node	Circuit Status	Operating Voltage	Current Year Max Demand	Current Year Power Factor	Forecast Year 1	Forecast Year 2	Forecast Year 3	Forecast Year 4	Forecast Year 5	Firm Capacity of Substation
Bishops Wood 132kV	Hereford (Bishops Wood)	Bodenham 66 11 (T1)	BODES_BB_1	Unchanged	11	2.7	0.941	2.7	2.7	2.6	2.5	2.4	13
Bishops Wood 132kV	Hereford (Bishops Wood)	Bodenham 66 11 (T2)	BODES_BB_2	Unchanged	11	2.8	0.969	2.8	2.8	2.7	2.6	2.4	13
Bishops Wood 132kV	Hereford (Bishops Wood)	Bromyard 66 11 (T1)	BROMS_BB_X	Unchanged	11	4.4	0.996	4.5	4.7	5.1	5.6	6.1	13
Bishops Wood 132kV	Hereford (Bishops Wood)	Bromyard 66 11 (T2)	BROMS_BB_Y	Unchanged	11	4.1	1.000	4.2	4.4	4.7	5.0	5.4	13

Pipeline Demand

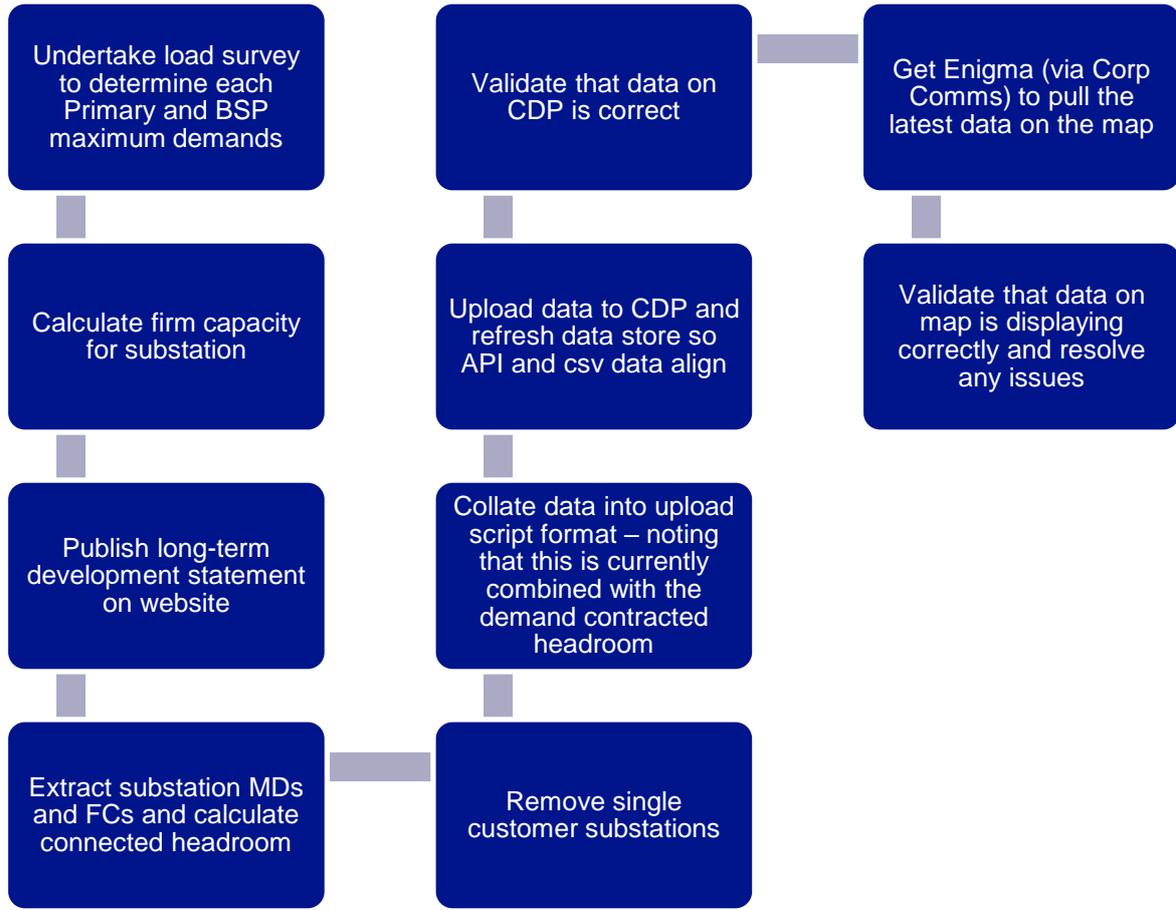
To determine the contracted pipeline of demand the Crown pipeline report is utilised. This is a monthly report that provides details on accepted schemes in the queue with information on upstream substations (Primary, BSP & GSP).

It is planned that this will be automated as part of an IT&D process that can update the contracted headroom on a monthly basis directly from Crown.

Update Process

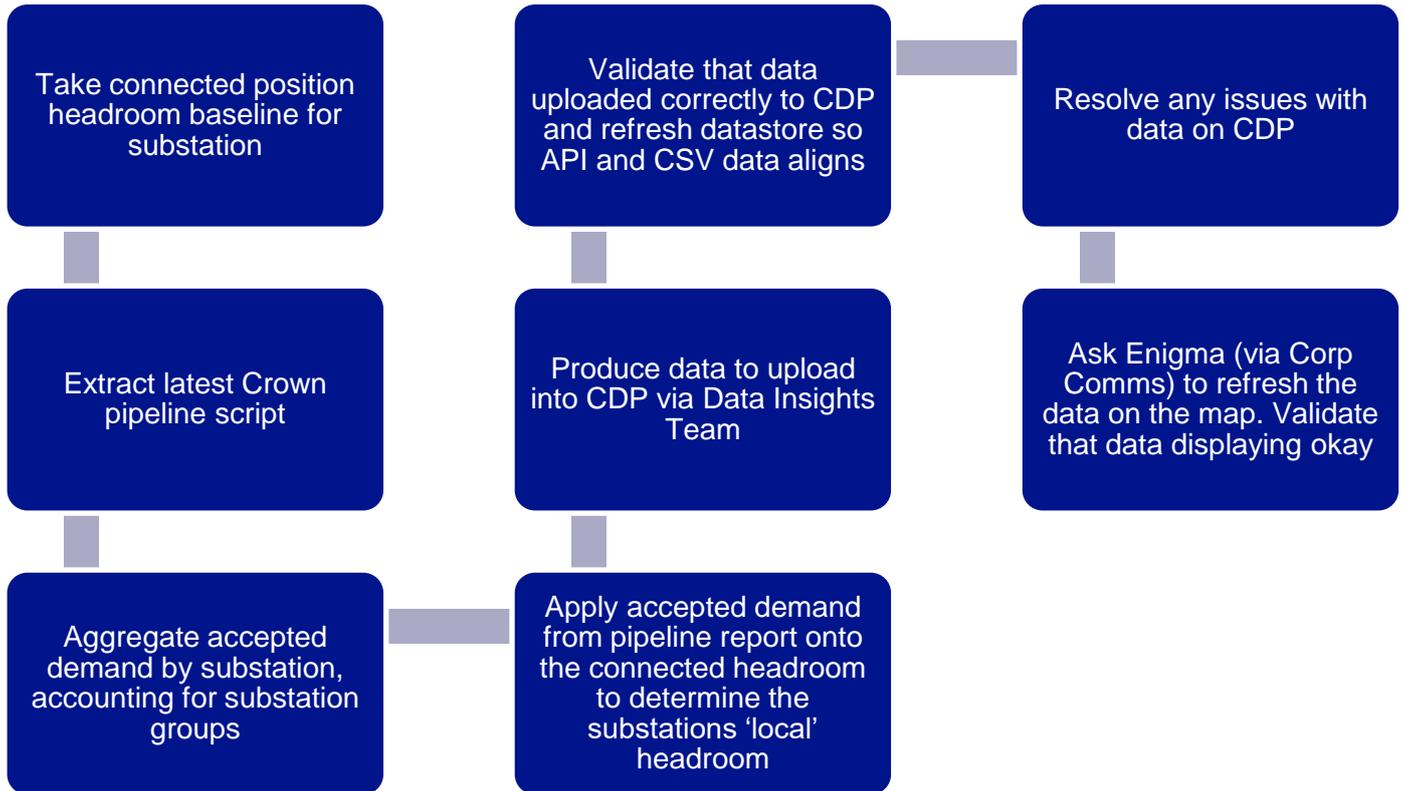
Connected

The high-level update process for the connected demand headroom at each substation is as follows:



Contracted

The process for calculating the contracted/accepted headroom for all Primary and BSP substations:



Points to note:

- It will require Data Insights to refresh the datastore to get all the data on the CDP to align

Planned update frequency

Connected

The LTDS is currently published every year at the end of November, with a partial update in May. There is significant work involved with undertaking a comprehensive review of all Primary and BSP substations to determine their:

- Maximum demand
- Firm Capacity

It is on this basis that whilst we publish the LTDS firm capacity headroom this will be updated on a yearly basis as the key inputs above are only updated at this frequency. It is expected the Primary/BSP connected demand will be updated in December or early January to align with the latest LTDS.

Note: There is currently an ongoing LTDS Reform that will change the publication timeline and frequency, so publication of this data on the map will be in alignment with this.

Contracted

The contracted pipeline report (linked above) is currently run on a monthly basis. The current process requires that the contracted pipeline is added to the connected maximum demand to determine the remaining headroom.

Data Exclusions

Data excluded from the Primary demand headroom calculation process:

- Any single customer substations

Known limitations

There are a number of limitations with applying a simplified LTDS style assessment of headroom:

- It does not capture upstream network constraints that are wider than the firm capacity assessment
- It does not capture other network issues, including voltage and fault level constraints

Future developments

There are a number of options to improve the visibility we provide to stakeholders

- Display upstream substation (e.g. BSP for Primary) headroom, although this is still limited to substation constraints.
- DSO have trialled running the same approach as detailed for the generation headroom calculation that runs a full contingency analysis and calculates the upstream constraint based on all credible outage combinations and the sensitivity of the substation/node to the fault.
- Provide additional fields that allow NGED to clearly flag where there are wider constraints