Flexibility Assessments for Load Related Schemes

January 2020

1. Introduction

SP Energy Networks (SPEN) is a Distribution Network Operator (DNO). We keep electricity flowing to 3.5m homes and businesses throughout our two licence areas, SP Distribution (SPD) and SP Manweb (SPM), covering central and southern Scotland, north Wales, Merseyside, Cheshire and north Shropshire. We do this through the network of overhead lines, underground cables and substations which we own and maintain.

To deliver Net Zero carbon targets economically and effectively, DNOs need to develop the way we design, build and operate our networks and explore new solutions. As we transition to a Distribution Services Operator (DSO), the use of flexibility services (where we pay third party assets to operate in ways which benefit the network) is one such solution to help us continue to deliver a safe, reliable, economical and decarbonised supply to customers.

Given the potential benefits of flexibility services, we are committed to considering flexibility alongside traditional network solutions for all new projects of significant value. In 2019 we reviewed our SPD and SPM RIIO-ED1 load related plans to identify opportunities to tender for flexibility services. This document provides a high-level overview of the approach we took.

2. Selection Criteria

Taking the RIIO-ED1 load related plans for SPD and SPM, which includes projects at all stages of progress from those not yet started to those that had already been delivered, an assessment was undertaken to identify sites suitable for flexibility. This consisted of a two-part process: the first part filtered out sites not suitable for flexibility based on an initial defined criterion; in the second part the remaining sites were subject to a detailed assessment:

a. Step 1: Site Filter

The first step was to filter out projects where flexibility would not be suitable or appropriate. The three criteria used were:

1. ***Project Driver:*** Projects to resolve fault level constraints have not been included due to technical limitations of using flexibility for this purpose at this stage.
2. ***Project Status:*** Projects at an advanced stage of delivery were excluded.
3. ***Financial Commitment:*** Projects with high abortive costs, or where the majority of allowed expenditure has already been committed, were excluded.

b. Assessment Methodology

All projects that met the above three filters were subject to a detailed assessment to determine the flexibility potential and to identify the flexibility service requirements (i.e. the required location, MW/MVAr magnitude, service type and time periods).

<u>System studies</u>

Extensive profile-based system studies covering N-1 and N-1-1 contingencies were undertaken using power flow analysis software to determine the network outage with the most onerous constraint. These assessments included any authorised new connections and modifications to the network.

An advanced automated design tool was developed to facilitate consistent time-profile based power-flow analyses and for post-processing of the data, and for the identified most onerous outage scenario(s), half-hourly time-profile power flow simulations (17,520 simulations/year) were then undertaken. These simulations were repeated for subsequent years with future demand projections to the end of the RIIO-ED1 price control period (March 2023).

Using these profile-based power flow simulations, the periods and duration of system risk were determined and the required MW/MVAR demand reduction/generation export capacity was calculated for each year. This provided the required MW/MVAr, periods and time duration of any flexibility service.

Assumptions

The detailed assessments were based on the following general assumptions:

- For demand constraints, an assessment of the generation connected to the network is undertaken to assess the maximum risk duration.
- The risk duration was calculated considering the following trigger levels:
    - Voltage levels beyond statutory limits
    - Thermal loadings above intact/cyclic rating of the circuit/transformer
    - Group demand exceeding existing firm capacity
- Local network demand forecasts were utilised.

The process flow diagram outlining the methodology for detailed assessments is presented in Figure 1.

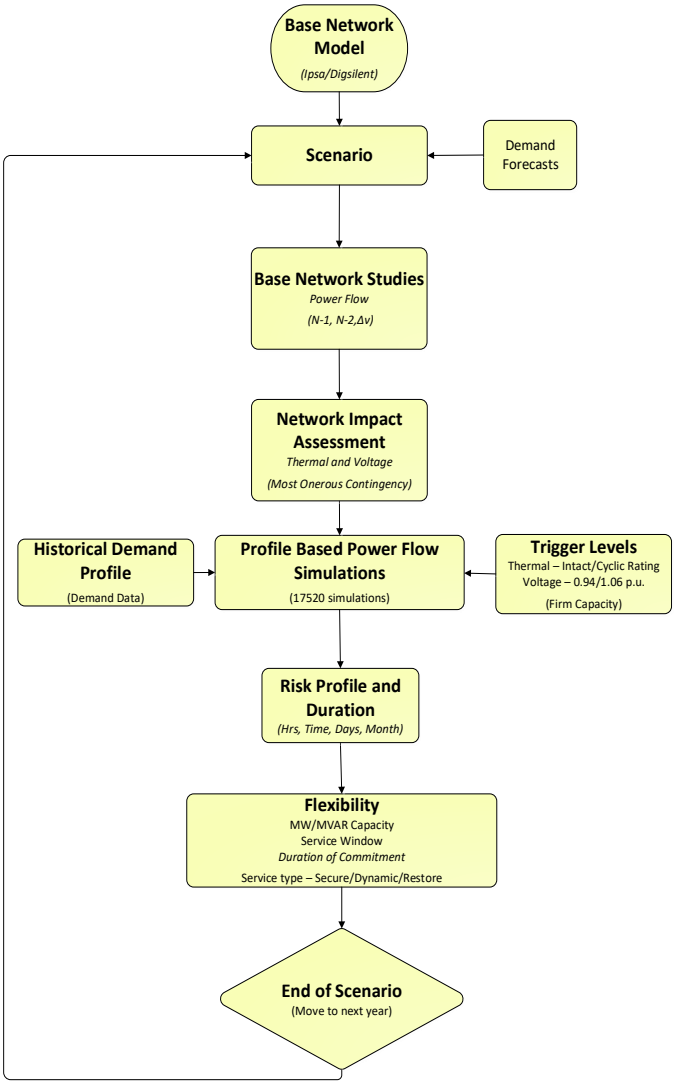

Figure 1: Flexible Capacity Assessment Methodology