Energy Potential

Probabilistic network charging with the CDCM

Summary: **An assessment of the 500MW model used within the CDCM and the benefits of moving to a probabilistic model of network charging**

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1. Executive Summary

This paper has been put together as a thought piece by Energy Potential. We highlight a key difference between the methodologies used to set network charges across different voltage levels, and suggest a new probability driven approach that has clear benefits to network users

The asset cost model used within the Common Distribution Charging Methodology (CDCM) determines the cost of building new network infrastructure, and is the key building block of the methodology. However, the DNO may or may not actually build the new network infrastructure. In the case where the network infrastructure is never built, no cost is incurred, and yet the CDCM model has allocated the majority of this 'hypothetical' cost for recovery by network users via unit rates which are avoidable by end users. This is inconsistent with the network charging methodologies used at higher voltage levels where asset costs are recovered weighted by the likelihood that the cost is incurred. Energy Potential believes that incorporating a similar probabilistic assessment around the 500MW model would improve the CDCM with more cost reflective prices that reflect the likelihood that each DNO will incur future capital expenditure.

This new approach could be used to determine the proportion of costs recovered from unit based charges. Unit rates would be higher where there is a greater likelihood of real reinforcement occurring, both across DNOs and by voltage level. Conversely, when reinforcement is deemed unlikely, the benefit to the network company of users changing their consumption pattern is much reduced. The approach would also result in more cost reflective credits to generators which would be higher at voltage levels and/or in DNO areas where reinforcement is more likely to be incurred. Furthermore, the methodology would aid the transition from DNOs to DSOs as it will require Distributors to understand their network reinforcement requirements on a more granular basis.

2. The 500MW Model within the CDCM

The CDCM is used to set Distribution Use of System (DUoS) charges for Low Voltage (LV) and High Voltage (HV) customers in GB. The methodology is forward looking and uses the 500MW model[1] to determine the asset costs used by each customer.

The 500MW model is the key building block of the DUoS charging methodology. It determines the cost of building a network sufficient to meet a demand peak of 500MW. The asset costs from the model are divided through by 500MW to determine a unit rate for building network at each voltage level (after adjustments for diversity and losses).

All network charging methodologies incorporate this element and the equivalent at Extra High Voltage (EHV) and transmission are as follows:.

- **EHV - Long Run Incremental Cost (LRIC) or Forward Cost Pricing (FCP) approach incorporating the Modern Equivalent Asset Value (MEAV) of assets**
- **Transmission – The Investment Cost Related Pricing (ICRP) model incorporating expansion constants that represent the cost of building new network.**

3. Network charging for EHV and Transmission

The methodologies to determine asset costs at EHV and transmission all use an **incremental** costing approach. They use a powerflow approach which assesses the **likelihood** of future reinforcement and

[1] also referred to as the Distribution Reinforcement Model (DRM) or the 500MW hypothetical model

allocates costs accordingly. Because these models allocate asset costs based on the likelihood of future reinforcement these models are fundamentally **probabilistic**. A summary of each is shown below:

- **LRIC** – Adds an increment of load to assets and assumes a constant growth rate to determine the number of years before each asset requires reinforcement. The Net Present Value of the reinforcement consequently forms the base asset cost assigned to each site.
- **FCP** – Uses a forecast of the future load for each group of EHV assets across a ten-year period to determine if reinforcement is required across this timescale. Any reinforcement costs are allocated to sites that use these assets and form the base asset costs**.**
- **ICRP** – Uses a powerflow approach to determine whether an increment of demand/ generation results in an increase or decrease in power flowing over the transmission network. These powerflows are valued at the expansion constants which reflect the cost of building new network. The powerflows multiplied by the expansion constants form the base asset costs used to determine the incremental cost differences across the country before the residual charge is added.

Although these methodologies are different they have two common elements:

- **Value of building new assets**
- **Probability of a requirement to build new assets**

The 500MW model used within the CDCM determines the value of building new assets but does not incorporate the probability of the new assets being built.

4. Opportunity to change

The probability of each DNOs requirement to build new network by voltage level could be incorporated into the CDCM and would enhance the cost reflectiveness of the tariffs produced. As a simplistic example, the DNOs could assess each substation connected to their network to determine the level of spare capacity. This would enable the probability of network reinforcement required across each voltage level. Depending on the level of data available, a ten-year forecast by substation could be adopted similar to FCP or a 1% per annum growth rate could be adopted as used within LRIC.

The key purpose of determining the probability of future reinforcement is to enable asset costs to be allocated to standing charges (fixed/ capacity) or unit rates. There is a sound principle behind this: the closer the infrastructure assets are to requiring reinforcement, so more costs should be recovered from unit rates, and therefore accurately reflect the marginal cost of peak consumption. Where there is lots of spare capacity, there is little benefit - from a network perspective - of customers moving consumption between periods, so the unit rate charge should be lower and standing charges higher. A probabilistic approach would provide flexibility in the pricing model so that DNOs set prices that reflect the likelihood of their network being reinforced by voltage level. This also passes through to generation which will be rewarded more at voltage levels and in DNO areas which are likely to require more reinforcement in the future.

Incorporating a probabilistic model into the CDCM would bring a number of benefits:

- **A more cost reflective price signal - unit rates will be higher where there is a greater likelihood of reinforcement occurring (both at DNO and by voltage level)**
- **More consistent approach between CDCM, EHV and transmission**
- **Generation will receive higher credits where reinforcement is likely and less where spare capacity exists**
- **A more flexible approach to pricing that reflects the DNOs expectation of what is likely to happen on their network in the future**
- **Assists in the transition from DNOs to DSOs as distributors will need to gather more information on how their networks are performing and the likelihood that different areas of the network will require reinforcement**
- **Enable a more granular locational price signal to be introduced at a later date if this is considered beneficial**

5. Summary

Energy Potential has developed this paper to aid discussion on how future locational charges should be set within the Ofgem forward looking taskforce. We believe there is an opportunity to make a fundamental change in approach which would result in more cost reflective tariffs which are more flexible and enable each DNO to reflect developments on their network.