Annex

NGET ET.07B Frontier Economics CVP quantification methodology

December 2019

As a part of the NGET Business Plan Submission

national**grid**

CVP QUANTIFICATION METHODOLOGY

NGET

This note sets out the methodology that we have used to estimate the consumer benefits delivered by each CVP item that we have quantified.

General methodology and assumptions

In general, unless indicated otherwise in the sections below, we have based our calculations on the below approach and assumptions.

We note that in many cases, we have used inputs from NGET or findings from research carried out by third parties. We have not assured the modelling or processes behind these inputs. In two cases, ET8 and ET15, NGET has carried out the estimation themselves, but these estimations are included in this document for completeness.

- We evaluate benefits relative to a counterfactual scenario, which is determined on a case-by-case basis. The counterfactual is based on what we would expect a reasonable, ambitious business to do. It could involve not carrying out the CVP action, only carrying out part of the CVP action, or delaying the CVP action. The counterfactual used to evaluate each CVP item is explained in the sections below.

- All CVP benefits are calculated net of costs to consumers associated with delivering those benefits. If benefits can be delivered without any incremental increase in funding, consumers incur no costs, so there is no need to net any costs off.

- Ofgem's business plan guidance states that companies' CVPs should demonstrate the additional value that their plans will generate for existing and future consumers. In line with this, we quantify value for consumers in T2, and in some cases beyond T2, depending on the expected duration of the CVP benefit (above and beyond what would be expected of a reasonable, ambitious company).

- Net benefits are calculated in present value terms at 2020/21 (when we expect Ofgem will evaluate the CVP). We use the Government Green Book standard discount factors to discount future costs and benefits.[1]

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[1] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685912/Discount_Factors.xlsx

- For consumer benefits resulting from carbon reductions, we use BEIS traded and non-traded carbon prices to quantify the value of emissions reductions.[2] The decision of whether to use traded or non-traded prices is made on a case-by-case basis, and depends on whether the emissions in question are included in the EU Emissions Trading Scheme (ETS) or not. in order to estimate the value of saved CO_2 emissions.

- All final CVP values are denominated in 2018/19 prices, in line with the Business Plan. As we understand that all inputs are in 2018/19 prices (or 2018 prices in the case of carbon prices), we do not make any inflation adjustments.

The sections below detail the methodology used for each quantified CVP area.

ET2 and ET3: Optimisation with ESO

ET2: Optimisation of harmonic filtering

NGET explains in its business plan that it has engaged extensively with the ESO for the following purpose:

Taking a coordinated approach in the connection of the increasing capacity coming from wind, solar, storage and interconnectors. This is aimed at minimising the risk to damage customer's equipment and it is generally referred to as harmonic filtering.[3]

NGET has commissioned Atkins to assess the benefits of this. Atkins has found that NGET's solution to harmonic filtering, which involves a coordinated approach with the ESO, could result in an estimated 65% reduction of the number of filtering units required.

In monetary terms, Atkins' final report estimates that the net present value of the savings would amount to **£18.82** for the T2 period, which we have included as a net benefit in our quantification. This CVP item is CVP1 in NGET's list.

ET3: Optimisation with ESO to reduce system costs

NGET has also engaged with the ESO to explore ways to minimise costs at the transmission network owner (TO)/system operator (SO) interface through TO flexibility, and collaborating on enhancing the existing network in order to reduce the costs of system operation.

On flexibility, NGET has estimated the savings from constraint costs (caused by outages) that would be delivered by optimised system access through TO flexibility, which are passed on to consumers. NGET has found that estimated consumer savings, net of the costs of TO flexibility, would be £188m per annum.

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[2] See central estimates provided in Table 3 in
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/696677/Data_tables_1-19_supporting_the_toolkit_and_the_guidance_2017__180403_.xlsx, Table

[3] This term can be explained as follows:
   - **Harmonics** are distortions which, at certain frequencies, risk damaging customers' equipment. They are generated when an increasing amount of capacity coming from wind, solar, storage and interconnectors is connected to the system;
   - The practice of limiting these distortions is called filtering.

Again, we have spread these savings over T2 and discounted, resulting in an £849m net present value.

NGET have suggested to us that because there is uncertainty about the scale of the approach in the T2 period they would like to take a conservative approach to valuing the benefits. NGET has proposed using 10% of the benefits as a conservative estimate. This produces a value of **£84.88m**. This CVP item is CVP8 in NGET's list.

ET4: Optimisation with DNOs to identify whole system opportunities

NGET's business plan explains that the joint efforts of NGET and the DNOs to identify whole system opportunities have the potential to either reduce the number of reactors required to meet compliance with Security Standards (SQSS[4]), such as voltage requirements, or to reduce construction costs. The cost of these construction works, at present, is £184m. NGET expects that collaboration with the DNOs has the potential to reduce this cost by at least 10%, whether this is ultimately incurred by NGET or the DNOs, generating £18.4m of savings for consumers over T2. NGET is currently developing a system operability uncertainty mechanism that will adjust allowances when required, so consumers receive the full benefits of the most efficient solution when it is needed.

We have equally apportioned these projected savings across the 5 years of the T2 period and discounting them using the Green Book discount factors mentioned above. The final estimate of net present value is approximately **£16.62m**. This CVP item is CVP2 in NGET's list.

ET5: Driving efficiency through collaboration, competition and innovation

Enhanced collaboration with the DNOs, aimed at delivering efficiency through competition and innovation has the potential to reduce baseline costs.

In particular, NGET has identified "a potential requirement to invest £199m through the T2 period on low voltage substation re-builds due to higher fault levels associated with distributed generation".[5] Cooperation with the DNOs has the potential to reduce the £105m investment by roughly 10%, whether ultimately incurred by NGET or the DNOs. NGET has therefore removed the £105m from its baseline costs, replacing these with an uncertainty mechanism to cover costs that may eventually be incurred.

Apportioning the £10.5m of savings across the five years of the T2 period and discounting them using the Green Book discount factors mentioned above gives a net present value of consumer benefits of roughly **£9.48m**. This CVP item is CVP3 in NGET's list.

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[4] https://www.ofgem.gov.uk/licences-industry-codes-and-standards/standards/security-and-quality-supply-standard-sqss

[5] October version of NGET business plan

ET6: Tougher Energy Not Supplied (ENS) targets

NGET is proposing a significantly tougher target for the Energy Not Supplied (ENS) incentive. The target for T1 is 316 MWh per annum, and NGET is proposing a target in the range of 175-254 MWh per annum using its formula based on current data. This represents a minimum reduction in target of 20%, and a maximum reduction of 45%.

NGET has suggested that we use a counterfactual scenario of a target of 254 MWh per annum to reflect that through T1 NGET has outperformed the ENS target. NGET has outperformed the target in T1 because, firstly, the ENS incentive encourages NGET to minimise ENS, and secondly, events that result in significant supply interruptions are low likelihood but high risk – so they can still happen but will be rare, meaning that performance will frequently be better than targets. NGET has asked that we use 175 MWh at its proposed target for the T2 period using its formula based on current data.

Because the counterfactual target is not binding, and NGET's proposed target for T2 is also not likely to be binding, by setting a tougher target NGET is giving up rewards it would have otherwise received under the counterfactual scenario.[6]

Since rewards to NGET are ultimately funded by consumers, a reduction in the ENS target will result in savings for consumers equal to the reduction in rewards implied by the tougher target. We have calculated this reduction in rewards in accordance with Ofgem's guidelines as mentioned in the RIIO-T1 Annual Report - *"TOs are set a target for ENS at the start of the price control. TOs then receive an annual penalty/reward depending on whether their actual ENS in the year is above or below the target level (£16,000/MWh multiplied by the efficiency incentive rate)"*[7].

NGET will be foregoing rewards on 79 MWh (the difference between 254 MWh and 175 MWh). The value of these rewards is calculated by multiplying together:

- the difference in target (79 MWh);
- the incentive rate of £16,000 (Ofgem's estimate of the value of lost load)[8]; and
- NGET's efficiency incentive rate (47%).[9]

We calculate this for each year in T2 and then calculate the net present value. This results in foregone rewards of approximately **£2.68m**, which is equal to the benefit to consumers. This CVP item is CVP4 in NGET's list.

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[6] As an illustration, consider a scenario where NGET achieves an ENS of 150 MWh in a given year. Under the counterfactual, NGET would be entitled to a reward for outperforming the target by 104MWh (difference between 254 MWh and 150 MWh). In comparison, under the stricter target it would be entitled to rewards on a lower volume of 25MWh (difference between 175 MWh and 150 MWh).

[7] See https://www.ofgem.gov.uk/system/files/docs/2019/03/riio_et_2018_19_annualreport_final_version_published.pdf

[8] The value that electricity users attribute to security of electricity supply. https://www.ofgem.gov.uk/ofgem-publications/53713/riio-t1-initial-proposals-nggt-and-nget-overview-2707212.pdf, page 15.

[9] NGET is entitled to a fraction of the rewards, with the remaining shared with consumers. https://www.ofgem.gov.uk/ofgem-publications/53601/3riiot1fpuncertaintydec12.pdf, page 118.

ET8: Supporting local communities

NGET is creating a new Urban Improvement Provision (UIP), which is a £50m consumer-funded budget to improve its assets and close public spaces in disadvantaged urban areas.

This action goes beyond Ofgem's minimum requirements and will deliver consumer benefits in the T2 period. NGET has proposed a cap of £50m on the UIP.

While we believe that this action results in consumer benefits greater than the amount NGET will spend, it is difficult to quantify the exact multiplier.

To develop a conservative multiplier value, we have used three alternative methods of calculating approximate consumer benefits.

- **At cost.** A conservative assumption we could make is that the expenditure under the UIP generates benefits equal to its cost, that is to say there is no net benefit.

- **Social benefit to cost ratio.** We have used a social benefit to cost ratio as reported in a study carried out by Auriga for Severn Trent Water, United Utilities and Thames Water. The study found that every £1 invested by water companies in social schemes delivered £3.06 of benefit.

  If the same ratio of cost to benefit is assumed for NGET's community initiatives, a spend of £4.4m by NGET will deliver approximately £14m of consumer benefits. We recognise that the cost to benefit ratio may not be translatable from the water sector to the energy sector, and the social projects it was based on may not be directly comparable to the community projects that NGET plans to contribute to. This is why we haven't used this ratio to calculate consumer benefits for the CVP, but it does demonstrate that benefits have the potential to be significantly higher than the consumer value proposed. Further evidence on higher benefit cost ratios for social schemes is provided by studies undertaken by Pro Bono Economics[10].

- **Consumer willingness to pay.** We have also calculated an estimate of the amount consumers are willing to pay for NGET to support local communities. This is based on a Willingness to Pay (WTP) study conducted by NERA and Explain for National Grid's electricity and gas consumers. The study found that domestic electricity consumers were willing to pay up to £8.26 per consumer per year for NGET's "current level of community activities", while non-domestic electricity consumers were willing to pay £19.23 per consumer per year to support local communities.

  Multiplying these WTP estimates with the number of households and businesses, respectively in England and Wales over 5 years results in a total willingness to pay of £1.5bn across both domestic and non-domestic consumers. Given that this is the value that consumers claim to attribute to NGET's community initiatives, this provides further evidence that the consumer value is significantly greater than NGET's spend on community initiatives. However, due to the limitations of willingness to pay research, we do not use

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[10] https://www.probonoeconomics.com/cases

these figures to provide a quantification of benefits for the CVP. WTP studies should be treated with caution as even well-designed analysis can be limited by a number of biases. For instance, when faced with complex choices, respondents may choose the default option by opting for the status quo or using a rule of thumb. Respondent's answers may also be limited by the experiences they have had.

In the absence of firm and specific evidence, it is difficult to estimate the benefits of the UIP. The Stakeholder Group has suggested applying a reasonably conservative multiplier, which NGET considers could be 1½:1 for social benefits to costs for the purposes of this CVP. This would mean the net consumer value of the UIP is 0.5 times its cost. NGET is forecasting expenditure as £10m each year, or £5m of net benefit each year. Discounting the benefits back to 2019-20 gives a value of **£22.58m**

This CVP item is CVP6 in NGET's list.

ET12: Caring for the natural environment

NGET is committing to improve the natural capital value of its non-operational land by 10% over the course of T2. The Natural Capital Committee defines natural capital as "those elements of the natural environment which provide valuable goods and services to people". The concept of natural capital has been developed to help incorporate the value of natural capital into decision making processes, and therefore it represents the societal benefits of natural capital.[11] This is therefore a helpful tool for valuing the consumer benefits of NGET's commitments around environmental improvements on its land holdings.

NGET has 28 "sustainability sites" covering 377 hectares (about 13% of its total land holdings), where it has done work to calculate an indicative baseline level of natural capital on its sites. It should be noted that this work is ongoing so these figures may change. This work has found that the baseline value of NGET's land is £115,962 per hectare in present value terms. This is an estimate of the natural capital value that these sites will deliver over 30 years.

Applying this baseline value per hectare to NGET's total land portfolio of 2,798 hectares (this is equivalent to 'non-operational' land), gives a total baseline value estimate of about £324m. An increase of 10% in this baseline value gives a total increase in natural capital value of about £32.45m.

NGET thought it might not be appropriate to claim a 30-year NPV for a CVP item because any CVP reward might need to be clawed back if the benefit was not delivered. We used the HM Treasury Green Book social time preference rate to adjust the NPV from 30 years to 10 years. This produced a CVP value of **£14.67m**.

This CVP item is CVP5 in NGET's list.

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[11] See
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/608850/ncc-natural-capital-valuation.pdf

ET14: Developing alternatives to SF_6

The NGET business plan explains that NGET plans to invest resources in research for decarbonising materials and methods, to reduce the amount of CO_2 produced by NGET.

In particular, NGET plans to carry out

- Research in the T2 period to find an alternative for SF_6, a powerful greenhouse gas used to insulate electrical gear.
  - Current levels of leakage are approximately 250,000 tonnes of CO_2 equivalent per year. If an alternative to SF_6 can be found, all of this leakage could potentially be avoided. However, it is unlikely that the full amount would be avoided, as some SF_6 would likely be released into the atmosphere when retrofitting assets.
  - The cost of this research is expected to be £2.5m over the course of T2.

However, conversations with NGET suggest that this areas of research is challenging and time consuming, and implementation could also be complicated.

In our analysis, we therefore assume that carbon savings are delivered only from the start of T3. We conservatively model that only 20% of the potential annual savings mentioned above will be realised in each year of T3. We do not model savings in price controls beyond T3, again to be conservative.

The value of the carbon savings from an alternative to SF_6 are monetised by multiplying the carbon savings in each year with the non-traded carbon price (because SF_6 is not covered in the EU ETS) We then calculate the present value of these savings.

In addition, we equally apportion the total research costs of £2.5m over the five years of T2, and calculate the present value of these costs.

Combining the present value of the benefits and the costs gives a final net present value of approximately **£13.1m**.

This CVP item is CVP7 in NGET's list.

ET15: Deeside Centre for Innovation

Benefits for Deeside have been estimated by NGET rather than Frontier Economics. NGET has estimated the net benefits of Deeside, using the following methodology.

- NGET has estimated the benefits of the Deeside Centre for Innovation in the T1 period at £56m.
- It expects £30m of costs in T2 on Deeside, and benefits are expected to accrue in T3.
- It has assumed that benefits in T3 will be double those in T1 (after adjusting the benefits for the different lengths of the T1 and T2 periods (8 years versus 5 years).

NGET considers this is a conservative calculation because in its view the proposals to open up and expand the Deeside Centre for Innovation in the T3 period should lead to higher benefits for consumers in terms of enabling the faster

implementation of newer low-carbon technologies and reducing costs through quicker and safer 'off-line' testing and commissioning.

This makes the net benefit of the Deeside Innovation Centre **£26.13m**.

This CVP item is CVP9 in NGET's list.