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BRIEFING EVENT:

Model used to quantify the impacts of BSC Modification P272

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Agenda

- **Background:**
  - Balancing and Settlement Code (BSC) Proposal 272 ('P272')
  - Ofgem impact assessment
- **Objectives of briefing event**
- **Introduction to Ofgem's model for quantifying impacts**
  - Purpose of the model
  - Model structure
  - How to...
  - Costs calculation
  - Benefits calculations
- **Q&A session**
- **Next steps**

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BSC Modification P272

- As set out in the BSC, settlement places incentives on suppliers to purchase enough energy to meet what their customers consume
- Most consumers assigned to Profile Classes for the purposes of estimating their consumption for settlement
- From 6 April 2014, consumers assigned to Profile Classes 5-8 (generally larger non-domestic consumers) will have advanced meters capable of recording half-hourly consumption data
- P272 raised by Smartest Energy and proposes that these consumers should be settled using half-hourly consumption data:
  - from April 2014 (original proposal)
  - from April 2015 (alternative proposal)

Ofgem impact assessment

- Ofgem is responsible for deciding whether modifications under the BSC are implemented
- We published our draft impact assessment on P272 in October 2013 for consultation – deadline for responses is 24 December 2013
- Wherever possible, we quantified the impacts of P272 using a model developed by Engage Consulting
- For those impacts that we quantified, our analysis suggests P272 is broadly revenue neutral for consumers but:
  - not all impacts have been quantified
  - approach to quantifying impacts is conservative in a number of respects
- Taking our qualitative and quantitative analysis together, we are minded-to approve P272

Objectives of briefing event

- We are committed to an open and transparent process of consultation
- Objectives of today are to:
  - Introduce stakeholders to the model we used to quantify the impacts of P272
  - Give stakeholders the opportunity to ask questions on how the model operates

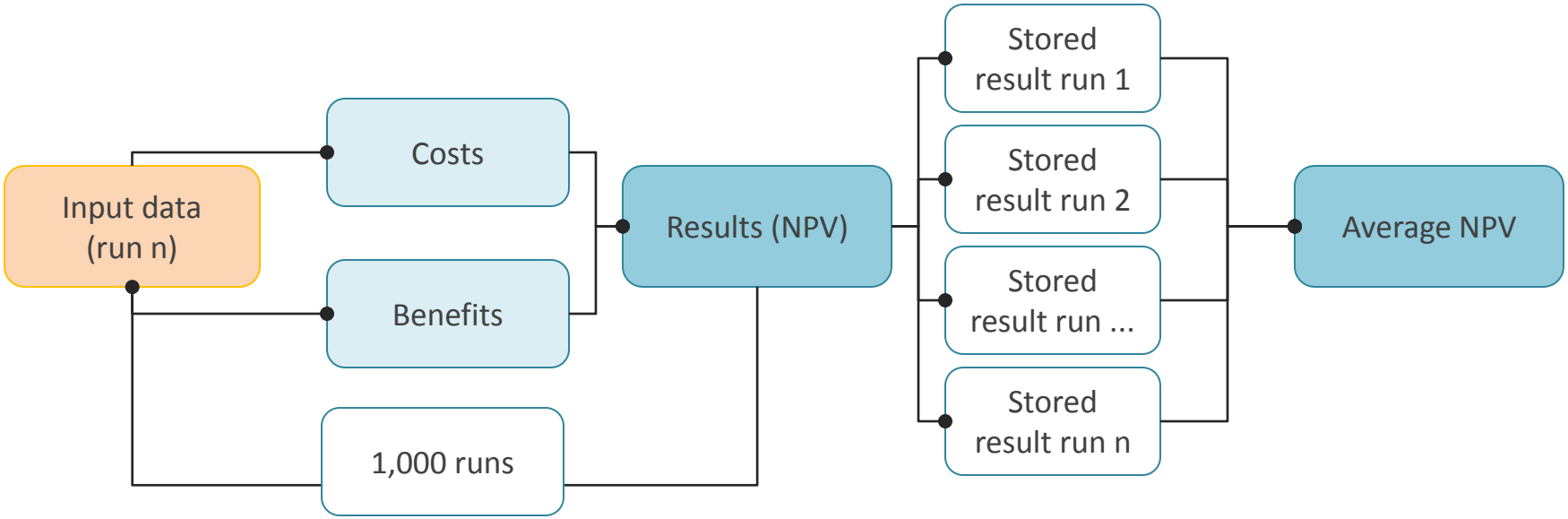
Purpose of the model

- We have identified a range of costs and benefits directly linked to the implementation of P272
- Our qualitative assessment discusses the rationale behind our hypotheses on costs and benefits
- Our quantitative analysis includes some of the costs and benefits discussed in the impact assessment
- The model attempts to estimate their monetary impact. It does not evaluate whether such costs and benefits would occur/ be realised
- The model is a supporting tool and our policy decision will be based on broader considerations of the merits of P272 against the BSC Objectives and our statutory duties
- We recognise that every modelling exercise carries a degree of uncertainty – we manage the uncertainty by :
  - taking a conservative approach to making assumptions around costs and benefits
  - using a Monte Carlo analysis to explore the potential scale of the impact

The Monte Carlo analysis performs the calculation using randomly selected variables within a range. It does so several times, usually hundreds or thousands. The assumption underpinning this approach is that, the more times the model is run, the more likely results are to be distributed as a normal distribution (and therefore the closer they will be to an average result)

Structure

- The model estimates the cost and benefits of P272 over 20 years
- The modelling period starts in 2013 and ends in 2032 – this period of time can be changed by the user
- The model calculates the Net Present Value (NPV) of each cost and benefit and stores results in a dedicated sheet
- A Monte Carlo simulation is performed to estimate the NPV of 1,000 combinations of input data
- The model returns the results of the average NPV of the 1,000 Monte Carlo runs



Key tabs

- Index
  - Provides a description of the model and links between sheets
- Input sheet
  - Contains input data/assumptions used in the Monte Carlo simulation
  - Contains the command to run the model
- Input standing data
  - Contains assumptions on market size of HH, PCs 5-8 and elective customers
- Summary results
  - Contains key results of the Monte Carlo simulation and details of the contribution of each cost and benefit to the overall result
- Costs calculations
  - Contains details of the calculation of each cost item and profiling
- Benefits calculations
  - Contains details of the calculation of each benefit and profiling

Creation of input data

- First, we define a range (MIN, MAX) and an average/peak
- Second, we specify the statistical distribution associated with the input data
  - The distribution defines how close the 1,000 values for each input data are to the most likely value
- Third, we use random numbers to generate a value within the range
  - Numbers are between 0 and 1 and are randomly generated using the RAND function in Microsoft Excel
- A working example:

From responses to WG consultation we estimated average supplier upfront costs	Select random number for run 1	We apply a normal distribution to emphasise values around the average	Calculate supplier upfront cost for run 1
£25.92m	0.845	NORMINV(0.845, 25.95, 1.4)	What is that value so that we can be around 84 per cent confident a random value be equal or less than that value? £27.35m

NORMINV (p, mu, sigma) returns the value x such that, with probability p (ie confidence interval), a normal random variable with mean mu and standard deviation sigma takes on a value less than or equal to x

How to...

- Change the assumptions/select different input data:
  - In the "Input" and "Input standing data" sheets assumptions can be changed either by amending the relevant cell or by selecting alternative options from the drop-down menu of the selected cell
- Run the model
  - In the "Input sheet", press "Run Monte Carlo Simulation" – this command will start running the macro (that can be found in the VBA window)
- See results of each Monte Carlo run
  - Results of each run are stored in the "Results" sheet
  - NB: the "Costs calcs" and "Benefits calcs" sheets show results of the last (1,000th) run only
- Change the random numbers
  - The "Random Numbers" sheet contains stored random numbers – the model does not generate random numbers
  - These numbers can be changed by the user by creating another spreadsheet, using the Excel RAND function to derive random values and then copying and pasting the new values in the model

Costs calculation

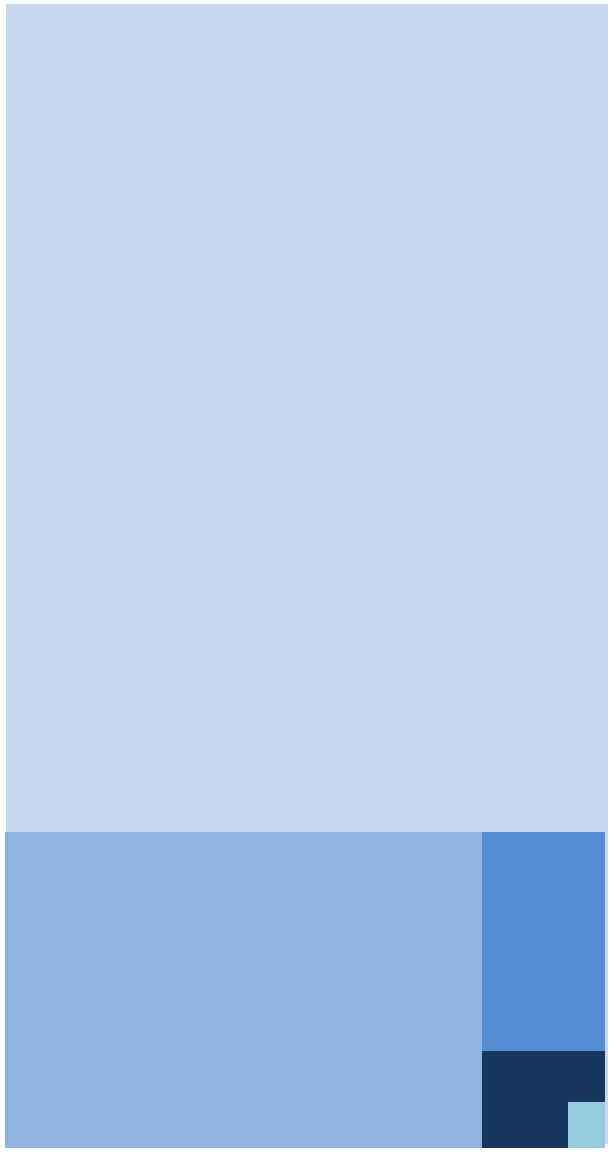
- Five cost categories:
  1. Suppliers implementation costs
  2. DNOs implementation costs
  3. Suppliers ongoing costs
  4. DNOs ongoing costs
  5. Increased system balancing costs
- Key assumptions
  - No annutization of costs – we assume everything is paid in the implementation period (ie 2014-2015)
  - No phasing of ongoing costs over the modelling period – we assume no increase/decrease of ongoing costs
- The Costs-Calcs sheet presents the results in NPV of each cost
- We considered the scope for assessing the impact of a higher uptake of elective HH customers. Should more PCs 5-8 customers move electively to HH settlement, the positive impact of P272 could be lower. However, implementation costs of P272 could also be lower. We do not have sufficient information to model the number of elective HH customers that would trigger new upfront costs, nor the magnitude of these costs. We welcome views and evidence to inform our assumptions on this matter.

Benefits calculation

- We identified a broad range of benefits. In the model, they are divided in four main categories as represented in the input sheet:
  1. Load reduction and load shifting as result of DSR
  2. Load reduction and load shifting as result of Energy Efficiency Initiatives
  3. Cost savings in managing the settlement process
  4. Improved forecasting
- Key assumptions include:
  - All benefits start in 2015
  - To some benefits we have applied a phasing factor (eg load shifting and load reduction at peak). This because we anticipate it will take time for the industry to realise full benefits
  - We have excluded from the calculation benefits that could result from energy efficiency initiatives. While at the beginning of our analysis we considered there could be benefits relating to energy efficiency initiatives directly linked to P272, we have decided to not consider these benefits and therefore excluded them from the model.
- The Benefit-Calcs sheet presents the results in NPV of each benefit
- The next slides describe the estimation of the three categories of benefits

Load shifting and load reduction at peak

From total peak load to volume shifted and reduced at peak...



Total peak load PCs 5-8 customers

Discretionary load = load that could be technically shifted

Uptake = customers who sign up to new products (eg ToU)

Customers who shift

Customers who reduce

Example – Base Case

20-36 per cent

20-24 per cent

25-50 per cent

12-20 per cent

Load shifting and load reduction at peak

...to estimation of the benefits...

	Example – Base Case
Volume shifted (not reduced)	Around 2 per cent of total volume at peak
Volume reduced	Around 0.4 per cent of total volume at peak

Load shifting savings

- Lower average generation costs
- Avoided investment in transmission
- Avoided investment in generation
- Avoided investment in distribution

Load reduction savings

- Electricity bills
- Air quality
- Carbon savings

Load shifting benefits

Load shifting savings	Description of impact	Relevant sheets
Lower average generation costs	Benefits come from purchasing electricity at lower wholesale prices – benefit is the difference between wholesale prices at peak and off-peak. Load shifted spread evenly across off-peak periods.	•Input •Standing_data •Reference_prices •Build_up
Avoided investment in generation	Less generation would be required to meet peak demand – benefit is the avoided cost of building peaking plants as shifted demand is generated using baseload plants. Model allows to select plants (gas or wind).	•Input •Generation investment calc
Avoided investment in transmission	TOs will incur in less costs to accommodate (lower) peak demand. Benefits calculated as portion of RIIO-T1 investment plans.	•Input •Reduced network investment
Avoided investment in distribution	DNOs will incur less costs to accommodate (lower) peak demand. Benefits calculated as portion of DPCR4 and DPCR5 investment plans.	•Input •Reduced network investment

Load reduction benefits

Load reduction savings	Description of impact	Relevant sheets
Electricity bills	Benefits come from buying and distributing lower volumes of electricity. Benefits are calculated as savings in the cost of electricity not used. As per DECC guidance, we valued lower energy consumption using the long-run variable cost of supply.	•Input •Input standing_data •Energy prices •Build_up
Carbon savings	Benefits are calculated as the value of trading carbon credits that are saved due to a reduced consumption of electricity. We use DECC toolkit to evaluate the scale of this impact.	•Input •Input standing data •Build_up •Conversion_CO2 •Prices CO2
Air quality	Benefits are calculated as the avoided air quality damage costs due to a reduction in the electricity produced. We use DECC toolkit to evaluate the scale of this impact.	•Input •Input standing data •Build_up •Air _quality

More effective and efficient market operations

Cost savings in managing the settlement process	Description of impact
Better data quality	Fewer FTEs will be required to deal with inaccurate data as a result, among others, of improved matching of purchases vs sales
Faster settlement	Suppliers would need to post less cash reserves as all PCs 5-8 will be settled at SF. Benefits equal to the avoided cash reserves.
Reduced HH Agents costs	Serving existing HH customers would be cheaper as Agents will benefit from a larger HH customer base and will therefore realise economies of scale
Reduced BSC Admin costs	Elexon could save 1 FTE as there will be no need of updating/creating new profiles

NB: there are no calculation sheets for those benefits, results are returned in the "Benefits_Calcs" sheet using data from "Input" sheet and "Standing Input" sheet.

Improved forecasting

Improved forecasting	Description of impact	Relevant sheets
More efficient balancing	• Benefit comes from difference between prices at which suppliers can contract forward for energy relative to the costs of NGET's balancing actions •Analysis found a linear relationship between improvement in forecasting and cost savings that are realised •Model allows user to vary improvement in forecasting accuracy (specified as the difference between the accuracy with which suppliers can forecast NHH and HH volumes) •For each run, model selects a number within specified range for forecasting accuracy and calculates benefit based on linear relationship	•Input •Input standing data •Forecasting improvement

Next steps

- We will publish the model and this presentation on the Ofgem website
- We encourage stakeholders to include in their responses to the consultation any available evidence to inform our analysis
- We expect to publish our decision in Q1 2014

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