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Market-wide Settlement Reform: Outline Business Case

Business Case

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Overview

Market-wide electricity settlement reform can play a key role as the energy sector decarbonises and we move towards a smarter, more flexible energy system. It can expose energy suppliers to the true cost of supply and put incentives on them to help their customers shift their consumption to times when electricity is cheaper to generate or transport, enabling significant benefits for consumers and the energy system as a whole.

This Outline Business Case is the second of three iterations of the Business Case, which we will use to support our final decision on market-wide settlement reform and set out the arrangements for implementation. We are developing the Business Case over time, leading up to our decision on market-wide settlement reform in the second half of 2019.

This iteration presents the results of a draft economic assessment of the impact of market-wide settlement reform. It also explores the project's strategic interactions in further detail and presents our further thinking on how to ensure key players can manage and deliver the reforms successfully. The draft assessment indicates substantial potential benefits, suggesting that our decision on the project should centre on when and how, rather than whether, market-wide settlement reform should be introduced.

Context

Market-wide settlement reform is enabled by the rollout of smart metering. It builds on recent changes to mandate half-hourly settlement (HHS) for medium to large non-domestic consumers and facilitate cost-effective HHS for domestic and smaller non-domestic consumers on an elective basis.

Market-wide settlement reform is expected to enable significant benefits for consumers by putting the right incentives on those in the market to develop and offer new tariffs and innovations to help consumers manage their energy use. We want to use market-wide settlement reform to help to facilitate a smarter, more flexible energy system and empower consumers to take an active role in the energy system transition as the sector decarbonises.

This Outline Business Case is the second of our three planned iterations of the Business Case for market-wide settlement reform. We are using the Business Case to assess the case for market-wide settlement reform and support our final decision, which we expect to take in the second half of 2019. The Business Case includes an economic assessment (in draft form in this Outline Business Case) of the costs and benefits of market-wide settlement reform, as well as setting out the strategic rationale for the project and examining how best to manage and deliver reform.

We are developing the Business Case iteratively alongside a Target Operating Model (TOM) for the settlement arrangements, under development through the ELEXON-led Design Working Group (DWG), supported by a Design Advisory Board (DAB). The Business Case will also take into account Ofgem's policy development on supplier agent functions and access to half-hourly data for settlement purposes.

Associated documents

Ofgem, Consultation on access to half-hourly electricity data for settlement purposes (July 2018) https://www.ofgem.gov.uk/publications-and-updates/consultation-access-half-hourly-electricity-data-settlement-purposes

Design Working Group, Consultation on Skeleton Target Operating Models (April 2018) https://www.elexon.co.uk/wp-content/uploads/2018/04/DWG-Consultation-Skeleton-TOMs-30April2018.pdf

Ofgem, Market-wide Half-Hourly Settlement (HHS): Strategic Outline Case (February 2018) https://www.ofgem.gov.uk/publications-and-updates/market-wide-half-hourly-settlement-hhs-strategic-outline-case

Ofgem, Our strategy for regulating the future energy system (August 2017) https://www.ofgem.gov.uk/publications-and-updates/our-strategy-regulating-future-energy-system

Ofgem, Electricity Settlement Reform Significant Code Review: Launch Statement, revised timetable, and request for applications for membership of the Target Operating Model Design Working Group (July 2017) https://www.ofgem.gov.uk/publications-and-updates/electricity-settlement-reform-significant-code-review-launch-statement-revised-timetable-and-request-applications-membership-target-operating-model-design-working-group

Ofgem and BEIS, Upgrading our Energy System – smart systems and flexibility plan (July 2017) https://www.ofgem.gov.uk/publications-and-updates/upgrading-our-energy-system-smart-systems-and-flexibility-plan

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Executive Summary

Settlement reconciles differences between a supplier's contractual purchases of electricity and the demand of its customers. Generators and suppliers trade electricity in the wholesale market in half-hourly periods. Currently, most customers are settled on a 'non half-hourly' basis, as they do not have meters that can record consumption or export in each half-hour period. They are settled using estimates of when they use electricity, based on a profile of the average consumer usage (within a given Profile Class) and their own meter reads (taken over weeks and months).

Smart meters can record the amount of energy consumed or exported within every half hour of the day. This provides an opportunity to make the settlement process more accurate and timely, and act as an enabler for new products and services. These can deliver positive outcomes for consumers through lower bills, reduced environmental impacts, enhanced security of supply and a better quality of service.

We want to use smart metering and the settlement arrangements to better link suppliers' costs with the consumption of their customers, exposing the true cost of supplying and transporting electricity in any given half-hour period. This will put incentives on suppliers and other parties to develop new tariffs and innovations to help consumers to manage their consumption. We expect suppliers to offer customers the choice of whether they take these up.

We are therefore taking forward the Settlement Reform Significant Code Review (SCR) to reform the settlement arrangements. We expect that this will involve moving to half-hourly settlement (HHS) as the wholesale market trades in half-hourly periods, but we are designing the arrangements for market-wide settlement reform to be flexible to any future changes to the granularity of the market arrangements.

We expect to take a final decision on market-wide settlement reform in the second half of 2019, with changes to the relevant industry codes and implementation to follow. This decision will be supported by the final TOM[1] for the future settlement arrangements and the Full Business Case, which will set out the plan for implementation.

We are developing our Business Case iteratively, with this Outline Business Case the second of three iterations. We are using the Business Case to examine the costs and benefits of options to deliver market-wide settlement reform, following the Five Case Model[2] methodology for major project business cases.

[1] More information on the design of the TOM so far can be found on the DWG webpage: https://www.elexon.co.uk/group/design-working-group/

[2] The Five Case Model is a methodology for producing business cases for spending proposals. See Green Book guidance: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/469317/green_book_guid ance_public_sector_business_cases_2015_update.pdf

This Outline Business Case builds on our Strategic Outline Case to examine the case for market-wide settlement reform, as follows:

- **Chapter 2 (the Strategic Case)** revisits the strategic rationale for introducing market-wide settlement reform and examines the interactions between the project and other projects in more depth than in the Strategic Outline Case. It also sets out the benefits case for considering market-wide half-hourly export settlement.

- **Chapter 3 (the draft Economic Case)** assesses the potential range of costs and benefits that could stem from different options for reformed settlement arrangements.

- **Chapter 4 (the Commercial Case)** examines the commercial drivers on key players to deliver market-wide settlement reform, drawing on experience from previous implementation projects and the expertise of our stakeholders.

- **Chapter 5 (the Financial Case)** provides an update on the resource implications for developing and delivering market-wide settlement reform.

- **Chapter 6 (the Management Case)** outlines our first steps at looking beyond the decision point in the second half of 2019 to consider how the governance arrangements should work for the code modification and implementation stages. It also provides an updated plan for the first phase up until the decision point in the second half of 2019, and describes the results of a recent project assurance review.

This Outline Business Case will be followed by the third and final iteration of the Business Case, the Full Business Case, which we expect to support the decision on market-wide settlement reform in the second half of 2019. Before then, we intend to consult on a draft Impact Assessment, with the final Impact Assessment published as part of the Full Business Case. We anticipate that this draft Impact Assessment will be published for consultation in summer 2019. The exact timing of this will depend on progress made on the design of the TOM and developing positions on key policy areas, as these will be needed in order to robustly estimate the potential costs of options for implementation.

We have always said that we expect we will need to introduce HHS on a market-wide basis to realise the full benefits of settlement reform. In this Outline Business Case we have focused primarily on assessing the case for market-wide settlement reform (compared to the existing elective HHS arrangements), considering the incentives that would be placed on suppliers and the benefits that could potentially be realised as a result. Our economic assessment in Chapter 3 indicates significant potential benefits from market-wide settlement reform, by placing incentives on suppliers to help their customers to shift their consumption to times when electricity is cheaper to generate and/or transport. Our assessment analyses the impact that different levels of load shifting would have on the energy system, indicating that the benefits to consumers could be billions of pounds over the period modelled (out to 2045). We have supplemented this system-wide assessment with analysis of the more direct benefits of changing the settlement arrangements, and a draft assessment of the scope of costs of implementation.

Our analysis in this Outline Business Case suggests that our decision should centre on determining exactly when and how, rather than whether, market-wide settlement reform should be introduced, due to the magnitude of potential benefits that can be realised. We will continue to assess the economic case for market-wide settlement reform, moving our focus to the impact of different timeframes and approaches to implementation. We will refine our assessment over time, quantifying costs where possible as more certainty is developed on the design of the TOM and decisions are reached on two key policy areas: access to half-hourly data for settlement purposes and the question of whether or not to centralise functions currently performed by supplier agents.

We are seeking feedback from stakeholders on two specific points discussed in this document: half-hourly export settlement (Chapter 2) and commercial drivers on the industry to deliver market-wide settlement reform (Chapter 4). The questions are set out in the relevant chapter. To provide your feedback, please fill in the feedback form published alongside this as a supplementary document and email this to half-hourlysettlement@ofgem.gov.uk by 17 October 2018. We also welcome any further comments or feedback on this Outline Business Case.

Unless you mark your response confidential, we will publish it on our website, www.ofgem.gov.uk, and put it in our library. You can ask us to keep your response confidential, and we will respect this, subject to obligations to disclose information, for example, under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004. If you want us to keep your response confidential, you should clearly mark your response to that effect and include reasons.

If the information you give in your response contains personal data under General Data Protection Regulation (EU) 2016/679 and Data Protection Act 2018, the Gas and Electricity Markets Authority will be the data controller. Ofgem uses the information in responses in performing its statutory functions and in accordance with section 105 of the Utilities Act 2000. If you are including any confidential material in your response, please put it in the appendices.

1. Introduction

1.1. We are using the Five Case Model[3] to develop and maintain a Business Case to support the decision on market-wide settlement reform in the second half of 2019. This Business Case will be used as an aid to the decision-making process, as well as a tool for communicating with our stakeholders about the arrangements for designing and implementing market-wide settlement reform.

1.2. The Five Case Model is a framework for assessing the viability and value of spending proposals. It looks at the potential proposal from a number of different angles, setting out the strategic rationale for reform, the economic impact of reform and how best the policy proposal can be managed and delivered. It does this through examining the proposal in a set of five different 'cases':

- The Strategic Case: the strategic context for the project and our case for change. This includes the rationale for intervention and an explanation of the outcomes we are seeking to achieve.
- The Economic Case: an economic assessment of the impact (costs and benefits) of options for market-wide settlement reform. This is presented in draft form in this Outline Business Case.
- The Commercial Case: the drivers on market participants to procure and implement new systems and changes to their own systems in line with the requirements of our planned reforms.
- The Financial Case: the resources that all stakeholders, including industry and ourselves, will need to deliver the project.
- The Management Case: the actions that will be required, and by whom, to ensure successful delivery of the reforms.

1.3. We are building up the information and detail in each of these cases over time by constructing the Business Case in three iterations, shown in Figure 1 overleaf. We published the first iteration, the Strategic Outline Case, in February 2018. We aim to publish the third and final iteration, the Full

[3] The Five Case Model is a methodology for producing business cases for spending proposals. See Green Book guidance: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/469317/green_book_guid ance_public_sector_business_cases_2015_update.pdf

Business Case, in the second half of 2019 alongside the final TOM and a decision on market-wide settlement reform.

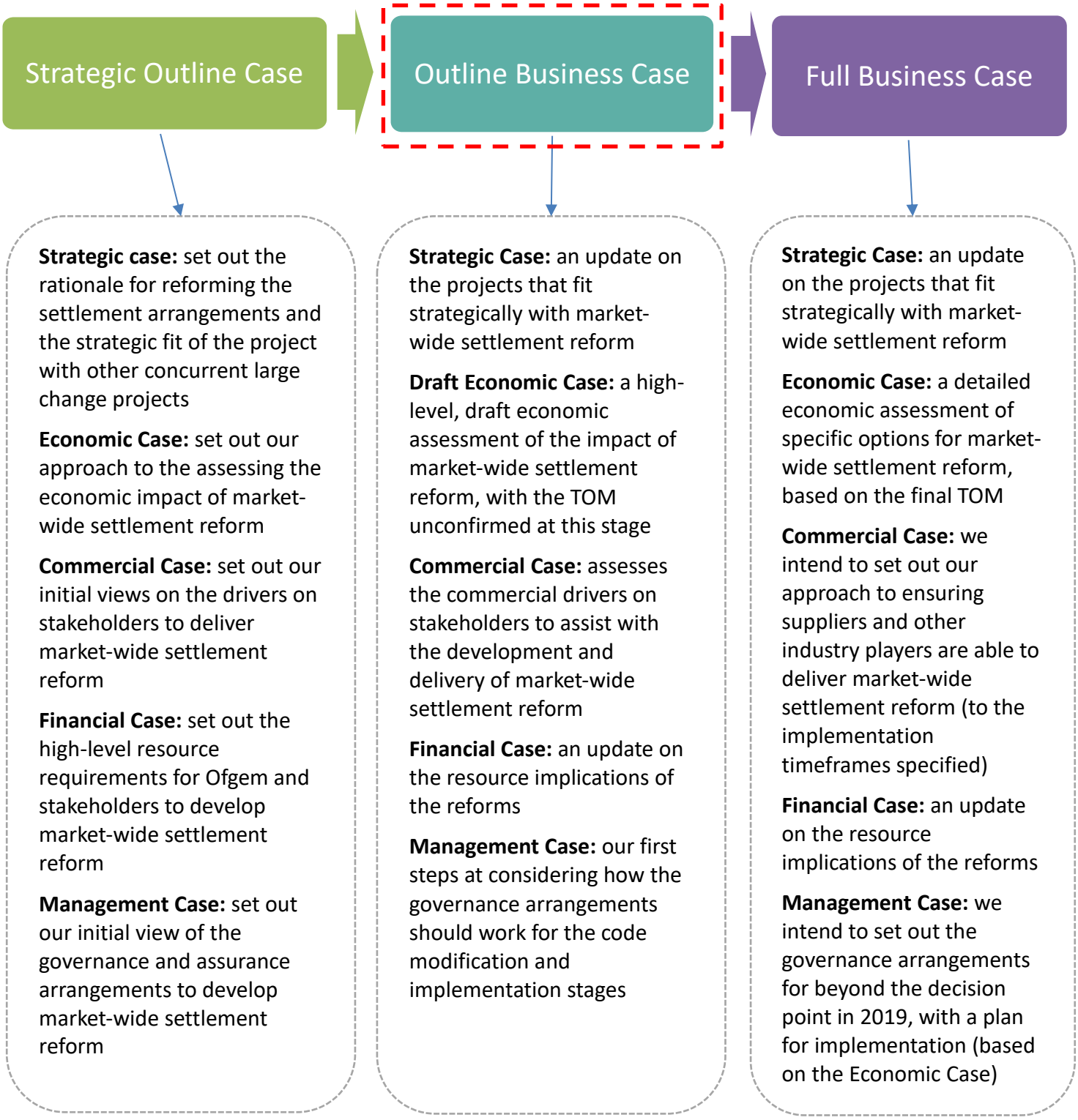


Figure 1: applying the Business Case process to settlement reform

1.4. In this Outline Business Case, we have focused largely on outlining the economic case for market-wide settlement reform (Chapter 3). The economic assessment at this stage is in draft form as the TOM is as yet undefined and there are open policy questions.

1.5. We have also used this stage of the Business Case to develop our thinking on the commercial drivers (Chapter 4) and how to manage the implementation and delivery of market-wide settlement reform (Chapter 6). Chapters 2 and 5 provide updates on the Strategic Case for market-wide settlement reform and the resource implications of running the project.

1.6. This Outline Business Case will be followed by the final iteration of the Business Case, the Full Business Case, which is planned for the second half of 2019. Prior to this, we intend to consult on a draft version of the economic assessment (in the form of an Impact Assessment) that will be presented in the Full Business Case to support our decision on market-wide settlement reform. An updated phase plan is provided in the Management Case (Chapter 6), and a detailed look at the next steps is set out in Chapter 7.

2. Strategic Case

Chapter Summary

The Strategic Case provides a more in-depth examination of the interactions between market-wide settlement reform and the dependent projects identified in the Strategic Outline Case. It also revisits the benefits, risks, constraints and dependencies of the project, and reiterates our Project Objectives. Finally, it sets out the benefits case for half-hourly export settlement and seeks views from stakeholders on this.

Strategic fit

2.1. In the first iteration of the Business Case, the Strategic Outline Case, we set out the case for changing the existing settlement arrangements and the rationale for market-wide settlement reform.

2.2. We used the Strategic Case to explore the strategic drivers for market-wide settlement reform, where it is expected to:

1) Facilitate decarbonisation and a smarter, more flexible energy system
2) Enable consumers to benefit from the energy system transition
3) Capitalise on smart metering infrastructure and previous work on HHS
4) Enable new and innovative business models

2.3. We examined the interactions between market-wide settlement reform and a number of other projects that are seeking to facilitate the energy system transition and improve outcomes for consumers.[4] These were:

- Smart metering[5]
- Network charging and access[6]

[4] See pages 10-16 of 'Market-wide HHS Strategic Outline Case': https://www.ofgem.gov.uk/system/files/docs/2018/02/market_wide_hhs_strategic_outline_case_february_2018.pdf
[5] For more information on the smart meter rollout, see: https://www.ofgem.gov.uk/gas/retail-market/metering/transition-smart-meters
[6] For more information on our reforms of network access and forward-looking charges, see https://www.ofgem.gov.uk/electricity/transmission-networks/charging/reform-network-access-and-forward-looking-charges and for more information on our Targeted Charging Review, see https://www.ofgem.gov.uk/electricity/transmission-networks/charging/targeted-charging-review-significant-code-review

- RIIO2[7]
- Future Retail Market Design[8]
- Switching Programme[9]
- Future Retail Regulation[10]

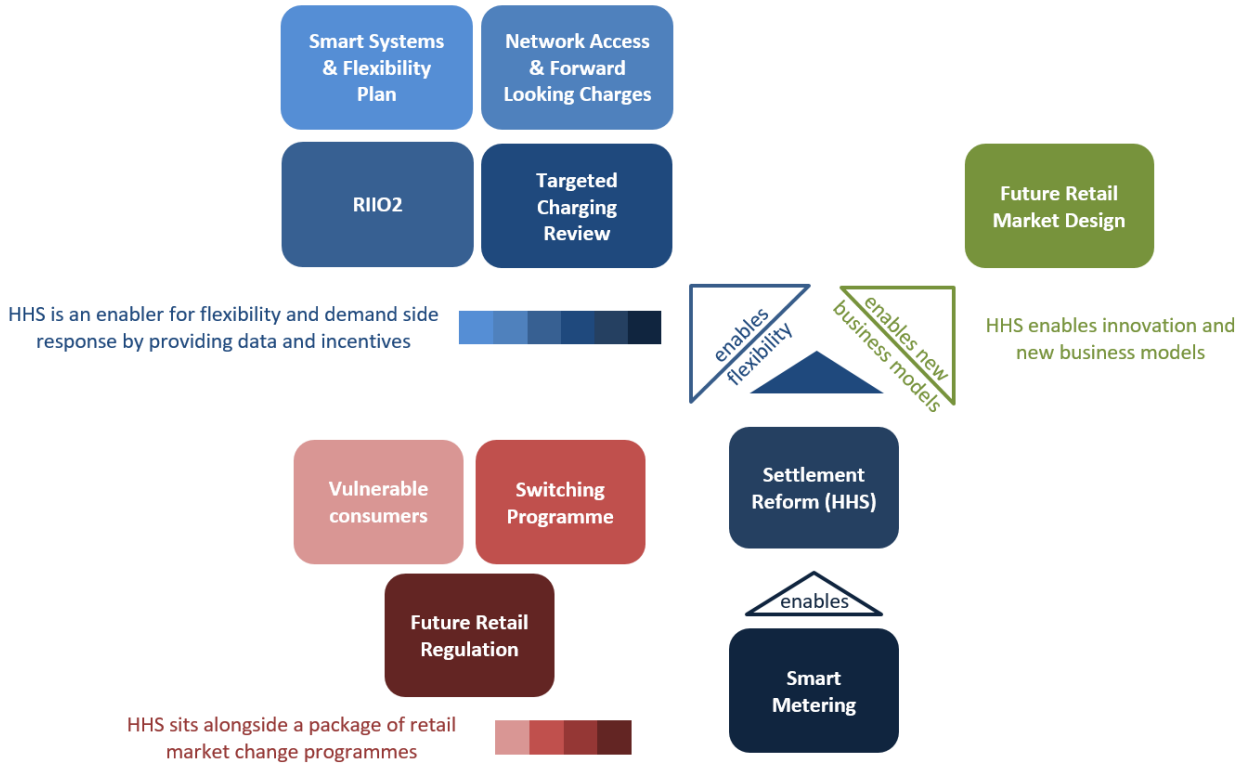


Figure 2: Settlement reform project interactions

2.4. For this Outline Business Case, we have examined the interaction between these projects and market-wide settlement reform in more detail.

[7] For more information on the RIIO2 price controls, see: https://www.ofgem.gov.uk/network-regulation-riio-model/network-price-controls-2021-riio-2
[8] For more information on our Future Retail Market Design work, see our response to our 2017 call for evidence: https://www.ofgem.gov.uk/publications-and-updates/future-supply-market-arrangements-response-our-call-evidence
[9] For more information on our Switching Programme, see: https://www.ofgem.gov.uk/gas/retail-market/market-review-and-reform/smarter-markets-programme/switching-programme
[10] For more information on our work on Future Retail Regulation, see https://www.ofgem.gov.uk/electricity/retail-market/market-review-and-reform/future-retail-market-regulation

Smart metering

2.5. Market-wide settlement reform is dependent on smart meters being available to domestic and smaller non-domestic consumers. Government has required that energy suppliers take all reasonable steps to roll out smart meters to all their domestic and small business customers by the end of 2020. Ofgem, along with the Department for Business Energy and Industrial Strategy (BEIS), is working with energy suppliers to ensure the rollout achieves the best possible outcomes for consumers. Smart meters will give consumers near real-time information on energy use, and bring an end to estimated billing. They will also open up new sources of flexibility and ways in which consumers can engage with the market. Smart meters record electricity consumption/export every half-hour of the day and can transmit this data remotely so industry can use this information for settlement.[11] It is through this functionality that consumers and industry can realise the benefits of market-wide settlement reform and that we can transition to a smarter, flexible energy system.

2.6. For most large suppliers, the number of smart meters in their customer portfolio at end of 2017 was broadly in line with their target annual milestones for the year. Suppliers' plans for 2018 indicate a modest increase in installations compared to previous years, followed by more significant ramp-ups in 2019 and 2020.[12]

2.7. We are mindful of the need for smart metering infrastructure to be in place in order to enable market-wide settlement reform, and therefore the dependency of the settlement reform timeline on the timeline for smart metering.

Network charging and access

2.8. Ofgem is currently taking forward two projects looking at the future charging arrangements for use of and access to the electricity network:

- The **Network Access and Forward-Looking Charging** project aims to provide better definition and choice of rights of access to network capacity and improve how the costs and benefits users confer on the network are signalled through charges.

[11] Subject to the rules for access to half-hourly electricity consumption data for settlement purposes, which we consulted on in July 2018: https://www.ofgem.gov.uk/publications-and-updates/consultation-access-half-hourly-electricity-data-settlement-purposes

[12] For more information on suppliers' progress against their rollout plans, see: https://www.ofgem.gov.uk/system/files/docs/2018/05/2018.05_open_letter_-_observations_from_rollout_plans.pdf

- The **Targeted Charging Review (TCR) SCR** is considering reform of the residual charging arrangements for both generation and demand to ensure they are in the interests of existing and future consumers.

2.9. Both the market-wide settlement reform SCR and the access and forward looking charging project are likely to capitalise on the capabilities of smart metering and the resulting more granular consumption data to deliver more cost-reflective market arrangements, and a more efficient outcome for the energy system and consumers. The benefits cases for both projects are closely interrelated, as HHS would be needed to enable a number of options that are under consideration for access reform,[13] while the signals produced from the future arrangements for network access would support the realisation of benefits from market-wide settlement reform.

2.10. The TCR SCR is considering a number of options for reform of the residual charging arrangements. The policy decision that is taken will influence the balance of incentives placed on network users, including suppliers, through the charging arrangements, and therefore influence the benefits case for market-wide settlement reform. If the residual charge is recovered from network users in such a way that does not send a time-related signal, it could dampen incentives on consumers to shift their consumption, or on suppliers to offer time of use products. While this may affect the extent of benefits that can be achieved, the outcome will be economically efficient if the signals to users more accurately reflect costs imposed on the system.

2.11. Collectively, the projects are seeking to enable more granular, more cost-reflective and more equitable signals to network users, including suppliers and ultimately consumers, for use of the energy system. The projects do this through seeking to make better use of existing system assets, and ensuring the right signals are sent to users of the electricity system. They are all looking to facilitate a smarter, more flexible energy system, with users' impact on the network more accurately signalled and charged for, in order to incentivise behaviour that delivers a better outcome for the system and for consumers. HHS is a fundamental building block that is required to ensure that time-based price signals for network pricing are passed through to suppliers.

2.12. The economic case for market-wide settlement reform (set out in Chapter 3) at this stage has been made based on it being a key enabler to realising the benefits of a more flexible system. These benefits have been demonstrated using evidenced assumptions for a range of potential load shifting outcomes. The load shifting that is achieved in practice will be determined not just by market-wide settlement reform but also by the future arrangements for network charging and access, and the signals that, collectively, they give to network users. We will examine the analytical interaction between these

[13] See 'Reform of electricity network access and forward-looking charges: a working paper': https://www.ofgem.gov.uk/system/files/docs/2017/11/reform_of_electricity_network_access_and_forward-looking_charges_-_a_working_paper.pdf

reforms further as we develop the Economic Case and as the direction on the charging projects becomes clearer, looking at the signals to network users, the strength of those signals, how suppliers and consumers are likely to respond and the resulting outcome for the system.

2.13. As set out in Appendix 1D[14] of our SCR launch statement, potential use of consumption data for calculating transmission and distribution network charging by suppliers and their appointed agents is within the scope of the work underway to develop the TOM for market-wide settlement reform. If network charging proposals currently being developed by Ofgem require changes necessitating a further Data Protection Impact Assessment (DPIA) or an update to the DPIA published alongside our access to half-hourly data for settlement consultation,[15] (eg access to additional types of personal data or requirement for additional parties to handle individual consumers' half-hourly consumption data beyond what is considered in the DPIA) this would be subject to further consultation.

2.14. In our TCR project, we intend to publish a minded-to decision in autumn 2018, which will set out implementation timelines and a target date for implementation. We are currently planning for April 2020 but are carefully considering views on the timescales and practical implications of any changes. We currently believe that the final phase of the TCR should be led by industry through working groups and code panel meetings.[16]

2.15. In July 2018, we published our consultation on network access reform, to seek views on our thinking on which areas should be reviewed as a priority and on how these should be taken forward.[17] Subject to consultation responses, we expect to decide whether to launch an SCR on network access reform by the end of the year. If we do, we expect we would conclude the SCR in the second half of 2020, with some changes applying from April 2022 and the remainder in April 2023. Industry-led changes on areas outside of the scope of the SCR could be implemented ahead of this.

[14] See 'Appendix 1: Significant Code Review timeline, consultation feedback summary and scope' https://www.ofgem.gov.uk/system/files/docs/2018/01/appendix_1_significant_code_review_timeline_consultation_feedback_summary_and_scope.pdf

[15] See ' Consultation on access to half-hourly electricity data for settlement purposes': https://www.ofgem.gov.uk/publications-and-updates/consultation-access-half-hourly-electricity-data-settlement-purposes

[16] We recognise that there are different notice periods for making changes to transmission and distribution charges and we will consider whether changes can be brought in at the same time, for example by considering a derogation to the 15-month notice period for changes to distribution charges

[17] See 'Getting more out of our electricity networks through reforming access and forward-looking charging arrangements': https://www.ofgem.gov.uk/publications-and-updates/getting-more-out-our-electricity-networks-through-reforming-access-and-forward-looking-charging-arrangements

RIIO2

2.16. The next network price controls, RIIO2, are seeking to ensure that the monopoly network companies have enough revenue to run a network that delivers what consumers need at an efficient cost. The price controls will need to ensure a fair return for the network companies, while also enabling the energy system transition by fostering a climate of innovation, and developing the networks in a way that is more responsive to the changes happening across the energy system.

2.17. We consulted in March 2018 on the framework for setting the RIIO2 price controls[18] and set out our decision in July.[19] Among many other proposals, the RIIO2 framework is looking at how to incentivise efficient network utilisation and how to enable whole system outcomes. The decision that we take on market-wide settlement reform, the timing for implementation of our reforms and the impact that they have on influencing the development and use of the network (particularly the granularity and accuracy of capacity requirements) will affect the approach to system development and investment that is needed by network companies in the RIIO2 price controls (and beyond). Our network charging and access reforms, referred to above, will improve information about the demand for and value of new network capacity.

2.18. The RIIO2 price control for electricity transmission is due to commence in 2021 (as well as gas transmission and gas distribution) and the price control for electricity distribution in 2023.[20] We will consider how this aligns with implementation timelines for market-wide settlement reform, and how the potential benefits from market-wide settlement reform could influence the development of the network in the 2020s.

Future retail market design

2.19. In order to ensure consumers fully benefit from the reforms underway in the energy market, and the growing opportunities for innovation across the energy system, we are examining the role that traditional energy suppliers play in the market. In November 2017, we published a Call for Evidence, seeking information on barriers to innovation, default supply arrangements for consumers that do not engage in the market, and protection for all consumers

[18] See 'RIIO-2 framework consultation': https://www.ofgem.gov.uk/publications-and-updates/riio-2-framework-consultation
[19] See 'RIIO-2 framework decision': https://www.ofgem.gov.uk/publications-and-updates/riio-2-framework-decision
[20] The potential for changing/aligning these price control periods was discussed in the March 2018 consultation and in the July 2018 decision (see footnotes 18 and 19).

regardless of how they access their energy supply.[21] We published our response to this Call for Evidence in July 2018.[22]

2.20. Our future supply work aims to enable innovative business models and propositions in the market, while also providing effective protection to disengaged consumers. Market-wide settlement reform will be a key building block in supporting these aims. To ensure that market-wide settlement reform can enable more innovation and new business models, we are adopting a design process that explores how the TOM for market-wide settlement reform can be compatible with a future where the traditional supplier may not be the primary interface all consumers have with the market.[23] The DWG have developed five skeleton TOMs with this in mind, and consulted on these in May 2018.[24] It is important that the future TOM is robust to different arrangements in the supply market and we will ensure this is the case wherever possible.

2.21. We intend to make our decision on market-wide settlement reform and the arrangements for implementation in the second half of 2019. We will continue to monitor the extent of any overlap between our work and potential reforms to retail market design, and assess how the benefits can best be leveraged and options for alternative retail market arrangements retained.

Switching Programme

2.22. In February 2018, we published the Outline Business Case for our Switching Programme,[25] setting out our decision to implement changes to the switching arrangements. This will enable faster, more reliable switching, which will in turn enable innovation and increased competition in the retail market. We would expect that the threat of losing customers means suppliers offer all their customers – including those on standard variable tariffs – a better deal.

2.23. As switching involves many of the same industry resources as settlement, particularly at smaller organisations, we, in Settlement Reform, have

[21] See 'Future of supply market arrangements – call for evidence': https://www.ofgem.gov.uk/publications-and-updates/future-supply-market-arrangements-call-evidence
[22] See 'Future supply market arrangements – response to our call for evidence': https://www.ofgem.gov.uk/publications-and-updates/future-supply-market-arrangements-response-our-call-evidence
[23] See 'Target Operating Model Design Principles': https://www.ofgem.gov.uk/system/files/docs/2018/01/updated_target_operating_model_design_principles.pdf
[24] See 'Design Working Group: Skeleton TOMs': https://www.ofgem.gov.uk/system/files/docs/2018/04/elexon_final_report_on_design_working_group_skeleton_target_operating_models.pdf
[25] See 'Switching Programme: Outline Business Case': https://www.ofgem.gov.uk/system/files/docs/2018/02/switching_programme_outline_business_case_and_blueprint_phase_decision.pdf

coordinated with our Switching Programme colleagues in order to minimise as much as possible the impact that conflicting timelines might have on industry.

Future retail regulation

2.24. We expect market-wide settlement reform, in combination with our work on future retail market design, to lead to new players, products and services in the market, increasing choice for consumers. For some consumers, for example the disengaged, new types of products and new business models may make it harder for them to engage with the market. This is why we are considering, as part of our future retail market design work, what sort of default arrangements will be necessary over the longer term.

2.25. To protect all consumers, support new market participants, and foster competition and innovation, we have committed over time to rely more on general principles rather than detailed prescriptive rules about how companies should run their businesses. Through this Future Retail Regulation work,[26] we have also strengthened the existing principles-based Standards of Conduct, to ensure they can achieve their policy intent into the future. We have also removed over 50 pages of prescriptive rules from the supply licences and introduced the SLC25 informed choices principles.

2.26. The Government response[27] to the 'MiData in Energy Call for Evidence' provides a direction for how consumers can easily access, control and share their energy data. This response, in the wider context of the National Data Strategy[28] and the Smart Data Review,[29] signals an important focus being placed upon maximising the benefits of data in the economy whilst ensuring the rights and privacy of consumers are maintained.

2.27. Market-wide settlement reform will give suppliers incentives to offer a range of new products and we expect suppliers to offer customers the choice of whether they take these up. We expect that consumers who cannot or will not engage with the market will still benefit from market-wide settlement reform as a result of the system-wide benefits it brings about.

[26] For more information on our Future of Retail Regulation work, see: https://www.ofgem.gov.uk/gas/retail-market/market-review-and-reform/future-retail-market-regulation

[27] See 'Implementing midata in the energy sector: call for evidence': https://www.gov.uk/government/consultations/call-for-evidence-implementing-midata-in-the-energy-sector

[28] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731349/20180730_HMT_Discussion_Paper_-_The_Economic_Value_of_Data.pdf

[29] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/699937/modernising-consumer-markets-green-paper.pdf

2.28. Our Settlement Reform and Future Retail Regulation teams have coordinated efforts to minimise risks to consumers in a half-hourly settled world. For example, we need to ensure that our rules support and enable clear communication of new time of use tariffs and demand response initiatives. To do this, in our current review of the rules governing supplier communications with domestic consumers,[30] we have proposed to introduce a suite of five new narrow principles to supplement the existing Standards of Conduct and SLC 25 informed choices principles.

[30] See 'Policy consultation: Domestic supplier-customer communications rulebook reforms': https://www.ofgem.gov.uk/system/files/docs/2018/05/policy_consultation_-_domestic_supplier-customer_communications_rulebook_reforms.pdf

Benefits, risks, constraints and dependencies

Potential benefits

2.29. Market-wide settlement reform will expose suppliers to the true cost of supply of their customers in every half hour period. We expect that suppliers will respond by offering an incentive to their customers (for example through a smart tariff, an incentive to use electric vehicle (EV) vehicle-to-grid functionality or other innovations) to reward them for shifting their consumption away from peak periods. A significant aggregate demand shift across the grid can deliver substantial benefits through reducing the need for generation capacity to supply peak periods and avoiding expensive network reinforcements, as well as lowering network operating costs. Using innovation enabled by HHS to reward consumers for matching their consumption with periods of high generation from renewables such as wind and solar photovoltaics (PV) can help to integrate this generation into the system and lower the carbon intensity of the GB generation mix.

2.30. Market-wide settlement reform is a key enabler for a smarter, more flexible energy system and market. It can help to realise the full benefits of smart technology, and to integrate low-carbon generation as the electricity system decarbonises and demand increases. It can help consumers to play a more active role in a rapidly changing energy system, facilitating increased uptake of EVs and storage, increases in distributed self-generation, and supporting new opportunities such as peer-to-peer trading. Consumers engaging with these new products stand to benefit directly through savings to their bills, while consumers who are less able or willing to engage will still benefit when a significant demand shift across the grid reduces overall system costs, or prevents potential increases in future system costs.

2.31. Figure 3 depicts the short, medium and long-term benefits of market-wide settlement reform. It illustrates the complex chain of cause and effect that could arise due to the change in incentives on market players from market-wide settlement reform, and the potential benefits. It highlights the uncertainties associated with the realisation of these benefits, with some outcomes certain to occur and some likely, but dependent on market dynamics, consumer response and external factors. However, we consider that market-wide settlement reform is needed to support the realisation of these benefits. As well as the system level benefits, it also highlights the more direct benefits from settlement reform, which should over time reduce barriers to market entry and enable competition and new business models.

2.32. Figure 3 should be viewed against a counterfactual where settlement for domestic and smaller non-domestic consumers remains under the non-half-hourly arrangements, with HHS on an elective basis for those that opt for this. The outcomes (such as reduced generation capacity needs and avoided network reinforcement) are therefore judged relative to this counterfactual. The ultimate outcome for the energy system and energy consumers will depend on many other factors, including those discussed in this Strategic Case and highlighted in our Strategic Outline Case.

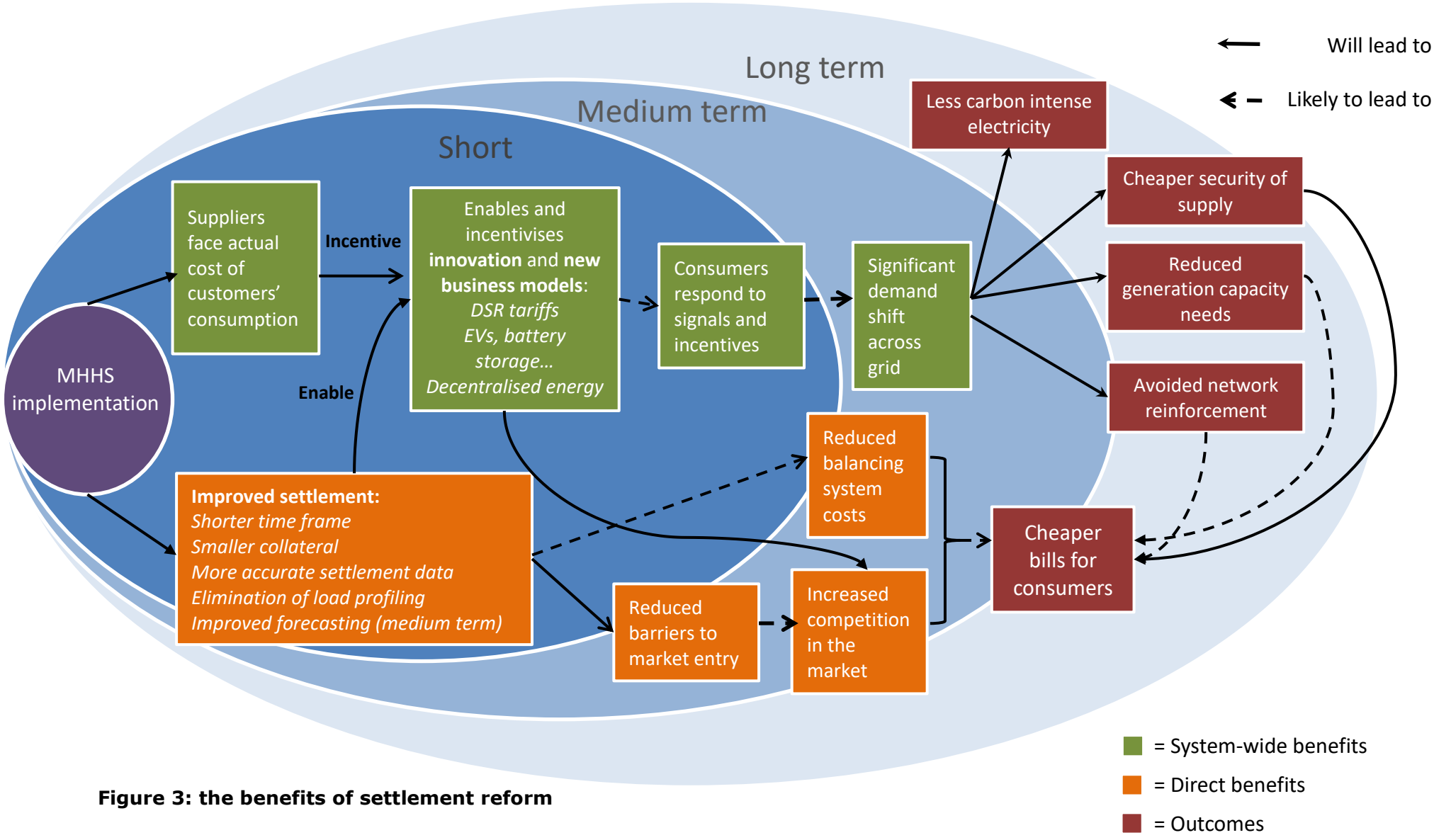


Figure 3: the benefits of settlement reform

Supporting innovation and new business models

2.33. Market-wide settlement reform can play a key role in supporting innovation through the incentive it places on suppliers to offer consumers products that can help them shift their consumption to times when electricity is cheaper to generate and transport. It is through these products, and often in conjunction with other technological changes, that market-wide settlement reform can enable new business models and drive transformation in the energy sector.

2.34. Market-wide settlement reform will give suppliers incentives to offer a range of new products like time of use tariffs and we expect suppliers to offer customers the choice of whether they take these up. Some examples of innovative tariffs that suppliers might offer or which might become more common because of market-wide settlement reform are:[31]

- **Smart tariffs:** This is a catch-all term that could refer to any of the below tariffs but which specifically does not refer to tariffs available with traditional meters, including Economy 7 tariffs.

- **Time of use (ToU) tariffs:** Unless otherwise specified, this refers to static time of use tariffs excluding Economy 7 tariffs.[32] This is where customers are charged a lower price at specified off-peak times that are consistent day to day or week to week, reflecting the fact that electricity is generally cheaper to generate and transport at these times. Some ToU tariffs could have different weekday and weekend rates.

- **Dynamic ToU tariffs:** Dynamic ToU tariffs are the same as above but where the time and/or costs of price periods are not fixed. This could vary on a week to week, day to day or even half-hour to half-hour basis.

- **Critical peak price (CPP) tariff:** These tariffs generally consist of flat price periods on most days but for a number of extreme peak days in the year, prices for specified periods within each day are far higher (usually 5-20 days in a given year aligning with system stress periods).

- **Critical peak rebate (CPR) tariffs:** CPR tariffs mirror CPP tariffs except that with CPR the consumer can get a rebate for load reductions during a specific period on relevant days relative to an estimated baseline consumption level. Those who cannot reduce demand will not pay any more for consumption during the peak period, while those who can will save.

[31] This list is an illustrative list of potential tariffs enabled by HHS, rather than exhaustive.
[32] Economy 7 tariffs charge lesser rates during night and greater rates during the day (or peak) time, however, this tariff does not need a smart meter but a specialised (and less advanced) Economy 7 meter.

- **Direct load control tariff:** A tariff where the consumer pays a lower than average flat rate but in return agrees to some direct load control by their supplier at specific time periods when load is turned down. The consumer would need a smart device(s) installed, which would be remotely operated by the supplier with customer consent or with agreed customer manual intervention.

Electric vehicles

2.35. EVs currently represent a small but rapidly growing part of the transport market, and widespread deployment of EVs by the late 2020s seems highly likely.[33] EV costs have fallen faster than expected, with further cost reductions expected in the near future. Some commentators consider that total ownership costs of EVs are already comparable with internal combustion engine vehicles and purchase price parity could be achieved as early as the next few years.[34] As market-wide settlement reform will likely lead to a far greater smart tariff and demand-side response (DSR) product range, EV owners in particular can benefit from the savings these tariffs offer consumers for charging their vehicles at off-peak times. Similarly, suppliers will also be incentivised to offer EV owners competitive propositions for any excess electricity stored in their EV at peak or otherwise grid-stressed times, should EV vehicle-to-grid functionality become a feature of the energy system. These advantages could potentially deliver significant potential cost savings for EV owners, leading to faster EV uptake, itself driving upfront EV costs down as manufacturers expand supply and take advantage of economies of scale.

2.36. Market-wide settlement reform makes EV-related DSR more likely due to the expected increase in smart tariffs offered by suppliers. National Grid's 2018 Future Energy Scenarios all predict significant EV take-up, with peak demand reduction due to off-peak charging of up to 32GW and peak demand reduction from vehicle-to-grid of up to 8GW in 2040, under some scenarios.[35] If the flexibility that National Grid predicts in this scenario can be realised, the financial savings to households of not having to pay for new generation capacity and network reinforcement could be significant, as we have shown in the draft Economic Case.

[33] https://www.ofgem.gov.uk/system/files/docs/2018/07/ofg1086_future_insights_series_5_document_master_v5.pdf

[34] For example, Green Alliance report 'How the UK can lead the electric vehicle revolution': http://www.green-alliance.org.uk/resources/How_the_UK_can_lead_the_electric_vehicle_revolution.pdf and DNV GL's inaugural 'Energy Transition Outlook': https://www.dnvgl.com/news/world-energy-demand-to-plateau-from-2030-says-dnv-gl-s-inaugural-energy-transition-outlook--99848

[35] Section 4.4, Transport demand, of National Grid's Future Energy Scenarios, http://fes.nationalgrid.com/media/1363/fes-interactive-version-final.pdf

2.37. Evidence from early adopter trials suggests most EV charging currently happens at home and at peak.[36] Market-wide settlement reform can help to ensure EVs are incentivised to charge at times when there is sufficient generation and network capacity. Without market-wide settlement reform, the cost of integrating EVs into the grid would be unnecessarily expensive, and would lead to higher costs for all consumers, slow the UK's rate of decarbonisation and make ensuring consistent supply much more expensive. In the draft Economic Case, we have tested four additional sensitivities to our modelling, of which one is the benefits of shifting EV demand.

2.38. We are designing our TOM to be compatible with a future where the traditional supplier may not always be the interface with the consumer and robust to alternative retail market arrangements. One way in which this may differ from the present is through a multi-supplier arrangement. ELEXON has already begun to look at this possibility from its perspective as Balancing and Settlement Code (BSC) manager.[37] This could allow consumers to have one supplier for their home, one for charging their EV and potentially another for selling electricity from their EV to the grid, allowing consumers to exert more competitive pressure on suppliers through finding the best deals.

Battery storage and distributed generation

2.39. Market-wide settlement reform can support take-up of domestic battery storage by delivering the types of tariffs and products to make battery storage viable, as well as providing a means by which to leverage the potential of distributed generation. A key consideration for consumers when choosing to purchase battery storage devices and distributed generation – usually in the form of solar PV – is their return on investment. Through the expected significant increase in smart tariff choice due to market-wide settlement reform, these products will likely become more financially attractive to consumers as HHS enables them to make an income from exporting unused energy to the grid during peak periods and provides more opportunities for price arbitrage between periods through ToU tariffs. More consumers will be able to consider purchasing or otherwise obtaining these products as a result of HHS.

2.40. Such products could come in the form of, for example, tariffs associated with solar panels and other forms of microgeneration, EVs and in-home batteries. For example, a consumer could switch to a ToU tariff that was bundled with a battery and consumer access device, providing analysis of consumption and

[36] Research by Scottish and Southern Energy Networks as part of the 'My Electric Avenue' project suggests that EVs like the Nissan LEAF "can result in a near doubling of evening peak load for a household", http://www.electricnation.org.uk/wp-content/uploads/2017/11/14-How-will-the-growth-of-electric-vehicles-impact-the-grid.pdf

[37] See ELEXON's white paper 'Enabling customers to buy power from multiple providers': https://www.elexon.co.uk/wp-content/uploads/2018/04/ELEXON-White-Paper-Enabling-customers-to-buy-power-from-multiple-providers.pdf

export as part of the contract. Although upfront costs of these products are expected to continue to fall into the future, the cost at present might not make them viable for some consumers.[38]

2.41. Not moving to market-wide settlement reform would reduce take-up rates, increase operating costs, slow reductions in upfront costs, and lengthen return on investment periods for battery storage and distributed generation, and subsequently slow down the rate of decarbonisation. Conversely, market-wide settlement reform could make batteries and distributed generation more viable sooner than would otherwise be the case.

2.42. There are potentially significant benefits for consumers from combining battery storage with products and innovations enabled by HHS, but we recognise that these solutions come with an upfront cost. Market-wide settlement reform aims to help with this issue by putting incentives on the market to bring about solutions. For example, local authorities, housing associations and community schemes could take advantage of their own scale and the market opportunities provided by HHS-enabled price signals and deploy this technology, allowing consumers to pool the cost of the upfront investment.

Peer-to-peer trading

2.43. Peer-to-peer trading (P2P), also known as P2P networks, are ones where consumers trade electricity directly with one another. Demand for this interaction is driven by the possibility of making savings (by purchasing energy from P2P arrangements at times when it is cheaper than traditional supply tariffs), providing a market for owners of distributed generation to earn return on exported energy. Demand for P2P has primarily arisen due to the increase in distributed generation in consumers' homes.

2.44. Market-wide settlement reform will likely lead to more consumers purchasing solar panels, battery storage and EVs with vehicle-to-grid functionality, and more suppliers offering smart tariffs. This will likely increase the demand for P2P arrangements as consumers look to take advantage of these platforms to earn a return on their investment or make savings in their energy costs. As market-wide settlement reform exposes suppliers to the true cost of their customers' consumption, this will incentivise market participants to introduce P2P platforms for consumers to trade localised/decentralised energy instead of consuming energy sourced from traditional supply arrangements. ELEXON has investigated regulatory barriers to P2P previously,[39] while Ofgem is continuing

[38] See the Carbon Tracker's report 'Expect the Unexpected: The Disruptive Power of Low-Carbon Technology': https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/collaborative-publications/Expect-the-Unexpected_CTI_Imperial.pdf

[39] See ELEXON's paper 'Potential BSC impacts of new technologies and business models': https://www.elexon.co.uk/documents/groups/panel/2018-meetings/279-june/279-14-potential-bsc-impacts-of-new-technologies-and-business-models/

to consider any barriers to P2P arising from settlement, as part of our TOM design work.

2.45. Without market-wide settlement reform, the majority of domestic and small non-domestic customers will likely remain on non-half-hourly arrangements, limiting the incentives for market participants to develop and offer P2P arrangements. As suppliers will not be exposed to the true cost of their customers' supply, the opportunities to create value by responding to price signals at times of high system demand and/or usage will be limited.

Smart appliances and automation

2.46. Smart appliances are those that enable consumers to participate in DSR. For example, fridges or freezers that are able to turn off for short periods without affecting food quality, or washing machines, dishwashers or tumble dryers that can be programmed to turn on at off peak times. Market-wide settlement reform will increase the opportunities for domestic and non-domestic consumers to participate in DSR with their smart appliances by leading to an increase in the number of smart tariffs available. Consumers can then be financially rewarded for shifting their consumption to off-peak times.

2.47. Evidence suggests that the automation that these devices enable can substantially increase the amount of consumption that is shifted. Some studies have suggested that this can be up to three times that of non-automated appliances.[40] This can lead to much greater financial savings for consumers.

2.48. The impacts on smart appliances of not having market-wide settlement reform, relative to having it, are the same as those listed for batteries and distributed generation. A key second order consequence of these impacts is that innovation in products and services based around automation is likely to be reduced because their target market is smaller and less dynamic. This would mean more sophisticated automation-based products would likely take longer to come to market, reducing the demand shift and savings which would otherwise benefit consumers.

Dynamic ToU tariffs and combinations with other innovations

2.49. For those consumers who have invested in an EV, distributed generation and smart appliances, the combination of these with automation and competitive smart tariffs would likely increase the potential size of financial savings considerably. For this market segment, new products from suppliers and third

[40]See DECC's report 'Demand Side Response in the domestic sector – a literature review of major trials':
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48552/5756-demand-side-response-in-the-domestic-sector-a-lit.pdf

party intermediaries would also help these consumers increase their savings potential.

2.50. Savings are not the only driver of such investment behaviour. Purchasing an EV and solar installation shows that some consumers are willing to invest in more environmentally conscious products, and shifting consumption to off-peak times would also help this. For these consumers, as well as for those who either have more appetite to engage in DSR or who have automated energy systems in their premises, dynamic ToU tariffs might enable additional savings. Some suppliers will likely want to take advantage of market-wide settlement reform to offer products with a unique selling point, such as dynamic ToU tariffs. The dynamic element of these tariffs could be driven by times of particular grid stress eg due to times of high renewable generation, allowing consumers to use greater amounts of renewable electricity and also reducing curtailment. This could become more important as more and more renewable sources of generation are added to the grid.

2.51. The innovations likely to arise, at least in part thanks to market-wide settlement reform, could themselves also facilitate further innovations when combined with the effects of other change programmes, for example our Switching Programme. This could come in the form of, for example, automated switching combined with automation of smart appliances and distributed generation or battery storage in the home, which could reduce the return on investment times of these products. This combination could also increase the effects of price competition on suppliers in the electricity market, as ever larger numbers of consumers rapidly switch from one supplier to another, with relatively little hassle.

2.52. Fewer dynamic ToU tariffs and similar propositions are likely to come to market without market-wide settlement reform. As such, fewer consumers would be likely to benefit from them and the benefit to the overall energy system from load shifting would be less. This could reduce the ability of the grid to cost-effectively cope with more renewable generation, which would lead to a more expensive and more carbon intense electricity generation system.

Potential risks, constraints and dependencies

2.53. In the Strategic Outline Case, we identified a number of interactions that either present risks to the delivery of the project, are critical dependencies or could constrain the realisation of the project's benefits. These were:

- *Smart metering*: the implementation of market-wide settlement reform, and the scale of benefits that can be achieved, depends on the rollout of smart meters, with a critical mass of smart meters needed to realise the full benefits of market-wide settlement reform. The scale of benefits from market-wide settlement reform will also depend on the levels of data available for settlement, based on the rules under which suppliers access their consumers' half-hourly data, which we consulted on in July 2018.

  At this stage, we have kept our analysis in the draft Economic Case high level. We intend to develop the Economic Case in the Full Business Case, using our best available information and the decision that we take on the rules for suppliers' access to consumers' half-hourly data for settlement purposes, to assess the economic impact of different timescales and approaches to implementation. This will take into account the smart meter rollout, and will inform the development of our plan for implementation, which we will present through the Management Case.

- *The market and consumer response*: realising the potential benefits of a flexible energy system enabled by market-wide settlement reform will depend on the nature of the incentives that are placed on the market through the settlement arrangements, and the market and consumer response to those incentives. This in turn will depend on factors such as the state of competition in the market, the environment for innovation and the value of flexibility stemming from wholesale price variations and network charges. The benefits that can be realised through increased flexibility enabled by market-wide settlement reform will also depend on whether suppliers and other energy/service providers are able to establish new products and services making use of customers' smart meter data,[41] the take-up rate of these offerings by consumers and the extent of their resulting load shifting behaviour.

  Our assessment in the draft Economic Case demonstrates the significant benefits of a more flexible electricity system (for which market-wide settlement reform is a key enabler). It does this through scoping out the potential range of load shifting outcomes that could result. The assumptions that inform this analysis have been built from estimates of take up of ToU tariffs and load shifting potential, taken from relevant studies. The outcome that is enabled by market-wide settlement reform therefore is likely to fall

[41] In line with the Data Access and Privacy Framework

within the range that has been analysed, which is discussed in the draft Economic Case.

- *Ofgem, industry and other stakeholders' resource constraints*: the success of our approach to designing and implementing market-wide settlement reform relies on stakeholders' engagement and ability to resource the project. The project is developing alongside a number of other change projects looking to transform the retail market, and relying on stakeholders' participation and engagement to do so. The project is therefore dependent on managing the resources that stakeholders can put towards developing the TOM, working on the necessary code modifications and implementing the changes required to transition to market-wide settlement reform.

  We have been working to understand and mitigate resources challenges resulting from running several concurrent change projects, by building this into our forward timeline for the project, aligning our plan for the project with those of others projects and speaking to our stakeholders to better understand their resource considerations. We will continue to develop our thinking and seek views on how best to manage the code modification and implementation stages, and build this into our plan for implementation in the Management Case.

- *Policy interactions and external factors:* there are a number of concurrent policy projects which present both risks and opportunities to the realisation of benefits from market-wide settlement reform, and external factors that could constrain the project.

  We have discussed the interaction with these projects in depth in this Strategic Case. The direction taken on each of these projects will affect the balance of signals that suppliers and consumers face, and potentially the scale of the benefits that can be realised through market-wide settlement reform. We will continue to examine the interaction between market-wide settlement reform and these projects, and, where there is an analytical overlap such as with projects on network charging, will develop our analysis of this using the Economic Case in the Full Business Case.

Project Objectives

2.54. We first outlined the objectives for our project in September 2017, and published a version of these with minor edits in the Strategic Outline Case. Objective 1 puts the project in the wider context of achieving organisational and government aims to support the transition to a low-carbon, smarter, more flexible energy system that delivers positive outcomes for consumers. Objectives 2 and 3 are specific to the outcomes that we are looking to achieve from changes to the settlement arrangements. These objectives align both

with Ofgem's regulatory stances[42] and our principal objective[43] to protect the interests of existing and future consumers, as well as our aim set out in our strategy for regulating the future energy system.[44]

2.55. We will continue to revisit and assess these objectives as the project develops, to ensure they remain fit for purpose.

No.	Project Objective	Measures
STRATEGIC ENERGY SYSTEM TRANSFORMATION OBJECTIVE		
1	To promote an electricity system that delivers the Government and Ofgem's objectives in a cost-effective manner, minimising the overall cost to current and future consumers of moving to a low-carbon electricity system while maintaining security of supply and system efficiency by:	
A	Minimising the need for infrastructure investment.	Lower 'peak' demand[45] (either national or local) in comparison to what would otherwise be the case
B	Facilitating more efficient use of generation assets and network assets.	Increase in use of low-carbon assets measured against predicted baseline.
OBJECTIVE SPECIFIC TO SETTLEMENT ARRANGEMENTS		
2	To develop settlement arrangements that incentivise all retailers and suppliers (current and future) to encourage customer behaviour (electricity demand) that contributes to a more cost-effective electricity system by:	
A	Linking future retailers' costs to their customers' actual consumption within the course of a day.	The proportion of customers settled in a manner that specifically links retailers' settled costs to customers' consumption. Evidence of new/changing retail offerings or business models that can be specifically identified as being dependent on settlement costs that vary with customers' consumption.
B	Encouraging new and disruptive business models (from current retailers or new entrants) through settlement arrangements that facilitate competition in new areas.	
3	To minimise undesirable distributional effects on consumers	

Figure 4: Project Objectives

[42] Ofgem's regulatory stances are set out on our website: https://www.ofgem.gov.uk/publications-andupdates/ofgems-regulatory-stances

[43] See 'Powers and duties of GEMA': https://www.ofgem.gov.uk/publications-and-updates/powers-andduties-gema

[44] In our strategy for regulating the future energy system, our overall aim is to ensure a regulatory framework that drives innovation, supports the transformation to a low carbon energy system and delivers the sustainable, resilient, and affordable services that all consumers need. More information can be found here: https://www.ofgem.gov.uk/publications-and-updates/our-strategy-regulating-future-energy-system

[45] This also seeks to capture better matching of demand and supply when supply is plentiful, for example during times of high wind or solar PV output

Export settlement

2.56. Export data is defined in Ofgem's licence conditions as "the flow of electricity from an eligible installation onto a distribution system or transmission system"[46]. Consumption and export are metered separately, so there are separate MPANs for consumption and export where this occurs in the same location.

2.57. Export settlement is in scope of the current Settlement Reform Significant Code review (SCR), as was stated in the SCR launch statement.[47] This section of the Outline Business Case sets our views on the potential costs and benefits of moving to market-wide half-hourly export settlement.

The rationale for settlement of export

2.58. Under the BSC it is optional to register and settle export from generation that is exempt from the requirement to hold a generation licence. If a non-licenced generator decides to be registered[48] into settlement, it has to be settled half-hourly when the capacity of the installation is greater than 30kW. Where the installation is 30kW or less, it can be settled half-hourly or non half-hourly.

2.59. The majority of small scale generation is currently not registered into settlement. This includes export under the existing Feed-in Tariffs (FITs) scheme as well as export from other sources not included in FITs.[49] As a consequence, the majority of small scale export is spilled onto the distribution network without being metered. This electricity must still be accounted for in the settlement process as it has an impact on the amount of electricity allocated to parties through settlement.

2.60. The unmetered export that is spilled onto the distribution network system has some negative effects. It is reallocated to suppliers operating within a Grid Supply Point Group (GSPG) via the GSPG Correction process, potentially causing cross-subsidies. This spill has a significant impact on suppliers' ability

[46] See 'Standard conditions of electricity supply licence': https://epr.ofgem.gov.uk//Content/Documents/Electricity%20Supply%20Standard%20Licence%20Conditions%20Consolidated%20-%20Current%20Version.pdf

[47] The scope of the SCR is set out in Appendix 1D of the SCR launch statement, with the addition that remaining non-half hourly unmetered supplies also be included in the scope for the TOM design. Specifically, Appendix 1D lists settling export as an area for reform with possible interventions to the Balancing and Settlement Code export and FIT rules.

[48] This would be done by either the generator itself if it is a BSC Party or by the generator authorising a BSC Party to be responsible for their export.

[49] Currently, the FITs scheme is available for the following technologies and capacities: solar PV (up to 5MW), wind (up to 5MW), micro combined heat and power (up to 2kW), hydro (up to 5MW) and anaerobic digestion (up to 5MW)

to forecast and purchase energy accurately, and could require more network investment to manage.

2.61. BEIS is responsible for the FITs scheme and is currently in the process of reviewing it and considering future options for small scale generation to compete independent of direct subsidy and on its own merits on a level playing field with other electricity generation technologies.[50]

2.62. Modelling undertaken by ELEXON in 2016 using 2015 FIT register data as part of the Settlement Reform Advisory Group showed that the spill from unmetered export is estimated to have been between 0.7 and 1 TWh in that year.[51] ELEXON recently updated the model using 2016 FIT register data and found that the estimated unmetered export had increased to between 1 and 1.2 TWh in 2016. In some networks, the volume of unmetered export can be substantial.

2.63. Since the introduction of the FIT scheme in 2010, there have been approximately 800,000 FIT generators installed (confirmed on the Central FIT Register as at March 2018)[52]. Even though deployment has slowed significantly, we expect this number to continue to increase. We also expect the export from other non-FIT 'behind the meter' sources to increase over the coming years, due to increases in the number of EVs, battery storage and other appliances that might facilitate electricity export in the future.[53] We think that the impact of the negative effects described above will increase over time, increasing the impact on the system by making balancing more difficult and expensive and by decreasing the accuracy of allocation of electricity volumes in the long term.

2.64. If all export was metered and settled there would be more accurate settlement and the arrangements would better reflect the impact that generation has on the networks.

The benefits case for market-wide half-hourly settlement of export

2.65. Smart meters present an opportunity to tackle the issue and to make settlement more accurate and cost-reflective, as they can record and send remotely the amount of energy exported within every half-hour period.

[50] See BEIS' July 2018 'Consultation on the Feed-in Tariffs scheme': https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/726977/FITs_closure_condoc_-_Final_version.pdf
[51] See Page 3, Paragraph 4.2 of ELEXON's work on modelling export spill: https://www.elexon.co.uk/wp-content/uploads/2015/11/02_SRAG_03_01-FiTs_Spill_v1.0.pdf
[52] Page 5 of https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/726977/FITs_closure_condoc_-_Final_version.pdf
[53] Pages 21-26 of this document

2.66. Our view is that HHS of export on a market-wide basis would help to realise the full benefits of market-wide settlement reform by:

- increasing the accuracy of allocation of electricity volumes,
- increasing the accuracy and efficiency of balancing at distribution network level, and
- increasing suppliers' ability to forecast and purchase energy accurately, reducing their costs related to imbalance position and wholesale energy prices.

2.67. We would expect suppliers to pass these cost savings onto consumers in the form of cheaper bills.

2.68. From a policy point of view, it would also facilitate the implementation of future policy relating to sites with small-scale low-carbon generation, based on real electricity generation data rather than on estimates. This could incentivise export of electricity when the system needs it and prices are higher, reducing system balancing costs and wholesale prices, and potentially reducing consumers' bills.

2.69. Finally, it would introduce an incentive for suppliers to reward consumers who export energy at times that are more beneficial for the system. This would incentivise and enable innovation and new business models, helping the viability of small scale generation, making it more attractive and economically viable. We have discussed how market-wide settlement reform supports innovation in the Strategic Case (pages 21-26).

2.70. We recognise that there are also costs related to market-wide HHS of export. These include: the registration of export sites (by assigning an export MPAN) which have previously not been registered for settlement under the BSC, the registration of new export sites and ongoing costs related to settling export sites. Smart meters enable the recording of export data, so there should not be extra costs related to metering.

2.71. It is worth noting that under the current FIT scheme, customers are paid on the basis of deemed export levels[54] where it is not practical or possible to measure export meter readings.[55] Thus, where an export capable meter (for example a smart meter) is installed, export from the FIT generator should no

[54] Currently 50% of total generation for solar, wind and anaerobic digestion; and 75% for hydro.
[55] Schedule A to standard condition 33 of the Electricity Supply Licence.

longer be deemed.[56] This may reduce or increase the FIT payment that a customer receives compared to those under deemed payments. Settling export on a half-hourly basis would not impact whether a customer receives actual or deemed payments, as the obligation on the FIT supplier to make payments on actual metered exports is triggered by the installation of the export meter.

What are your views on the potential costs and benefits of half-hourly settlement of export? What are the risks and opportunities? Please send us your responses to the questions we have set out below by 17 October 2018 using the feedback form provided alongside this Outline Business Case. If responses are not marked as confidential, we will publish them on our website. We will consider these comments and use them to inform our next steps on half-hourly export settlement.

1. Do you agree with the scope of the costs and benefits of half-hourly export settlement that we have outlined? Are there any costs or benefits that we might have overlooked?

2. What are the impacts for your organisation of implementing market-wide half-hourly export settlement?

3. What are the impacts for consumers of implementing market-wide half-hourly export settlement?

4. What are the impacts for small scale generators of implementing market-wide half-hourly export settlement?

[56] Except where a FiT Order signed by the Secretary of State allows otherwise. Installation of smart meters mean it is possible to measure the export from a FIT installation and therefore triggers a requirement for the FIT generator to be paid based on metered rather than deemed export. The energy industry are working towards this and Ofgem is monitoring progress by industry in achieving compliance. See Page 53, Paragraph 6.47 of Ofgem's 'Guidance for Licenced Electricity Suppliers': https://www.ofgem.gov.uk/publications-and-updates/feed-tariffs-guidance-licensed-electricity-suppliers-version-10/.

3. Draft Economic Case

Chapter Summary

The draft Economic Case sets out our initial assessment of the impact of settlement reform. It analyses the case for market-wide settlement reform compared to elective HHS (the counterfactual) based on the incentives that are placed on the market.

It does this firstly by considering the potential benefits for GB from a more flexible energy system. It does this by using a GB power market model (the Dynamic Dispatch Model[57] (DDM)) to demonstrate the potential significant benefits of a more flexible energy system, enabled by market-wide settlement reform. The model seeks to quantify the benefits from levels of load shifting.

The draft economic case also takes account of the difficult to quantify benefits, such as increased competition and innovation and improved quality of service for customers which we expect would result from the move to a more flexible energy system. The draft economic case then considers the extent to which market-wide settlement is a necessary enabler to achieve these benefits compared with the counterfactual.

The case also considers the (likely to be easier to quantify, but smaller) direct benefits and costs from moving to market-wide settlement.

The draft economic case has been developed from the best available evidence for us at this moment in time. We recognise that at this stage, with the TOM yet to be completely defined and open policy questions, it is not possible to estimate all of the impacts of market-wide settlement reform. We will continue to refine the assessment over time moving towards the Full Business Case. However, as one of several key enablers for a more flexible system, there will always be significant benefits (for example of innovation and impact on competition and improved outcomes for consumers from the retail market) that it will not be possible to quantify and/or attribute solely to market-wide settlement.

Our assessment outlines a strong benefits case for settlement reform on a market-wide basis compared to the expected scale of costs, and indicates that our focus should now move to the questions of when and how to implement market-wide settlement reform.

[57] For further information on the DDM, see: https://www.gov.uk/government/publications/dynamic-dispatch-model-ddm

Analytical approach

The development of the Economic Case

3.1. In the 5 Case Model, the Economic Case is used to identify and appraise a range of options to achieve the Project Objectives (set out in the Strategic Case). The economic assessment is used to demonstrate that the policy proposal optimises value for money and creates material benefits for consumers. It is ultimately used to determine a 'preferred option' that can be taken forward and implemented.

3.2. We have begun this appraisal for settlement reform by conducting a mixture of qualitative and quantitative assessment, highlighted in Figure 5 overleaf. A long list of options was first identified, with this long list whittled down to a short list (including a 'preferred way forward'). This narrowing of options is a qualitative process, achieved by assessing the options against the Project Objectives and a set of five 'Critical Success Factors', which ask how well an option has/delivers:

1. Strategic fit and business needs. For market-wide settlement reform, this relates to how well the option facilitates a smarter, more flexible energy system and the option's alignment with the strategic direction of related policy projects (discussed in Chapter 2).

2. Potential value for money. For market-wide settlement reform, this relates to the anticipated benefits of the option, when weighed against the expected costs.

3. Potential achievability. For market-wide settlement reform, this relates to the acceptability of the option for stakeholders, and whether the option is operationally feasible.

4. Supply side capacity and capability. For market-wide settlement reform, this relates to the industry's ability to deliver the necessary systems and process changes to enable settlement reform.

5. Potential affordability. For market-wide settlement reform, this relates to the extent to which both Ofgem and the industry can afford to develop and implement the option, and to maintain the settlement arrangements in the long term.

3.3. Once identified, this short list of options can then be subjected to cost benefit analysis to determine the option that optimises public value (the preferred option). For market-wide settlement reform, this means the option that best optimises value for money and delivers material benefits for consumers. The assessment is quantitative where possible, although for settlement reform there are a number of costs and benefits that are either difficult to quantify or cannot be quantified, and these are assessed qualitatively. The process of assessment is summarised in Figure 5.

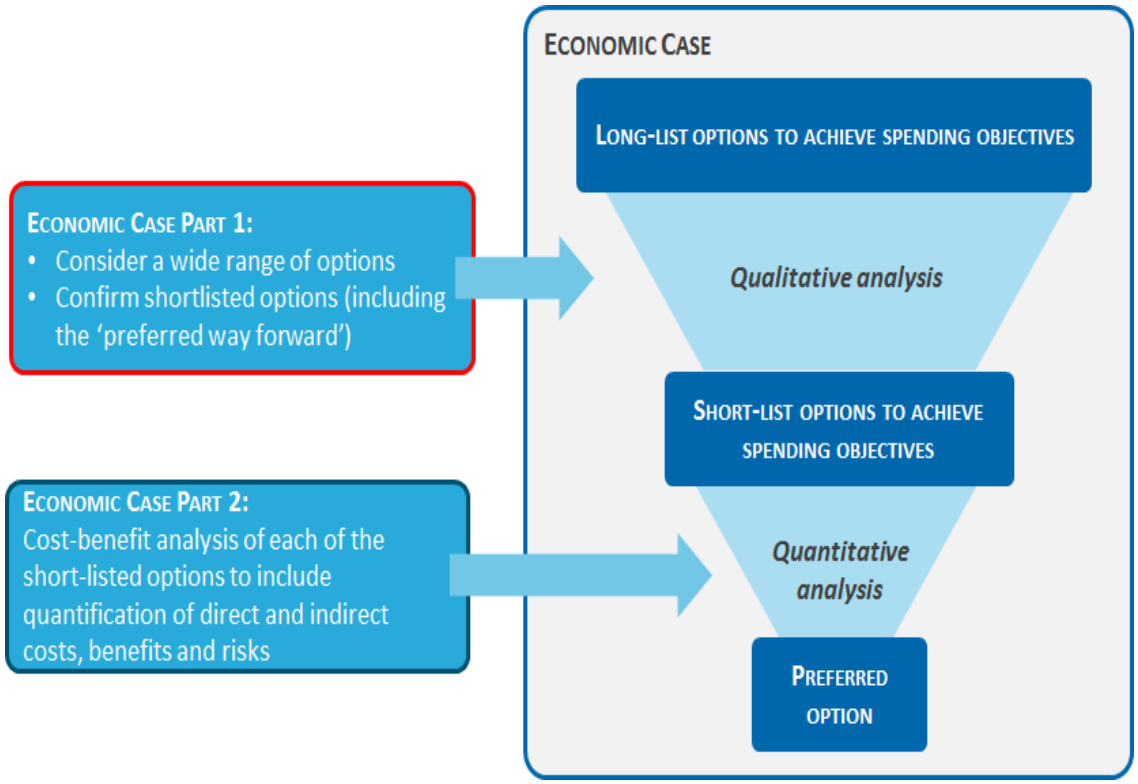


Figure 5: the Economic Case process

3.4. For settlement reform, we are developing the economic assessment iteratively, recognising the ongoing development of the policy and design workstreams, and the interactions between these different workstreams.

3.5. We set out the first steps at the qualitative options assessment in a document published in September 2017.[58] In the Strategic Outline Case, we used the Economic Case to outline our intended approach to assessing the economic impact of market-wide settlement reform. The actual assessment will take place in the last two iterations of the Business Case, as follows:

- Outline Business Case: a **high-level, draft economic assessment** of the impact of market-wide settlement reform. The draft Economic Case assesses the high-level case for market-wide settlement reform compared to elective HHS (the counterfactual). It presents a range of likely impacts, to outline the scale and materiality of the expected costs and benefits. We have not conducted a more detailed assessment against specific options for settlement reform at this point, with the TOM yet to be finalised and open policy questions around

[58] See 'Project Objectives and Assessment Options for the market-wide half-hourly settlement Business Case': https://www.ofgem.gov.uk/publications-and-updates/project-objectives-and-assessment-options-market-wide-half-hourly-settlement-business-case

access to half-hourly data for settlement purposes and the question of whether or not to centralise functions currently performed by supplier agents.

- Full Business Case: an **economic assessment** of specific options for settlement reform, including the timing and phasing of implementation. These options will be determined using the output from the qualitative assessment process so far (see Appendix 1) and any further refinement of this assessment that is possible by the Full Business Case stage. The specification of options will take into account policy positions on access to half-hourly data for settlement purposes and the question of whether or not to centralise functions currently performed by supplier agents. This economic assessment will resemble an Impact Assessment. **We will consult on a draft Impact Assessment before the final version is presented as part of the Full Business Case.**

Analytical challenges

3.6. The case for market-wide settlement reform is complex. We are looking to use the settlement arrangements to change the balance of incentives for those in the market, but the response of the market and the behavioural response of consumers is uncertain and will depend on factors outside the scope of this project. We expect that introducing a new set of incentives into the market and redefining the settlement process will have a range of potential competition effects, but these are challenging to predict and quantify. For example, we expect that the new forms of tariffs and innovations resulting from market-wide settlement reform will lead to new business models that challenge the existing dynamics of supply competition, but it is difficult to predict how this will develop.

3.7. The scale of uncertainties associated with suppliers' behaviour under these new incentives, consumers' behavioural response and future system conditions makes the analysis much more complex.

3.8. Given this complexity, our approach looks to estimate the potential costs of implementing market-wide settlement reform and then test whether benefits can be identified that justify these costs, describing the conditions under which such benefits would arise and factors that might reduce or accentuate benefits. This benefit analysis is both quantitative (where possible) and qualitative. Our quantitative analysis has used a GB power market model to estimate the impact of different levels of consumer load shifting resulting from a more flexible energy system. Bringing about such a system is dependent on market-wide settlement reform, and we will be testing whether the levels of load shifting needed to justify the costs can be reasonably expected as a result of our reforms. The counterfactual in the assessment is assumed to be the continued rollout of smart meters, with HHS for domestic and smaller non-domestic consumers on an elective basis only. Some of the key benefits expected from market-wide settlement reform, such as the impact on competition and innovation (summarised later in this chapter and described in

the Strategic Case sections 21-26) will come about in addition to these system benefits. We have assessed these in qualitative terms. There are also more direct benefits related to the efficiency and accuracy of the settlement process, which we are seeking to quantify where possible.

Scope

3.9. This economic assessment primarily focuses on the **system-wide benefits** of using the settlement arrangements to facilitate a change in consumption patterns to make better use of our network and generation capacity, and reduce the need for future investment.

3.10. This seeks to capture benefits such as:

- Generation and network investment savings: the avoided infrastructure development costs resulting from making better use of existing infrastructure, by better correlating demand and generation with conditions on the network
- Operational savings: the costs of operating generation assets during peak periods that are avoided by shifting consumption patterns
- Emissions savings: the carbon emissions that are saved by making better use of low carbon generation assets

3.11. There may also be other, **more direct benefits** of settlement reform that merit appraisal and should be included within scope of the analysis. These could include:

- More accurate forecasting and matching of supply and demand, resulting in a reduction in the residual imbalance that the System Operator needs to resolve, and therefore the costs of doing so.
- A more accurate settlement process, with better data quality and fewer settlement errors.
- A more efficient settlement process, with (potentially) shorter settlement timeframes, reducing suppliers' exposure and the amount of collateral suppliers need to post to cover this exposure.
- A process based on electricity consumption data from smart meters, removing (or minimising) the need for estimation and the current profiling arrangements.

3.12. We expect significant benefits to arise from the key role that market-wide settlement reform plays in supporting **competition and innovation** in the market. We have discussed these competition and innovation effects both in

the Strategic Case (pages 21-26) and in the results section of this draft Economic Case (pages 56-57).

3.13. We issued a voluntary information request in September 2017[59] to gather evidence from stakeholders on the **costs** of market-wide settlement reform and to explore which impacts should and should not be included in scope.

3.14. This request explored the scope of costs in a number of areas:

- Systems costs: the changes/upgrades to IT systems that suppliers and other parties would have to make as a result of market-wide settlement reform
- Operational costs: the impacts on the operations and processes that stakeholders undertake related to settlement. This includes (not exclusively) activities such as profiling, data collection and aggregation, forecasting, data transfer and meter operation
- Balancing costs: the impact on suppliers' costs for matching energy purchases to customers' demand profile and imbalance costs charged by the System Operator
- Customer messaging costs: the potential costs to suppliers of explaining settlement reform and the resulting new tariffs and products to their customers. We asked respondents to justify why these costs should or should not be attributed to settlement reform.
- Impacts on competition: the potential effect of market-wide settlement reform on competition and new business models in the market, and on the incentives on suppliers to help customers to manage their consumption
- Code administrator costs: the potential impact on the BSC code administrator (ELEXON) of market-wide settlement reform (both transitional and ongoing costs)
- Distribution Network Operator (DNO) costs: the potential operational, IT or other impacts on DNOs
- DCC costs: the potential operational, IT or other impacts on the DCC, including the length of time needed for implementation

[59] See 'Information request for mandatory half-hourly settlement Business Case': https://www.ofgem.gov.uk/publications-and-updates/information-request-mandatory-half-hourly-settlement-business-case

Interaction with other market-wide settlement reform workstreams

3.15. We are currently considering the rules relating to access to consumers' half-hourly electricity consumption data (collection and use of this data) for settlement purposes. The policy decision that is taken on **access to half-hourly data for settlement purposes** will influence the scale and timing of benefits that can be achieved from market-wide settlement reform, and potentially the costs and phasing of implementation.

3.16. We consulted in July 2018[60] on options for access to half-hourly data.

3.17. At this stage, the economic assessment in the draft Economic Case has been made independently of a decision on policy for half-hourly data for settlement purposes, and does not assume a particular policy option is pursued. The decision on this policy area will feed into the assessment at the Full Business Case stage.

3.18. We are currently considering the question of whether or not to centralise functions currently performed by **supplier agents**. We published a working paper in March 2018[61] which summarised our initial analysis on this issue, considering whether or not a central agent could have merit in principle. We next intend to issue an update on this workstream this summer, following work we have been progressing since the working paper.

3.19. This policy area will have a significant effect on both the costs of market-wide settlement reform and the timescales for implementation.

3.20. At this stage, the economic assessment in the draft Economic Case has been made independently of a decision on the future of agent functions, and does not assume a particular policy option is pursued. The decision on this policy area will feed into the assessment at the Full Business Case stage.

3.21. We have tasked ELEXON with leading the DWG to develop the arrangements and processes for market-wide settlement reform in the form of potential **Target Operating Models (TOM)s**. In Stage 1 of the TOM work, the DWG has developed and evaluated a set of skeleton TOMs which outline high level options for revised settlement arrangements to deliver market-wide settlement reform. They consulted on these skeleton TOMs in April 2018,[62]

[60] See 'Consultation on access to half-hourly electricity data for settlement purposes': https://www.ofgem.gov.uk/publications-and-updates/consultation-access-half-hourly-electricity-data-settlement-purposes
[61] See 'Supplier agent functions under market-wide half-hourly settlement': https://www.ofgem.gov.uk/publications-and-updates/supplier-agent-functions-under-market-wide-half-hourly-settlement
[62] See the DWG's 'Consultation on Skeleton Target Operating Models': https://www.elexon.co.uk/wp-content/uploads/2018/04/DWG-Consultation-Skeleton-TOMs-

following an Ofgem decision to approve them for consultation,[63] and are now taking forward Stage 2 of the TOM work in 2018/19. The DWG will be developing the TOMs in more detail with the objective of identifying a preferred final TOM to support Ofgem's decision on settlement reform in the second half of 2019.

3.22. In order to robustly assess the potential costs of market-wide settlement reform, the final TOM will first need to be defined. Once the final TOM is delivered to Ofgem for our decision, we will issue an information request to gather evidence on the costs of the model (or models, in the event that it is not possible to decide between different TOM options without further evidence gathering). We will use the draft Impact Assessment to assess, at a high level, the impact of different options, including different options for the commencement and phasing of implementation. The final assessment will be presented in the Economic Case of the Full Business Case.

3.23. We are considering what protection may be needed for those **consumers** who cannot, or are less able to, engage actively with the innovation and new tariffs that Settlement Reform should incentivise, in particular those in vulnerable situations. Towards the end of this chapter (pages 66-69) we have summarised our initial analysis looking at the potential distributional effects on consumers of market-wide settlement reform, specifically looking at the effects on vulnerable consumers, small businesses and any possible regional implications.

3.24. We intend to issue a call for evidence on consumer impacts in the second half of 2018. We will use the evidence from this and our own analysis to develop our thinking for presentation in the Full Business Case.

30April2018.pdf

[63] See 'Decision to approve skeleton TOMs': https://www.ofgem.gov.uk/publications-and-updates/decision-approve-skeleton-toms

Initial assessment

Options

3.25. At this point, with the TOM yet to be completely defined and open policy questions, the draft economic assessment cannot be made against specific options for settlement reform.

3.26. Instead, this draft Economic Case assesses the high-level case for settlement reform. It presents a range of likely impacts, to outline the scale and materiality of the expected costs and benefits.

3.27. The draft assessment assumes the following specification at this stage:

- All consumers and meter types (smart and advanced meters, and unmetered supplies) are covered by the eventual policy for settlement reform[64]
- The granularity of the settlement period is half-hourly[65]
- A 20 year modelling period of 2025 - 2045, allowing a period for implementation between 2020-25.[66]

3.28. To form options, the key parameter to be tested at this stage is the *policy approach*. We have used this assessment to test the implications of the following options:

1. Business as usual (counterfactual): lower HHS levels.
   Under this option, HHS remains under the current **elective** arrangements only.

2. Preferred way forward: higher HHS levels.
   Under this option, HHS is introduced on a **market-wide** basis.

[64] Our assessment accounts for benefits from Profile Class 1-4 consumers only, but the TOM is being developed to accommodate HHS of these consumers as well as HHS of consumers covered by P272 and traditional HH sites. The costs of accommodating this in the TOM are minimal, particularly when compared to the magnitude of other costs and benefits in the assessment.
[65] We have used this assumption as we expect that market-wide settlement will involve moving to HHS, as the wholesale market trades in half-hourly periods. We are designing the arrangements for market-wide settlement reform to be flexible to any future changes to the granularity of the market arrangements.
[66] The choice of 2025 as the starting year for the modelling does not imply a 5-year implementation period, it simply allows a period of time for implementation which is still to be determined and gives market players time to bring new products and innovations to market. The plan for implementation will be determined at the Full Business Case stage.

We have consulted separately on access to half-hourly electricity consumption data for settlement purposes. The direction that is taken on this policy area will influence the proportion of the market that is settled on a half-hourly basis, even under a move to introduce HHS on a market-wide basis.

The focus of our economic analysis at this stage is to compare the rationale for elective and market-wide HHS, analysing the incentives that would result under each option and the associated costs and benefits. We recognise that the policy direction taken on access to half-hourly data for settlement purposes will influence the scale of benefits that can be achieved through market-wide settlement reform, and we will take this into account in our decision-making.

3.29. The choice of moving to market-wide HHS or remaining with the elective HHS arrangements will determine the nature of the incentives that are placed on suppliers, and therefore affect the range and scale of products and innovation that we are likely to see in the market to help consumers change their consumption patterns.

Scenarios

3.30. Market-wide settlement reform will put incentives on suppliers to offer products/services that encourage and enable consumers to shift consumption away from peak periods. While there are a number of benefits that can be derived on an individual consumer level, the ultimate aim is to deliver an aggregate level of load shifting of an order of magnitude that will deliver significant system-level benefits.

3.31. Predicting electricity system outcomes is extremely challenging due to uncertainty about technological, market and behavioural factors that influence those outcomes. Instead of a 'bottom-up approach' of seeking to identify and quantify every impact on the electricity system of reforming the settlement arrangements, the assessment at this stage will focus on understanding one key outcome – the extent of **load shifting**. This 'top-down' approach tests the impact on the energy system of different levels of load shifting, and then seeks to examine how likely those levels of load shifting are to occur under either elective HHS or market-wide HHS.

3.32. To achieve this, we have taken a two-stage scenario approach:

- Load shifting scenarios: these scenarios identify a range of load-shifting outcomes under each of the policy options, by specifying a likely upper and lower bound to the possible load shifting outcomes.

- Electricity system scenarios: these scenarios identify different potential pathways for the development of the electricity system in the future. Two electricity system scenarios have been used:

1. A scenario consistent with BEIS' annually-updated **Reference Case scenario** (2017 figures). This is the main projection in BEIS' Energy and Emissions Projections,[67] and is based on central projections for the key drivers of energy emissions, such as fossil fuel prices, GDP and population.
2. A **'low fossil fuel' scenario**, in which there is less value associated with flexible demand, which we expect to act as a lower bound for overall system benefits of load shifting. This scenario is tested to analyse the sensitivity of the assessment to future fossil fuel prices.

3.33. This results in four scenarios that were tested:

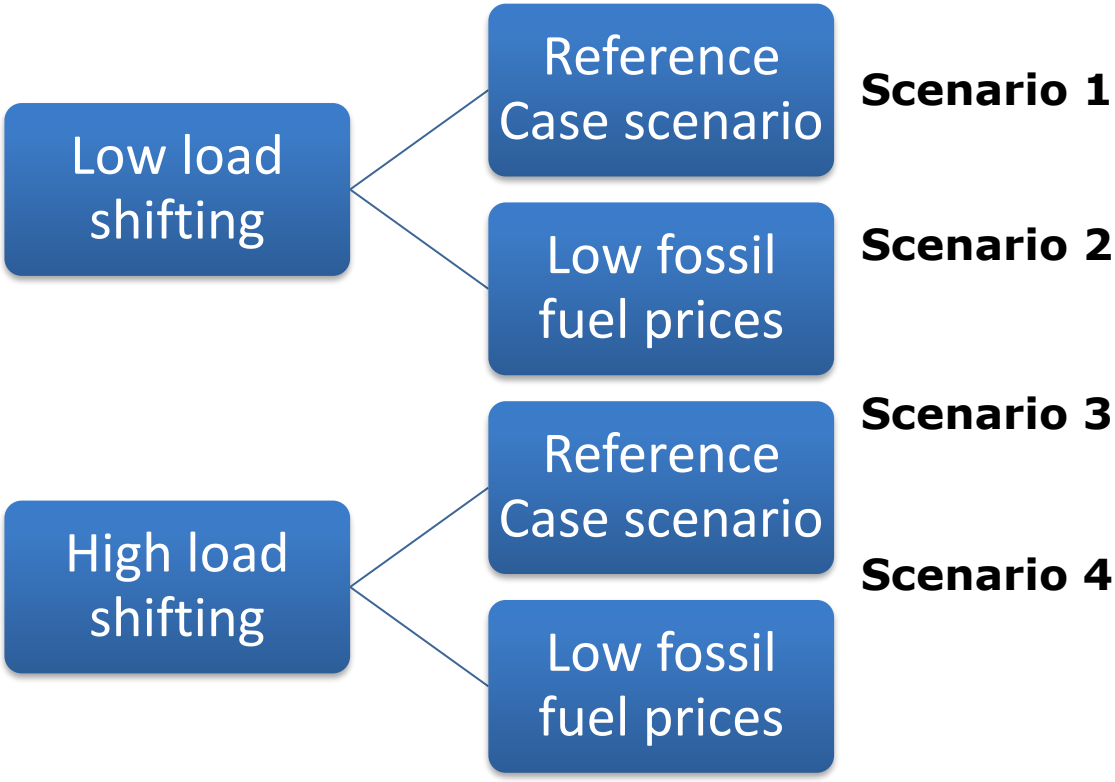


Figure 6: Scenarios for DDM modelling

[67] See BEIS' 2017 Energy and Emissions Projections: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/671187/Updated_energy_and_emissions_projections_2017.pdf

Understanding suppliers' incentives

3.34. Within this framework, the link between the options and the scenarios is critically important. The examination of this link and assessment of the probability of load shifting scenarios comes down to incentives that are placed on suppliers through the options.

3.35. We have sought to examine the impact of settlement reform on suppliers' incentives to help their customers to shift their consumption by using a set of analytical questions. The set of analytical questions that we have used aimed, at a high level, to answer the questions:

- What are supplier's incentives to elect to settle customers half-hourly? *This applies to elective HHS only.*
- What are suppliers' incentives to encourage their customers to shift their energy consumption to cheaper periods? *This applies both to a scenario where HHS remains under the elective arrangements and a scenario where HHS is introduced on a market-wide basis.*

Modelling assumptions and parameters

3.36. We have sought to quantify the impact of a shift in consumption as a result of changes to the settlement arrangements using a GB power market model – the Dynamic Dispatch Model[68] (DDM). The model analyses electricity dispatch decisions from GB power generators and investment decisions in generating capacity from 2010 through to 2050. It can show the impact of policy decisions on generation, capacity, costs, prices, security of supply and carbon emissions.

3.37. The modelling period we have chosen for the analysis is from 2025 through to 2045. This modelling period is appropriate due to the long term nature of the chain of benefits resulting from market-wide settlement reform, as described in the Strategic Case. It also allows for an introduction date between 2020-2025, recognising that with the TOM still under development it isn't possible yet to set a precise period for implementation. The implementation plan will be set out at the Full Business Case stage.

3.38. We specified the load-shifting constraint, the maximum proportion of demand that consumers make available for load-shifting, as a percentage of demand during peak periods that is shiftable to off-peak periods. The maximum

[68] For more information on the DDM, see: https://www.gov.uk/government/statistics/the-dynamic-dispatch-model-a-fully-integrated-power-market-model

proportion of demand was specified as a 'straight line' progression from the value at 2025 to a maximum value during the modelled time period.

3.39. The assumptions for load shifting have been determined through a review of evidence and trial data on consumer load shifting. The load shifting assumptions that we have used have been selected in order to outline the potential range of outcomes as a result of settlement reform, rather than identifying specific outcomes that we consider to be most likely.

Assumption	Load shift scenario	2025 value	Max value at 2045
Percentage of total demand during peak hours that can be shifted	Low load shift	1%	6%
	High load shift	10%	30%

Figure 7: Load shifting assumptions

3.40. We have assumed an 8-hour window by which demand in any half-hour is allowed to shift (either up to 4 hours earlier or up to 4 hours later). We have tested the implications of this assumption through two sensitivity tests, restricting the shifting window to 4-hours and then to 2-hours.

3.41. The DDM is a suitable model to use for this analysis, but has limitations which are important to recognise when assessing the results, notably:

- The DDM accounts for network cost savings at the transmission level only, so omits distribution network cost savings. This means the analysis will underestimate the potential savings in this area.

- The DDM treats EV demand separately to demand of domestic households. We have added this as a sensitivity, to highlight the extent of extra benefits that can be achieved.

- The DDM can either allow both domestic and non-domestic load to shift, or only domestic load. It does not distinguish within these categories, so it has not been possible to quantitatively test with the same scope as the scope of our project (Profile Classes 1-4). We have used a shift of both domestic and non-domestic load as our base case (recognising that non-domestic load will shift in the future, even if the benefits of this cannot all be attributed to our project), with domestic only tested as a sensitivity.

- The output from the DDM model does not account for any costs to consumers of load shifting. These could be costs to purchase technological enablers such as smart appliances or batteries, or costs in understanding and responding to price signals in tariffs. Some of these costs could be mitigated to an extent if suppliers can offer new products and innovations that are simple for consumers to understand and engage with.

3.42. The figures from the modelling are intended to set out an indicative range of potential benefits, rather than specific estimates, in order to highlight the magnitude of potential benefits that can be achieved. These figures are supplemented in our assessment by qualitative assessment of the impact we expect market-wide settlement reform to have on competition and innovation in the market.

Understanding direct benefits and costs

3.43. We have analysed available evidence on the direct benefits and costs of market-wide settlement reform. Our evidence sources include:

- Responses to the 2017 Business Case Information Request[69]
- The Ofgem-led Electricity Settlement Expert Group (ESEG)[70]
- The ELEXON-led Profiling and Settlement Review Group (PSRG)[71]
- P272 Impact Assessment[72]
- Bilateral meetings with stakeholders

3.44. Many stakeholders told us, in response to the 2017 Information Request, that it is not possible to robustly estimate costs until there is more certainty about the TOM and key policy decisions. Our assessment of direct benefits and costs at this stage is therefore largely qualitative. We have sought to define the costs and direct benefits that should and should not be included in scope of the assessment and indicate (where possible) their potential materiality.

[69] See 'Information request for mandatory half-hourly settlement Business Case': https://www.ofgem.gov.uk/publications-and-updates/information-request-mandatory-half-hourly-settlement-business-case
[70] For more information on the ESEG, see: https://www.ofgem.gov.uk/electricity/retail-market/forums-seminars-and-working-groups/electricity-settlement-expert-group
[71] For more information on the PSRG, see: https://www.elexon.co.uk/group/profiling-and-settlement-review-group-psrg/
[72] See 'Mandatory half-hourly settlement for Profile Classes 5-8 – draft impact assessment for consultation': https://www.ofgem.gov.uk/publications-and-updates/balancing-and-settlement-code-bsc-p272-mandatory-half-hourly-settlement-profile-classes-5-8-%E2%80%93-draft-impact-assessment-consultation

Results

System-wide benefits from load shifting

3.45. The output from the DDM modelling is set out in Figures 8-11, in £millions rounded to the nearest £10 million. These results are presented in Net Present Value (NPV) terms, discounted with 2018 as the base year and using 2018 real prices. We have used the Green Book discount rate to calculate NPVs. This discount rate is set at 3.5% (in real terms) for the entire period of the analysis (2018-2045) in line with the Green Book guidance.[73]

3.46. The outputs are presented as:

- **Net welfare** - consisting of carbon cost savings, generation, capital and network cost savings, balancing cost savings, unserved energy, interconnectors and unpriced carbon

These can be broken down into:

- **Consumer surplus –** consisting of wholesale price reductions, low carbon and capacity payments, network costs, balancing costs and unserved energy
- **Producer surplus** – consisting of wholesale price reductions, low carbon and capacity payments and producer costs

Some benefits to one group directly transfer into costs against the other group, generating net zero benefits/costs, while others generate additional benefits/costs. Outputs such as capacity payments, for example, generate a cost (negative) to consumers, but are transferred as a benefit (positive) of exactly the same amount for producers.

3.47. The outputs show a **net welfare increase under all scenarios,** with a net system benefit that increases over time. This increase is primarily driven by benefits derived from generation and capital[74] cost savings, as well as savings on interconnector flows. These interconnector savings make up a higher proportion of the net welfare increase under the high load shift scenario, which also sees an increased contribution from network cost savings. Carbon cost savings make a significant contribution in all scenarios, as better use is made of existing generation infrastructure and new build plant has a lower

[73] See 'The Green Book: Central Government Guidance on Appraisal and Evaluation': https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[74] The DDM does not account for distributional network costs or cost savings, which would be additional to the figures presented in this analysis

carbon intensity. There is a significant welfare transfer[75] from producers to consumers, which is greater under the high shifting scenarios than the low. This comes from a reduction in wholesale prices during peak periods.

3.48. The wide range of potential benefits under the base case, at approximately **£1.8billion - £5.4billion NPV by 2045** across the different scenarios, is reflective of both the analytical approach (to scope out the range of possible outcomes from settlement reform) and the sensitivity of the modelling to key factors such as future fossil fuel prices and the window of time in which load can be shifted. The influence of future fossil fuel prices is minimal in the low load shifting scenario (Figures 8 and 9), but increases in importance under the high load shifting scenario (Figures 10 and 11).

3.49. The base case allows shifting of both domestic and non-domestic demand, but does not allow demand from EVs to shift. This is down to practical limitations with what can be achieved with the DDM model, but does mean that the figures that are presented do not fully reflect the impact of the move to market-wide settlement reform for domestic and smaller non-domestic consumers. In order to present the full range of potential benefits, we have sensitivity tested the results to show the impact when allowing EV demand to shift as well as domestic and non-domestic demand, and to show the impact when allowing domestic demand only to shift.

3.50. The results indicate significant potential system-wide benefits, and also highlight the scale of benefits that could be achieved by putting in place the right framework, enabled by the settlement arrangements, to incentivise increased levels of load shifting. The results are discounted in NPV terms, and presented in £millions, rounded to the nearest £10 million.

	-Scenario 1- 2017 EEP-consistent Reference Case		
	2030	**2040**	**2045**
Net welfare			
Change in net welfare	**410**	**1030**	**1,850**
Distributional analysis			
Change in consumer surplus	*740*	*620*	*2,350*
Change in producer (generator) surplus	*-390*	*330*	*-580*

Figure 8: Modelling output - low load shifting scenarios

[75] A welfare transfer does not generate additional benefits or costs, but redistributes benefits or costs from one group to another (producers to consumers or vice versa)

	-Scenario 2- Low fossil fuel prices		
	2030	**2040**	**2045**
Net welfare			
Change in net welfare	**310**	**1,250**	**1,800**
Distributional analysis			
Change in consumer surplus	*100*	*2,500*	*3,820*
Change in producer (generator) surplus	*160*	*-1,330*	*-2,090*

Figure 9: Modelling output - low load shifting scenarios

	-Scenario 3- 2017 EEP-consistent Reference Case		
	2030	**2040**	**2045**
Net welfare			
Change in net welfare	**1,460**	**3,540**	**5,370**
Distributional analysis			
Change in consumer surplus	*2,010*	*8,780*	*12,340*
Change in producer (generator) surplus	*-720*	*-5,470*	*-7,210*

Figure 10: Modelling output – high load shifting scenarios

	-Scenario 4- Low fossil fuel prices		
	2030	**2040**	**2045**
Net welfare			
Change in net welfare	**1,410**	**3,320**	**3,450**
Distributional analysis			
Change in consumer surplus	*2,370*	*3,890*	*6,900*
Change in producer (generator) surplus	*-1,140*	*-850*	*-3,730*

Figure 11: Modelling output – high load shifting scenarios

Sensitivity testing

3.51. We tested four additional sensitivities, across all four scenarios:

1. Reducing the shifting window from 8 hours to 4 hours
2. Reducing the shifting window from 8 hours to 2 hours
3. Limiting shifting to domestic demand only
4. Including the benefits of smart EV demand

3.52. **Reducing the shifting window** reduces net welfare benefits, with this effect becoming more pronounced with a much smaller shifting window (though this effect varies across scenarios). This is shown in Figure 12.

3.53. An 8-hour shifting window, assuming an allowed shift of 4 hours each side of peak periods, aligns with a number of different load shifting possibilities, such as shifting washing machine and dishwasher load, overnight charging or utilising domestic battery storage. While an 8-hour window therefore seems realistic, moving this to a 4-hour (2 hours either side of peak) or 2-hour (1 hour either side of peak) window allows us to consider how the benefits could change. We will examine the available evidence on this and use this to develop our economic analysis going forward.

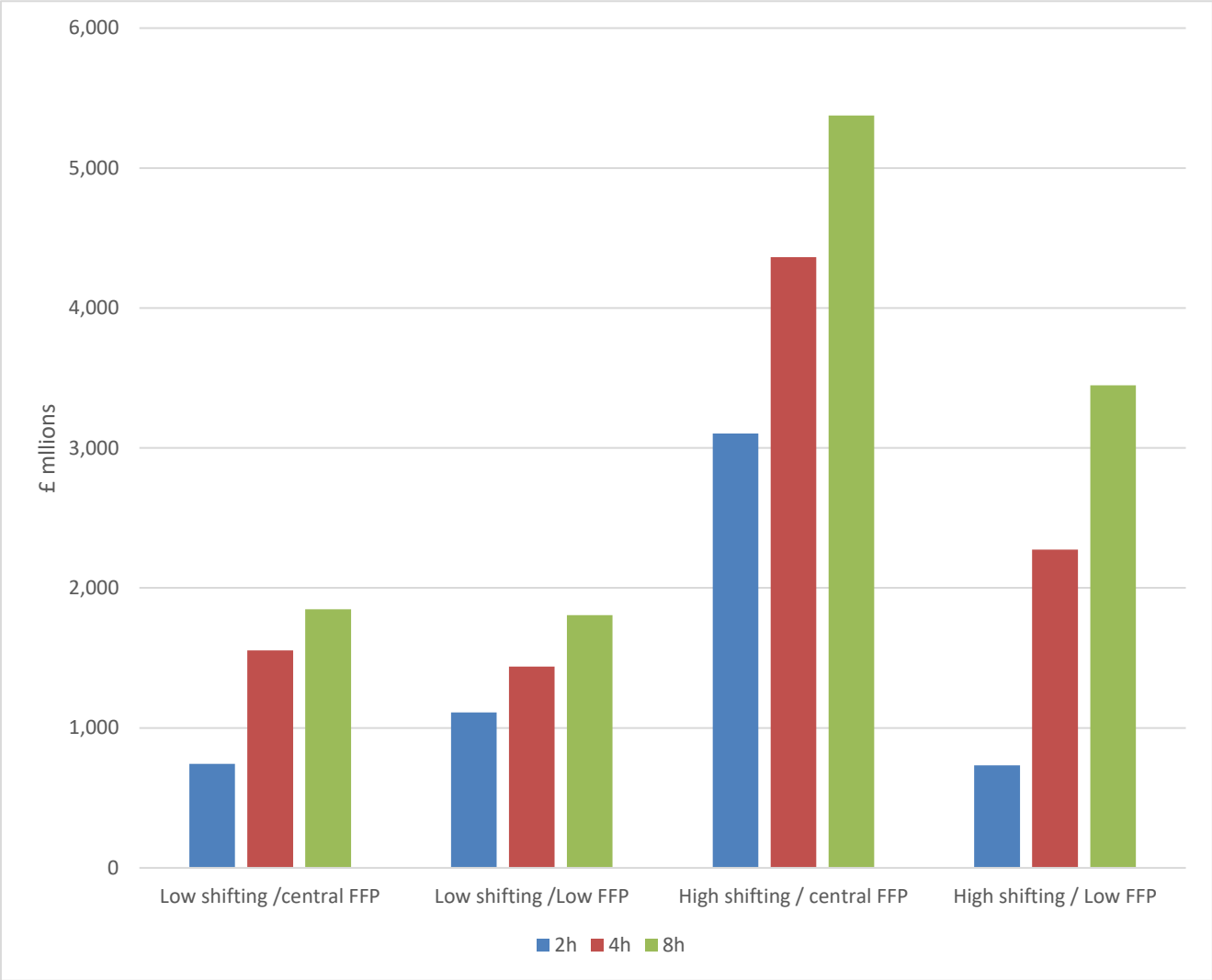


Figure 12: Sensitivities 1 and 2 – reducing the shifting window, 2045 NPV figures (8-hour window is the base case)

3.54. The DDM treats **domestic and non-domestic load** separately, but does not separate smaller non-domestic consumers (Profile Classes 3-4) from other sources of non-domestic load, such as non-domestic consumers covered by P272 (formerly Profile Classes 5-8) and 'traditional' half-hourly sites in Measurement Class C.[76] The estimate for domestic and non-domestic shifting therefore will overestimate the benefits associated with settlement reform, whereas the estimate for domestic only will underestimate the benefits.

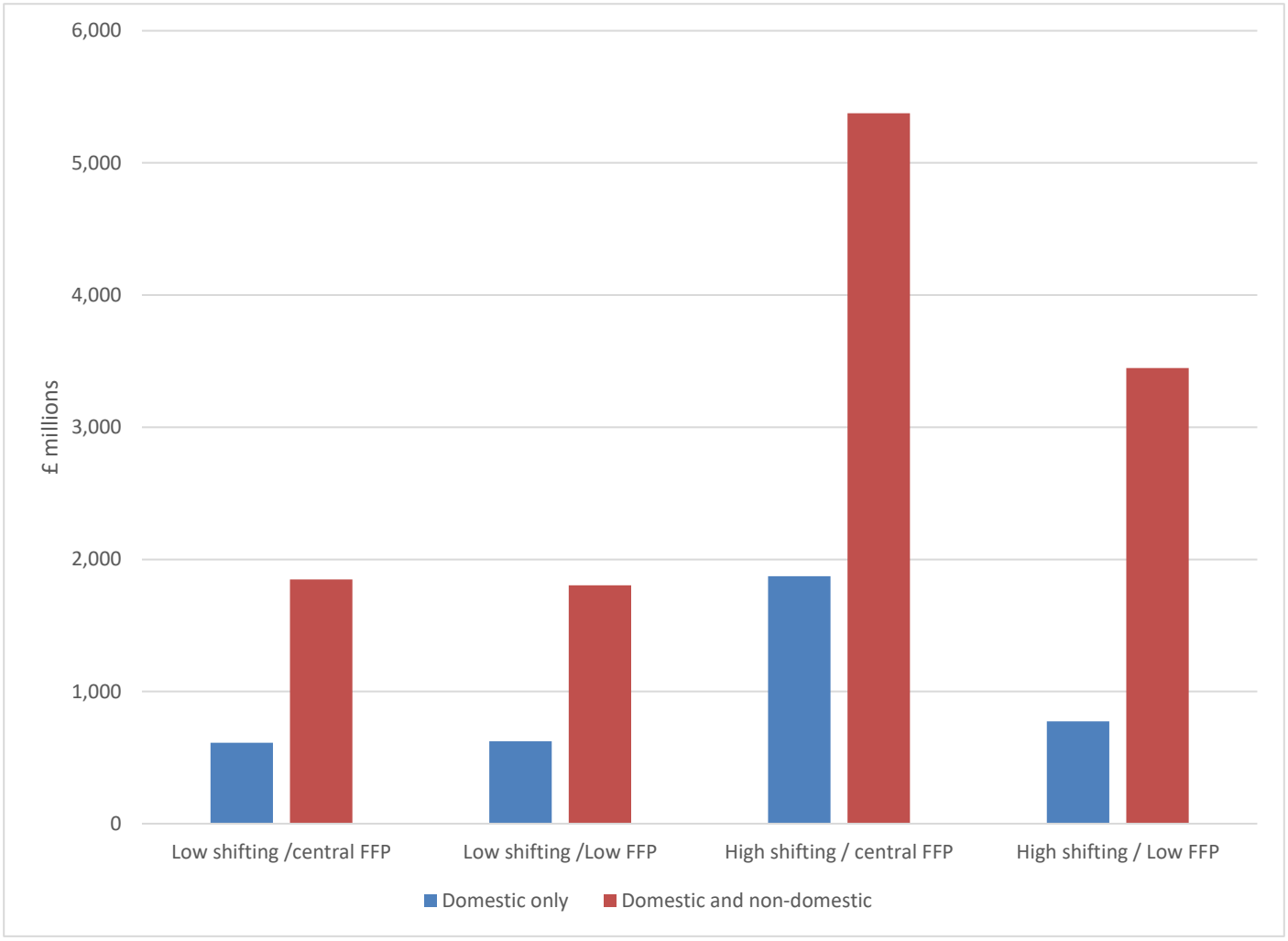


Figure 13: Sensitivity 3 – domestic demand only, 2045 NPV figures (domestic and non-domestic is the base case)

[76] GB metering systems are categorised by seven Measurement Classes. For more information, see: https://www.elexon.co.uk/wp-content/uploads/2017/06/change_of_measurement_profile_class_v13.0.pdf

3.55. The DDM treats **EV demand** separately to domestic and non-domestic load, so the modelling results do not account for potential for shifting EV demand. This risks significantly underestimating the system-wide benefits of settlement reform, given the potential of EVs for load shifting (discussed in the Strategic Case).

3.56. Adding in smart EV demand increases the upper bound of the range, from £5.4bn to £8.7bn, showing the significant benefits to the system that can be achieved.

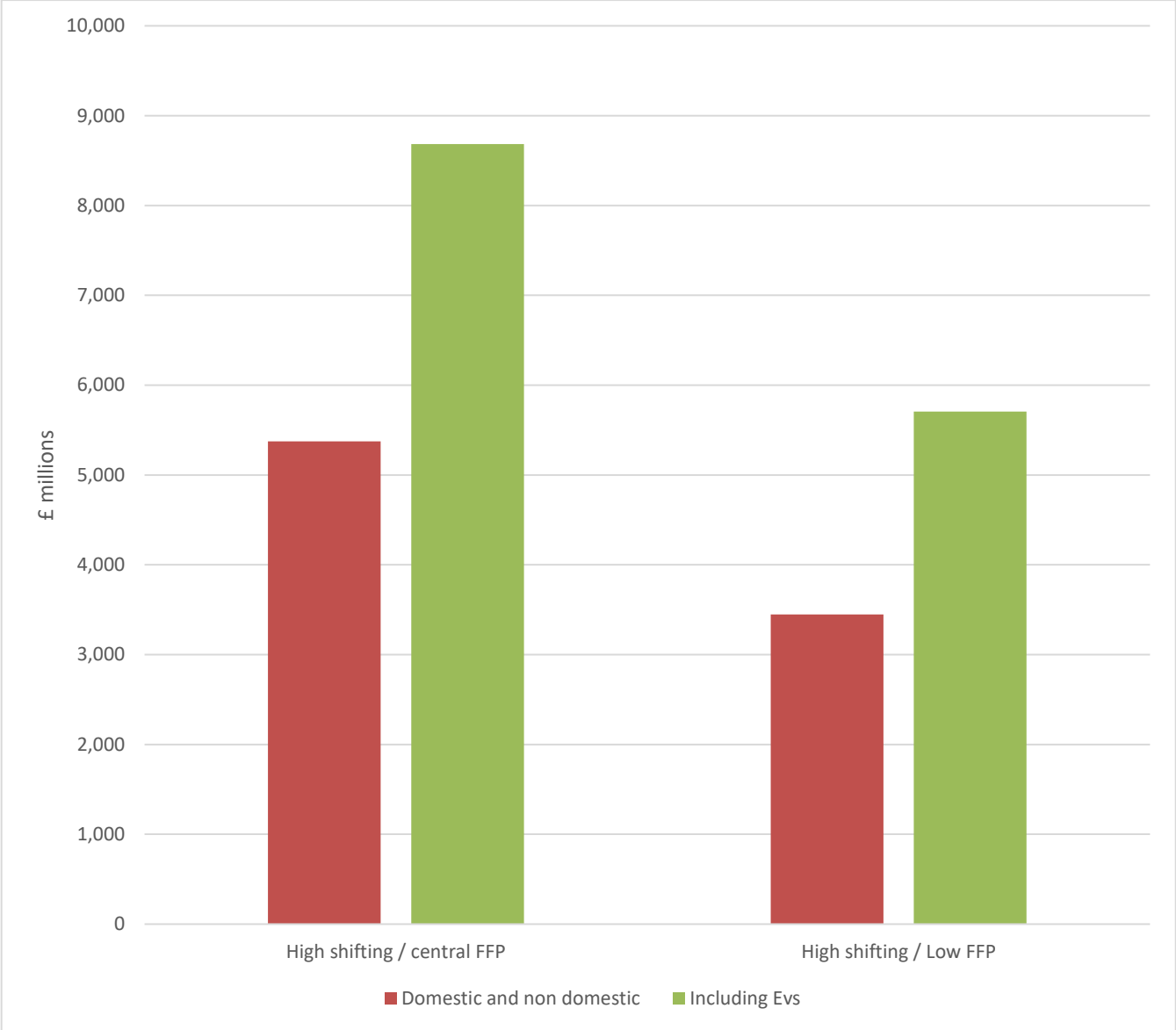


Figure 14: Sensitivity 4 – including EV demand, 2045 NPV figures

Market-wide HHS compared to elective HHS

3.57. To link our analysis of load shifting system outcomes back to options for settlement reform, we have analysed **suppliers' incentives** under both elective and market-wide HHS.

3.58. We have sought to analyse these incentives in a structured way by setting out a series of analytical questions. This analysis of incentives looks to determine how settlement policy – the choice of an elective or market-wide approach - will affect how much load-shifting occurs in future, and the potential benefits for consumers.

3.59. At a high level, the analysis of incentives can be broken down into two key questions:

1. *What are suppliers' incentives to settle customers half-hourly under elective HHS (the counterfactual)?*

2. *What are suppliers' incentives to encourage customers to shift their consumption away from peak periods?*

3.60. We have taken each of these two high level questions and broken them down into a number of sub questions, which form the basis of our analysis. Our analysis is set out in Appendix 2, with our conclusions below.

Summary: the case for market-wide settlement reform

3.61. The rationale for settlement reform is in part predicated on delivering a significant aggregate level of load shifting that will mean that costs of expensive new generation infrastructure and network reinforcement can be avoided. Elective HHS alone is unlikely to deliver the levels of half-hourly settled customers to achieve this scale of load shifting, and a move to HHS on a market-wide basis is needed to place the right incentives on the market to deliver a significant level of load shifting. This view was shared by the CMA in their 2016 Energy Market Investigation, where they found that *"elective half-hourly settlement is unlikely to be an effective substitute for full, mandatory half-hourly settlement. This is because under mandatory settlement, all suppliers bear the full costs that their customers impose on the electricity system".*[77] The CMA also highlighted concerns around cherry-picking, recognising that while elective HHS may enable individual suppliers to make

[77] CMA Energy Market Investigation (2016) *Page 696*: https://assets.publishing.service.gov.uk/media/5773de34e5274a0da3000113/final-report-energy-market-investigation.pdf

cost savings, overall system costs would be unlikely to fall under elective HHS and the potential benefits of HHS would not be realised.

3.62. Achieving the higher end of the potential benefits presented in the draft Economic Case would require a critical mass of consumers being half-hourly settled, for ToU products and other innovations to be commonplace and for consumers to shift their consumption away from peak periods as a result. Without implementing HHS on a market-wide basis, there is only a limited incentive for suppliers to elect to half-hourly settle their customers, and therefore far less of an incentive to develop and offer new products and innovations to help customers shift their consumption away from peak periods. This limited incentive means the levels of HHS we expect to see under elective HHS will not be enough to realise load shifting of the scale necessary to deliver benefits to consumers from avoided network and generation investment.

3.63. HHS also exposes suppliers to risks (as well as opportunities), which suppliers may well be unwilling to elect to take on. Firstly, the current profiling arrangements provide suppliers with a degree of protection against variability in customers' consumption patterns and predictability in terms of their forecast shape, and suppliers may not wish to take on the risks of moving to HHS, even if it would open new market opportunities. Secondly, there are risks around the level of take-up of the products and innovations enabled by HHS, which may deter some suppliers from being a first-mover in the market, or adopting HHS at all. With elective HHS, we are far less likely to find solutions across the market that can bring forward the types of tariffs and innovations on a scale that will really influence the level of acceptance and adoption of these. Market-wide settlement reform will help in this regard, by exposing suppliers to a new incentive to help their customers to shift their consumption away from peak periods.

3.64. Not all the benefits of HHS will flow to suppliers directly, so the commercial incentives to elect to take-up HHS are limited, even though the potential benefits to the energy system and to consumers are significant. This makes the incentives on suppliers to introduce HHS weak relative to the potential benefits for consumers, and justifies a market-wide approach. This is particularly true given the current market context, with a significant proportion of consumers in the market disengaged. If the status quo (non half-hourly settlement) allows suppliers to maintain market share by keeping consumers disengaged, there is little incentive for these suppliers to elect to settle customers half-hourly and offer them new and innovative products. The CMA shared this concern, noting that "*suppliers have a financial incentive to keep their customers disengaged, since they are generally on higher tariffs and have a lower propensity to switch*"[78].

[78] CMA Energy Market Investigation (2016) *Page 696*: https://assets.publishing.service.gov.uk/media/5773de34e5274a0da3000113/final-report-energy-market-investigation.pdf

3.65. Market-wide settlement reform has a key role to play in supporting innovation, which we have discussed in the Strategic Case, and in doing so facilitating a transformation in the retail market. While elective HHS enables those firms wanting to be early movers and innovators in this market to develop new products and services, this has so far been at a very small scale. Market-wide settlement reform can enable these innovations to become widespread, generating network effects with these products becoming normalised and better understood by consumers.

3.66. Unlocking the benefits from new technologies such as those discussed in the Strategic Case relies on a market where HHS is the norm, and this market is only likely to come about if HHS is introduced on a market-wide basis. Without market-wide HHS, it is unlikely that opportunities for load shifting will be opened up to the disengaged (or the less engaged) through innovations such as smart appliances or battery storage. Similarly, HHS is needed to facilitate some of the solutions we are looking at for the future arrangements for network charging and access.

3.67. There are also process and efficiency reasons for introducing HHS on a market-wide basis, rather than introducing it incrementally. The TOM design work is taking an approach based on first principles, looking to optimise the design of enduring settlement arrangements for market-wide settlement reform. A number of the direct benefits discussed on pages 57-60, such as shorter settlement timeframes and removing the profiling arrangements, can only be realised with a significant number of half-hourly settled customers. Market-wide settlement reform would also avoid a situation where multiple settlement systems (i.e. half-hourly and non half-hourly) are required to run concurrently as would be the case with incremental changes under elective. Similarly, moving the market across to HHS avoids any potential unintended consequences for circumstances where customers change between half-hourly and non half-hourly settlement systems.

3.68. Based on our quantitative analysis of load shifting outcomes and qualitative analysis of market incentives, we think that market-wide settlement reform is the best way to make sure that suppliers have the right incentives to help their customers to shift their consumption away from peak periods and deliver a significant aggregate level of load shifting that will benefit all consumers through lower system costs.

Supporting innovation and competition

3.69. Market-wide settlement reform will support competition firstly by reducing the overall costs of settlement and therefore removing barriers to entry for new market players. This could be for example through market players needing to post less collateral with ELEXON in the settlement process, or realising cost savings through more accurately forecasting demand.

3.70. Secondly, exposing suppliers to the true cost of supply of their customers in every half hour period places incentives on them to encourage load shifting.

This opens up an opportunity for suppliers to reduce the costs of serving their customer base, allowing those suppliers who take up this opportunity to potentially gain a competitive advantage over their competitors by offering new and innovative tariffs. Market-wide settlement reform can enable new technologies and business models that capitalise on the new incentives placed on the market, facilitating and incentivising load shifting and therefore costs reduction. We have discussed these new technologies and business models in-depth towards the end of the Strategic Case (pages 21-26).

3.71. The combination of lower entry barriers and the opportunities for costs reduction, together with the new technologies and products enabled by HHS, could have an important impact on competition in the market. When combined with other Ofgem projects that are seeking to support competition and innovation in the market, such as the work on network charging and access and future retail market design (both discussed in the Strategic Case), market-wide settlement reform could have a profound impact on the dynamics of the market. These competition effects are challenging to predict and quantify, but should be recognised as an important consequence of the project that can deliver positive outcomes for consumers. This view was shared by the Competition and Markets Authority (CMA) in their 2016 Energy Market Investigation, which found that the current system of load profiling reduces the competitiveness of domestic retail electricity supply.[79]

Direct HHS benefits appraisal

3.72. Market-wide settlement reform should also deliver benefits related to efficiency and process improvements in the arrangements themselves. These benefits are additional to the quantitative benefits outline in the results of the DDM modelling and the benefits to competition and innovation set out earlier in the chapter. Our assessment of the more direct benefits of settlement reform is set out in the table below.

3.73. We have not quantified a number of these benefits, and have instead outlined the scope of the benefits and indicated (where possible) their materiality. As the DWG develops the TOM further, we will work with stakeholders to understand these potential benefits further, and seek to quantify these where possible, although some areas will not be quantifiable.

[79] See CMA Energy Market Investigation (2016) *Page 591*: https://assets.publishing.service.gov.uk/media/5773de34e5274a0da3000113/final-report-energy-market-investigation.pdf

Direct benefit area	Estimated impact
Settlement timeframe	• Smart meters and market-wide settlement reform would transform the settlement process, from a non-half-hourly process based on estimation and meter readings taken through site visits (and provided by the consumer) to a half-hourly process based on actual half-hourly data retrieved from the meter remotely. This could enable the timeframes for settlement[80] to be reduced, from a current timeframe of 14 months (or longer to account for disputes) to potentially six months or less.[81] • Suppliers put up collateral (credit cover) with ELEXON to cover an estimate of their imbalance charges up until the first financial settlement run (after 3 weeks) in case of default/non-payment. If the first settlement timeframe can be brought forward, this would reduce the collateral that suppliers need to put up with ELEXON and therefore reduce the costs and risks associated with settlement (and credit cover). This could have potentially positive competition effects, by supporting smaller suppliers and benefitting new entrants. • Reducing the number of settlement runs or changing the frequency of the runs could reduce the costs incurred through the settlement process.[82] • The potential scope for reducing the settlement timeframes is evidenced by the difference in performance standards for half-hourly sites and NHH sites.[83] The half-hourly read performance standards were relaxed slightly for elective HHS, but still remain far

[80] For further information on the current settlement timeframes, see 'Electricity Settlement Expert Group: Settlement Timetable': https://www.ofgem.gov.uk/ofgem-publications/88226/slideselexon.pdf

[81] Based on analysis undertaken by the Electricity Settlement Expert Group in 2014 (page 2-3) https://www.ofgem.gov.uk/sites/default/files/docs/2014/11/7.2_conclusions_from_stage_one.pdf

[82] The potential impacts are discussed in the PSRG's 2014 report on reducing settlement timescales: http://www.elexon.co.uk/wp-content/uploads/2014/11/03_PSRG37_01a_Attachment_A_PSRG_Reducing_Settlement_Timescalesv0.3.pdf

[83] Performance standards are set out in 'Electricity Settlement Expert Group: Settlement Timetable': https://www.ofgem.gov.uk/ofgem-publications/88226/slideselexon.pdf
There has historically been a requirement of 99% for half-hourly sites from the first settlement run (SF) through to the last settlement run (RF) compared to a requirement of 30% for non half-hourly sites at SF increasing in stages up to 97% by RF.

	above the performance standards for non half-hourly sites,[84] reflecting the benefits of remote data retrieval. **Summary:** *The benefits of a shorter settlement timeframe and a more streamlined settlement process are potentially significant. We have not yet gathered information on the benefits of changing the settlement timeframes but will work with the DWG through its TOM design work to scope out what is practicable and achievable. It should be possible to shorten the settlement timeframes and realise substantial benefits for market players. We expect this to have a positive effect on competition, although the exact amount is difficult to predict and quantify.*
Data quality	• Using smart metering and an automated process for retrieving half-hourly electricity consumption data for settlement should reduce the scope for errors in settlement, lowering the costs that suppliers incur in managing the risks associated with these errors. • For suppliers, costs savings could be realised by having smaller data quality teams, with less need for manual data quality processes. Our P272 assessment showed that suppliers could realise potential cost savings of around £18m NPV on average by reducing the size of their data quality teams.[85] This analysis was based on former Profile Class 5-8 consumers, but we would expect the savings from market-wide settlement reform to be similar or greater (dependent on the extent to which these costs are fixed or vary according to scale/volume of electricity consumed). • Better quality data in the settlement process would allow suppliers to develop more accurate models for forecasting demand.[86] This improved data could have profound implications for the market by facilitating new and innovative business models, and enabling suppliers to better understand their customer base and the market for ToU and other innovative products. **Summary**: *The potential benefits to suppliers in scaling back their manual data quality processes are of reasonable significance in the context of the scale of costs to implement market-wide settlement reform (discussed in the next section). This data will be an important enabler of*

[84] For information on the changes made through the elective HHS work, see: https://www.ofgem.gov.uk/system/files/docs/2016/05/elective_hhs_conclusions_paper.pdf The performance standard was reduced from 99% to 90% at the first interim settlement run (R1) for measurement classes F&G.
[85] Based on our best understanding of a team's typical size, and assuming that the resources allocated to data quality teams by ally suppliers could be reduced by between 50-0 employees.
[86] We are consulting on the rules for access to data for forecasting through our consultation on access to data: https://www.ofgem.gov.uk/publications-and-updates/consultation-access-half-hourly-electricity-data-settlement-purposes

	a future, more competitive market, supporting both new entrants and new and innovative business models.
Matching supply and demand	• Market-wide settlement reform should enable suppliers (at least in the long term) to better forecast the demand of their customer base. This should mean that the volume and number of energy balancing actions undertaken by the System Operator should reduce (over time) as a result of settlement reform, and therefore the costs of residual balancing should decrease. • HHS should also be of benefit for generators in better understanding domestic consumption in aggregate, and for DNOs, who may be able to reduce their costs. **Summary:** *Better matching of supply and demand, and better understanding of consumption, should be able to improve the efficiency of the whole supply chain. In the short term the benefits may be limited, but should increase over time as suppliers develop their forecasting expertise and consumers their consumption patterns. We have not been able to quantitatively estimate this benefit. We will continue to explore the potential benefits in this area with stakeholders, and will seek further evidence once the TOM is defined, although it may still not be possible to quantify this.*
Removing profiling	• Introducing HHS on a market-wide basis should allow for the removal of the profiling arrangements. The future of the profiling arrangements will depend on the final TOM, as well as the number of residual sites that remain under the NHH processes and the number of instances where settlement period interval data is temporarily unavailable. • The intention is to develop a TOM which allows for a simpler process for non-half-hourly sites, converting register reads to HH data upfront in the settlement process. The costs of administering the BSC would therefore reduce due to lower costs in retrieving data from sites that would have previously made up the load profile sample. All suppliers will benefit from these reduced costs of retrieving and analysing data, and thus will be able to pass these cost savings on to consumers. **Summary:** *There are potential benefits to be realised from removing the need for profiling activity but it is difficult to quantify these at this stage, as the future arrangements for NHH sites have not been defined and the number of sites that will need to remain under the NHH process (or an amended NHH process) is unclear. We will seek to gather evidence to assess this once we have a clearer idea of the final TOM, although it may still not be possible to quantify this.*

Costs appraisal

3.74. The evidence we have available to us at this point in time to analyse some of the direct costs of market-wide settlement reform is limited, with the TOM as yet undefined and decisions to be made on key policy areas.

3.75. Our assessment of costs at this stage is therefore largely qualitative. Our focus has been on defining the costs that should and should not be included in scope of the assessment and understanding the potential scale of different costs. We have used the evidence available to us from the 2017 Business Case Information Request, from the P272 Impact Assessment, from previous and current industry working groups and from other meetings with stakeholders.

3.76. Our assessment is set out in the table below.

Cost area	Estimated impact
Systems impacts	• Suppliers would need to upgrade a number of their IT systems – settlement, meter read submission, meter operations, wholesale trading and demand forecasting. • Suppliers would also have a number of optional changes to billing (if billing half-hourly) and customer-facing systems, which would depend on their commercial strategy. • Supplier agents would need to upgrade their systems for data collection and aggregation to support the increased quantity of half-hourly data (although this will depend on the policy decision that is taken on whether or not to centralise functions currently performed by supplier agents). **Summary:** *Without firm policy decisions and without knowing the TOM design, it is difficult to accurately estimate the potential systems costs. Based on analysis conducted for P272, responses received to the Information Request and further conversations with stakeholders, we would expect this to be the greatest area of impact, with potential costs which might be in the order of tens of millions of £s across the industry. Costs should only be included in scope if they are not either incurred anyway due to the smart meter rollout or incurred as part of business as usual IT development costs.*

Operational impacts	• Suppliers and supplier agents would both incur ongoing operational impacts, largely related to the costs of storing, transferring and managing data. • The future processes for data retrieval, processing and aggregation are being considered through the DWG's TOM work. The future costs of these will depend on the TOM variant that is chosen, as well as the policy decision that is taken on agent functions. • Data transfer costs would likely increase due to the increase in the volume of data being transferred,[87] although the cost in terms of £/KB of data would likely decrease significantly due to economies of scale. This cost increase would be relatively minor in the context of existing data transfer costs, due to the scalability of the system architecture for data transfer. • A proportion of these operational impacts would be mitigated by the potential benefits of improved data quality and the simplification of processes for any residual non half-hourly sites. **Summary:** *Without firm policy decisions and without knowing the TOM design, it is difficult to accurately estimate the extent of potential operational impacts. Based on analysis conducted for P272, responses received to the Information Request and further conversations with stakeholders, potential costs in this area might amount to millions of £s per year. However, a proportion of these costs could be offset against the potential operational benefits, as discussed in the direct benefits appraisal. For costs to be included in scope, they must not either be incurred anyway due to the smart meter rollout or incurred as part of business as usual operational costs.*

[87] This will depend on the architecture and technology used to implement and operate the new HHS processes

Forecasting and balancing impacts	• By exposing suppliers to the true cost of supply in any half-hour period, suppliers will need to forecast the demand of their customer base in each half-hour. Currently suppliers only need to forecast the total volume of the consumption of their customer base, as the consumption across the day is assumed to match the shape of an average profile (in a given Profile Class). • To forecast half-hourly demand and to realise the benefits of more accurately matching supply with demand (covered in the benefits appraisal on page 60), suppliers would need to invest to build expertise in demand forecasting. Suppliers would need to develop their forecasting systems and models, and the expertise of their forecasting teams. • The impact of forecasting is likely to differ for different types and sizes of supplier. Larger suppliers may be less exposed to forecasting risk as the size of their customer base may mean that their consumption profile is more likely to average out to be similar to the current consumption Profile Classes. Conversely, smaller suppliers may be more exposed to forecasting risk if the average consumption profile of their customer base looks different to the current consumption Profile Classes. **Summary:** *In the short term, suppliers would have to adjust to forecasting the shape of their customers' consumption as well as the total volume, and build expertise in an area that most suppliers will have limited previous experience in. In the long term, we would expect benefits to be realised in this area as suppliers build forecasting expertise and the better matching of supply with demand reduces the costs incurred by the System Operator in residual balancing.* *The precise quantitative impact of market-wide settlement reform on forecasting and balancing is unclear, as short term costs need to be weighed against long term benefits. We recognise that moving to forecasting half-hourly demand presents some risks (possibly significant ones, especially for suppliers with a small, volatile or unpredictable customer base) but also opportunities for suppliers to compete over this new activity. We intend to take forward further work in this area, working with suppliers and other stakeholders, to understand how the risks weigh up against the long term benefits, and the potential impacts on different types of supplier.*
Customer messaging impacts	• Settlement is a back-office function, so the actual process of moving customers over to HHS should need minimal (if any)

	customer messaging,[88] provided it is well-planned and does not disrupt customer service or ability to switch. • The customer messaging costs that would be incurred by suppliers would be in marketing new products and supporting customers in understanding these new products. While this will be needed to realise the full benefits of market-wide settlement reform, offering ToU products or other innovation will be optional for suppliers, and therefore these customer messaging costs will be as well. • Realising the potential benefits of market-wide settlement reform and ensuring consumers are protected and informed will need the input of other actors, for example third party intermediaries. It is important that suppliers and other industry stakeholders educate customers so that they understand the new products and services which are offered, and how different parties may require access to their consumption data to enable these. **Summary:** *We are not intending to include customer messaging impacts in scope of the analysis, as the settlement process itself does not need to be explained to customers. However, we recognise that to achieve the full benefits of market-wide settlement reform, suppliers and other industry stakeholders will incur costs to market new products and educate consumers. We will work with our stakeholders to understand these costs and their materiality when compared against the projected benefits in our analysis.*
BSC/ELEXON impacts	• ELEXON will need to change the terms and provisions in the BSC and the settlement processes in accordance with the final TOM. This will include, for example, rules and requirements for non-half-hourly processes, including supplier agents and registration/appointments processes. • ELEXON's ongoing costs for supporting the settlement arrangements will change, although it is difficult to estimate these without a final TOM. ELEXON will also incur a one-off cost to upgrade their systems to manage market-wide settlement reform (although the existing systems will need to be upgraded at some point irrespective of market-wide settlement reform).

[88] Suppliers will need to communicate with their customers to give them the chance to opt in or opt out of sharing their half-hourly data for settlement purposes, if either of these two options is taken forward through our policy work on access to data for settlement purposes.

	Summary: *The precise impact on ELEXON is difficult to estimate and quantify without the final TOM. We intend to gather quantitative information in this area through a second information request, once the final TOM is confirmed. It is important to note that ELEXON will incur costs at some point to upgrade their settlement systems regardless of market-wide settlement reform, so the costs in this assessment should only be those costs that are additional to business as usual.*
DCC impacts	• The DCC will need to be able to deal with significantly greater volumes of data, which has potential implications in terms of DCC bandwidth and capacity and that of its communications providers Arqiva and Telefonica. The scheduling and retrieval of data for settlement could affect DCC costs, and potentially its performance. This will also apply to supplier agents in relation to advanced meters. • The costs incurred by the DCC may also be influenced by the timing and phasing of the transition period for suppliers to move customers to HHS. **Summary:** *The DCC should see much lower impacts than suppliers and supplier agents (discussed on pages 61-62), as data is not stored on its network - it is used as a data 'pipe' rather than data storage. It is too early to robustly estimate and quantify the impacts on the DCC, but we would expect these to be less significant in the context of the other impacts discussed and the projected benefits of the project.*
Network operator impacts	• The costs to DNOs relate to the arrangements for supplier billing, where an aggregated billing solution is likely to be much lower cost than a site specific billing solution. Estimates from DNOs vary markedly, but we would expect based on information provided that an aggregated billing solution would incur costs for each DNO region of the order of tens of £1000s, whereas a site specific billing solution is likely to incur costs of the order of hundreds of £1000s, or potentially more than a million per DNO region. **Summary:** *Any potential impacts on network operators will depend on the final TOM design. While the difference between costs under aggregate and site specific billing is clearly sizeable, these costs are still small in comparison with other the other costs discussed. These costs may also be offset to some extent by benefits to network operators of consumers shifting their consumption, although this will also depend on the future arrangements for network charging.*

Consumer impacts of market-wide settlement reform

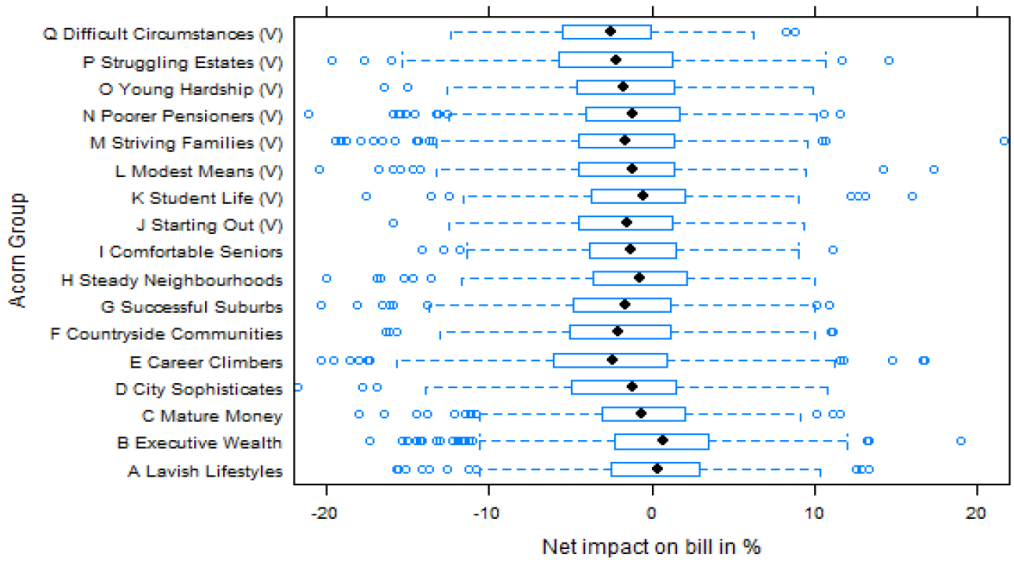
Distributional effects

3.77. In 2017, we commissioned Cambridge Economic Policy Associates (CEPA) to deliver a report on the distributional impacts of ToU tariffs.[89] This report analysed the distributional impact of ToU tariffs on different sociodemographic groups of consumers and assessed the potential for behavioural change among consumers with different characteristics.

3.78. The report used several of the best available sources of evidence including two large ToU trials, consumer panel data collected by BEIS and other academic literature. The trials had limitations, including exclusion of certain categories of vulnerable consumers and those on dual fuel or fixed rate tariffs, tariff designs which may not represent real world products, and money back guarantees if a trial participant's bill would have risen while on a trial.

3.79. The CEPA report found that the average consumer would make some bill savings after expected behaviour change is taken into account, if they choose to take up a ToU tariff. While there was a small difference *between* particular sociodemographic groups, the spread *within* each group was much larger:

Figure E3. Impact on bill in relative terms under static ToU reference tariff (% net impact on bill compared to a flat tariff), assuming customers adjust consumption to tariff



Key: Black Dot shows median, Box shows interquartile, Bars show 2nd to 98th percentiles, circles are outliers[2]

Figure 15: CEPA report: Distribution of bill impacts under the static ToU reference tariff by socio-economic group

[89] See 'Distributional Impacts of Time of Use Tariffs': https://www.ofgem.gov.uk/publications-and-updates/distributional-impacts-time-use-tariffs

Consumer impacts

3.80. The CEPA work suggests that a key motivation for consumers to change behaviour and shift load is seeing real financial savings. They can achieve such savings by becoming more engaged with the market, taking up new technology such as smart appliances and/or better understanding their energy usage, eg through the use of an in-home device connected to a smart meter. However, persuading them to engage may also depend on them identifying financial savings before they take steps to engage.

3.81. Those consumers with greater potential to lose out are those who either cannot, or choose not to, engage and who are therefore unaware of their ability to offer DSR. Even allowing for a certain level of engagement by all consumers, individual customer characteristics and circumstances and the way certain customers use electricity could adversely affect their ability to respond to price signals, eg consumers who tend to be peak users of electricity and who are unable to change. These consumers may already be in a vulnerable situation or may be at risk of falling into a vulnerable situation. We will consider whether, and what, further action may be needed to help these consumers.

3.82. Should the tariffs on offer become increasingly complex, eg dynamic ToU tariffs, consumers will need appropriate help to bridge the gap between the tariff they think may suit their situation and the tariff that actually does. Suppliers are already required to seek to identify those in vulnerable situations and also enable all customers to make informed choices about their tariff and energy supply. Building on these existing principles, we have proposed introducing a package of new narrow principles regarding supplier-customer communications.[90] These look to facilitate more timely and engaging communications and should enable consumers, including the vulnerable, to better understand and manage their costs and consumption.

3.83. The CEPA report noted that consumers today generally prefer a simple and predictable ToU tariff structure, with no real variation day-to-day, that they can understand (static ToU tariffs rather than dynamic ones). Innovative smart technology, such as battery storage (which may be provided on a community basis) or automation can make it easier for consumers to benefit from time of use products and allow a greater number of consumers to engage in demand-side flexibility. This may stimulate increased consumer interest in more complex ToU tariffs. However, the risk of sudden changes to a vulnerable consumer's ability to offer flexibility would need to be addressed, if necessary, by other mitigation measures.

[90] Our policy consultation on changing supply licences to reform supplier-customer communications through principles-based regulation (May 2018) is here: https://www.ofgem.gov.uk/publications-and-updates/domestic-supplier-customer-communications-rulebook-reforms

3.84. We will explore these issues further through our call for evidence later in 2018 on consumer impacts.

Impact on small businesses

3.85. There is limited evidence to date of how smart meters and ToU tariffs may affect small and medium enterprise (SMEs) consumers (Profile Classes 3 and 4 in current settlement arrangements) and their expected take-up of smart tariffs. Only a few trials and studies have looked at the small business impact in detail. This category of customer mainly includes microbusinesses (less than 10 employees) but also some commercial businesses and industrial businesses (employing up to 250 employees).

3.86. In some ways, many microbusiness consumers are likely to face similar challenges to domestic customers eg needing better communication about their usage from suppliers. The impact of this will need to be addressed appropriately. Where energy usage is a big part of a business's cost, these businesses may be more willing to consider load shifting solutions (to the extent that their business operations allow).

3.87. The opportunity to realise bill savings through ToU tariffs and other innovations may be limited by the ability of a business to make a significant change to when energy is consumed. Many businesses, particularly industrial and commercial firms, may operate a strict time pattern, eg weekly or seasonal, that inhibits any meaningful load shifting activity.

3.88. Innovations such as battery storage may have a more significant impact on those businesses with a larger load. They may have potential to transition existing load, such as refrigeration or heating, to equivalent smart appliances where the business cost justifies the investment. Energy efficiency measures may also become more relevant due to a lack of load shifting ability. Businesses, in a similar way to domestic consumers, will want to see a tangible return as actual cost savings.

3.89. As with the impact on domestic consumers, this is an area which we will explore further through our call for evidence later in 2018 ahead of publishing the Full Business Case.

Equality and regional implications

3.90. If flexibility in the energy system, enabled by market-wide settlement reform, can produce a significant aggregate load shift away from peak periods, the resulting system-wide benefits should then be realised by all consumers as a result of system costs savings from lower infrastructure investment.

3.91. We intend to investigate if market-wide settlement reform would have any differing effects on consumers in different geographical regions in GB, and how those effects might manifest themselves. This could, for example, be a

result of differences between urban and rural areas, with some consumers potentially less able to directly access the full benefits of market-wide settlement reform. This could be for a number of reasons, such as broadband provision, access to off-street parking for EV charging or whether properties have space for enabling technologies such as solar PV or heat pumps.

3.92. We will also consider whether market-wide settlement reform could have any equality implications, in accordance with our duty to have regard to the Public Sector Equality Duty in the Equality Act 2010. This assessment will be part of the draft Impact Assessment, rather than a standalone equality assessment.

3.93. We will consider these areas further in the draft Impact Assessment. We anticipate that this draft Impact Assessment will be published for consultation in summer 2019, although the exact timing will depend on progress made on the design of the TOM and developing positions on key policy areas.

Summary

3.94. Our assessment at this stage has outlined the scale, scope and materiality of impacts from market-wide settlement reform, both in terms of the benefits associated with settlement reform and the costs of implementation. We have used the assessment to examine the role that market-wide settlement reform has as enabler of innovation and new business models to deliver benefits to the system and consumer through shifting consumption. We have sought to quantify the benefits where possible, and presented further qualitative benefits. Within this, we have sought to examine the rationale for moving from elective to market-wide HHS, based on the incentives that this would place on the market.

3.95. The assessment has shown benefits of a scale that exceeds the scale of potential costs. The benefits from load shifting in our assessment (including the sensitivity testing) have a lower bound of £100s of millions out to 2045, with an upper bound of several £billion out to 2045. The breadth of the range reflects both the inherent uncertainty in predicting electricity system outcomes and assessing the likelihood of load shifting behaviour, and also the range of potential outcomes that the project could deliver.

3.96. Market-wide settlement reform would provide the market with the right tools to enable new and innovative business models, bringing new products and services to market and supporting more dynamic competition. This is difficult to predict and quantify, but we do not think it would be delivered by elective HHS alone (for the reasons discussed on pages 54-56 and in Appendix 2).

3.97. The costs to implement market-wide settlement reform look, on the basis of information currently available, to be in the order of tens of millions of pounds in upfront costs, with millions of pounds per year of ongoing costs to support the increase in data amounting from the new settlement processes. This would amount to an overall cost for implementation and operation of the arrangements for market-wide settlement reform in the region of tens of

millions of pounds (approaching £100million) from implementation until 2045. This assessment may prove to be either an under or over estimate of costs, but it provides an indicative figure by which to compare the benefits.

3.98. Achieving the upper end of the benefits will need the right incentives for the market to bring forward new business models, products and services, and for those in the market to help consumers to manage their energy consumption and shift their consumption to cheaper periods. Reforming the settlement arrangements on a market-wide basis would enable the right incentive framework, based on our analysis, for this market to develop. It would potentially unlock further benefits by enabling options under consideration for access reform. It would also enable more direct benefits related to efficiency and process improvements in the settlement arrangements themselves.

3.99. **Our assessment outlines a strong benefits case for settlement reform on a market-wide basis, and indicates that our focus should now move to the questions of when and how to implement market-wide settlement reform**. We have begun our thinking as part of the assessment options work and will be developing this further, using the expertise of the DWG, the DAB and our stakeholders to determine practical options for the transition to market-wide settlement reform.

3.100. Options for transition will impact both the costs that are incurred and benefits that can be achieved. Suppliers and other stakeholders will need a reasonable period to implement new systems and processes, while earlier implementation would allow for earlier realisation of the benefits but may increase costs. The timing and phasing of implementation will be dependent on factors including the implementation of other change programmes such as the switching programme, the smart meter rollout and the direction taken on the policy interactions discussed in the Strategic Case.

3.101. We will examine all of this in more detail and will be seeking quantitative evidence through a second information request including the impacts of different implementation timeframes. We intend to issue this information request in spring 2019, to inform the draft Impact Assessment in summer 2019, before the final Impact Assessment is presented as part of the Full Business Case in the second half of 2019. Exact timings will depend on progress made on the development of the TOM and decisions on key policy areas, as these will all be needed in order to robustly estimate the costs of the reforms.

3.102. We will also continue to refine our assessment of the overall costs and benefits, using the final TOM and policy decisions to refine our quantitative estimates, based on evidence provided in the second information request. This will allow us to move from this high level and indicative assessment to assessing specific options for settlement reform, in line with the business case methodology of quantitatively assessing a short list of options.

4. Commercial Case

Chapter Summary

The Commercial Case sets out further information about the factors that suppliers and other industry players may consider regarding whether to deliver market-wide settlement reform. It examines potential drivers for change, drawing on experience from previous implementation projects and from the expertise of our stakeholders.

4.1. In the Strategic Outline Case, we highlighted the range of potential outcomes for reformed settlement arrangements, from evolving the existing arrangements incrementally to establishing new IT settlement solutions and ways of working, through requisite changes to the industry codes. We noted that the ongoing TOM design work and our decision on which TOM design to approve would determine the form of the reformed settlement arrangements to be implemented. Any new systems solutions would need to be procured by industry, in line with the approved design, and not by Ofgem.

4.2. We also highlighted previous examples of major industry change programmes which took longer to implement than originally planned due to a lack of coordination across stakeholders or a lack of incentives to drive forward change on the part of industry. We are seeking to avoid potential delays by engaging with industry and other key stakeholders early and throughout the process of designing reformed settlement arrangements, eg using the DWG and DAB to help develop the detailed TOM design but also by engaging more widely with stakeholders through bilateral meetings and at stakeholder events. This will ensure that the TOM designs presented to us for consideration and our final decision will have had considerable prior input from industry experts and from those parties expected to implement the final TOM.

Commercial drivers

4.3. The use of actual half-hourly consumption data for settlement will open up a number of opportunities for suppliers, eg to more accurately forecast their purchase requirements and to then offer consumers new products and services, such as smart time of use tariffs, based on actual usage information. We have identified a number of potential commercial drivers that could encourage suppliers and other market participants to deliver market-wide settlement reform in a timely, cost-effective way where they may not otherwise wish to do so. We have divided these drivers into 'push' and 'pull' factors.

Push factors

4.4. We have identified certain factors that may push market participants towards implementing robust, enduring reformed settlement arrangements where they may not have otherwise wished to do so. These may arise out of obligations

on them or where there is a commercial advantage compared with the alternative, ie continuing to operate existing arrangements for longer.

Placing an obligation on market participants to cooperate to deliver market-wide settlement reform

4.5. Delaying the implementation of reformed settlement arrangements could affect both the timing and scale of realisable benefits that could be achieved. Later implementation could have adverse financial implications for market participants' businesses, as well as not enabling benefits for consumers early enough and delaying the move to a smarter, more flexible system.

4.6. Once we have approved a final TOM design for the enduring settlement arrangements, we anticipate a transitional period prior to full implementation. This will allow market participants to implement the changes and adjust to how they operate in the market. We anticipate making changes to industry codes that cover the transition to, and full implementation of, the enduring arrangements. System changes may be required for the transition and for full implementation.

4.7. For licensed parties, we may consider changes to the relevant licences to ensure there is timely delivery of the approved TOM design through the industry codes. We would set out in the form and wording of the licence changes the obligation to be placed on them, ie a duty to cooperate to implement the reformed settlement arrangements, obtaining the support of other non-licensed parties, eg supplier agents, to achieve this as needed.[91] Where parties do not cooperate in line with the licence, there would be a risk to them of facing compliance and enforcement action. Our current approach of collaborative working with all stakeholders to produce the approved TOM design is aimed at avoiding or mitigating this potential risk.

Competition pressures on existing market participants

4.8. Using actual half-hourly electricity consumption data will be attractive to potential new entrants to the energy market who may spot a competitive advantage in delivering a better product or service to consumers or developing a niche market unserved by existing suppliers. These new entrants may initially pursue opportunities through elective HHS while also seeking to influence the final TOM design for market-wide HHS. We expect that these new entrants will actively engage in the TOM design process to help develop

[91] Ofgem's Switching Programme has consulted on a form of words for the licence drafting that captures this obligation in respect of that project and which could also apply to other 'significant code projects' delivering major reform such as settlement reform (see https://www.ofgem.gov.uk/publications-and-updates/switching-programme-proposed-modifications-regulation-and-governance (paras 2.5 to 2.13)) We are currently considering responses to this consultation.

an enduring settlement design that is future-proof and that enables their business model(s).

4.9. New entrants pose a potential commercial threat to existing suppliers. Should more new players enter the market, initially by using the elective HHS route, existing suppliers may counter this challenge by pursuing market-wide settlement reform with more vigour. While they could consider pursuing the elective HHS route themselves (affecting the scale of additional benefits achievable through market-wide settlement reform), a push towards pursuing enduring reform instead is likely to unlock greater realisable benefits for them much more effectively and through future-proof arrangements to meet competitive pressures.

Impact of ongoing technological change

4.10. The existing settlement arrangements for domestic and most non-domestic customers have been in place since full market opening in 1998. In the 20 years since, the speed of technological change in the energy market has increased. In the future, the potential availability of significant amounts of actual electricity consumption data from smart meters will provide a useful resource for market participants when they develop new products and/or services.[92] This granular data will provide a more detailed picture of individual customers' demand and also about their propensity to change usage behaviour.

4.11. Certain parts of the existing settlement arrangements are due to change in any case. This will risk introducing further significant settlement errors and adversely affecting cost reflectivity should the existing arrangements continue broadly as they are. These changes will affect the accuracy and usefulness of standard load profiles further, decreasing their relevance and value over time. The varied ways that consumers will use energy in the future suggest that the current settlement arrangements have outlived their usefulness in a different technological age.

4.12. The case for making changes to settlement processes, whether incrementally or in a fundamental way, will become unarguable and industry may recognise that circumstances push them towards taking action. Energy policy generally is also driving industry towards implementing the tools to facilitate a smart, flexible energy system. Industry may decide that changes cannot be delivered effectively by incrementally changing the current settlement processes and instead seek to make more fundamental changes through the TOM design process.

[92] The availability of half-hourly data to energy providers is subject to consumers consenting to share it under the Data Access and Privacy Framework.

Pull factors

4.13. The counterpoint to the 'push' factors above is that these same factors also 'pull' market participants towards realising the benefits of market-wide HHS as early as potential opportunities open up to them.

Opportunities to innovate based on technological change

4.14. Technological advances will enable new routes to market for industry participants. These advances include a widespread penetration of smart meters, smart appliances, EVs and battery storage. The common factor with these new technologies is that they facilitate and generate useful data about consumers' actual energy usage. Market participants can use the data generated (subject to the Data Access and Privacy Framework and other data protection legislation) to develop new tariff products and/or services based on these and other emerging innovative technologies.

4.15. The opportunity for suppliers to use actual electricity consumption data[93] from their customers should help them forecast their wholesale purchase requirements more accurately over time and lower their 'cost to serve'. This will require some form of upgrade to the existing settlement arrangements.

4.16. Industry will want to pursue market-wide settlement reform because of the wider commercial benefits, as well as allowing for further innovative products/services that can be delivered in the future as a smart, flexible energy system becomes established and matures.

Increasingly accurate and faster processing of settlement using half-hourly data

4.17. One of the long-term benefits for market participants of implementing changes to existing settlement arrangements is faster processing of settlement data. Access to half-hourly data should progressively eliminate issues with settlement errors, although some legacy issues where traditional meters are retained may remain. Reducing the overall cost of settlement to market participants, through shorter timescales, with the benefits passed through to consumers, offers a strong incentive that will pull them towards upgrading the existing settlement architecture.

4.18. There will be a transitional period before full implementation when there may be risks around forecasting using actual data instead of standard profiling. These risks may arise as market participants get used to the new settlement

[93] Our consultation on access to half-hourly electricity data for settlement purposes sets out our proposal that half-hourly electricity consumption data should be made available for forecasting aggregated by supplier and by Grid Supply Point (GSP) group: https://www.ofgem.gov.uk/publications-and-updates/consultation-access-half-hourly-electricity-data-settlement-purposes

processes and when they have a mixture of actual and estimated data to use for a period of time which may affect their ability to forecast their purchasing requirements more accurately. The draft Economic Case (pages 34-70) identifies a number of variables and risks attached to the timing of realising benefits, such as the speed with which suppliers could achieve more accurate forecasting of their purchasing requirements. In the short term, the risk of more, rather than less, forecasting errors could adversely affect the cost of the settlement arrangements. However, in the longer term, forecasting errors should reduce and the benefits of enduring settlement reform should outweigh these risks and will be an incentive to market participants to deliver change.

New business models in a changing energy market

4.19. The current energy retail market does not work well for all consumers. Settlement reform is one of a number of initiatives Ofgem has underway to fundamentally change the way in which the energy market operates. We expect increased competition driven by new entrants with different business models, particularly those who are also more adept at processing and using data. Suppliers may consider adapting their current business models away from 'pure' energy supply towards an energy service provider role. This change may pull them towards offering a wider range of services to compete with new entrants, eg partnering with manufacturers of EVs or smart appliances, to offer a route to the energy market that the manufacturer may not otherwise have by connecting the smart product to an existing market player with a known market reach.

Potential disincentives to progress market-wide settlement reform

4.20. While there are a number of reasons set out above why market participants may have incentives to progress market-wide settlement reform, there are also potential disincentives for them to do so which could impact effective progress towards reformed settlement arrangements. We are using our ongoing stakeholder engagement with industry to seek to minimise the risks of this happening.

Limiting competition and keeping customers disengaged

4.21. Existing suppliers may wish to limit the impact of new entrants taking advantage of settlement reform to compete and bring new products to the market. They may also want to ensure that their customers remain largely disengaged from the competitive energy market and do not move to potential competitors. By not progressing with market-wide settlement reform in a timely way and retaining the existing arrangements for a longer period, they may feel able to achieve these aims.

Procurement costs of new systems for market-wide settlement reform

4.22. As the TOM design progresses into the detail of the systems design required to implement reformed settlement arrangements, industry may view the costs of making significant systems investment as prohibitive despite the potential benefits (for themselves and for consumers) as a whole. There is a risk that this prevents proper and timely full implementation of the system changes or that delays extend the transition period and lower the realisable benefits of market-wide settlement reform.

The impact of other ongoing market changes

4.23. The smart meter rollout will enable a number of wider consumer benefits. Progress on the rollout will affect the speed at which these benefits are realised. The energy market is going under significant change, so Ofgem needs to consider how to introduce reforms to the settlement arrangements at the same time as other regulatory and industry changes are being delivered. Our view, as also expressed in the Outline Business Case for the Switching Programme[94] is that effective coordination across the various change programmes can, and will, deliver real consumer benefits and should not be a cause for delay.

Lessons from other change programmes

Settlement reform for Profile Classes 5-8 (P272)

4.24. In the Strategic Outline Case, we noted that, while the changes to implement settlement reform in the large non-domestic customer market (P272) were eventually successful, there were a number of issues that caused delays and which were then reflected in lessons learned:

- Variable interaction between industry parties because of, for example, the use of different supplier approaches to the communication of changes to customers and a lack of awareness about all the parties involved in the process aside from suppliers themselves. A more consistent communication approach was considered to be necessary.

- Ensuring that communication to, and involvement of, a wide group of affected stakeholders be managed earlier in the process.

[94] See page 109 of the Switching Programme Outline Business Case: https://www.ofgem.gov.uk/system/files/docs/2018/02/switching_programme_outline_business_case_and_blueprint_phase_decision.pdf

- Post-implementation monitoring of supplier performance needed further thought, including clear determination of the end point of the project, so that future monitoring could be arranged appropriately.

4.25. For market-wide settlement reform, we intend to address the issues highlighted above by taking a collaborative approach to developing change through early and ongoing interaction with industry and wider stakeholders. We will consider how best to manage the transition from the existing to the reformed settlement arrangements and provide clarity to industry and wider stakeholders, eg whether we are best placed to act as an 'involved' project sponsor undertaking whole of project engagement. We note that aspects of the P272 process, such as the phased transition introduced by P322, worked well. Setting interim targets towards achievement of full implementation may also be helpful. We also note that applying a licence obligation on parties providing them with a duty to cooperate may help achieve more cohesion in the way parties work to implement the reformed settlement arrangements.

Gas Settlement Reform (Project Nexus)

4.26. In the Strategic Outline Case, we highlighted the challenges that arose in making reforms to change the gas settlement systems, including introducing new settlement classes (Project Nexus), which resulted in significant delays to final implementation. Some key learning points from the early phases of this project were:

- A lack of central coordination of the project and insufficient regulatory powers for compelling market participants to work together to achieve go-live. This resulted in Ofgem assuming control at a late stage to sponsor the project in the interests of protecting consumers and to complete implementation.

- A lack of commitment initially and for a period of time thereafter amongst industry to drive forward the changes. This changed towards the end of the project but was not a guaranteed outcome. Collaborative working by industry was needed from the beginning to complement, rather than replace, any regulatory requirements such as licence conditions to minimise risk to delivery and to consumers.

- A rigorous approach to developing and testing replacement systems was adopted by the systems owner and operator, Xoserve, to deliver the changes successfully in conjunction with an experienced delivery partner, despite initial problems and delays, albeit that delivery was also late and over budget

- Poor preparation by individual contributors to the end solution caused additional costs and delays to be incurred in delivery and this could recur in the case of other large, multi-party projects if not managed effectively.

Smart meter rollout

4.27. Suppliers have a regulatory obligation to take all reasonable steps to roll out smart meters to their domestic and small business customers by the end of 2020. To date, more than 11 million smart meters have been installed nationwide.[95] In developing our approach to monitoring supplier progress, we learned lessons from the rollout of advanced meters to larger non-domestic customers.[96] For the smart rollout, we require suppliers to report to us on their plans and progress each year, and publish open letters sharing key observations that we expect suppliers to take into account. Key areas that we highlighted most recently[97] included:

- Consumer engagement – we expect suppliers to deploy a variety of channels and continuously test, learn and adapt their engagement strategies.
- Consumer experience – suppliers must ensure that customers have a positive experience of the smart metering journey, including complying with obligations under the Standards of Conduct and Smart Metering Installation Code of Practice (SMICoP).
- Customer eligibility – suppliers need to actively seek to open up eligibility and remove constraints on their ability to deliver the rollout, eg resolving technical issues.
- SMETS2[98] preparedness – suppliers must ensure they are ready to install SMETS2 meters at scale by the SMETS1 end date.

4.28. We are currently using our Settlement Reform SCR to take forward an end-to-end process for developing and delivering settlement reform to tackle the issue of lack of coordination, using industry input throughout to drive the changes and obtain stakeholder buy-in to the final reform package. As explained in the Management Case, we also have statutory powers through the Smart Meters Act 2018 that will assist us in delivering the project. We have discussed the application of these statutory powers further in the Management Case.

[95] See here for the most recent BEIS statistics on the rollout of smart meters: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/712151/2018_Q1_Smart_Meters_Report_.pdf
[96] See here for our decision on supplier reporting to Ofgem during the smart meter rollout (Oct 2014): https://www.ofgem.gov.uk/sites/default/files/docs/2014/10/final_proposals_on_supplier_reporting_0.pdf
[97] Our most recent communication about suppliers' smart meter rollout plans and progress is here: https://www.ofgem.gov.uk/system/files/docs/2018/05/2018.05_open_letter_-_observations_from_rollout_plans.pdf
[98] SMETS stands for Smart Metering Equipment Technical Specifications.

Stakeholder views

4.29. In thinking more widely about the commercial drivers outlined above, we have also sought views from the DWG and DAB and other industry experts. The key points discussed with them include:

- The potential for forecasting errors by suppliers seeking to forecast demand for their customer base for a period following market-wide settlement reform. This could adversely impact suppliers, potentially affecting their ability to operate efficiently and their market position. However, there could also be opportunities for other suppliers who are more confident with using half-hourly data during the migration to new settlement arrangements and are also better at forecasting their requirements. It was noted that the time taken to unwind existing arrangements (standard load profile errors) could raise supplier risk. The risk of forecasting errors and their impact is discussed further in the draft Economic Case.

- P272 implementation – there was a view that the transition to P272 had been problematic due to issues with change of measurement class, high levels of manual processing of data from the affected customers, and a lack of preparedness to implement changes despite a long notice period. Some differences between implementing the P272 changes and the proposals for market-wide settlement reform were noted, eg less manual processing will be involved as market-wide HHS would encompass more remote management of data by suppliers through smart technology for a much bigger group of consumers (domestic and smaller non-domestic).

- There was a view that early clarity about the shape of the new settlement arrangements would benefit all market participants so that that they can prepare appropriately to build the most cost effective infrastructure in a timely way. There is a risk that delays to understanding the detailed new arrangements could lead to 'snagging' issues that then delay potential benefits. This would be particularly important where the transition period is concerned, to understand when this would end and the enduring arrangements would begin.

- The role played by innovation in the future as well as the rollout of new technologies to consumers generally should be recognised. Small-scale smart devices, eg smart plugs, are seen as affordable technology that can engage more consumers with their energy use at low cost and also allow them to understand how to offer DSR to their supplier or provider. These devices could be a viable option for those consumers who may be less willing or able to making a significant purchase of a large smart product, eg a smart appliance or EV.

4.30. As the settlement reform project moves forward into the detailed design phase (Stage 2 of the TOM work) and beyond, we will monitor whether these issues are being addressed and the potential solutions for minimising risks, eg

whether the risks of significant forecasting errors, affecting the whole market as well as individual market participants, are being addressed. We will also monitor whether the proposed reformed arrangements develop in a way that provides future proofing so that new technologies and innovation can be appropriately accommodated.

Have we identified the right commercial drivers? Are there others that we have not identified and should consider? How can we look to either capitalise on the positive impacts of these drivers or mitigate any negative impacts? Please send us your comments by 17 October 2018 using the feedback form provided alongside this Outline Business Case. If responses are not marked as confidential, we will publish them on our website. We will consider these comments and use them to inform the development of the plan for implementation, which will be set out in the Full Business Case.

5. Financial Case

Chapter Summary

The Financial Case provides an update on the information set out in the Strategic Outline Case about the resourcing implications of developing and then delivering market-wide settlement reform.

5.1. In the Strategic Outline Case, we set out the arrangements for conducting the SCR and provided an initial overview of the likely resourcing requirements for industry and ourselves. We also summarised the funding arrangements for the various parties most closely involved in this work or likely to be involved as the preferred TOM is implemented.[99] This information was provided in general terms as it was not possible to set out more detail about the costs of undertaking design and development of the reformed settlement arrangements at such an early stage of this work. In this Outline Business Case, we provide a further update on the resourcing of work undertaken to date.

Resource implications for design and development of reformed arrangements

Update on the resourcing of design work

5.2. The first phase (Stage 1) of TOM design involved the development of potential TOM designs (skeleton TOMs) for further consideration. We approved the skeleton TOMs for consultation with wider stakeholders in April 2018.[100] We also agreed that the DWG should begin work on Stage 2 of the TOM design work involving more detailed development of the skeleton TOMs.[101]

5.3. ELEXON has incurred costs in leading and supporting the Stage 1 TOM work, alongside the costs incurred by the DWG members to take part in the Stage 1 development of the skeleton TOMs, amounting to six meetings which were held over six months.

[99] See the Strategic Outline Case for more details on funding arrangements for the different parties: https://www.ofgem.gov.uk/publications-and-updates/consultation-access-half-hourly-electricity-data-settlement-purposes

[100] ELEXON's consultation on the skeleton TOMs is here: https://www.elexon.co.uk/consultation/dwg-consultation-skeleton-target-operating-models-april-2018/?utm_source=Newscast+final&utm_campaign=f2c65dd5f3-EMAIL_CAMPAIGN_2018_04_30&utm_medium=email&utm_term=0_14d01e9481-f2c65dd5f3-393806781

[101] Our approval decision is here: https://www.ofgem.gov.uk/publications-and-updates/decision-approve-skeleton-toms

5.4. Ofgem has also incurred costs to date in respect of the Settlement Reform project encompassing a range of workstreams (among them TOM design, business case development and policy development). Ofgem is funded through fees levied on licensed companies, subject to agreement from HM Treasury on its overall annual revenue. Ofgem's Performance Delivery Board scrutinises Ofgem's forward work programme and makes decisions about how to allocate its budget to specific projects and work programmes on an ongoing basis. These decisions are made based upon a business case submission by project or programme teams, including activity planning in support of a budget proposal. For the Settlement Reform project, we have received a multi-year budget approval which we review on an annual basis.

5.5. Stage 2 of the TOM design work will involve a more detailed consideration of the skeleton TOMs to seek to establish a preferred TOM design. We expect to receive the final report from the DWG in spring 2019 after which we will consider its contents before deciding on which option to take forward as part of the Full Business Case in the second half of 2019. ELEXON will continue to lead this with the participation of stakeholders, including the DWG. The DAB will continue to play a role throughout Stage 2.

5.6. Once the implementation phase is underway for delivering the preferred model for market-wide settlement reform, there is likely to be a resource requirement on a number of parties (ELEXON, other code administrators, ourselves and industry generally) to deliver the changes required. This will involve drafting industry code changes (and any licence changes) that are identified as required to underpin the revised arrangements to be delivered in the affected codes, consulting on these, and then implementing the changes. It is too early to say what resourcing may be needed for this exercise as it will depend on the scope and scale of changes to be made, which will be determined by the preferred TOM. As noted in the Management Case, we expect to end the SCR following the design and development phase and take forward implementation using the powers in the Smart Meters Act 2018. We will consider nearer the time the most efficient way to deliver the necessary changes, in terms of the time and cost involved.[102]

5.7. We expect there will be a phased transition to market-wide settlement reform to ensure a smooth progression from the current settlement arrangements to the new settlement arrangements. The costs of this will need to be considered as part of our decision on the preferred TOM to be taken forward. The resource associated with this transition is also currently uncertain.

[102] The Impact Assessment associated with the settlement reform powers in the Smart Meters Act estimates industry and Ofgem resource savings from using the powers compared with continuing the SCR process of 13.5 months, with cost savings of £0.7 million to Ofgem and £1.3 million to industry. More information can be found here: https://publications.parliament.uk/pa/bills/lbill/2017-2019/0083/smart-meters-IA.pdf

6. Management Case

Chapter Summary

The Management Case updates the plan for the first phase up until the decision on market-wide settlement reform, including our key milestones. It sets out our first steps at looking beyond that decision point to consider how the governance arrangements may work for the code modification and implementation stages in light of new powers provided by the Smart Meters Act 2018. It also outlines the results of a project assurance review carried out by the Infrastructure and Projects Authority.

Phase plan

6.1. The delivery of market-wide settlement reform is likely to involve major changes to systems (central systems and market participants' systems) and market rules (licences and industry codes). Other significant market reforms are also taking place simultaneously. All these changes will require careful planning and management.

6.2. The project is progressing through its design phase, with a continuing focus on TOM design and policy considerations on access to data and agent functions. Policy work on consumer protection, and the development of the Business Case, is also ongoing.

6.3. Figure 16 overleaf presents an updated (since the Strategic Outline Case) and more detailed overview of each of the individual work streams in the first phase, up to the decision on progressing with market-wide settlement reform. The first phase plan also sets out how the individual work streams interact, and highlights key milestones.

6.4. The plan is based on the assumptions that policy decisions on access to data and agent functions will take place by the end of 2018 and the DWG will deliver the preferred TOM option by spring 2019. We will continue to monitor progress with these workstreams, with a particular focus on the impact on the project if delays are foreseen.

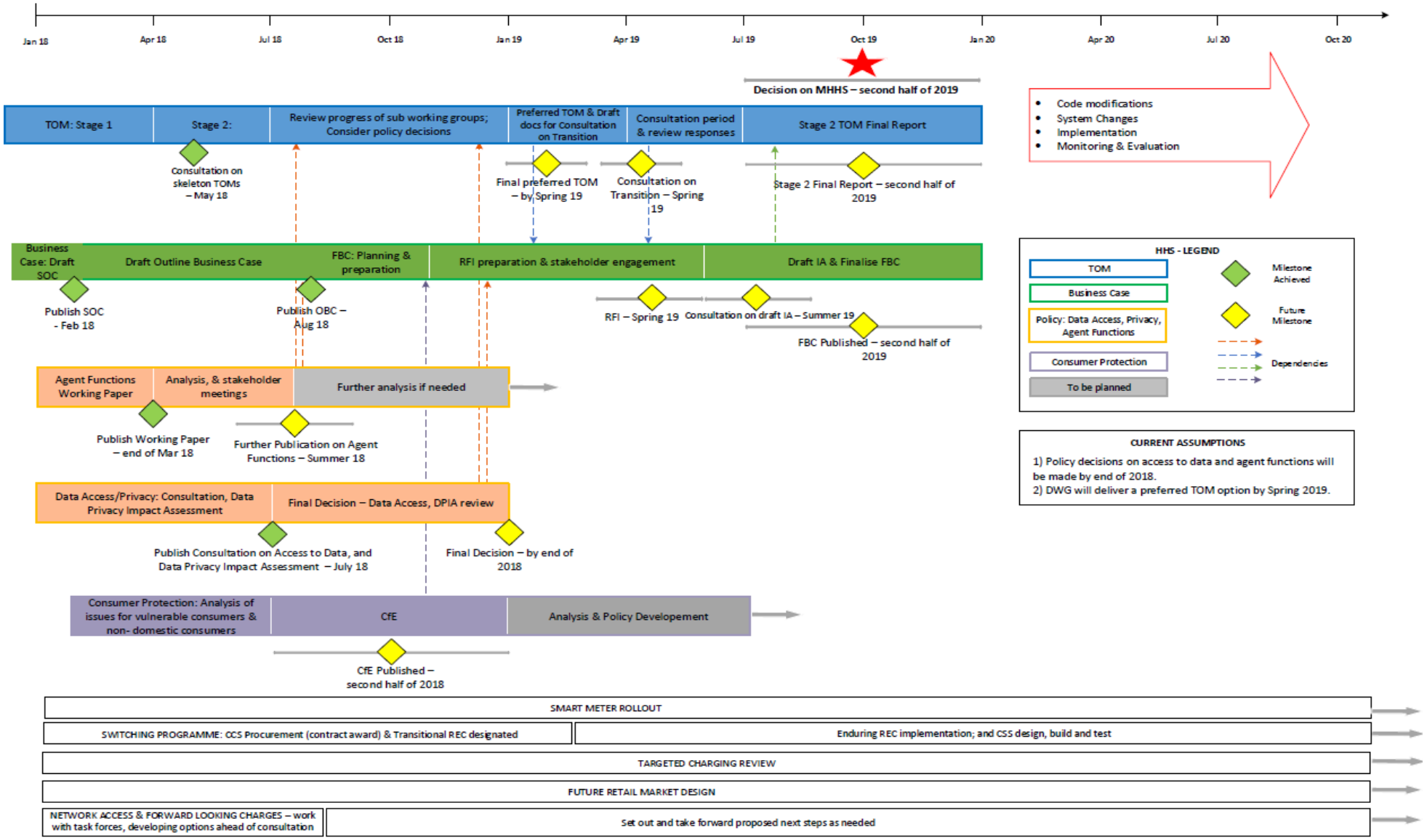


Figure 16: First Phase Plan - Updated

First phase milestones

6.5. The milestones for the design phase of the project are in Figure 17 below. These are our best estimate based on the information we currently have, but may change over time based on the policy and design decisions that are made and the impact of any unforeseen external factors.

Key: GREEN – Milestone achieved; **BLACK** – Future milestone.

Milestone	Date
SCR launch statement published	July 2017
Distributional analysis published	
Information Requests (Business Case and agent functions) published	August 2017
Decision on DWG membership	September 2017
Information Request (access to data for settlement purposes) published	October 2017
Decision on DAB membership	November 2017
Strategic Outline Case published	February 2018
Working paper on Agent Functions published	March 2018
ELEXON Consultation on Skeleton TOM Options	May 2018
Consultation on Access to Data for Settlement Purposes and Data Privacy Impact Assessment published	July 2018
Outline Business Case (this document) published	August 2018
Further publication on Agent Functions	Summer 2018
Final decision on Access to Data for Settlement Purposes	By end of 2018
Call for Evidence on Consumer Impacts	Second half of 2018
Final preferred TOM delivered to Ofgem by ELEXON	By Spring 2019
Request for Information – Full Business Case	Spring 2019
ELEXON Consultation on Transitional Approach	Spring 2019
Consultation on Draft Impact Assessment for Full Business Case	Summer 2019
Stage 2 TOM Final Report delivered by ELEXON	Second half of 2019
Publish Full Business Case	Second half of 2019
Decision on market-wide settlement reform	Second half of 2019

Figure 17: First phase milestones

Governance arrangements for code modifications and implementation

6.6. In the Strategic Outline Case, we noted that delivering market-wide settlement reform will involve major changes to systems (central and market participants' own systems) and to market rules (licences and industry codes). These changes will require careful planning and management. In the case of systems changes, Ofgem will not own or procure these systems. Instead, we will look to industry to undertake an effective procurement process that delivers the relevant changes in a cost efficient way.

6.7. In the case of market rules changes (to licences and codes), the Smart Meters Act 2018[103] now provides Ofgem with powers to amend codes and licences specifically where these changes are required to deliver HHS. The powers are available to us for five years from the point at which they are switched on by the Secretary of State. We expect to make a request for the powers to be switched on after the publication of our Full Business Case and decision on market-wide settlement reform in the second half of 2019.

SCR Option 3

6.8. For the present, we continue to undertake a SCR process to progress market-wide settlement reform.[104] The SCR route we have chosen (Option 3) involves us leading an end-to-end process which, if we chose to apply it through to full implementation, would result in us developing code modifications for the relevant industry codes that will be affected prior to making a decision on which changes to implement.

6.9. We are engaging with stakeholders throughout the design and development phase through the various channels established including the Design Working Group, the Design Advisory Board, regular conference calls, workshops and bilateral meetings. We will seek to ensure that, once we enter the implementation phase, appropriate code changes can be developed and, importantly, subsequently delivered in a coordinated manner. We will take the final decision on the enduring settlement arrangements and transitional arrangements to be taken forward for implementation.

6.10. We will consider the appropriate implementation process for making the changes as we develop our Full Business Case and decision on market-wide settlement reform in the second half of 2019. Following our decision, we expect to bring the SCR process to a suitable conclusion and use the Smart

[103] See here for information about the Act: https://services.parliament.uk/Bills/2017-19/smartmeters.html

[104] The SCR process provides a tool for Ofgem to initiate wide-ranging and holistic change and to implement reform to a code based issue. This holistic approach allows us to ensure the effective and efficient delivery of changes with a significant cross-code and/or code-licence impact.

Meters Act powers from that point instead, building on the work done during the SCR to that point

Smart Meters Act

6.11. The Smart Meters Act received Royal Assent on 23 May 2018.[105] This provides new powers to the Authority from a date when the powers are switched on by the Secretary of State (based on a request from the Authority) and as appointed in regulations. These powers will be in place for the Authority's use for a maximum of five years from the 'switch on' date to deliver market-wide settlement reform by:

- modifying electricity codes and code documents to enable settlement of electricity imbalances using customers' actual half-hourly metered consumption data,[106] and

- making licence modifications which are necessary or desirable to enable settlement of electricity imbalances using customers' actual half-hourly metered consumption data earlier than the normal 56 days 'standstill' period required before licence modifications come into effect.[107]

6.12. In applying the legislative powers, the processes to run the end-to-end process under SCR Option 3 will remain relevant, eg developing a package of code changes through industry workgroups, undertaking wider stakeholder consultation and/or impact assessments on code changes which may be more complex or have material effect, and the use of code administrators' expertise (while we retain decision-making power over the changes delivered).

6.13. In terms of how we undertake the drafting of our package of code changes in line with the legislative powers, we could undertake this work ourselves, it could be led by an existing code body (such as ELEXON, as the BSC is likely to be the main affected code), or we could commission a third party to do this. We will consider these options further as we progress with the project. We expect our role is likely to be that of the 'involved project sponsor' to manage implementation and deliver positive outcomes for consumers.

6.14. The Act sets out a specific process for us to follow when making code changes, involving publishing a notice stating that we are proposing a modification(s) to a code(s), the effect of the proposed modification(s), the date from which the proposed modification(s) will take effect and our

[105] See footnote 106.
[106] This can occur where the Authority considers the modification *necessary or desirable* for the purposes of enabling or requiring half-hourly electricity imbalances to be calculated using information about customers' actual consumption of electricity on a half-hourly basis
[107] The purpose of this condition is that the Authority considers the modification necessary or desirable for enabling or requiring half-hourly electricity imbalances to be calculated using information about customers' actual consumption of electricity on a half-hourly basis. The Authority's decision can take effect within the 56 day standstill period where it considers it necessary and expedient to do so.

reasons for proposing the modification(s), for a minimum of 28 days. We would send the notice to specified parties, eg relevant licence holders, the Secretary of State, Citizens Advice bodies and devolved government bodies.

6.15. Following the consultation period, we would publish a modification notice stating that we are making a code modification(s), details of the modification(s) and its effect, the date from which the modification(s) applies, how we considered and addressed any representations made through the consultation, and the reason(s) for making the modification(s).

Assurance Review

6.16. Since the publication of the Strategic Outline Case, the project has gone through a Gateway 2 Assurance Review.

6.17. The five business case methodology highlights that assurance reviews are a key part of the business case process. In June 2018, we put the project forward for an Assurance Review through the Cabinet Office Infrastructure and Projects Authority.

6.18. The primary purpose of the Assurance Review was to provide the project's Senior Responsible Owner (SRO) with assurance over the activities and structure of the project, ahead of the publication of this Outline Business Case.

6.19. The Gateway 2 Review took place in June 2018. The delivery confidence assessment from the review was Amber. The Review Team found that the project is set up for successful delivery, however there are a few issues for management attention. These are resolvable at this stage and, if addressed promptly, should not present a cost or schedule overrun. We are addressing them as we move forward to the next stage of the project, and will undertake further assurance reviews as appropriate.

7. Next Steps

Developing our Business Case

7.1. This is the second iteration of our Business Case. The next and final iteration, the Full Business Case, will include an economic assessment of specific options for market-wide settlement reform, using the options framework (see Appendix 1). It will also use the Commercial, Financial and Management Cases to set out the plan for implementation and the governance arrangements beyond the decision point in the second half of 2019.

7.2. We aim to publish the Full Business Case in the second half of 2019 to support our decision on market-wide settlement reform, alongside the final TOM. Before this, we intend to consult on a draft version of the economic assessment (in the form of an Impact Assessment). The exact timing of the Full Business Case and the draft Impact Assessment will depend on the progress that has been made on key policy areas that will need to feed into this. It will also rely on the design work to develop the final TOM, which will be needed to gather robust evidence (through an information request) on the costs of implementing the new settlement arrangements.

Feedback

7.3. We continue to seek input from stakeholders through established channels including the DWG, DAB, regular conference calls and bilateral meetings.

7.4. If you would like to feed into the project and are not currently actively engaged, please contact the team at half-hourlysettlement@ofgem.gov.uk. We also welcome any feedback on this document.

Appendix 1 – Assessment Options

7.5. Our first steps at developing a long list of options for assessment and narrowing this down to a short list through a process of qualitative options assessment were outlined in a document published in September 2017.[108] The diagram setting out these options is shown below as Figure 18.

7.6. The options framework in the Five Case Model methodology envisages selecting one option (either Green or Amber) from each category of choice (or sub-category) to form an option to test, and doing this two or three times to create a shortlist of assessment options to quantitatively assess.

7.7. At this point, with the TOM yet to be completely defined and open policy questions, we are not in a position to rule out options in a number of these areas. The economic assessment therefore cannot yet be made against specific options for settlement reform, so instead we have based our economic assessment at this stage on just one key parameter – the policy approach. The assessment tested the high-level case for market-wide settlement reform against a counterfactual of elective HHS, presenting a range of likely impacts to outline the scale and materiality of the expected costs and benefits.

7.8. We will continue to refine this shortlist as policy decisions are made, the TOM is better defined and we know more about what is practically achievable in terms of a timeframe for implementation. We will then be in a position to create a short list of options which we can quantitatively assess in the draft Impact Assessment, and ultimately present in the Full Business Case.

[108] See 'Project Objectives and Assessment Options for the market-wide half-hourly settlement Business Case': https://www.ofgem.gov.uk/publications-and-updates/project-objectives-and-assessment-options-market-wide-half-hourly-settlement-business-case

Choices – what implementation options are available?		Extent of difference from status quo →			
Service Scope (WHAT?) – Coverage	1. Who will be covered	Small subset of consumers (eg based on technology/ consumption/DNO region)	A larger subset of consumers	All consumers	
	2. Metering	Just SMETS2 smart meters	All SMETS smart meters (1&2)	All advanced and smart meters	
Service Solution (HOW?)	3. Policy approach	Settlement incentives on suppliers delivered through encouraging 'chunking'	More promotion of elective (voluntary + incentives)	Market-wide	
	4.Granularity of settlement period	Half-hourly		Flexible to reasonable future systems	
	5. Approach to data access[109]	Access to data subject to existing data access rules (i.e. consumer consent required)[110]	HH data available for settlement purposes only with an option for consumers to opt-out	HH data is available for settlement purposes only	HH data is available for settlement only, following pseudonymisation or anonymisation
	6. Approach to agent functions	Retain existing competitive supplier agent market	Retain competitive supplier agent market with reform	Central agent	
	7. Approach to policy communications	Individual suppliers lead communication	Coordinated approach (Ofgem, industry and BEIS)	Ofgem or government led	
Service Delivery (WHO?)	8. Policy approach	Ofgem			
	9. Design of Target Operating Model	Industry led by Ofgem		Industry led by ELEXON	
Implementation (WHEN?)	10. Commencement	Slower commencement		Faster commencement	
	11. Phasing	Slow phase	Fast phase	Big bang	
	12. Period for systems changes	18 months	12 months	6 months	

Figure 18: Options framework

[109] Where options enable access to half-hourly data without consumer consent this data would only be available to be used for settlement purposes. Consideration of rules on access to data for any other purpose, including marketing, are out of scope of the half-hourly settlement project. Further consideration will need to be given as to any bespoke rules which may be necessary for consumers with a smart meter installed prior to the point at which any regulatory or code changes are made. Our consultation on access to data for settlement purposes can be found on our website: https://www.ofgem.gov.uk/publications-and-updates/consultation-access-half-hourly-electricity-data-settlement-purposes

[110] In accordance with Part B of electricity supply standard licence condition 47, suppliers can obtain electricity consumption data from microbusinesses relating to a period of less than one month on an opt-out basis. This means that opt-out is the status quo for this group.

Appendix 2 – Analytical questions on suppliers' incentives

What are suppliers' incentives to settle customer half-hourly under elective HHS (the counterfactual)?

Suppliers have an incentive to settle customers half-hourly for either (or both) reasons of *cost reduction* or *product differentiation*.

Suppliers may be able to reduce costs through more accurate and efficient settlement, better forecasting leading to less imbalance exposure and securing better prices for electricity in the wholesale market.

Suppliers can use HHS to offer new innovative products and services, thus differentiating their business model from others in the market. In a competitive market with a highly homogeneous product, such as the electricity retail market, companies compete with each other mainly on price. HHS enables companies to differentiate their products, through offering innovations such as static or dynamic ToU tariffs, and capitalise on new innovations and technologies such as EVs, smart appliances and battery storage. These new competitive activities can give the chance for new entrants to gain a foothold in the market, or for existing market players to gain market share if they are established, creating more competition and points of difference on quality and different services. It can also help suppliers to build a more stable customer base.

These incentives are unlikely to be strong enough on an elective basis for a number of reasons:

- Information asymmetries: Suppliers may not know the consumption pattern of individual consumers and their ability and willingness to shift load before settling them half-hourly. Some consumers (those with 'peakier' consumption profiles who are unwilling or unable to load shift) might be more expensive to serve when settled half-hourly. In order to minimise this risk, some suppliers might try to game the elective arrangements by "cherry picking" customers to settle half-hourly on the basis that those customers are cheaper to serve i.e. the difference between that customer's profiled usage and their actual usage would benefit the supplier's imbalance and trading position. Others might opt to not settle clients half-hourly at all.

- Upfront costs: HHS has the potential to reduce supplier costs, but companies must also invest in IT systems, in training staff, in marketing etc in order to realise the full benefits. Suppliers may be unwilling to make this level of investment in order to test new tariffs or innovations, or if they are unsure of the customer response, though that response will not become clearer without suppliers investing in moving towards HHS.

- The recipients of the benefits are not solely suppliers: a significant amount of the benefits of HHS are expected to be realised at a system level, so not all of the benefits of HHS will flow to suppliers directly. This means that for these benefits to be realised we need a certain degree of uptake of products and innovations that will encourage consumers to shift their consumption, and therefore a certain degree of HHS. This weakens the incentive for individual suppliers to act alone if there is not an industry-wide effort.

Faced with these risks, companies might prefer not to offer HHS, at least until there is more certainty about the level of acceptance of HHS and the resulting products and innovations in the market. Suppliers may prefer to 'opt-out' of the incentives produced by HHS and instead stick to the protection that is afforded to them through the profiling arrangements. Suppliers may be unwilling to expose themselves to the risks associated with being a first mover in the market, particularly if they anticipate a move to market-wide HHS in the future.

Elective HHS has enabled suppliers who wish to settle their customers half-hourly to do so cost effectively. While this has allowed these suppliers to test HHS, there are barriers to elective achieving the level of uptake needed to deliver benefits at the system level that are discussed in the rest of the draft Economic Case. Even if the elective arrangements were sufficient, over time, to transition the market over to HHS, we expect this to significantly delay the benefits that can be realised from settlement reform, therefore significantly reducing the benefits to consumers.

What are suppliers' incentives to encourage customers to shift their consumption away from peak periods?

The extent to which suppliers have an incentive to help customers to shift their consumption away from peak periods under elective HHS (the counterfactual) is not clear. "Early movers" in the market are likely to have a competitive advantage over other suppliers who are not doing this if they offer innovative products and services to help customers to load shift and save money. If these innovative products and services are the norm, suppliers that do not develop and offer them would be in a disadvantaged situation in the market.

In a situation where suppliers are exposed to the true cost of supply of their customer base through market-wide settlement reform, they will be exposed to the full costs that their customers impose on the electricity system. In order to compete effectively in the market, suppliers will have an incentive to lower electricity purchase costs by helping customers to consume electricity more efficiently by offering them innovative products, services and other solutions.

Upfront costs are relevant here too. If not enough customers are settled half-hourly, the costs of encouraging load shifting (design of new DSR tariffs, training staff, marketing and communication efforts, investment in IT etc) might offset the expected benefits and therefore suppliers might decide not to pursue measures that encourage load shifting.

Appendix 3 - Glossary

A

Advanced Meter

The electricity supply licence defines an advanced meter as one that must be capable of recording half-hourly consumption data and of providing suppliers with remote access to this data.

B

Balancing and Settlement Code (BSC)

The BSC is the document that sets out the terms for electricity balancing and settlement in Great Britain, including the governance process for modifications to the BSC.

Balancing and Settlement Code (BSC) Panel

The Balancing and Settlement Code (BSC) Panel is established and constituted pursuant to and in accordance with Section B of the BSC. It is responsible for ensuring that the provisions of the BSC are given effect to fully, promptly, fairly, economically, efficiently, transparently and in such a manner as will promote effective competition in the generation, supply, sale and purchase of electricity.

C

Critical peak price (CPP) tariff

These tariffs are generally comprised of flat price periods on most days but for a number of extreme peak days in the year, prices for specified periods within each day are far higher (usually 5-20 days that in a given year that are due to system stress periods).

Critical peak rebate (CPR) tariffs

CPR tariffs mirror CPP tariffs except that with CPR the consumer can get a rebate for load reductions during a specific period on relevant days relative to an estimated baseline consumption level. Those who cannot reduce demand will not pay any more for consumption during the peak period, while those who can will save.

D

Data Access and Privacy framework

The Government has developed a data access and privacy policy framework to determine the levels of access to energy consumption data from smart meters that suppliers, network operators and third parties should have. It also establishes the purposes for which data can be collected and the choices available to consumers.

Data and Communications Company (DCC)

The DCC is the company that manages the data and communications to and from smart meters.

Demand-side response (DSR)

Actions taken by consumers to change the amount of energy they take off the grid at particular times in response to a signal, such as a price.

Direct load control tariff

A tariff where the consumer pays a lower than average flat rate but in return agrees to some direct load control by their supplier at specific time periods when load is turned down. The consumer would need a smart device(s) installed, which would be remotely operated by the supplier with customer consent or with agreed customer manual intervention.

Discounting

Discounting is a technique used to compare costs and benefits occurring over different periods of time.

Discount Rate

Discount rate is the annual percentage rate at which the present value of future monetary values are estimated to decrease over time.

Distribution Network Operators (DNOs)

DNOs are the companies that are licensed by Ofgem to maintain and manage the electricity distribution networks in Great Britain.

Dynamic ToU tariffs

Dynamic ToU tariffs are similar to static ToU tariffs, but the time and/or costs of price periods are not fixed. This could vary on a week to week, day to day or even half-hour to half-hour basis.

E

Electricity Settlement Expert Group (ESEG)

The ESEG was an expert group of stakeholders convened by Ofgem with the objective of identifying options for using half-hourly data in settlement. Seven meetings were held between June and November 2014.

Electricity supplier

A company licensed by Ofgem to sell energy to and bill customers in Great Britain.

ELEXON

ELEXON is the organisation responsible for administering the BSC. The role, powers, functions and responsibilities of ELEXON are set out in Section C of the BSC.

Economy 7 tariffs

Economy 7 tariffs charge lesser rates during night and greater rates during the day (or peak) time, however, this tariff does not need a smart meter but a specialised (and less advanced) Economy 7 meter.

F

Feed-in Tariffs (FIT)

The Feed-in Tariffs (FIT) scheme is a government programme designed to promote the uptake of renewable and low-carbon electricity generation technologies. Introduced on 1 April 2010, the scheme requires participating licensed electricity suppliers to make payments on both generation and export from eligible installations.

G

Green Book

The Green Book is guidance issued by HM Treasury on how to appraise policies, programmes and projects. It also provides guidance on the design and use of monitoring and evaluation before, during and after implementation.

Grid Supply Point Group (GSPG)

GSPG means a Systems Connection Point at which the Transmission System is connected to a Distribution System

I

Imbalance charge

This is the charge that suppliers (and other market participants) pay for any difference between contracted and metered volumes. See also settlement process.

N

National Grid Electricity Transmission (NGET)

NGET is the System Operator for the electricity transmission system in Great Britain, with responsibility for making sure that electricity supply and demand stay in balance and the system remains within safe technical and operating limits.

Net Present Value (NPV)

NPV is a generic term for the sum of a stream of future values (that are already in real prices) that have been discounted to bring them to today's value.

Non-half-hourly settlement (NHH)

As part of the settlement process, NHH settlement is the arrangement for estimating how much energy a supplier's customers use in each settlement period based on meter readings spanning longer intervals. These consumers are not settled using half-hourly consumption data.

O

Ofgem

The Office of Gas and Electricity Markets (Ofgem) is responsible for protecting gas and electricity consumers in Great Britain. It is governed by the Gas and Electricity Markets Authority (GEMA).

P

Profile Class

Consumers that are not settled using actual meter readings for each settlement period are grouped into one of eight Profile Classes. For each Profile Class, a load profile is created that estimates the consumption shape of the average consumer. This load profile (or variations of it) is used to determine the consumption in each half hour for all consumers assigned to the Profile Class. See also non-half-hourly settlement.

Profiling and Settlement Review Group (PSRG)

The PSRG was a sub-group of the Supplier Volume Allocation Group (SVG) from 2010-15. The PSRG reported to the BSC Panel and was tasked with maintaining the integrity of the settlement arrangements in the short to medium term as smart meters are rolled out.

R

Real price

Real price is the nominal price (i.e. current cash price at the time) deflated by a measure of inflation.

Real terms

Real terms is a reference to the value of expenditure at a specified general price level (calculated by dividing a nominal cash value by a general price index).

S

Settlement period

The period over which contracted and metered volumes are reconciled. This is defined as a period of 30 minutes. See also settlement process.

Settlement process

Settlement places incentives on generators and suppliers to contract efficiently to cover what they produce or their customers consume respectively. For suppliers, it operates by charging for any difference between the volume of electricity that they buy and the volume that their customers consume.

Significant Code Review (SCR)

The SCR process is designed to facilitate complex and significant changes to a range of industry codes. It provides a role for Ofgem to undertake a review of a code-based issue and play a leading role in facilitating code changes through the review process.

Smart Energy Code (SEC)

The Smart Energy Code (SEC) is a multi-Party agreement, coming into force under the DCC Licence, which defines the rights and obligations of energy suppliers, network operators and other relevant parties involved in the end to end management of smart metering in Great Britain.

Smart meter

A meter which, in addition to traditional metering functionality (measuring and registering the amount of energy that passes through it), is capable of providing additional functionality (for example, recording consumption in each half hour of the day and of being remotely read) is known as a smart meter. It must also comply with the technical specification (SMETS).

Smart tariff

This is a catch all term that could refer to any tariff enabled by a smart meter but which specifically does not refer to tariffs available with traditional meters, including Economy 7 tariffs.

Static time of use tariff

A time of use tariff that fixes in advance the peak and off-peak periods for electricity consumption and the prices applied at these times.

Supplier Volume Allocation (SVA) arrangements

Within the BSC, the SVA arrangements provide the mechanism for determining the allocation of energy volumes to suppliers in each half hour of the day.

System Operator

The entity charged with operating the Great Britain high voltage electricity transmission system, currently National Grid Electricity Transmission Plc.

T

Time of use (ToU) tariffs

Unless otherwise specified, this refers to static time of use tariffs excluding Economy 7 tariffs. This is where customers are charged a lower price at specified off-peak times that are consistent day to day or week to week, reflecting the fact that electricity is generally cheaper to generate and transport at these times. (Some time of use tariffs could have different weekday and weekend rates).