

PUBLIC

# Market-wide Half-Hourly Settlement

Design Working Group Consultation on  
Skeleton Target Operating Models



ELEXON  
Version 1.0  
30 April 2018

# MARKET-WIDE HALF-HOURLY SETTLEMENT

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## OFGEM FOREWORD

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Making a positive difference  
for energy consumers

Ofgem welcomes this consultation from the Design Working Group on the skeleton Target Operating Models (TOMs) for Market-wide Half-Hourly Settlement.

To maximise the opportunities provided by a smart flexible energy system, we launched the Settlement Reform Significant Code Review last year with the objective of developing and then (subject to an Impact Assessment) implementing an enduring process to enable Market-wide Half-hourly Settlement. One of the key products of the Significant Code Review is the development of a TOM, outlining how Settlement arrangements (including market participants, industry organisations, and code bodies) will need to change to deliver Market-wide Half-Hourly Settlement.

The TOM design work has been developed for Ofgem by the ELEXON-chaired Design Working Group. The Group has met monthly since October and produced five high level 'skeleton' TOM options, as set out in this consultation.

We have approved the skeleton TOMs, concluding the first stage of the TOM design work. The Design Working Group will now, through this consultation and a stakeholder seminar, seek stakeholder views on the skeleton TOMs to inform them as they proceed to stage 2, which is where the detailed design of the skeleton TOMs will be undertaken. We would like to thank ELEXON and all the members of the Design Working Group for providing their time, experience and expertise to work on this important product and for delivering a robust set of skeleton TOMs in a timely manner.

This consultation document has been prepared by the Design Working Group to inform stakeholders about the skeleton TOMs and seeks your input on the design and evaluation work to date. Market-wide Half-Hourly Settlement is a fundamental market reform which will impact both existing and future participants in the energy market. It is important that stakeholders who have not yet been directly involved in the TOM design work are provided with the opportunity to review and give input at key stages. For this reason I would encourage all stakeholders to take the opportunity to look at and respond to the consultation document. The responses will help shape the next stage of the design work.

Further information on the Settlement Reform project and the Significant Code Review as a whole can be found at the [Ofgem website](#).

Thank you for your interest in this important reform and we look forward to hearing from you on the TOM design work.

Yours sincerely,

Cathryn Scott

Partner

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## EXECUTIVE SUMMARY

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This four week consultation seeks stakeholder feedback on the Skeleton Target Operating Models (TOMs) and their initial assessment. The rollout of smart and Advanced Meters means that the majority of customers' meters will be capable of recording and storing energy usage in half hourly time periods and providing remote access to that data. This presents the opportunity to use the more granular data in the energy market and unlock the benefits this will bring. The Skeleton TOMs are designed for the end to end Settlement process (meter to bank) for the target end state. The Skeleton TOMs are described by a number of key services, ranging from Meter registration, right through to Volume Allocation.

These TOMs have been developed by the ELEXON led Design Working Group (DWG). The TOM development work forms part of the [Ofgem led Significant Code Review \(SCR\) on Market-wide Half-Hourly Settlement \(MHHS\)](#). The main objective of the TOM development is to create an enduring Settlement process that is simple, more accurate and facilitates innovation based on the [Design Principles](#) set out by Ofgem.

The DWG has developed five Skeleton TOMs that meet Ofgem's Design Principles:

### **TOM A: Combined Retrieval and Processing with Separate Aggregation**

TOM A features combined retrieval and processing services with a separate aggregation service

### **TOM B: Separate Retrieval with combined Processing and Aggregation**

TOM B features a combined processing and aggregation service with a separate retrieval service in the smart Meter Market Segment.

### **TOM C: End to end service covering Retrieval through to Aggregation**

TOM C is similar to TOM B but without the separate retrieval service in the smart Meter Market Segment.

### **TOM D: Separate Services**

TOM D is similar to TOM A but with a separate retrieval service in the smart Meter Market Segment.

### **TOM E: Single central service covering Retrieval through to Volume Allocation**

TOM E is the only TOM with a single central service for the smart Meter Market Segment.

The Skeleton TOMs were presented to the [Design Advisory Board \(DAB\)](#) for their advice informing Ofgem's decision on Stage1 of the SCR. The DAB agreed that the TOMs presented a sensible set of Settlement design options and recommended them to be progressed to Stage 2. The minutes of the meeting where the DAB discussed the skeleton TOM will be available on [Ofgem's DAB webpage](#). Ofgem approved them on 12 April (see [website](#)).

This consultation forms part of Stage 2 of the Ofgem led Significant Code Review (SCR) on Market-wide Half-Hourly Settlement (MHHS). The DWG will consider stakeholder feedback as part of their detailed assessment of the TOMs. The DWG will also seek to add lower level detail on the processes required to deliver the services set out in the TOMs, along with the transitional arrangements required to implement the preferred TOM.

The key aspects of the consultation include questions on each TOM's efficiency, resilience, simplicity, accuracy, and effect on the consumer. Views are also sought on any future developments, in particular flexibility.

The TOM designs have dependencies on Ofgem policy area work on data privacy, the future of Agent Functions and the MHHS business case. There is also an interaction with work by the Department for Business, Energy and Industrial Strategy (BEIS) as the Settlement of export will be influenced by relevant policy decisions made by BEIS. These work areas and their interactions will continue during Stage 2 of the TOM development in the Ofgem SCR.

**For more information on the DWG please contact: [Design.Authority@elexon.co.uk](mailto:Design.Authority@elexon.co.uk) or visit the [Design Working Group](#) page on the BSC Website**

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## INTRODUCTION

As part of Stage 1 of the Ofgem led SCR on MHHS the ELEXON led DWG delivered a [report](#) setting out five Skeleton TOMs and their initial assessment. Ofgem has now made a decision to approve the skeleton Target Operating Model (TOM) options delivered by the ELEXON-led DWG.

This consultation seeks wider stakeholder feedback on the Skeleton TOMs – considering whether any essential components are missing, identifying any potential barriers to future developments/innovation and giving respondents the opportunity to express preferences for specific TOMs.

The main objective of the TOMs is to create an enduring Settlement process that is simple, accurate and does not impede innovation, based on the [Design Principles](#) set out by Ofgem. This consultation sets out the key services of the end to end Settlement process for MHHS, describes the DWG developed TOMs, the advantages of the design common to all TOMs and an initial assessment against the Design Principles.

This consultation forms the first part of Stage 2 of the SCR.

[Appendix A](#) sets out the Risk, Issues, Assumptions and Dependencies (RAID) for the TOM development work. [Appendix B](#) contains the collated consultation questions. [Appendix C](#) set out a Glossary of Terms used in this consultation.

The detailed timeline for the Settlement design work and overall Ofgem SCR process can be found in the Ofgem SCR Launch [Statement](#). The high level timetable for Stage 2 of the SCR is as follows:



### How do I respond to the consultation?

Please provide your consultation responses to [Design.Authority@elexon.co.uk](mailto:Design.Authority@elexon.co.uk) by 8am on the 29 May 2018 using the [response template](#) provided with this consultation.

**For more information visit the [Design Working Group](#) page on the BSC Website.**

## 1. What do we mean by the Balancing and Settlement Code and Settlement?

The [Balancing and Settlement Code \(BSC\)](#) is a legal document which defines the rules and governance for the Balancing Mechanism and Imbalance Settlement ('Settlement') processes of electricity in Great Britain.

Settlement reconciles discrepancies 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' (NHH) 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 (within a given Profile Class).

Energy Suppliers purchase their electricity in advance based on their forecasted estimates of what they expect their customers to use in each half-hour period. The difference in each half-hour period between the volumes of energy purchased by Suppliers to cover their requirements and the volumes their customers are assumed to have used are identified, reconciled, and paid for through the Settlement system.

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## 2. What is the scope of the DWG work?

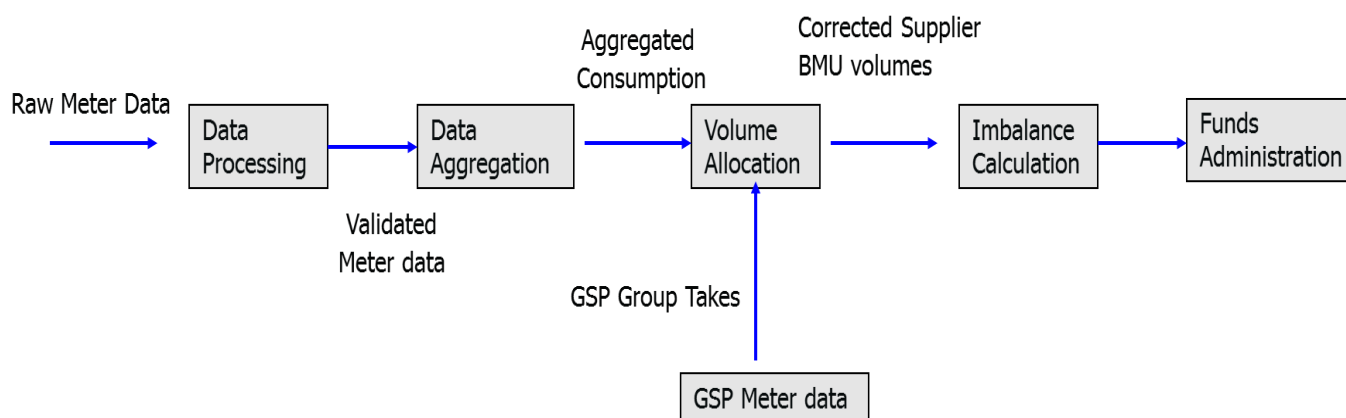
The scope of the DWG work covers the [Meter to Bank](#) process for all Settlement Meters connected to distribution networks. This includes:

- Meter Registration - the recording of information pertinent to Settlement Metering Systems;
- Meter Operations - fitting and maintaining Settlement Meters;
- Data Retrieval - getting information from Settlement Meters;
- Data Processing – validating and estimating Settlement Meter data;
- Data Aggregation - summing Settlement Meter data to required granularity; and
- Volume Allocation – allocating Meter volumes to Trading Parties that are signatories to the BSC.

Outside scope are Metering Systems connected to the [Transmission System](#) or those that are part of the [Central Volume Allocation](#) (CVA) arrangements (these can include generators embedded in distribution networks). Metering Systems at [Grid Supply Points \(GSPs\)](#) are used in the Settlement calculations. The SCR does not seek to change any requirements for these Metering Systems, the definition of [GSP Groups](#) or the defined distribution regions. The definition of [Balancing Mechanism Units \(BMUs\)](#) is out of scope. However, we note that new types are already being [considered by the industry](#). The approach to the application of [Zonal Transmission losses](#) is also outside the scope.

## 3. What is the Meter to Bank process?

The Meter to bank process is as follows:



The 'raw' Meter data is retrieved from the Meter and provided to a data processor for validation. Any invalid data is rejected and replaced with estimated data. The validated Meter data is passed to an aggregation process that sums data according to defined criteria (and applies losses currently for half-hourly data). This data is passed to the volume allocation process. This process sums data from the aggregation process up to 'BMU' level and corrects for any difference between the aggregated BMU data and the amount of energy known to be on the distribution network. This information is derived from the GSP Meter data (the GSP Group Take). The corrected BMU data is passed to a process that aggregates the BMU data to [Trading Party](#) level and compares the data to the Trading Party's contracted volumes to calculate imbalance. The imbalance payments to and from Trading Parties are undertaken by the Funds Administration process.

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## 4. What is a Target Operating Model (TOM) for MHHS?

A TOM for MHHS is a set of services and processes required to deliver Settlement Period (SP) level data from a Meter to a central Settlement body to enable the calculation of the amount of energy a Supplier's customers have consumed in each Settlement Period for each Settlement Day (SD). This calculation is then used in the Imbalance Settlement process which compares the Supplier's contracted purchases of energy to the amounts deemed to have been consumed (sales) by each Supplier's customers (and recognises any amounts of energy contracted by National Grid under the Balancing Mechanism). Additionally, it is intended that the TOMs will allow for shorter Settlement timescales. The smart Meter roll out should allow for more frequent collection of consumption data and allow reduction from the current 14 month reconciliation window. It should be noted that there is a dependency on the data privacy/ data access policy decision on the granularity of data that can be collected from smart Meters. Reduction in Settlement timescales could also provide further benefits (e.g. reduction in credit cover).

## 5. What do we mean by Meter data?

Meter data is any data that is stored at and can be collected from the Meter. This includes Register Readings for both cumulative and Time of Use (ToU) registers, Active Import (AI) and Active Export (AE) data at Settlement Period level. It may include Reactive Power Meter data where, for example, such data is required for network charging purposes. Meter data can also include information on how Meters are configured such as the time of operation of the ToU Registers.

## 6. What do we mean by Meter data for non-Settlement purposes?

As well as providing Meter data for Settlement, Meter data may be collected for non-Settlement purposes. This could include Meter data that is required for customer billing or energy management services.

## 7. What was the Objective for Stage 1 of the DWG work?

Stage 1 of the DWG work developed several potential TOMs for the target end state when most customers will have a Meter capable of delivering Settlement Period level data for Settlement purposes. All the TOMs have been evaluated against the [Design Principles](#) set out by Ofgem.

Stage 1 did not seek to consider low level detailed processes. For example, how Meter data is validated or how data is estimated when data is missing or invalid. Detailed design is being considered in DWG Stage 2. Stage 2 will also deliver detailed transitional arrangements for the preferred TOM. These will also be consulted on as part of Stage 2.

## 8. What are the Skeleton TOM Evaluations?

A Skeleton TOM is a description and a map of services, showing link/interaction between the services that cover the end-to-end Settlement arrangements (Meter to bank) for Market-wide HHS. Each TOM covers all the different Market Segments (Metering types), e.g. smart Meters, Advanced Meters, non-smart Meters (dumb/legacy) and Unmetered Supplies. See below for details and Appendix B for glossary of terms.

The Skeleton TOMs have been evaluated using the DWG agreed objectives and evaluation criteria set out in the DWG working document '[Evaluation Criteria for HHS Target Operating Models](#)'. The objectives are listed below along with evaluation criteria.

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## DWG agreed objectives

Objective	Description
<b>Accurate</b>	Maximising the use of actual half-hourly consumption data Cost-reflective and equitable Make electricity demand forecasting more reflective of actual usage
<b>Timely</b>	Less commercial risk, e.g. credit cover and Settlement timescales Reduces barriers to entry for new market participants through quicker Settlement and reduced costs
<b>Efficient</b>	Reduces Settlement costs Facilitates efficient use of energy resources and flexibility
<b>Facilitates innovation</b>	Improves opportunities to offer new products that benefit the consumer Provides opportunities to provide flexibility, e.g. Demand Side Response or peer to peer trading Supports new technologies Flexible to include new entrants (Third parties, new entrants, new market types)

## The Evaluation Criteria to be used by the DWG in evaluating the Skeleton TOMs:

- 1. Coverage**
- 2. Cost Reflectivity**
- 3. Timing**
- 4. Design Simplicity**
- 5. Design Flexibility**
6. Consequential Impacts
7. Data Privacy
8. Solution costs
9. Ease of Implementation
- 10. Facilitates new technologies and innovation**
- 11. Impact on new entrants**

It should be noted that this report only contains an initial assessment of the merits of the individual TOMs. [An initial evaluation of all TOMs](#) against the criteria in **bold** has been made by the DWG. Consequential Impacts, Solution Costs, Ease of Implementation and some elements of Data Privacy will need to be considered in Stage 2 of the TOM development work, when more is known about Policy decisions and the Business Case.



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## 9. What are the DWG Baseline Principles?

### **TOM Baseline Principles: Foundation for development**

ELEXON proposed a number of 'agreements in principle' for the DWG to use in the TOM development. This helped the DWG consider how services could be grouped and to discount certain options (e.g. the retention of existing NHH processes). The baseline principles, agreed by the DWG, are that the Market-wide Half-Hourly Settlement (MHHS) TOMs will:

- i) be optimised for the longer term 'target state' where the majority of Meters will be Smart or Advanced. Any Meter not either of these should be considered under the transitional arrangements, although the TOMs should still be able to support them;
- ii) only consider as transitional states (and not the final TOM option) any designs that use the existing Elective HH and Non Half Hourly (NHH) Settlement arrangements;
- iii) cover HH meter data (Active Import and Active Export) for Settlement purposes only. While non-Settlement activities (such as billing) are out of scope, the design will aim not to be actively detrimental to these;
- iv) aim to design out elements of the existing Non-Half Hourly (NHH) profiling process such as the use of Annualised Advances (AAs) and Estimated Annual Consumptions (EACs);
- v) aim to have at least one TOM aligning with the policy developments for data privacy and consideration of agent functions;
- vi) not consider technology or architecture factors at this stage;
- vii) consider any new Unmetered Supplies arrangements only once a framework is in place for the metered segments of the market so as not to constrain the possibilities for the TOM design; and
- viii) not consider Settlement timescales until TOM options have been further developed (in Stage 2 of the TOM development work).

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## 10. What are the Market Segments that are covered in the TOM design?

The TOMs are designed to cover all Metering Points connected to the distribution networks. These are settled under the Balancing and Settlement Code in Supplier Volume Allocation (in England and Wales and Scotland) taking into account the type of Meter data that can be obtained from the Metering System. The five Market Segments are:

- i) Smart Meters with Settlement Period level data available;
- ii) Smart Meters with only Register Readings available;
- iii) Non-smart Meters with Register Readings;
- iv) Advanced Metering Systems with Settlement Period level data available<sup>1</sup>; and
- v) Unmetered Supplies.

The purpose of Stage 1 is to design an end to end Settlement design for the target end state. It is assumed that this target end-state is when the majority of Meters will be smart. Therefore, the number of non-smart Meters will be small. Furthermore most Advanced Meters in the current non-half hourly sector will either be replaced with a smart Meter or be settled in the Advanced Metering Systems Market Segment.

## 11. Why do the TOMs not explicitly set out the role of the Supplier?

In the context of the TOMs the Supplier is the party as currently defined under the [Electricity Act 1989](#) and the holder of a [Electricity Supply Licence](#) with these functions/obligations under the BSC:

1. Registrant of Metering Systems;
2. Party liable for settled energy costs;
3. Provider of retail electricity services;
4. Accessing Smart Meters serviced via the [Data and Communications Company \(DCC\)](#).

The Supplier will be responsible for configuration of smart Meters and collection of data for customer billing. The Supplier could also be the party that is providing, procuring or interfacing with the services defined in the TOMs.

It is also recognised that in the future the role of the Supplier may change. For example, new market participants could take on the role traditionally known as Supplier. Furthermore, the customer may contract with new or multiple energy providers in future, with one potentially being the Supplier as we know it currently for just the customer's demand and others for generation or other specialist energy services, e.g. for an Electric Vehicle. A Supply contract could become part of a wider bundled service to customers. For the purposes of this document the Supplier is the party providing the functions and obligations set out above.

## 12. Why do the TOMs refer to Settlement Period Level data and not Half-Hourly data?

Currently Settlement is based on a Settlement Period equal to thirty minutes. The TOMs refer to Settlement Period level data rather than Half-Hourly data as the Settlement Period could change in the future. For example, it could be harmonised across Europe to a shorter duration of fifteen minutes or even shorter in the future.

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<sup>1</sup> For the avoidance of doubt this segment includes all traditional Half-Hourly Metering Systems (>100 kW Maximum Demand (MD)) that are currently mandated to be settled on a HH basis, Metering Systems moved to HH Settlement under [BSC Modification P272](#), Advanced Meters settled HH that are not currently mandated to be settled HH. The latter could include customers currently in Profile Classes 1 to 4, noting that whole current customers could elect to have a smart Meter and move to segments i) or ii) set out above.

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This may mean Metering Systems will need to be replaced or re-configured to provide data at the harmonised level. Additionally, where Metering Systems only provide Register Readings there would also be a requirement to 'load shape' or 'profile' the Meter advances to a more granular Settlement Period than the current thirty minutes.

## 13. What will be the new assurance regime?

When implemented new assurance process will be required. However, it is hoped that the TOM design will deliver much more accurate data for Settlement than can be achieved using the existing Non-Half Hourly (NHH) processes. The assurance regime will be considered once the preferred TOM is identified. This is because the assurance regime could look quite different for some services, if some elements are centralised or provided by multiple market roles.

## 14. What are the services featured in all Target Operating Models (TOMs)?

This section describes all the services that cover the end-to-end Settlement process for MHHS that have been used to construct the TOMs. Within some of the TOMs, some of these services have been combined into a single service.

**A high level description of the services is set out below:**

### 1. Registration Service

- registrar for all Metering Systems (and other related registration information) in Supplier Volume Allocation (SVA). A service currently undertaken by Licenced Distribution System Operators (LDSOs)

### 2. Metering Service

- responsible for installing, commissioning and maintaining all Meters and associated physical technical details, (and associated equipment)

### 3. Meter Reading Service

- responsible for obtaining Register Readings (RR) from non-smart Meters only

### 4. Retrieval Service<sup>2</sup>

- responsible for accessing and retrieving energy usage data (import and export) from Meters and associate technical details

### 5. Processing Service

- responsible for validating and estimating Meter data (SP and RR), converting Register Readings (RR) to Settlement Period level data, providing data to relevant parties and exception reporting

### 6. Load Shaping Service

- responsible for deriving 'Load Shapes' to be used by the Processing Service in converting Register Readings (RR) to Settlement Period level data

### 7. Settlement Period level Unmetered Supplies Service

- responsible for calculating Settlement Period level data for Unmetered Supplies such as street lights and traffic signals

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<sup>2</sup> For the avoidance of doubt, the retrieval service is the service requesting and receiving energy usage data but not the communication services to the Meter. The Data and Communications Company for smart Meters and the communications service providers for Advanced and AMR Meters (such as Vodafone, EE and O2) are not deemed part of the retrieval Service.

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## 8. Aggregation Service

- responsible for receiving and aggregating Settlement Period level data for use in Settlement, network charging and other non-Settlement purposes such as flexibility

## 9. Volume Allocation Service

- responsible for receiving aggregated Meter volume from aggregation service, applying correction to ensure all energy is accounted for and calculating Balancing Mechanism Unit (BMU) volumes.

In each of the TOMs, multiple market implementations of each service have been considered (competitive provision or single/multiple monopoly providers), except where a particular implementation is a key feature of the TOM or not appropriate for that service.

Services have also been defined in a way that allows different ways for market participants to deliver them, such as 'self-serve' (in house say for a Supplier) and/or independent provider options. Where services have been combined, this does not preclude individual services within the grouping being subcontracted to other providers. However, a single organisation will remain responsible for ensuring the delivery all the services in a particular grouping.

All TOMs assume that the LDSO will remain responsible for providing the necessary Distribution Losses data to allow the application of losses by the relevant service.

**The detailed functions and responsibilities of each service are listed below and are split by Market Segment where relevant.**

### Registration Service

This service will be responsible for:

- acting as registrar for all Metering Systems;
- receiving, validating and processing updates from the registrant;
- maintaining and updating data items as appropriate within the Registration system;
- interfacing with other parts of the registration infrastructure such as the Electricity Central Online Enquiry Service (ECOES) and the Central Switching Service (CSS); and
- provision of registration data or access to registration data to other parties as required.

### Metering Services for Advanced, Smart and non-smart Metering Systems

This service will be responsible for:

- installing, commissioning and maintaining Advanced, smart and non-smart Meters;
- configuration of non-smart and Advanced Meters;
- maintaining an accurate register of Physical Meter Technical Details (MTD);
- energisation and de-energisation of Advanced, smart and non-smart Meters (excluding large LV & HV);
- connection and disconnection of Advanced, smart and non-smart Meters; and
- Meter and communication equipment fault investigation where a site visit is required.

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## Meter Reading Service for non-smart Meters

This service will be responsible for:

- obtaining non-smart Meter Register Readings (RR) from non-smart Meters either via a site visit or remotely as applicable; and
- providing non-smart Meter Register Readings (RR) to the Processing Service for smart and non-smart Meters.

## Retrieval<sup>3</sup> and Processing Service for Advanced Meters

This service will be responsible for:

- retrieving the Settlement Period level Active Import (AI) and Active Export (AE) consumption (and other data as required e.g. reactive power) data from Advanced Metering Systems;
- receiving and maintaining Meter Technical Detail (MTD) data from the Metering Service for Advanced Metering Systems;
- validating Settlement Period (SP) level consumption data for Active Import and Active Export (and other data as required) using a common set of agreed validation rules to be implemented electronically where possible;
- estimating Settlement Period (SP) level consumption data for Active Import and Active Export (and other data as required) where such data fails validation or is missing or unavailable;
- maintenance of standing data as appropriate;
- exception reporting for any Metering Systems where data is deemed to be invalid or where access or issues with Metering Systems are identified;
- providing access to validated Settlement Period (SP) level data to the separate Aggregation Service(s); and
- providing validated Settlement Period (SP) level data to the other parties as appropriate.

## Retrieval Service for smart Meters

This service will be responsible for:

- retrieving the Active Import (AI) and Active Export (AE) data log (Settlement Period level) data from smart Meters where required for Settlement. This retrieval will be achieved via the Data and Communications Company (DCC) service;
- retrieving Time-of-Use (TOU) Register Readings (RR) for Active Import Registers and the Active Export Register and Meter configuration data from smart Meters where required for Settlement. This retrieval communication method will be achieved via the Data and Communications Company (DCC) service; and
- providing access to the retrieved data to the Processing Service for smart and non-smart Metering systems.

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<sup>3</sup> The retrieval and processing is combined in all TOMs as the processor is likely to need access to the Meter for this Market Segment. However, it is noted that there are currently a number of instances where the retrieval service is outsourced in this Market Segment. The TOMs do not explicitly preclude these situations.

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## Processing Service for smart and non-smart Metering Systems

This service will be responsible for:

- accessing the Active Import (AI) and Active Export (AE) data log (Settlement Period level) data for smart Meters from the Retrieval Service for smart Meters where required for Settlement.
- accessing Time-of-Use (TOU) Register Readings (RR) for Active Import Registers and the Active Export Register and Meter configuration data for smart Meters from the Retrieval Service for smart Meters where required for Settlement.
- accessing Meter Register Read (RR) data and Meter Technical Details (MTDs) for non-smart Meters from the Meter Reading Service according to a defined reading schedule from the Retrieval Service for smart Meters where required for Settlement;
- validating Settlement Period (SP) level consumption data for Active Import and Active Export or Register Readings (RR) for smart and non-smart Meters using a common set of agreed validation rules to be implemented electronically where possible;
- estimating or defaulting Settlement Period (SP) level consumption data for Active Import (AI) and Active Export (AE) where such data fails validation or is missing or unavailable;
- calculating Meter Advances (MAs) for Register Read (RR) data;
- conversion of Register Readings (RR) into Settlement Period (SP) level data using information on Meter configuration and data provided by the Load Shaping Service (LSS);
- estimating Settlement Period (SP) level data for Metering Systems with Register Readings (RR) where such data fails validation or is missing or unavailable;
- maintenance of standing data as appropriate;
- exception reporting for any Metering Systems where data is deemed to be invalid or where access or issues with Metering Systems are identified;
- providing access to validated Settlement Period (SP) level data to the Aggregation Service(s); and
- providing access to validated Settlement Period (SP) level data to any other parties as appropriate.

## Load Shaping Service

This service will be responsible for:

- receiving smart Meter Settlement Period (SP) data for Active Import (AI) and Active Export (AE) from the 'Processing Service for Smart and non-smart Meters' according to an agreed schedule;
- deriving 'Load Shape' data for an agreed number of categorisations relating to the type of Metering Systems for which Load Shaping information is required; and
- providing 'Load Shape' data for the agreed categorisations to the Processing Service for Smart and non-smart Meters according to an agreed schedule.

# MARKET-WIDE HALF-HOURLY SETTLEMENT

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## Settlement Period level Unmetered Supplies Service

This service will be responsible for:

- receiving inventory data associated with unmetered Supplies from distribution businesses;
- validating the inventory data as appropriate;
- accessing other dynamic information relating to the operation of unmetered Supplies;
- accessing standing data relating to Unmetered Supplies;
- calculating Settlement Period level data for Unmetered Supplies according to a defined schedule; and
- providing access to calculated Settlement Period level data to the Aggregation Service for Advanced Metering Systems.

## Aggregation Service

This service will be responsible for:

- maintenance of standing data as appropriate;
- receiving registration data from the Registration Service;
- accessing validated Settlement Period level data for Smart and non-smart Meter from the Processing Service for smart and non-smart Meters according to a defined schedule;
- accessing validated Settlement Period level data for Advanced Metering Systems from the Processing Service for Advanced Metering Systems to a defined schedule;
- accessing validated Settlement Period level data for Unmetered Supplies from the Settlement Period level Unmetered Supplies Service to a defined schedule.
- identifying duplication or omission of Metering System data;
- Estimating data where missing according to Settlement timescales;
- aggregating the Settlement Period level data based on defined aggregations for the calculation of Imbalance Settlement purposes based to defined Settlement timescales;
- aggregating the Settlement Period level data based on defined aggregations for the calculation of network charging (as appropriate) based on defined Settlement timescales;
- aggregating the Settlement Period level data based on defined aggregations for other purposes, e.g. flexibility or for future smart grids based on defined Settlement timescales, where appropriate information has been provided to facilitate this option;
- applying distribution network loss factors as appropriate using data provided by distribution businesses;
- provision of aggregated consumption volumes and losses to the Volume Allocation Service according to Settlement timescales; and
- provision of aggregated consumption volumes and losses to other parties as required.

# MARKET-WIDE HALF-HOURLY SETTLEMENT

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## Volume Allocation Service

This service will, according to Settlement timescales, will be responsible for:

- receiving aggregated Settlement Period level data from the Aggregation Service;
- receiving information from other central services on the net volume of energy entering a distribution region<sup>4</sup> for each Settlement Period (as currently provided by the Central Data Collection Agent (CDCA));
- aggregating data for Balancing Mechanism Units (BMUs);
- aggregating all data within a distribution region;
- comparing and calculation differences between the aggregated BMU data with the information on the net volume of energy entering a distribution region for each Settlement Period;
- correcting the BMU data within a distribution region as appropriate;
- aggregating the corrected BMU data across distribution regions for use in the imbalance Settlement calculations;
- providing out-turn data to the service responsible for the Imbalance Settlement calculation;
- maintaining standing data as appropriate; and
- providing reports and data to other parties as appropriate.

## 15. What were the main considerations when grouping services?

The DWG started from the basis that the services would be separately defined so that market participants would have maximum freedom in how these might be organised and delivered.

In considering a TOM with four separately defined services (Retrieval, Processing, Aggregation and Volume Allocation) the DWG noted that Processing (as currently defined) in the traditional HH (Advanced) market is an extension of Retrieval and therefore there was less justification for maintaining this as a separate service. The Aggregation Service could cover all Market Segments with MPAN and Settlement Period level Meter data as its input, allowing future flexible aggregations of SP Meter data. The TOMs propose to dispense with NHH processes, including EACs and AAs. Therefore, the Aggregation service will largely be a summation of Settlement Period level data across the MPAN portfolio held by the Data Processing service in a set of defined categories.

The DWG also approached the Advanced HH Market Segment with the principle that any change from the current baseline would largely be driven by the design choices taken in the Smart Meter segment.

For the centralised TOM option, the DWG noted that a single 'Retrieval to Volume Allocation' service was possible for Smart and non-smart Meters. However, this option had less clear benefits for the Advanced HH market, where the Retrieval Service is more complex, as there is not an existing single (central) system (the DCC) for collecting data from all the installed Advanced Meter types. Therefore, any TOM based on a centralised model would probably need to integrate the Advanced segment in a way that left its existing 'Retrieval + Processing' services intact. However, both the Smart and Advanced segments in this centralised model would share a common market-wide Aggregation and Volume Allocation Service.

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<sup>4</sup> Currently Volume Allocation aggregates data by Grid Supply Point (GSP) Group which is analogous to a distribution region.



# MARKET-WIDE HALF-HOURLY SETTLEMENT

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When considering services across Market Segments the DWG felt that, even though some services like Processing could look very similar for 'Smart with Settlement Period data' and Advanced Meters, it was prudent to leave these as separate services until the detailed requirements for each service became clearer.

<b>Question 1</b>	<b>Are there any Settlement processes or services not identified that should be included as part of the HHS Meter to Bank process?</b>
Answer:	
Rationale:	

# MARKET-WIDE HALF-HOURLY SETTLEMENT

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## THE FIVE SKELETON TOMS

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The following section sets out the five Skeleton TOMs developed by the DWG:

- A.** Combined Retrieval and Processing with Separate Aggregation;
- B.** Separate Retrieval with combined Processing and Aggregation;
- C.** End to end service covering Retrieval through to Aggregation;
- D.** Separate services; and
- E.** Single central service covering Retrieval through to Volume Allocation.

Each TOM has been designed to provide advantages over the current Settlement arrangements. These are set out below.

### Advantages common to all TOMs as a result of Baseline Principles adopted

The TOMs have been designed to create an optimal end-to-end Settlement process for all five Market Segments and focussing on the majority of Meters in the target end state being smart Meters. The following lists the advantages that the TOMs will provide over the current market model for NHH and HH Settlement:

#### Creating Settlement Period and Metering System level data up front for Meters with Register Readings

- For Meters with only Register Readings, the TOMs produce Settlement Period level Meter data earlier in the Settlement process, as part of the Processing service, (currently it is calculated in BSC systems in Supplier Volume Allocation using aggregated data). This allows Settlement Period level data for all Meter segments to be available consistently and much earlier (and potentially to a wider set of parties for flexibility purposes). This is done by creating a new Load Shaping Service to replace the existing complex NHH 'profiling' process. The conversion of Meter register advances into Settlement Period level at an earlier stage also allows for greater optionality in how certain services can be delivered;

#### Simplifying data aggregation

- Aggregation becomes a much simpler<sup>5</sup> service overall as it will only need to aggregate Settlement Period level data. Interfaces with Volume Allocation would be simplified if there were a cross Market Segment service;

#### Simplifying Change of Agent processes

- The Change of Measurement Class (CoMC) and the Change of Agent (CoA)<sup>6</sup> process are hugely simplified as there are no longer separate NHH processes requiring a change of agent from NHH to HH and vice versa, which are complex and error-prone. Additional unnecessary data hand-offs for Meters with Register Readings have been avoided as the Processing service covers both non-smart and smart Meters;

#### Improving the Settlement of embedded export

- This design provides support for more accurate Settlement of embedded export by having access to accurate Settlement Period level data for export on smart Meters (provided that the export is registered for Settlement);

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<sup>5</sup> note new types aggregations may be required for flexibility offerings

<sup>6</sup> where the same provider is used for both Settlement Period and Register Read processes

# MARKET-WIDE HALF-HOURLY SETTLEMENT

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## **Simplifying the switch between Settlement Period data and Register Read data**

- The Retrieval and Processing Services allow Meters to move from being settled on Register Readings to Settlement Period level data without requiring a complete change of Settlement processes (and agent as is currently the case). Additionally, the services will ensure continuity in service provision and accuracy in data even where Settlement Period level data may not be available;

## **More accurate and simpler Settlement of Unmetered Supplies**

- The creation of a common Settlement Period level process for Unmetered Supplies (facilitated by the Settlement Period level Unmetered Supplies Service) will deliver a more accurate calculation. It will also make it easier for new entrants and smaller Suppliers to enter this segment;

## **Improving Settlement Timescales<sup>7</sup>**

- Accessing Settlement Period level data remotely from Smart Meters should allow for improved accuracy of Settlement at earlier reconciliation runs. Therefore it will facilitate shorter reconciliation periods than are used currently and hence positively impacts on Suppliers and the cost to service their customers;

## **Efficiency in provision of enduring arrangements**

- The TOMs avoid having to maintain separate enduring processing arrangements for the non-smart Meters (once the transition to the target state has been completed). The only process required is the separate Meter Reading Service to accommodate any remaining legacy non-smart Meters.

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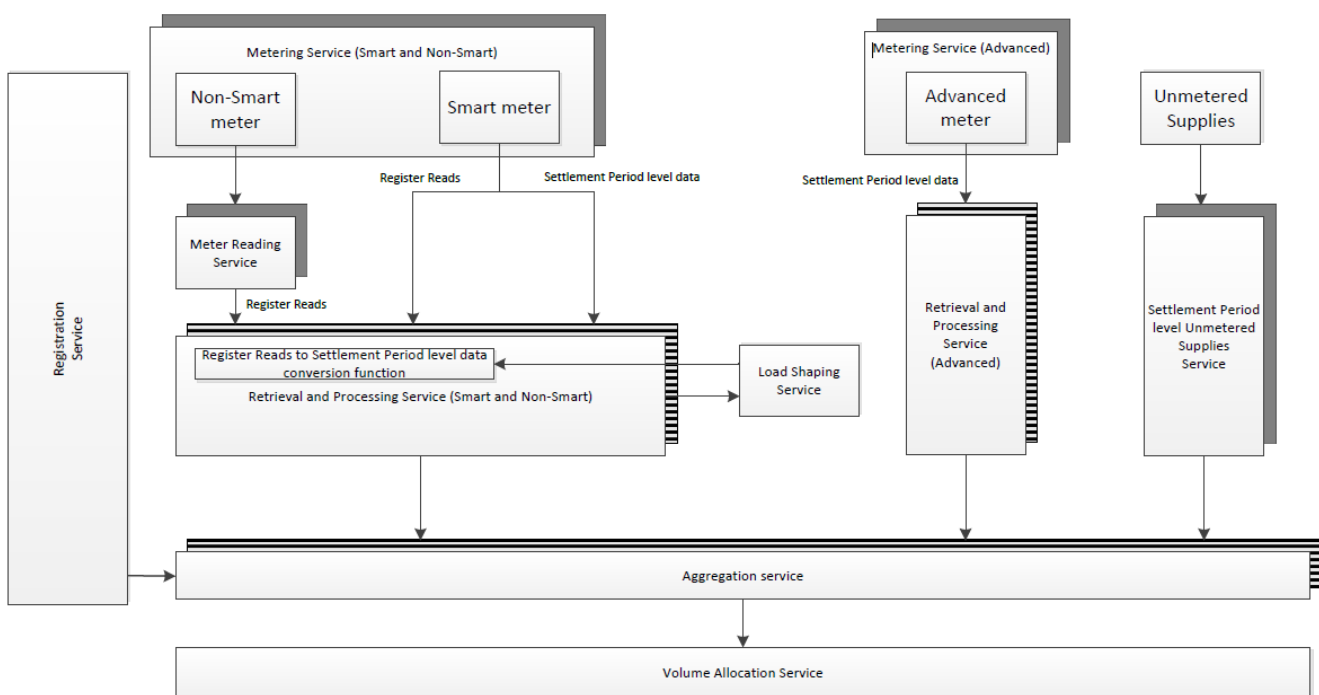
<sup>7</sup> It should be noted that the overall timescales for Settlement will have a dependency on the number of Metering Systems that cannot be remotely read and will require a site visit. If these are small enough in number not to be material, the consumption for such Meters could be estimated for Settlement purposes. This would also allow for faster Settlement.

# MARKET-WIDE HALF-HOURLY SETTLEMENT

## TOM A: COMBINED RETRIEVAL AND PROCESSING WITH SEPARATE AGGREGATION

### Description of TOM A:

The basis of this TOM is that Retrieval and Processing are bundled into a single service, one variant for Smart (including non-smart) and one for Advanced. This reflects the different ways of communicating with these Meters and the different Meter functionality and configurations. The Retrieval and Processing Service (smart and non-smart) will also apply conversion where Settlement Period level data is not available before providing access to Settlement Period data to the Aggregation Service that covers all market Segments. The Aggregation Service will sum up the data provided for all market Segments before providing access to aggregated volumes to a single Volume Allocation Service.



**Key to shadows**

- Competitively procured
- Competitively procured or single/multiple monopolies
- No shadow Single or multiple monopolies

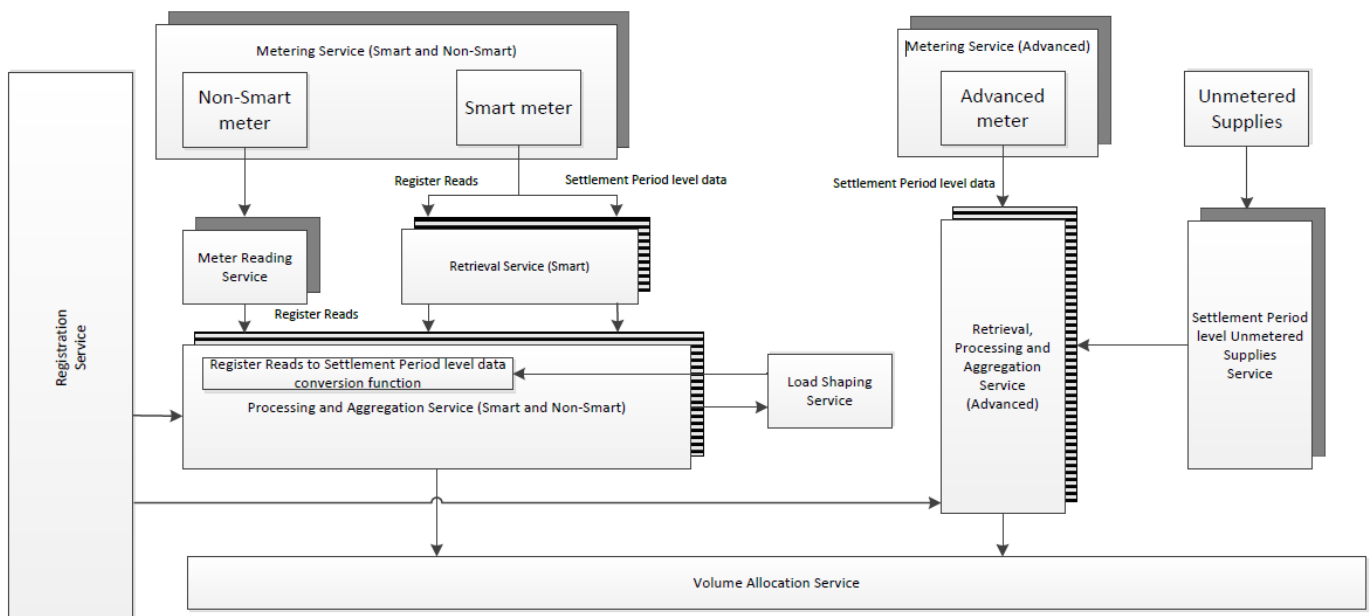
# MARKET-WIDE HALF-HOURLY SETTLEMENT

## TOM B: COMBINED PROCESSING AND AGGREGATION WITH SEPARATE RETRIEVAL

### Description of TOM B:

The basis of this TOM is that the Processing and Aggregation are bundled into a single service for Smart (and non-smart) Meters. The retrieval of readings via the [Data and Communications Company \(DCC\)](#) is separated out to allow more flexibility in who might deliver that Retrieval Service.

With Aggregation done as part of Processing, it means that with multiple Processing Services operating the data will be aggregated first before reaching the Volume Allocation Service which covers the whole market. That would mean that there is no single view of MPAN level data across Suppliers.



**Key to shadows**

- Competitively procured
- Competitively procured or single/multiple monopolies
- No shadow: Single or multiple monopolies

# MARKET-WIDE HALF-HOURLY SETTLEMENT

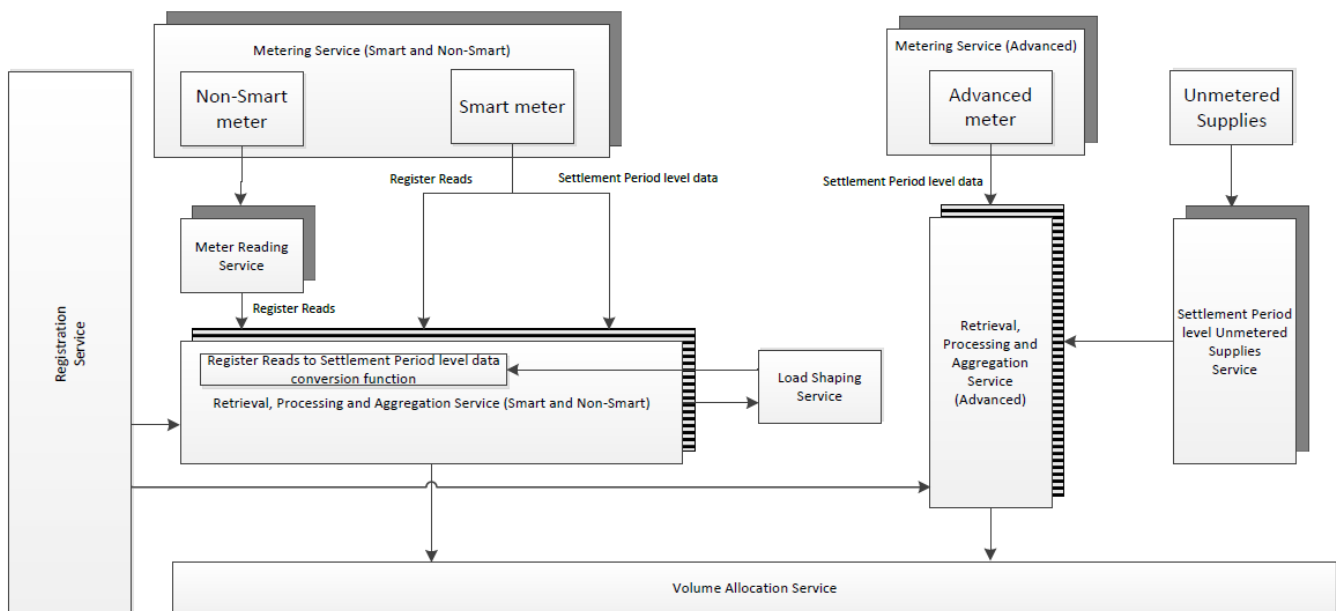
## TOM C: END-TO-END SERVICE COVERING RETRIEVAL THROUGH TO AGGREGATION

### Description of TOM C:

The basis of this TOM is that Retrieval, Processing and Aggregation are bundled into a single service, one variant for Smart (including non-smart) and one for Advanced Metering Systems. This reflects the different ways of communicating with these Meters. The Retrieval, Processing and Aggregation Services will sum up the data provided before providing access to aggregated volumes to a single Volume Allocation Service.

With Aggregation done together with Retrieval and Processing, it means that with multiple Retrieval, Processing and Aggregation Services operating the data will be aggregated before reaching the Volume Allocation Service which covers the whole market. There is no single Market Segment-wide view of Meter level data

The key feature of this model is the reduction in defined interfaces between services. Meter level data is accessed once for Settlement, validated then aggregated with the aggregated data going straight into the Volume Allocation Service.



**Key to shadows**

- Competitively procured
- Competitively procured or single/multiple monopolies
- No shadow: Single or multiple monopolies

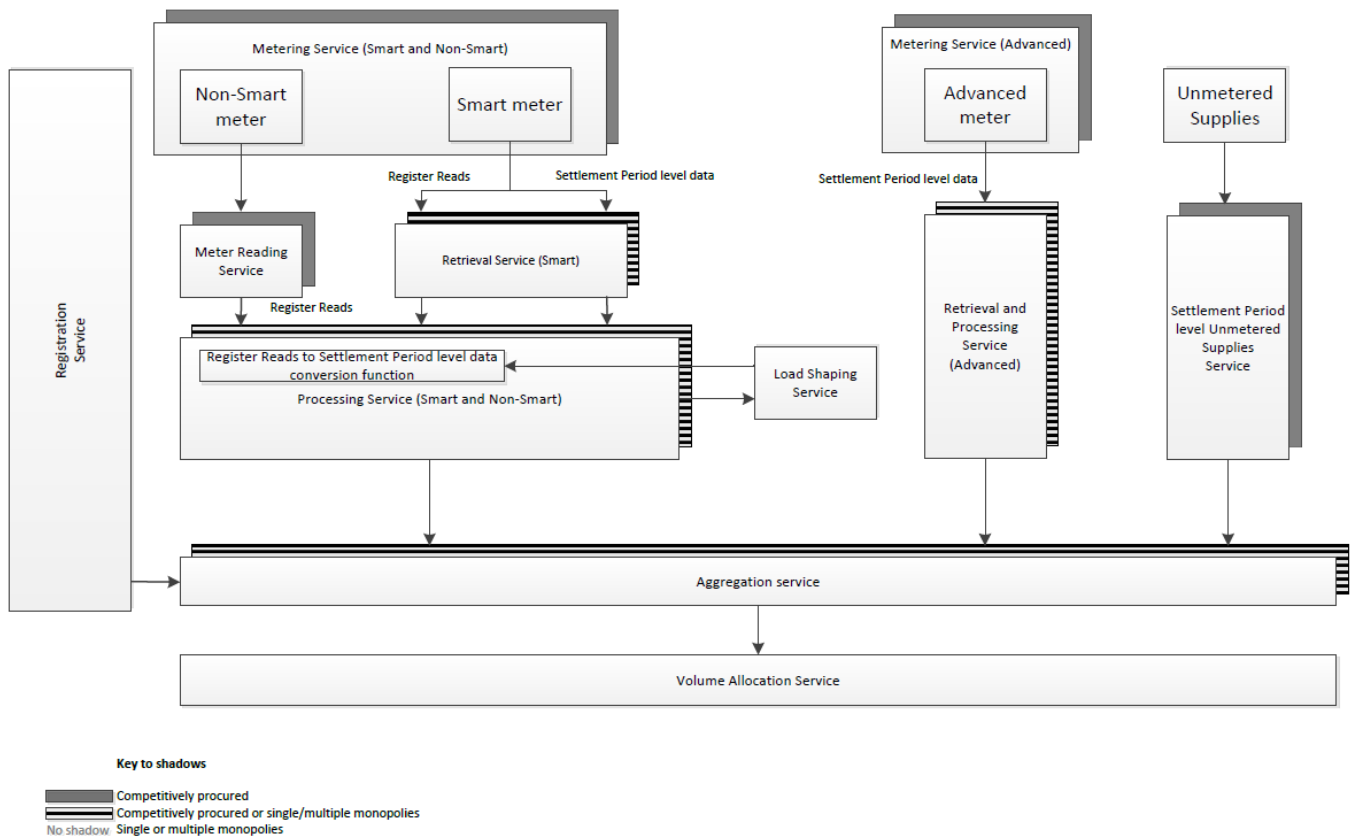
# MARKET-WIDE HALF-HOURLY SETTLEMENT

## TOM D: SEPARATE SERVICES

### Description of TOM D:

The basis of this TOM is that Retrieval, Processing and Aggregation are kept as separate services. Smart (including non-smart) and Advanced Metering Systems are also separated, reflecting the different ways of communicating with these Meters. The retrieval of readings via the [Data and Communications Company \(DCC\)](#) is also separated out which allows more flexibility in who might deliver that Retrieval Service.

The Smart Meter (and non-smart Meter) Processing Service will also apply conversion where Settlement Period level data is not available before providing access to Settlement Period level data to the Aggregation Service that covers all market Segments. The Aggregation Service will sum up the data provided before providing access to aggregated volumes to a single Volume Allocation Service.



# MARKET-WIDE HALF-HOURLY SETTLEMENT

## TOM E: SINGLE CENTRAL SERVICE COVERING RETRIEVAL THROUGH TO VOLUME ALLOCATION

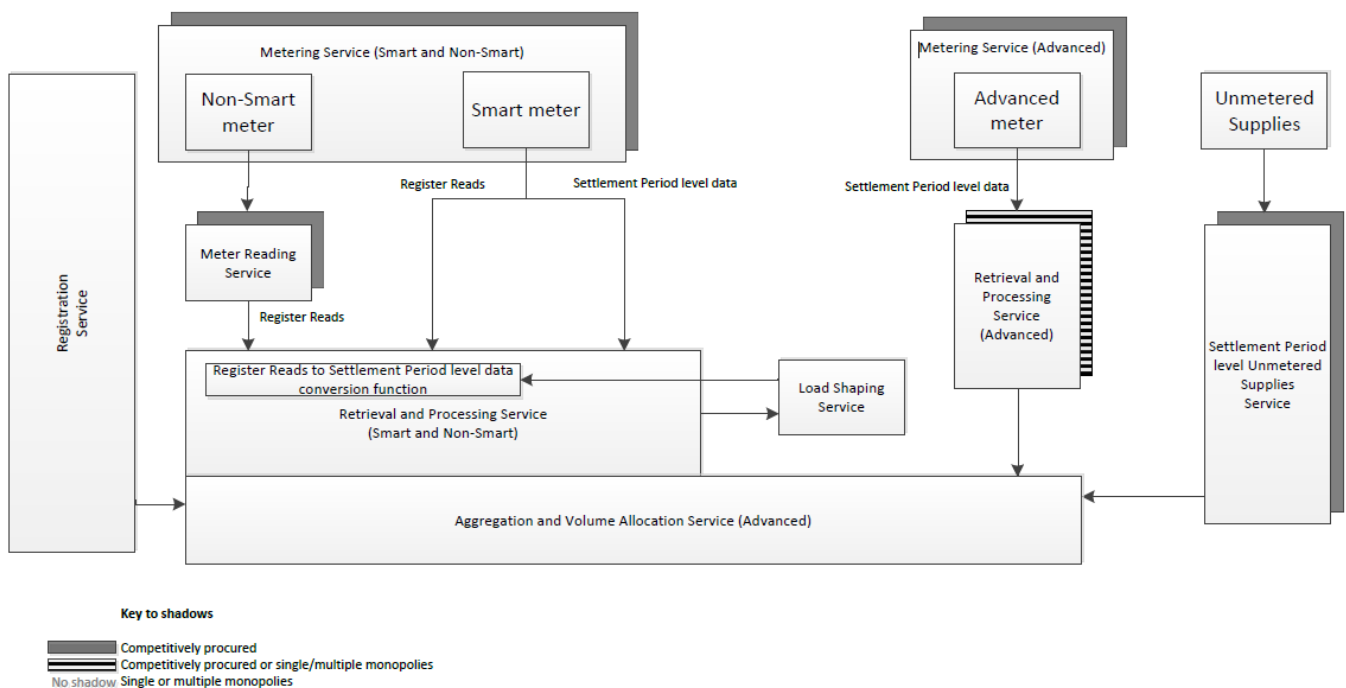
### Description of TOM E:

The basis of this TOM is that Retrieval, Processing, Aggregation and Volume Allocation are all provided by a single central Service for Smart and non-smart Meters. Retrieval and Processing for Advanced Meters and Unmetered Supplies are left separate with the option that these services could be competitively or centrally procured.

The central Retrieval and Processing Service will also apply conversion where Settlement Period level data is not available before providing access to Settlement Period level data to the internal Aggregation Service that covers all market Segments. The central Aggregation Service will sum up the data provided before providing access, to aggregated volumes, to the associated Volume Allocation Service.

This TOM has the fewest defined interfaces for the transfer of Meter data.

This TOM is dependent on Ofgem making a policy decision to have single central Settlement service for Smart and non-Smart Meters. Ofgem’s consideration of whether or not to centralise supplier agent functions is being considered separately to the DWG design work.





# MARKET-WIDE HALF-HOURLY SETTLEMENT

<b>Question 2</b>	<b>Are there any TOMs or aspects of TOM design that would better facilitate the most efficient delivery of the HHS Meter to Bank process?</b>
Answer:	
Rationale:	

<b>Question 3</b>	<b>Are there any TOMs or aspects of TOM design that would better facilitate the most accurate allocation of energy?</b>
Answer:	
Rationale:	

<b>Question 4</b>	<b>Are there any TOMs or aspects of TOM design that would be less resilient? e.g. resulting in a failure in a Service to be delivered</b>
Answer:	
Rationale:	

<b>Question 5</b>	<b>Are there any TOMs or aspects of TOM design that would deliver the best result for the end consumer?</b>
Answer:	
Rationale:	

## 16. What future innovation could the TOMs support?

It is expected that all the TOMs will not hinder benefits to the end consumer being realised from innovation in technologies and energy services. To achieve this, the TOMs are designed to be as flexible as possible (within certain market constraints), so as to enable future innovations. For example, future uses of the TOMs could include accommodating new processes to support Electric Vehicles (EVs) (both charging and discharging), vehicle to grid services, Peer to Peer trading (P2P), community energy schemes, energy flexibility offerings such as DSR, battery storage offerings, Time-of-Use (ToU) tariffs and future services from Smart Grids. These innovations may require the TOMs to support multiple and/or different parties (other than the Supplier) contracting with the consumer. The TOMs could also support the provision of HH Meter data to new participants (with the appropriate access rights) both in aggregate form (new forms of aggregated data) or individual HH Meter data. It should be noted that many of these innovations will require market changes beyond the Settlement system in order to happen.

# MARKET-WIDE HALF-HOURLY SETTLEMENT

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<b>Question 6</b>	<b>Are there any innovations in technologies or energy services not considered in this document which should be accommodated by the TOMs?</b>
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Answer:

Rationale:

<b>Question 7</b>	<b>Are there any specific aspects of TOM design that would present a barrier to new market entrants, technologies or innovations?</b>
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Answer:

Rationale:

<b>Question 8</b>	<b>Do you have a preference for any of the TOMs and why?</b>
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Answer:

Rationale:

# MARKET-WIDE HALF-HOURLY SETTLEMENT

## INITIAL ASSESSMENT OF ALL SKELETON TOMS AGAINST OFGEM DESIGN PRINCIPALS

### Purpose of the design principles

The SCR Launch Statement sets out Ofgem's plan to implement an enduring process for the HH Settlement of domestic and smaller non-domestic consumers' electricity usage that delivers benefits for consumers by maximising the opportunities smart metering provides in enabling a smart, flexible, energy system.

Ofgem's outcomes for the Market-Wide half-hourly Settlement (MHHS) project are set out in the project objectives, which form part of the Business Case. These are as follows:

1. incentivise all retailers and suppliers (current and future) to encourage customer behaviour in their future electricity demand that contributes to a more cost-effective electricity system;
2. promote the efficient use of, and investment in, energy infrastructure that delivers on government objectives of a flexible, safe and secure low-carbon electricity system; and
3. minimise undesirable distributional effects on consumers.

The design principles provide guidance and strategic direction to the Design Working Group (DWG) and Design Advisory Board (DAB) whose respective roles are to develop and review products for the Target Operating Model (TOM) to realise reforms towards HHS. Ofgem will also use these design principles to inform its decision-making when considering whether to accept or reject recommendations from the DWG.

### Detailed Design Principles and initial assessment of TOMs against the principles

Reference	Design Principle and Criteria	Initial Assessment
1	<b>Settlement timetable</b>	
	<p>The TOM design work provides an opportunity to consider how to reduce the Settlement timetable to maximise the opportunities provided by smart metering and to achieve the strategic goals of HHS. In particular, consideration should be given to the extent to which a reduced Settlement timetable would reduce credit cover costs for existing suppliers and new entrants.</p> <p>Full consideration is to be given to how reduced timings (including post reconciliation dispute runs if needed) of each Settlement run and a reduced number of runs will create a Settlement system which benefits all parties and maintains robust performance assurance.</p>	<p>This design principle will be addressed in detail in Stage 2 of the DWG work. The DWG will be able to draw on two previous investigations on reducing the Settlement timetable:</p> <ol style="list-style-type: none"><li>1. In 2015, ELEXON proposed a change to reduce Settlement timescales (<a href="#">BSC Panel paper 234/16a</a>). This report detailed an approach for identifying ways in which Settlement timescales can be reduced.</li><li>2. Ofgem. <a href="#">Electricity Settlement Expert Group (ESEG)</a> has also looked at options for reducing the Settlement timetable. The conclusions of ESEG on the Settlement timetable are set out in the <a href="#">Stage 1 conclusions paper</a>.</li></ol>

# MARKET-WIDE HALF-HOURLY SETTLEMENT

Reference	Design Principle and Criteria	Initial Assessment
2	<p><b>Data retrieval, processing and validation</b></p>	
	<p>The TOM design work will seek to maximise efficiency and realise consumer benefits to deliver the best achievable balance between speed, accuracy and minimisation of data errors within reduced Settlement timescales. To achieve this, the TOM design work will consider:</p> <ol style="list-style-type: none"> <li>1. which enduring roles and responsibilities for data retrieval and processing promote a relatively simple model whilst avoiding the potential to stifle innovation and competition in delivering these benefits; and;</li> <li>2. as a starting point, consider how best to build upon the changes to data validation and processing introduced under elective HHS.</li> <li>3. For the avoidance of doubt, Ofgem will take the policy decision on whether or not to centralise functions currently performed by supplier agents.</li> </ol> <p><b>Data estimation</b></p> <p>To maximise the opportunities provided by smart metering and arrangements for accurate Settlement, the TOM should only provide for estimation where necessary. In particular:</p> <ol style="list-style-type: none"> <li>1. The decision on profiling and estimation should balance reducing costs with retaining adequate accuracy for robust performance assurance;</li> <li>2. Where applied, the process of estimation should be as simple and cost-effective as possible, lowering barriers to entry for new entrants;</li> <li>3. It should limit manual intervention in the estimation process for smart meters; and</li> <li>4. Contingency for a catastrophic failure of Settlement arrangements will also need to be in place.</li> </ol>	<p>The detailed processes for retrieval, processing and validation will be addressed in Stage 2 of the DWG work.</p> <p>The Stage 1 work has defined the Services that will be undertaking the retrieval and processing activities. These Services may be grouped differently in each TOM.</p> <p>Each TOM identifies the Service that will undertake the processing function. This service will be the Service that performs data validation and estimation.</p> <p>Each TOM also identifies a Load Shaping Service that will replace the current profiling arrangements. This Service will be used for customers where Settlement Period level data cannot be obtained.</p>

## MARKET-WIDE HALF-HOURLY SETTLEMENT

3	<b>Treatment of non-half hourly (NHH) settled customers</b>	
	<p>A number of customers may not have transitioned to HHS (e.g. as they may not have HH capable meters). The TOM design work will need to consider how to settle these consumers in the most cost-effective manner whilst limiting impacts on the accuracy of Settlement. Full consideration should be given to how to apply reformed HHS arrangements to any remaining non-half hourly sites, to examine the impacts and to ensure appropriate treatment.</p>	<p>All TOMs address the treatment of customers where only register readings can be obtained. They address these in a cost-effective manner by using the same Service that will be processing the Settlement Period level data from the Meter. Significant cost efficiencies are gained by not having dual processes and not retaining the legacy NHH arrangements in the Target end state.</p>
4	<b>Change of Measurement Class (CoMC)</b>	
	<p>The TOM design work will need to address the transition period involving the mass migration of sites to HHS. It should consider how best to develop an effective and efficient CoMC process (or other method for migration to HHS) in light of any experience gained from the expected increased migration to HHS arising from changes introduced by elective HHS. This includes who should hold Meter Technical Details for installed smart meters, any necessary changes to relevant industry codes and, if required, how to accommodate change of supplier and/or metering system alongside the CoMC. This will require robust processes for CoMC (or other method for migration to HHS) to be in place. Solutions should aim to realise significant efficiency and consumer benefits.</p>	<p>Under Stage 1, the DWG questioned whether the concept of Measurement Classes was required in the target end state design options. However, the DWG will revisit this question during Stage 2.</p> <p>All the TOMs address the changes from Register Readings (NHH currently) to Settlement Period level Settlement and vice versa by defining a single Smart and non-smart Service. Once customers are transitioned to this Service the change between Register Readings and Settlement Period level Settlement only require different data to be sourced from the Meter. There would also be no requirement to change Agent or to pass Meter data between parties. This is a significant improvement on the existing CoMC processes. Smart Meter Technical Details will not be required for the Service processing the smart Meter data. Settlement Period level data does not require any Register mapping. For customers being settled using Register Readings the configuration of the Time-Of-Use registers can be obtained from the smart Meter.</p>

## MARKET-WIDE HALF-HOURLY SETTLEMENT

5	<b>Settlement of export</b>	
	<p>The TOM design work should consider the potential benefits of including metered export in mandatory HHS. Specifically:</p> <ol style="list-style-type: none"> <li>1. At a minimum, improvements to the process for Settlement of export should provide solutions for elective take-up;</li> <li>2. Any Settlement arrangements including export should facilitate accurate measurement and allocation of electricity volumes;</li> <li>3. The solutions to the Settlement of import and export should align in the long term to realise the full benefits of Settlement reform. This will improve the accuracy of balancing at distribution network level into the mid-2020s to support increased uptake of micro-generation; and</li> <li>4. The enduring Settlement arrangements for export should facilitate the implementation of future policy on small-scale low-carbon generation.</li> </ol>	<p>All TOMs will facilitate the accurate Settlement of export data from Smart and Advanced Meters where this has been registered for Settlement.</p> <p>This would be as accurate as the Settlement of Import from smart Meters as the export data is identical in format where stored in the smart Meter data log.</p> <p>The DWG RAID log identifies an issue as there is currently no requirement to meter or settle export data from Micro-generators. .</p>
6	<b>Unmetered supplies</b>	
	<p>The TOM design work should consider HHS of unmetered supplies (both for non-half hourly and existing half-hourly unmetered supplies).The potential to reduce the amount of inaccurate data processed at each Settlement run should be considered to provide improvements to Settlement performance whilst limiting the burden of change where potential benefits are limited.</p>	<p>All TOMs remove the existing NHH Unmetered Supplies arrangement. Each TOM identifies a new Service that will provide Settlement Period level data for UMS. This arrangement will allow more accurate allocation of UMS consumption than can currently be achieved in the NHH arrangements. This is because the existing NHH profiling arrangements cannot cater for the dynamic switching and dimming of UMS apparatus. The new UMS Service will be able to obtain feedback from Photo Electric Control Unit (PECU) arrays and Central Management Systems and output a Settlement Period level data flow for Settlement purposes. For smaller UMS portfolios, some pre-aggregation may be required to reduce the number of MPANs that a Supplier has to register.</p> <p>The new Service may also provide opportunities for Smart cities and new</p>

## MARKET-WIDE HALF-HOURLY SETTLEMENT

		technologies such as EV charging infrastructure where the appropriate Settlement Period level measuring capability has been installed.
7	<b>Network Charging</b>	
	<p>The TOM should facilitate changes aimed at improving the accuracy of data used for the billing of, and determining charges for, distribution networks. These changes should be appropriate for delivering benefits for domestic and small non-domestic consumers settling on a half-hourly basis.</p> <p>The TOM design work should also take account of and accommodate any changes to the network charging regime which have an impact on HHS.</p>	<p>All the TOMs have an associated Aggregation Service(s) that will aggregate Settlement Period level data either direct from the Meter or processed to Settlement Period level from Register Readings. Aggregated data can also be provided by the Volume Allocation Service for completeness, as is the case now.</p> <p>This will allow any network charging changes to process the data into the required format for network charging.</p> <p>There may also be a timing benefit since the network charging data can be passed direct to the networks without passing through the central Settlement arrangements as currently occurs in the NHH and elective HH arrangements.</p>
8	<b>Transition</b>	
	<p>As part of the Business Case, Ofgem will develop an approach for the transition to HHS with the aim of providing certainty to industry on the timeframe for change and expectations on them. This will consider the costs and benefits of different implementation timeframes based on the commercial decisions that affect organisations in the transition, including the resources required to manage concurrent industry changes. The work on the transitional approach will need to be informed by the design of the TOM as it develops.</p> <p>The TOM design work will include the design of Settlement arrangements which will give effect to the transitional approach outlined by the Business Case. The TOM design work will also provide information for the Business Case on the costs and benefits of different timeframes for and approaches to the transition.</p>	<p>The detail of the transitional arrangements will be considered in Stage 2 of the DWG work once there is more certainty on the preferred TOM.</p> <p>This is to avoid nugatory work on defining arrangements for multiple TOMs that may not be progressed.</p>

## MARKET-WIDE HALF-HOURLY SETTLEMENT

9	<b>Innovation</b>	
	<p>It is expected that new technologies and energy businesses models will offer customers a range of new energy services and smooth the transition to a smarter energy market. The TOM should enable, and not impede the entry of these new energy services into the market.</p> <p>Specific consideration should be given in the TOM design work to how Settlement arrangements could interact with, and facilitate new technologies and flexibility offerings.</p>	<p>The TOM designs have sought to allow for flexible aggregation of Settlement Period level data from smart Meters.</p> <p>This data could be actual Settlement Period level data or Settlement Period level data derived from Register Readings.</p> <p>Access to these aggregations or even the Meter level data would support many innovative offerings. For instance a community energy scheme or Peer to Peer platform may be able to access data for each consumer within the arrangement regardless of each consumers Supplier.</p> <p>The DWG noted that many of these innovations will require market changes beyond the settlement system in order to happen.</p>

<b>Question 9</b>	<b>Do you agree with the DWG's initial assessment against the Design Principles? Are there any points not identified by the DWG?</b>
Answer:	
Rationale:	




# MARKET-WIDE HALF-HOURLY SETTLEMENT

## INITIAL EVALUATION OF ALL TOMS AGAINST EVALUATION CRITERIA

The DWG undertook an initial evaluation of all TOMs against the evaluation criteria. It was identified that only certain criteria could be assessed at this stage:

### 17. Approach to evaluation






Statements are provided across all TOMs on the strength and weaknesses against the criteria, where it is currently possible the approach to rate the TOMs against the criteria. The following descriptors are used to show the relative merits:

Strongly supports –  assessed to completely deliver against the criterion

Supports –  delivers mostly what is required by the criterion

No assessment –  cannot be assessed at this stage

### 18. Initial Evaluation

Criterion	Considerations	Evaluation Criteria	All TOMs	Comment
<b>Coverage</b>	The TOM covers all required end-to-end processes.	Meets requirement in the Key Roles and Responsibilities document		Covers all processes set out in the document however the TOMs are currently silent on data transfer and communication - this will be covered in Phase 2.
	Are new Market Roles required or are current roles no longer needed?	New or adapted Role types		Covers all new (e.g. Load Shaping) and adapted services required.
	How are consumers remaining on traditional metering or whose HH data is not available settled?	Meter types		Covers all Settlement metering (as per target/end-state assumptions) and also unmetered supplies. TOMs assume SMETS 1 meters will either be replaced with SMETS 2 meters or adopted under the DCC. Behind-the-meter metering is being considered flexibility.
	Settlement arrangements for export consumption	export coverage		Covers Settlement of active export, where such export is registered for Settlement. Export Settlement will be influenced by relevant policy decisions made by BEIS.
	How are Unmetered Supplies incorporated?	UMS coverage		Features a defined Unmetered Supplies Service to facilitate the half-hourly Settlement of all unmetered supplies.
	The TOM covers interaction with Customer Billing.			

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Criterion	Considerations	Evaluation Criteria	All TOMs	Comment
		customer billing interaction	✓	Customer billing data is provided by Meter Reading Service (non-smart), Processing Service (Advanced), Settlement Period Unmetered Supplies Service (UMS) and directly from the meter (Smart meters)
		Potential participants to fulfil role	✓	Registration, Metering and Advanced Retrieval/Processing services are largely unchanged and can therefore be provided by existing participants and well as new.
		Registration arrangements	✓ ✓	Largely unchanged from current arrangements though new registration data and new interfaces may be required.
<b>Cost Reflectivity</b>	Cost-reflectivity of option	quality of data to Settlement	✓ ✓	Maximises the use of Settlement period level data. Where SP-level data is not available from the meter, Register Reads are converted to SP-level data using actual SP-level data rather than profiles.
	How well option facilitates flexibility , e.g. DSR		customers and meter types	
		Network charges	✓ ✓	Settlement period level data will be available from the processing services for network charging purposes, subject to data privacy option.
<b>Timing</b>	Overall length of Settlement and dispute process	Does the model allow for faster Settlement against the baseline or other TOMs? Timing of first run for financial Settlement.	✓	Depends on percentage of meter reads required. TOMs would allow for faster collection of data, enabled by retrieval through the DCC.
	Overall length of Settlement and dispute process	Ensuring arrangements remain robust, accurate and fair	Timing of final reconciliation run	-

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Criterion	Considerations	Evaluation Criteria	All TOMs	Comment
<b>Design Simplicity</b>	Complexity of design and scope for simplification	Statement on simplicity of design	<input checked="" type="checkbox"/>	Improvement on status quo.
		Impact of supporting smart and traditional solutions in parallel	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Supports both traditional and smart Meters in parallel
	Level of automation Robustness and ease of upgrading	Robustness and ease of upgrading	-	Cannot be assessed yet as no detail on lower level infrastructure.
<b>Design Flexibility</b>	Whether it can easily adapt to future changes in market  Whether it can it handle bulk CoS/change of agent events	How adaptable the TOM is and why?	-	Cannot be assessed yet as TOM specific criteria.
		How will it handle bulk CoS events/change of agent ensuring correct allocation?	<input checked="" type="checkbox"/>	Removes reliance on historic data (currently used for profiling).
	Supplier Of Last Resort	Supplier Of Last Resort	<input checked="" type="checkbox"/>	Same as above
<b>Impact on small suppliers/new entrants</b>	Impacts of any approach on small suppliers/new entrants	Identifying specific issues for small suppliers/new entrants stemming from an assessment of other criteria	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	Settlements process will be simpler. Faster and more accurate Settlement should mean lower credit cover costs.
<b>Supports New Technologies and Innovation</b>	How the design supports and does not impede new technologies and innovation	Identify how access to different levels of meter and aggregation could support new technologies or other innovation such as DSR, Peer-to-Peer and Smart Grids	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	All TOMs could be adapted to allow flexible aggregation of Settlement Period Level data.

### Question 10

**Do you agree with the DWG's initial evaluation against the evaluation criteria?**

Answer:

Rationale:

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## INITIAL ASSESSMENT OF THE INDIVIDUAL TOMS

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The DWG acknowledged that only an initial assessment of the merits of the individual TOMs was possible at this stage of development. All TOMs cover the same set of Meter to Bank processes but with different service groupings. As such only a limited assessment is possible until more is known about the detail of the other policy areas that Ofgem are considering.

The main features of all TOMs were developed using Market Segments as a base. The DWG identified key features of each TOM, highlighting benefits and potential issues with each.

### **TOM A Combined Retrieval and Processing with Separate Aggregation**

TOM A features combined retrieval and processing services with a separate aggregation service, which would allow aggregation across Market Segments. This could facilitate flexibility and future innovation developments such as P2P trading (through cross Market Segment aggregations), as well as a potential more equitable allocation of costs to consumers (through changes to GSP Group Correction).

### **TOM B Separate Retrieval with combined Processing and Aggregation**

TOM B features a combined processing and aggregation service with a separate retrieval service in the smart Market Segment. The DWG noted that this separation could cause issues with data validation, and the lack of the cross-segment aggregation service may make future market opportunities more complex.

### **TOM C End to end service covering Retrieval through to Aggregation**

TOM C is similar to TOM B but without the separate retrieval service in the smart Market Segment. This creates one service for smart and advanced meters respectively that provides retrieval, processing and aggregation as part of that service. These could be delivered either competitively or as a standard service.

### **TOM D Separate Services**

TOM D is similar to TOM A but with a separate retrieval service in the smart Market Segment. If provided by the Supplier, this would largely reflect the current DCC arrangements (subject to the data access policy decision). A separate retrieval service independent of Suppliers could allow the opportunity to coordinate data requests more efficiently. It has the same benefits as TOM A on cross Market Segment aggregation.

### **TOM E Single central service covering Retrieval through to Volume Allocation**

TOM E is the only TOM where a choice of processing service is not available to the Supplier and is subject to Ofgem's policy decision on whether or not to centralise agent functions, which is being considered separate to the DWG's TOM design work. This TOM provides a more centralised view of Settlement, with potentially one centrally procured agent doing retrieval, processing, aggregation and volume allocation. This TOM would mean changes to DCC security arrangements because of DCC and SEC requirements, and would further impact the SEC regarding register read and third party SEC users. This TOM would also have a long implementation time, as it would require a transparent competitive tender process to provide the central Settlement service.

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## Appendix A - RAID Log

The Risk, Issues, Assumptions and Dependencies for the TOM development work (RAID) are set out below. This document will also be further developed by the DWG. This RAID log is one of two RAID log for the DWG project and focusses on the TOM and any potential impactors.

18.1 The DWG has identified the following risks, assumptions, issues and dependencies:

### Risks

No.	Risk	Notes
R01	Risk that changes de-stabilise the existing HH Settlement	The existing HH market of some 260k metering systems account for around 50% of the energy Settlement. Changes to the Settlement arrangements for smart Metering Systems should not disturb the established activity.

### Assumptions

No.	Assumption	Notes
A01	That Suppliers will remain the registrant of Metering Systems	This reflects the current Supplier Hub model which may change in future to recognise multiple Suppliers or different organisations contracting with the consumer <sup>8</sup> .
A02	That the communication networks (specifically the DCC) will be able to handle the amount of data that will be required for HHS arrangements	DCC will need to assess all the capacity considerations.
A03	That the DCC is able to meet its SLAs in terms of maintaining successful communication links with meters	DCC will need to assess the impact of HHS volumes.
A04	That the HH data on smart meters is of a level of accuracy and is suitable for use in Settlement	As per the current BSC meter Code of Practice requirements
A05	That there will be some Meters for which HH data cannot be collected	This may be due to meter capability (non smart Meters), communications issues or outcome from the data privacy policy work area.
A06	That Settlement will continue to be in Clock time and Meter data will need to be converted from UTC	Smart Meter data is stored in UTC and a process is needed to provide both UTC and clock time versions of the data.
A07	That Settlement data will need to be processed from Watt hours (Wh) to kilowatt hours (kWh) for processing and Mega Watt hours (MWh) following	As per the current Settlement process.

<sup>8</sup> *Ofgem is currently undertaking a review of supply market arrangements. For further information see <https://www.ofgem.gov.uk/publications-and-updates/future-supply-market-arrangements-call-evidence>.*

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No.	Assumption	Notes
	Aggregation.	
A08	That all smart Meters will be serviced by the DCC in the target end state.	This may require adoption or replacement of some SMETS Meters.

## Issues

No.	Issue	Notes
I01	Settlement of export	There is an issue with microgeneration export spill. There is currently no requirement to meter or settle export data from Micro-generators.
I02	Related meters	There are issue with losing identification of the related Metering system when transitioning Sites between HH and NHH Settlement.
I03	Identifying types of customers and metering at point of sale	There is an issue with identifying what type of metering and type data can be accessed from customers at point of sale, e.g. legacy NHH, Smart HH/NHH.
I04	Whether FITs Meters (and other 'behind the Meter' metering) are included within the smart metering data model	There may be requirements (benefits/efficiencies) for the Settlement process to accommodate or interface to new meter data from non-Settlement meters.
I05	Interaction with Customer Billing	The TOM will need to take account of the interaction with customer billing activity and the basis by which Settlement and billing data are reconciled.

## Dependencies

No.	Dependency	Notes
D01	Smart Meter Roll out	The smart Meter roll-out plays a key role in delivering the functionality for HHS. There will be a need to monitor the uptake of smart metering and estimate the potential number of customers remaining on non-smart Meters.
D02	Faster Switching	Interaction of TOMs and any centralised registration arrangements developed to support centralised switching will also need to be considered.
D03	SCR Policy Decision: Data Access	The TOMs will need to reflect the policy decision made on access to HH data for Settlement purposes.

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No.	Dependency	Notes
D04	SCR Policy Decision: Centralisation	The TOMs will need to reflect the policy decision to be made by Ofgem on whether or not to centralise Agent Functions
D05	European Policy	European policies could also impact the design of the TOM. It is possible that changes to Settlement to support European policy decisions that could be progressed within the same timeframe, e.g. 15 minute Settlement Period
D06	Flexibility initiatives	The TOMs will need to be seen as a key enabler for any new innovation around demand side flexibility, aggregation, community energy and emerging smart grid options that are currently being developed
D07	Targeted Charging Review SCR and Wider Charging Futures Initiative	Changes to transmission and distribution charging, for demand and generation, could impact the data requirements from any new Settlement processes.
D08	Brexit	The DWG will need to keep an eye on any impacting factors that may come out of Brexit.

Question 11	Are there any Risks, Assumptions, Issues or Dependencies not identified by the DWG that should be included in the RAID log?
Answer:	
Rationale:	

Question 12	Do you have any further comments?
Answer:	
Rationale:	

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## Appendix B - Collated Consultation Questions

<b>Question 1</b>	<b>Are there any Settlement processes or services not identified that should be included as part of the HHS Meter to Bank process?</b>
Answer:	
Rationale:	

<b>Question 2</b>	<b>Are there any TOMs or aspects of TOM design that would better facilitate the most efficient delivery of the HHS Meter to Bank process?</b>
Answer:	
Rationale:	

<b>Question 3</b>	<b>Are there any TOMs or aspects of TOM design that would better facilitate the most accurate allocation of energy?</b>
Answer:	
Rationale:	

<b>Question 4</b>	<b>Are there any TOMs or aspects of TOM design that would be less resilient? e.g. a failure in a Service to be delivered</b>
Answer:	
Rationale:	

<b>Question 5</b>	<b>Are there any TOMs or aspects of TOM design that would deliver the best result for the end consumer?</b>
Answer:	
Rationale:	



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<b>Question 6</b>	<b>Are there any innovations in technologies or energy services not considered in this document which should be accommodated by the TOMs?</b>
Answer:	
Rationale:	

<b>Question 7</b>	<b>Are there any specific aspects of TOM design that would present a barrier to new market entrants, technologies or innovations?</b>
Answer:	
Rationale:	

<b>Question 8</b>	<b>Do you have a preference for any of the TOMs and why?</b>
Answer:	
Rationale:	

<b>Question 9</b>	<b>Do you agree with the DWG's initial assessment against the Design Principles? Are there any points not identified by the DWG?</b>
Answer:	
Rationale:	

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<b>Question 10</b>	<b>Do you agree with the DWG's initial evaluation against the evaluation criteria?</b>
Answer:	
Rationale:	

<b>Question 11</b>	<b>Are there any Risks, Assumptions, Issues or Dependencies not identified by the DWG that should be included in the RAID log?</b>
Answer:	
Rationale:	

<b>Question 12</b>	<b>Do you have any further comments?</b>
Answer:	
Rationale:	

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## Appendix C - Glossary of Terms

### A

#### **Advanced Meter**

The electricity supply licence defines an Advanced Meter as an electricity Meter that, either on its own or with an ancillary device, and in compliance with the requirements of any relevant Industry Code:

- a) provides measured electricity consumption data for multiple time periods, and is able to provide such data for at least half-hourly time periods; and
- b) is able to provide the licensee with remote access to such 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 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.

#### **Balancing Mechanism Units (BMU)**

A unit which exports or imports electricity. Export units are usually Generation units and import units are usually nominal units per supplier per GSP group.

### C

#### **Central Volume Allocation (CVA)**

Central Volume Allocation refers to the allocation of active energy from:

- a) BM Units other than Interconnector BMUs and Supplier BMUs;
- b) Interconnectors;
- c) Grid Supply Points; and
- d) GSP Groups;

### D

#### **Data Aggregator (DA)**

As part of the Settlement process, the party appointed by an electricity supplier in accordance with Section S of the BSC to aggregate metered consumption data to meet the requirements set out in the BSC.

#### **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.

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## **Data Collector (DC)**

As part of the Settlement process, the party appointed by an electricity supplier in accordance with Section S of the BSC to retrieve, validate and process Meter readings to meet the requirements set out in the BSC.

## **Data and Communications Company (DCC)**

The DCC is the company that manages the data and communications to and from domestic consumers' 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.

## **Dynamic time-of-use tariff**

A dynamic time-of-use tariff is one that provides for price or pricing structures to vary at short notice in response to market events, subject to contractual terms.

## **E**

### **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.

## **G**

### **Grid Supply Point (GSP) Group**

There are currently 14 GSP Groups consisting of: (i) the Distribution System(s) which are connected to the Transmission System at (and only at) Grid Supply Point(s) which fall within one Group of GSPs, and (ii) any Distribution System which: (1) is connected to a Distribution System in paragraph (i), or to any other Distribution System under this paragraph (ii), (2) is not connected to the Transmission System at any Grid Supply Point and the total supply into which is determined by metering for each half hour.

## **L**

### **Licensed Distribution System Operators (LDSOs)**

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

## **M**

### **Market Segments**

The five Market Segments are the four combinations of Meter types and Meter consumption data (Settlement Period level and Register Readings) plus Unmetered Supplies.

### **Market-wide**

Market-wide in the context of the SCR means the Settlement of Settlement Period data where such data can be accessed subject to data privacy and data access policy.

Market-wide in the context of Services means a service which would provide cross-segment-aggregation.

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## 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.

### **Non-half hourly Settlement (NHH)**

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

### **Non-smart Meter**

A non-smart Meter is a Meter that is either not compliant with the Smart Metering Equipment Technical Specifications (SMETs) or one where only Register Readings can be collected due to Meter functionality or data privacy and data access policy. The latter category can include Meters with Advanced capability, e.g. ones that have been installed for customers in Profile Classes 3 and 4.

## 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 (NHH) 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

### **Register Readings**

Register Readings are the Meter readings obtained from a Settlement Meters tariff registers. This could be the cumulative register or the Meter's Time-of-Use (TOU) Registers. These readings may be taken remotely or via a site visit.

## S

### **Settlement Period**

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

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## Settlement Period level data

Settlement Period level data is consumption data that is the granularity of the Settlement Period this could be actual consumption data obtained directly from the Meter or consumption data derived from Register Readings or Unmetered Supplies that is processed to Settlement Period granularity.

## 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 volumes 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 smart Meter is a Meter which is compliant with the Smart Metering Equipment Technical Specifications (SMETs). 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.

## 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.

## T

### Time-of-use (ToU) tariffs

Energy tariffs that charge different prices at different times of the day, week, month or year are known as time-of-use tariffs. See also dynamic time-of-use tariff and static time-of-use tariff.

## Trading Party

A Trading Party means a BSC Party, other than the Transmission Company, which holds Energy Accounts.

## U

### Unmetered Supplies

Unmetered Supplies (UMS) means a supply of electricity to a particular inventory of equipment in respect of which a Licensed Distribution System Operator (LDSO) has issued an Unmetered Supply Certificate. For example, this equipment could be any electrical equipment that draws a current and is connected to the distribution network without a Meter, i.e. there is no Meter recording its energy consumption, e.g. street lights, traffic signs, zebra crossings, etc.

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Acronyms used in this document are listed in the table below.

Glossary of Defined Terms	
Acronym	Definition
AE	Active Export
AI	Active Import
BMU	Balancing Mechanism Unit
CoA	Change of Agent
CoMC	Change of Measurement Class ( <i>process</i> )
DCC	Data and Communications Company
DSR	Demand Side Response
DWG	Design Working Group
EV	Electric Vehicle
HH	Half Hourly
NHH	Non Half Hourly
MHHS	Market-wide Half Hourly Settlement
MTD	Meter Technical Details
P2P	Peer to Peer
RR	Register Readings
SD	Settlement Day
SP	Settlement Period
SVA	Supplier Volume Allocation
SVAA	Supplier Volume Allocation Agent ( <i>BSC Agent</i> )
TOM	Target Operating Model
ToU	Time-of-Use
UMS	Unmetered Supplies