I-SEM Training
Balancing Market Bidding and Data Submission

August 2017

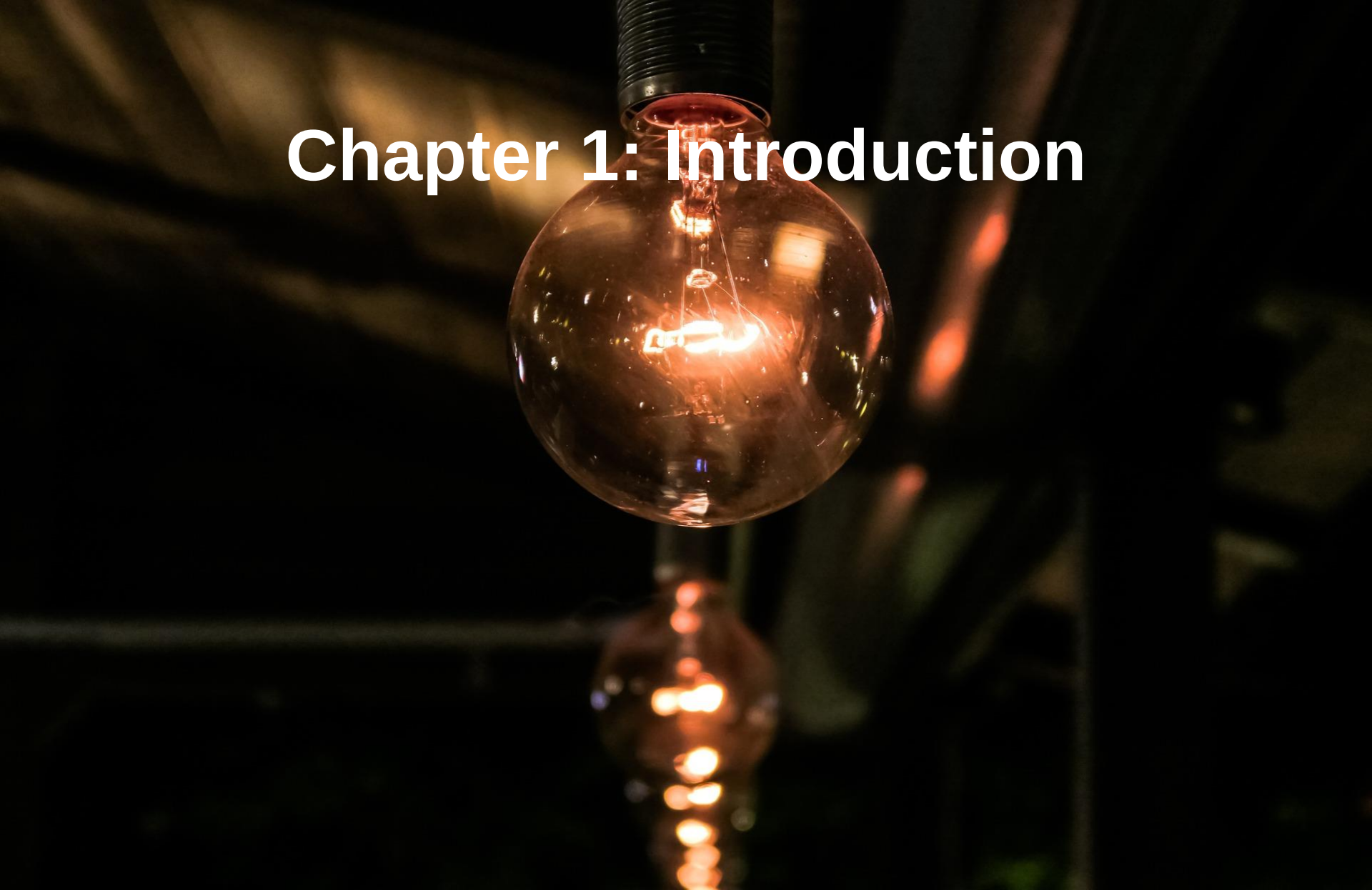
Learning Objectives

- How to access SEMO balancing market (BM) systems
- Timelines for data submission for the BM
- Process for technical data requirements for the BM
- Process for commercial data requirements for the BM
- The application of complex and simple commercial offer data in the BM
- Default data requirements and how these are used in the BM
- The Validation Technical Offer Data process
- How to access data publications

Balancing Market Bidding and Data Submission Topics

- Chapter 1: Introduction
- Chapter 2: Submission Rights, Requirements and Timing
- Chapter 3: Data Submission and Retrieval Processes
- Chapter 4: Data Publication and Reporting
- Chapter 5: Registration Data (SLT Only)
- Chapter 6: Physical Notification Data
- Chapter 7: Units Under Test
- Chapter 8: Grid Code Data (SLT Only)
- Chapter 9: Technical Offer Data
- Chapter 10: Commercial Offer Data

Chapter 1: Introduction



Balancing Market Bidding and Data Submission Intro

- The Self Learning Training Materials will concentrate on the core theory of all elements in data submission for bidding in the Balancing Market. These materials will include all the training information developed on unit type specific data, so that a unit with particular data requirements will not have to attend Instructor Led Training to find information for their particular circumstances if they feel the Self Learning Training is sufficient. These materials will also include all training information developed on (Validation) Registration Data and Grid Code Data (i.e. these will not be covered in Instructor Led Training except for answering any questions trainees have), because while they affect balancing market positions they are not core to the process of submitted bidding data, and the details in these areas do not change much between the SEM and I-SEM arrangements.

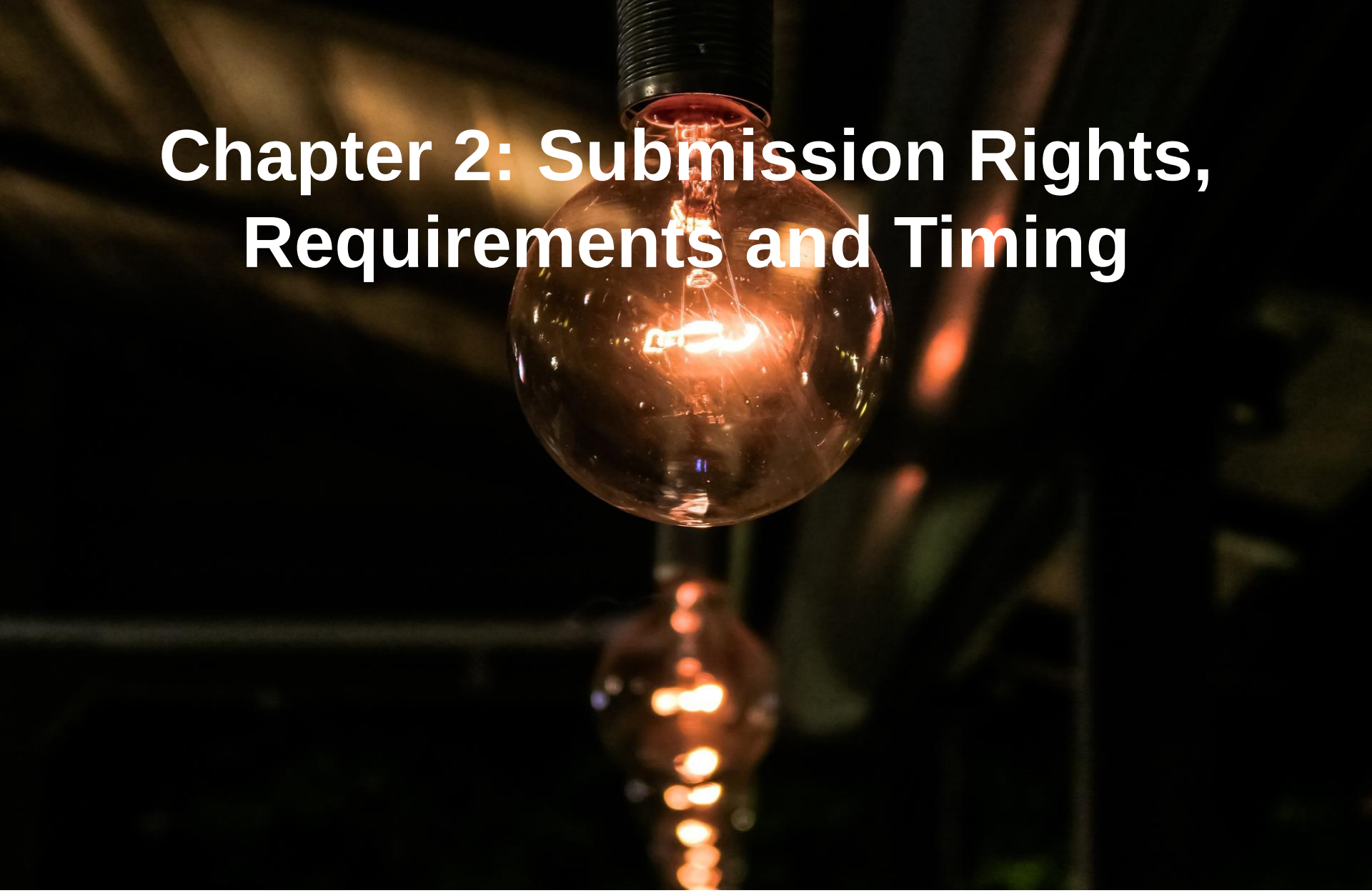
- The Instructor Led Training Materials will build on this theoretical knowledge by concentrating on processes as defined under the Agreed Procedures, considering some more specific practical details and requirements of data submission such as validation rules, and concentrating on those areas which are new or changed by a large extent in the I-SEM arrangements (in particular Physical Notification Data, Commercial Offer Data, and how this data is used in Scheduling, Dispatch, Pricing and Settlement). The Instructor Led Training session will also allow time for trainees to ask questions arising from their reading of the Self Learning Training Material.

Balancing Market Bidding and Data Submission Intro

- A note on sign conventions:
  - Power (MW) or energy (MWh):
    - Being input into the SEM are positive values;
    - Increases to the amount being input into the SEM / decreases to the amount being taken from the SEM, are positive values;
    - Being taken from the SEM are negative values;
    - Decreases to the amount being input into the SEM / increases to the amount being taken from the SEM, are negative values.
  - Power (MW) or energy (MWh) in relation to an Interconnector:
    - Being imported into the SEM are positive values;
    - Increases to the amount being imported into the SEM / decreases to the amount being exported from the SEM, are positive values;
    - Being exported from the SEM are negative values;
    - Decreases to the amount being imported into the SEM / increases to the amount being exported from the SEM, are negative or zero values.
  - Amounts (in € or £):
    - Due to a Participant or Unit from the Market Operator are positive values;
    - Due from a Participant or Unit to the Market Operator are negative values.

Balancing Market Bidding and Data Submission Intro

- A Trading Day (TD) is a 24 hour period starting at 23:00:
  - E.g. the period of time for Trading Day 01/04/2018 would start at 23:00 on the calendar day 31/03/2018, and would end on 23:00 on the calendar day 01/04/2018;
  - This aligns with European Trading Days, which start at midnight Central European Time.
- An Imbalance Settlement Period is a half-hour period starting on the hour and on the half hour.



Chapter 2: Submission Rights, Requirements and Timing

Submission Rights, Requirements and Timing – 1/7

- Participating in the TSC arrangements is mandatory for all units above the De Minimis Threshold, and therefore all of these units must provide some level of data:
  - For some which cannot be physically dispatched / controlled, registration data may be all that is required for imbalance settlement;
  - For others which can be physically dispatched / controlled, additional detailed data is required to determine their operation on system and settlement of balancing actions.
- Units of different types and with different attributes have different rights and obligations for submission of data.

Submission Rights, Requirements and Timing – 2/7

- Data types submitted include the following:
  - (Validation) Registration Data ((V)RD):
    - Used to identify and categorise units based on characteristics and represent some aspects of how a unit physically operates which tend to not change frequently over time.
  - Physical Notification Data (PND):
    - Used to represent the generation profile desired by a unit in the absence of responding to requests for balancing services, forming the start point of scheduling and dispatch, and used in settlement. Also includes data for requesting Unit Under Test status.
  - (Validation) Technical Offer Data ((V)TOD):
    - Used to represent how a unit physically operates so it can be modelled in scheduling and dispatch and settlement.
  - Grid Code Data:
    - Used in addition to TOD and VRD to reflect how a unit physically operates in areas which aren't related to the balancing market or which are related to real-time operational data updates, for scheduling and dispatch.
  - Commercial Offer Data (COD):
    - Used to represent the costs of operating and forecasts of the unit's power and energy availability, for scheduling and dispatch and settlement.

Submission Rights, Requirements and Timing – 3/7

Unit Type / Data Type	*Registration Data*	*Physical Notification Data*	*Grid Code / System Data*	*Technical Offer Data*	*Commercial Offer Data*
Dispatchable Generator; Autoproducer Unit					
Controllable/non-Dispatchable Generator					
Dispatchable Generator with Priority Dispatch and Zero Marginal Costs					
Demand Side Unit					
Supplier Unit (incl. ASU); Trading Site Supplier Unit					
Energy Limited Generator Unit					
Assetless Unit; Trading Unit; Interconnector Error Unit; Interconnector Residual Capacity Unit; Non-Controllable and Non-Dispatchable Generator					
Dual Rated Generator Unit					
Interconnector					
Pumped / Battery Storage Unit					
Registered Generator Unit Below De Minimis Threshold; Aggregated Generator Unit					

EIRGRID semo Single Electricity Market Operator SONI

Must Submit ***May Submit*** ***Must not Submit***

Depends on Configuration ***Submitted with Specific Requirements***

Submission Rights, Requirements and Timing – 4/7

- Participants are obliged to provide data within certain timeframes:
  - Registration data within registration timeframes;
  - Default COD and VTOD must be submitted as part of registration to ensure that there will always be some form of this data available if data is not submitted for a given day or period. Participants must review and update as necessary at least once per quarter;
  - (Note that the default data submission in registration is part of the enduring registration process, a slightly different process was undertaken for the transitional registration process pre-go-live);
  - Trading Day and Imbalance Settlement Period specific COD, TOD and PND between Balancing Market Gate Opening and Gate Closure times.

- Different timelines may apply in Emergency Communications situations, with such extensions to data submission beyond Gate Closure Times determined as required by the MO;

- The Market Operator has the right to query data, when submitted:
  - This is not a part of the validation process, and data will not be rejected or changed on the basis of such as query;
  - The MO can raise a query to inform the participant if data looks incorrect, but the obligation and right to change the data rests with the participant only.

- There are technical requirements which must be met in participants submitting data;

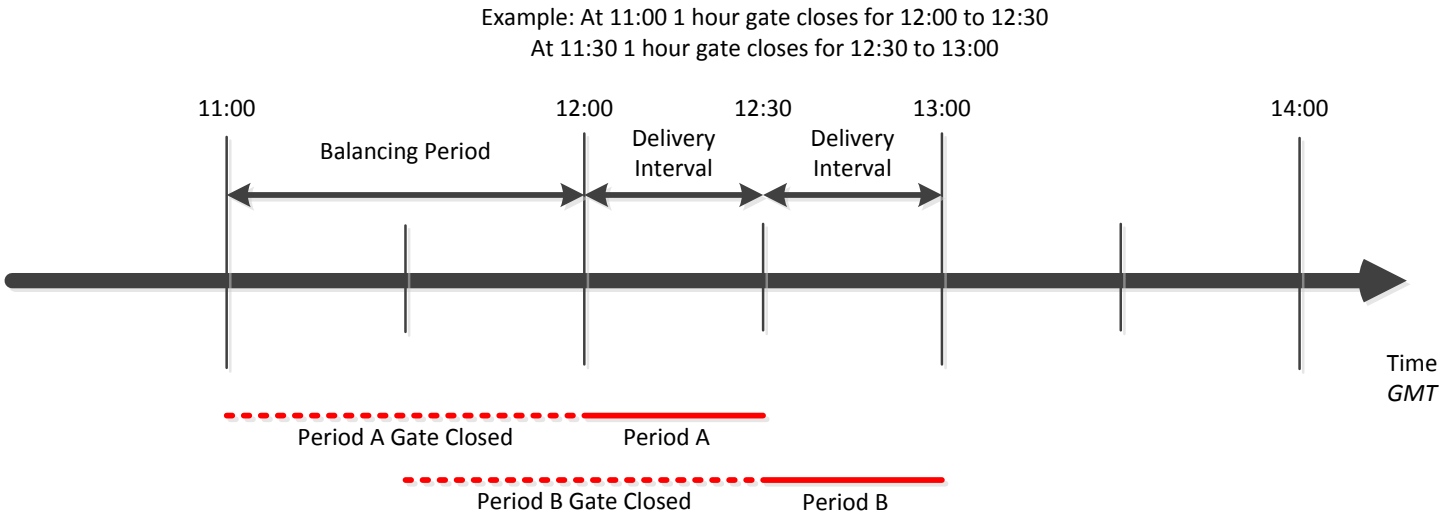
- Some unit types must submit a certain subset of data, or must submit particular values in their data transaction.

Submission Rights, Requirements and Timing – 5/7

- The Balancing Market Gate Opening Time is the time from which data can be submitted for a given period:
  - At 12:00 TD-19 data submission for the Trading Day opens, Participants can submit data relevant to number of individual days up to 19 days in advance;
  - e.g. if it is currently 13:00 on 01/04/2018, the latest Trading Day for which data can be submitted would be 19/04/2018.
- There are two Balancing Market Gate Closure times:
  - Gate Closure 1 (GC1):
    - At 13:30 TD-1 data submission closes for a Trading Day for some data, and default data rules apply for other elements of data;
    - At this time Data submission closes for Validation Data Set (VDS) Number for the Trading Day, no resubmission of VDS Number is possible for Trading Day after GC1 except for allowances for change in timelines following Emergency Communications processes;
    - If no initial PND and COD submitted to be used in scheduling and dispatch, default/standing values will be used until updated values submitted.
  - Gate Closure 2 (GC2):
    - At 1 hour before the start of each Imbalance Settlement Period, data submission closes for all data;
    - Data submission closes for PND and COD to be used in dispatch, pricing and settlement.

Submission Rights, Requirements and Timing – 6/7

- Balancing Market Gate Closure 2 for an Imbalance Settlement Period:
  - After this point in time all data submission for a period is no longer possible;
  - Aligned with Intraday continuous gate closure;
  - On the hour and half-hour, every half-hour, the following 90 minutes are “Closed”;
  - A period is considered “Open” if GC2 for the period has not yet passed.



Submission Rights, Requirements and Timing – 7/7

- A Bid Offer Acceptance (BOA) is where a unit in the Balancing Market is dispatched differently to their market position (as represented through a unit's PND), thus accepting an offer if the unit was dispatched higher, or accepting a bid if the unit was dispatched lower. The quantities and prices associated with a BOA are calculated using PND, VTOD and COD;

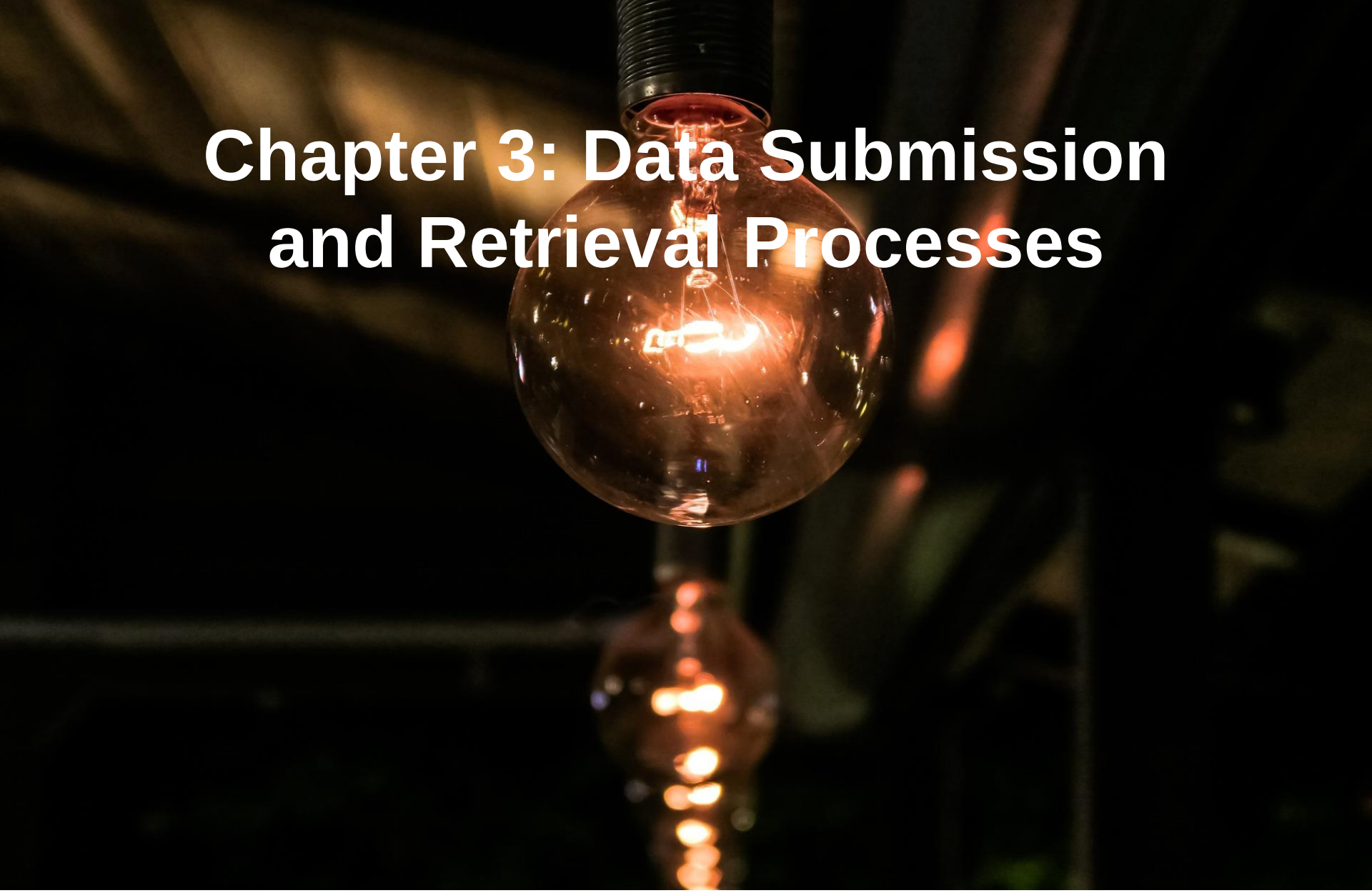
- For PND, the final data at GC2 (the unit's Final Physical Notification) will be used to calculate Bid Offer Acceptances;

- However for COD it is not only the final data at Gate Closure 2 which will apply in all cases. Each submission over time for a period may be used in pricing and settlement based on the timing of accepting offers and bids, and the timing of updating this data;

- This is because Dispatch Instructions which affect an Imbalance Settlement Period can be issued at any time before or after GC2 for that period. For example, a dispatch instruction five hours in advance of the period would be required to synchronise a unit with a five hour notice time;

- The COD which is present and active for the period at the time of the instruction giving rise to the BOA is the COD used to calculate the quantities and prices for that BOA. In this instance, the COD which is present for that period at the time of the Dispatch Instruction, five hours before the period, applies to the BOA even if the COD for that period is updated afterwards before GC2;

- The Imbalance Settlement training materials will cover this in more detail.



Chapter 3: Data Submission and Retrieval Processes

Data Submission and Retrieval Processes (1/18)

- The Balancing Market Interface (BMI) is the primary means by which participants interact with the market;
- It allows participants to submit data for:
  - VRD, VTOD, COD, and PND;
  - Separated into “Generator” VTOD and COD, and “Demand” VTOD and COD (demand in this case means Demand Side Unit, not a Supplier Unit);
  - Also allows Participants to retrieve a list of valid or cancelled Settlement Reallocation Agreements (the process to submit requests to set up or cancel Settlement Reallocation Agreements is offline and is updated in the system by the MO);
  - The term Market Participant Interface (MPI) is sometimes also used, as it is the term for the equivalent of the BMI in the SEM.
- Participants can also use the BMI to retrieve the data it has submitted and retrieve reports which are available;
- There are a number of procedures outlining how Parties interact with the BMI in TSC Agreed Procedures. This is elaborated further in detail in the Instructor Led Training materials.

Data Submission and Retrieval Processes (2/18)

Registration Data Submission.

- Registration Data must be submitted to the MO and assessed to ensure it meets the eligibility criteria;
- A Participant and/or its Units are registered upon receipt of a Commencement Notice, and will be eligible for trading from the start of a Trading Day which corresponds with the relevant Effective Date on that Notice;
- A unique Digital Cert is issued to the persons nominated by the Party as Users;
- The Party undergoes Communication Channel Qualification;
- Thereafter the User is permitted access to the BMI on behalf of the registered Participant and Unit.

Data Submission and Retrieval Processes (3/18)

Registration Data Submission.

- Once registered, Participants can update their Registration Data and that of their units via the BMI;
- Such update requests must be submitted at least 3 Working Days before the effective date and are subject to validation and approval by the MO;
- Exceptions to this include:
  - Change Registered Capacity or Maximum Generation of an AGU;
  - The Firm Access Quantity of Trading Site(s) for each Trading Day.
- Where a Participant wishes to change Registered Capacity or Maximum Generation of an AGU, they must send a Registration Pack with updated information to the MO (no fee required). The change will approved upon validation of the Registration Pack;
- Where a Participant wishes to change the Firm Access Quantity of a Trading Site, they must submit the appropriate form available from the MO website. The form is then issued to the relevant SO and validated in accordance with B.9.3 of the Code.

Data Submission and Retrieval Processes (4/18)

Registration Data Submission.

- A Participant may apply to change its attributes between being controllable or not, and dispatchable or not;
- They may register a Generator Unit as Non-Controllable until its Operational Readiness Confirmation is granted:
  - Upon receipt of confirmation, a Participant can apply to change their Registration Data to Controllable via the BMI.
- If the unit meets necessary Grid Code qualification requirements, they can also apply to change their Registration Data from being Non-Dispatchable to being Dispatchable;
- The application for change must be submitted at least 19 Trading Days prior to the effective date of the change (i.e. before Gate Opening for the Trading Day which is to be the effective date of the change);
- Email confirmation must follow the request no later than 1 Working Day after submission of the request by an approved Registration User;
- MO will (if approved) make the change in the system no later than 5 Working Days prior to the effective date and email the relevant Parties notifying that the change is complete.

Data Submission and Retrieval Processes (5/18)

Registration Data Submission.

- Some Registration Data is validated by External Organisations, in particular:
  - The SOs in respect of Grid Code compliance;
  - The MDPs in respect of meter data and retail market.
- Registration applicants should liaise with the SO and/or MDP prior to submission of a Registration Pack to facilitate the validation of Registration Data within 20 Working Days by the relevant External Organisations;
- The roles of these organisations is outlined in Agreed Procedure 1.

Data Submission and Retrieval Processes (6/18)

Registration Data Submission.

- Standing Offer Data (in the TSC Agreed Procedure 4 and the Technical Specification), also known as Default Data (in the TSC), is used as Gate Closure Data for GC1 to ensure valid offer data is always available for a Generator Unit;
- It is made up of both COD and VTOD items, they must be initially submitted during registration and can be updated following Communication Channel Qualification:
  - The earliest effective date for a Standing Offer Data submission is TD+19 days;
  - When a unit is being registered it must make a standard daily COD submission for each day until the day before the Standing Offer Data becomes effective to guarantee that they have data available, because the Standing Offer Data cannot be used for those days (VTOD set number 1 can be used from the Effective Date);
  - E.g. If a Unit, as part of registering, submits Standing Offer Data on 24th August, but their Effective Date for registration is 1st September, their Standing Offer Data will only be effective from 12th September, therefore they will need to make daily COD submissions for the days between 1st September and 11th September.
- This data must be kept up to date as necessary, Participants must review at least once per quarter.

Data Submission and Retrieval Processes (7/18)

Registration Data Submission.

- Standing Offer Data for COD has a Day Type Parameter that identifies the calendar days for which the data will apply:
  - Identifies values of SUN, MON, TUE, WED, THU, FRI, SAT, or ALL;
  - All Generators must have one SOD set with an “ALL” Day Type, and may submit multiple other SOD sets with other Day Types which would be selected as default data ahead of the “ALL” SOD set on those days;
  - Standing Offer Data with an “ALL” Day Type cannot have an expiry date, but SOD with other Day Types can have an expiry date after which the Market Operator shall not utilise the SOD set as default data.

Data Submission and Retrieval Processes (8/18)

Daily Data Submission and Retrieval.

- At a high level, the process for submitting or retrieving data, or retrieving a report, is as follows:
  - The Participant's system selects the required Data Transaction and submits it using an established connection;
  - MO's system issues a response message confirming that:
    I. there was no error in any Element of a Data Transaction, and all of the relevant Elements of the Data Transaction are stored in the MO Market System; or
    II. there was an error in a Data Transaction for a given Element, and the Data Transaction is rejected. The Participant will be required to submit a new Data Transaction. Note, Data Transactions included within the same message which have no errors are deemed successful and stored in the MO Market System.
  - If no response is received from the MO, a Participant may call the MO Helpdesk to establish whether it has been received.
- VRD, VTOD, COD and PND successfully submitted by a Participant to the MO will be passed to the SOs for validation and/or for use in scheduling and dispatch.

Data Submission and Retrieval Processes (9/18)

Daily Data Submission and Retrieval.

- Participants can submit and retrieve two classes of data:
  - Market Participant Registration data; and
  - Balancing Market Interface data.
- Some requirements around this include the following:
  - Only data from a single class can be used per Data Transaction, but multiple elements of that data class can be submitted in one Data Transaction;
  - Only one Settlement Reallocation Data Element can be included with an individual Data Transaction, and for submission must be via Type 1 Communication Channels;
  - Participants can request a specific Data Report or a list of all available Data Reports for a Data Report Data Transaction request;
  - Market Participant Registration data cannot be through Type 3 Communication Channels.
- See Agreed Procedure 4 Table 1 and Appendix 2 for Class and Element Mapping;
- The MO processes data it receives in order of receipt:
- Due to various levels of parallelism and pooling being implemented in this processing, sequencing cannot be guaranteed, Participants should configure their systems if a particular sequence of submission is desired.

Data Submission and Retrieval Processes (10/18)

Daily Data Submission and Retrieval.

- The MO will make daily, weekly, monthly and annual Data Reports, including settlement reports (confidential to that Participant), available via the BMI;
- Participants can submit a request for a specific Data Report through the BMI;
- Where Data Reports are updated by the MO, a message will be sent to the BMI to inform Participants that the Report is available;
- Reports can be viewed and accessed via Type 2 and Type 3 Channels;
- Reports and scheduled timelines of reports are set out in Appendix 2 “Report Listing” of Agreed Procedure 6.

Data Submission and Retrieval Processes (11/18)

Daily Data Submission and Retrieval.

- Validation checks for data submission, data retrieval and report requests include the following:
  - The submitted message is in the correct format;
  - The Sending Party is authorised to submit it;
  - The Data Transaction was submitted within timelines;
  - All required data is present for periods required.
- See Technical Specification for further information regarding the format, content and validation of Data Transactions and response messages.

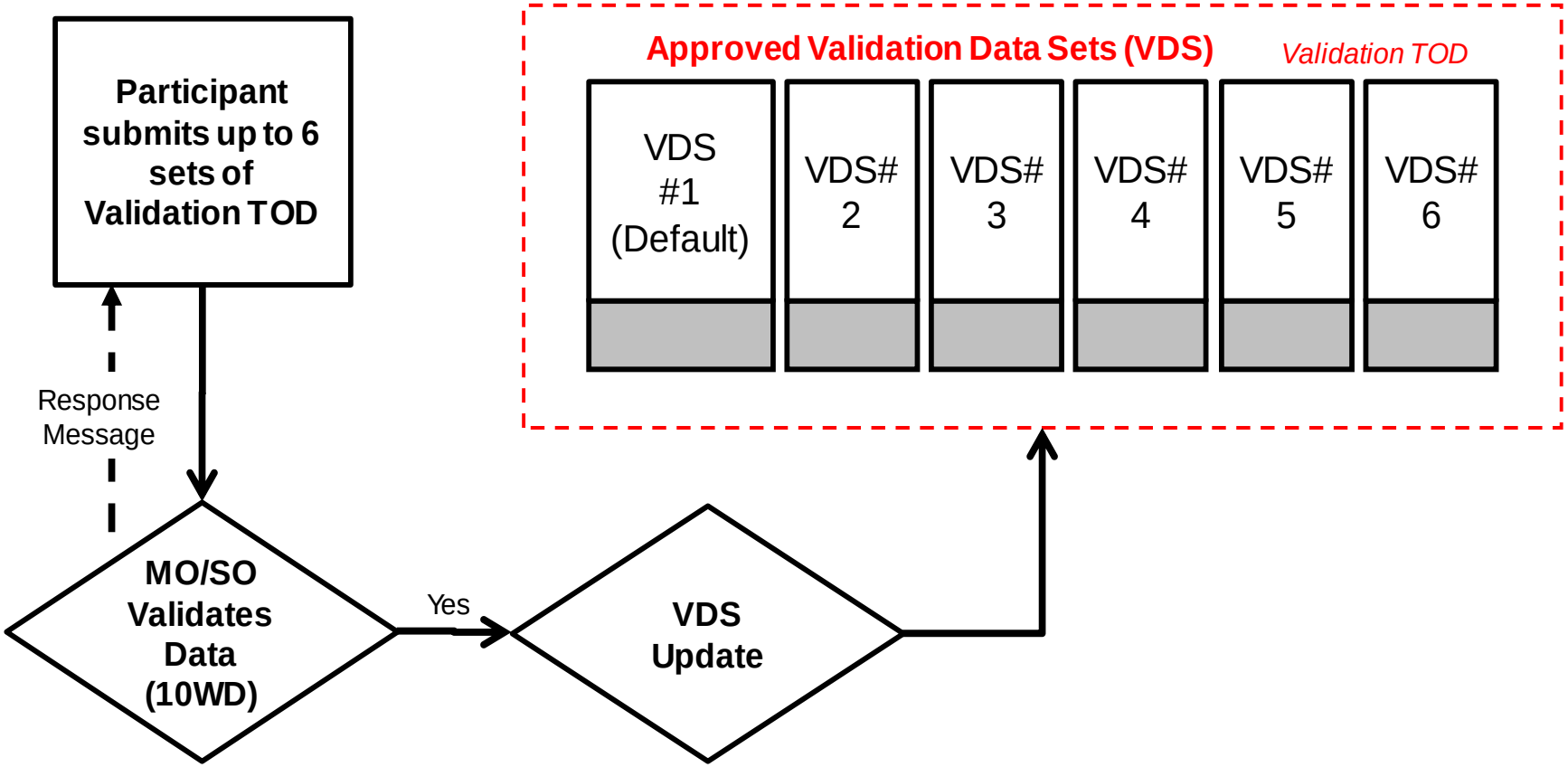
Data Submission and Retrieval Processes (12/18)

Submission of VTOD.

- Participants can submit up to six Validation Data Sets via the BMI;
- The set designated as no. 1 is the one used as Default Data / Standing Offer Data:
  - If a different VDS is intended to be used as default VTOD on different days, an explicit Validation Data Set Number submission for those days is required, for example it is not possible to select set number 2 as the default;
  - The MO issues the sets to the SO for approval;
  - When approved, the sets are numbered and approved in the MPI.
- Participants can submit a VDS Number up to 10 minutes prior to Gate Closure 1 to identify which of the six sets to use for a Trading Day, submissions include:
  - A Trading Day; and
  - A VDS Number.
- The following slides outline the processes for submitting and updating VTOD in a Validation Data Set, and VDS Numbers for use day-to-day.

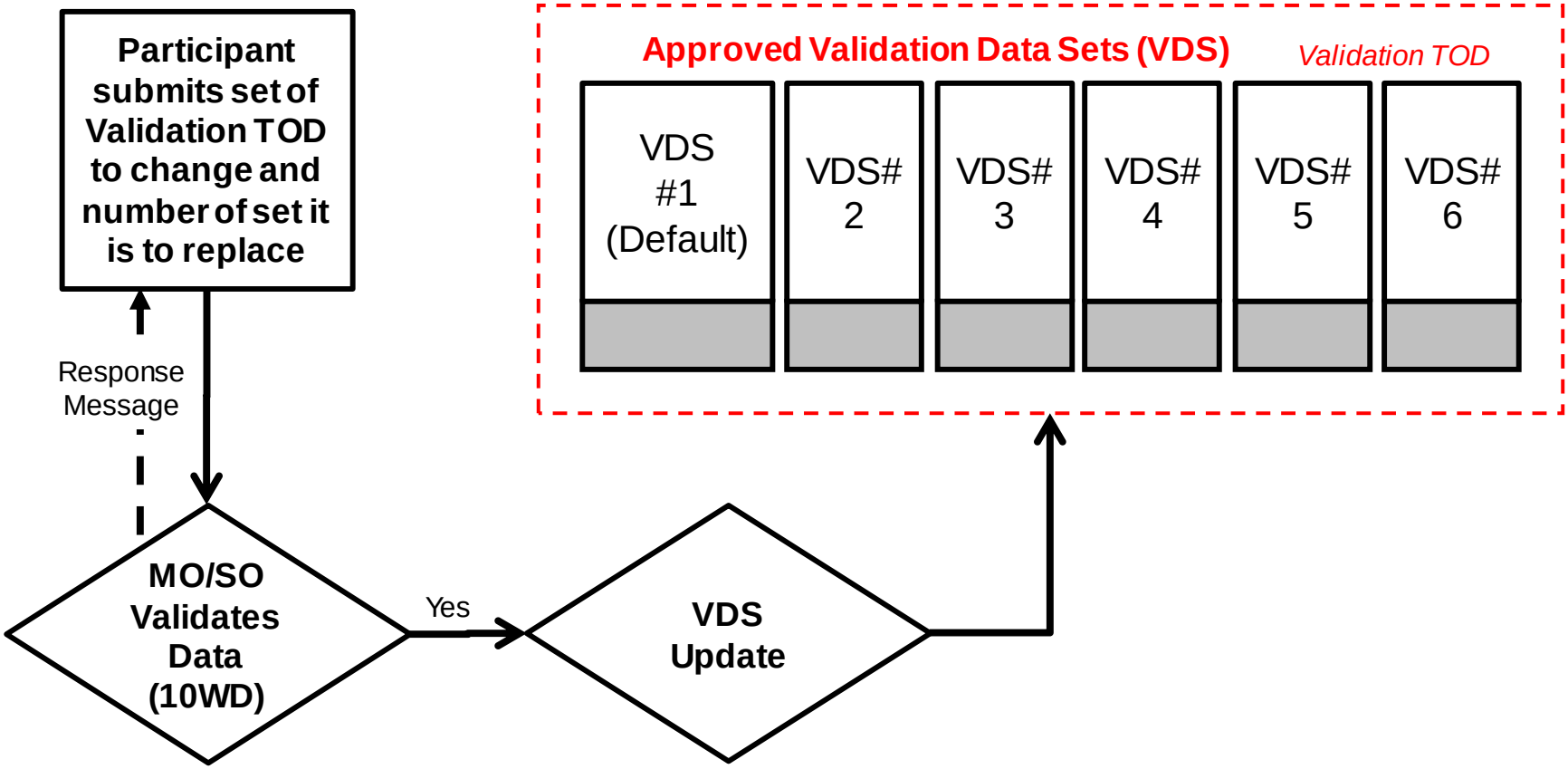
Data Submission and Retrieval Processes (13/18)

Submission of VTOD.



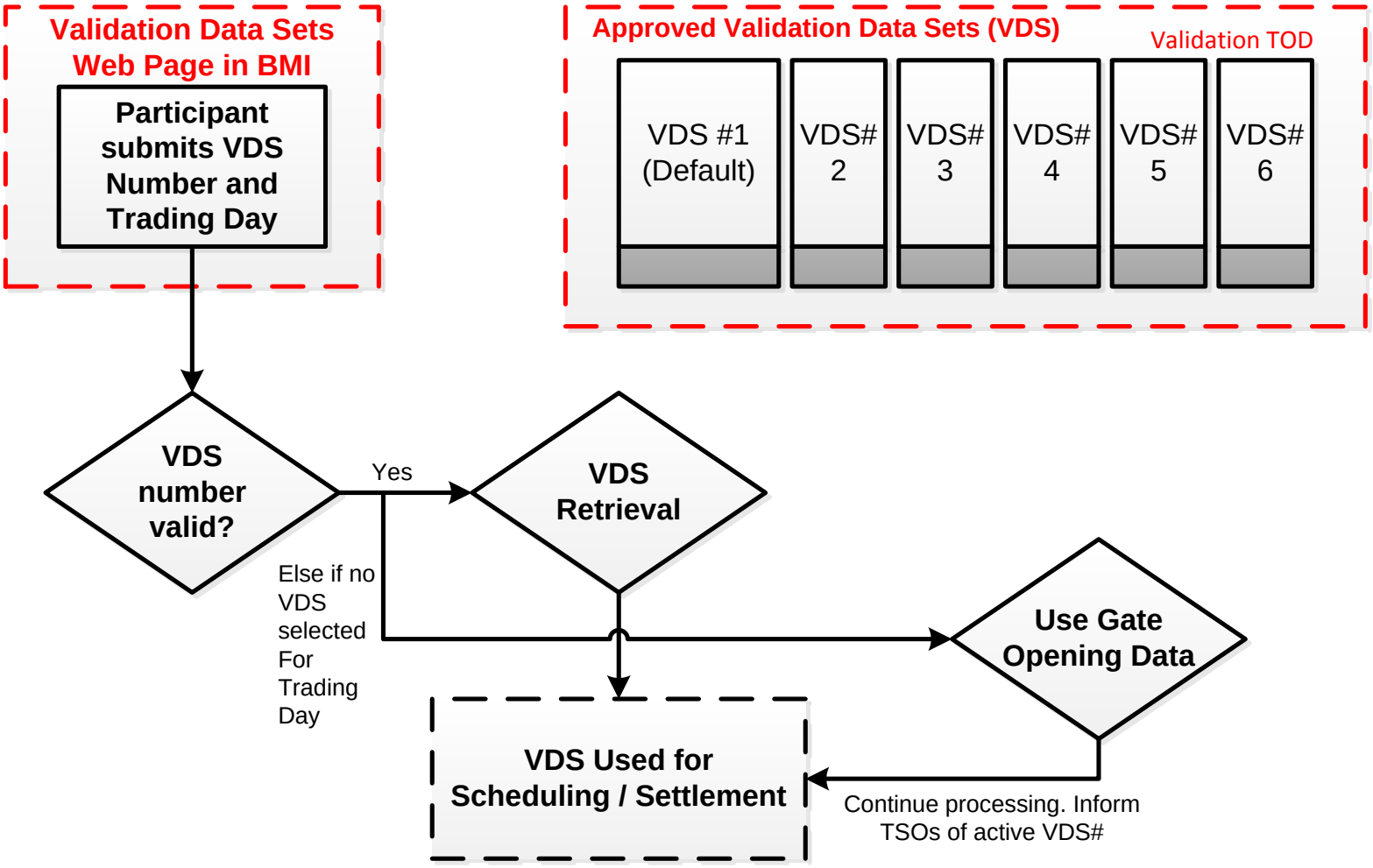
Data Submission and Retrieval Processes (14/18)

Submission of VTOD.



Data Submission and Retrieval Processes (15/18)

Submission of VTOD.



Data Submission and Retrieval Processes (16/18)

Emergency Communications.

- Participants must submit their own data. The only instances where the MO can enter data on behalf of the Participant are:
  - During the Initial Registration process; or
  - As a result of a system or communication failure.
- Detail of processes for Emergency Communications are in Agreed Procedure 7;
- There are two types of communication failure:
  - General Communication Failure (GCF) – where the MO has technical issues, impacting on data submission for all Parties;
  - Limited Communication Failure (LCF) – where one or more, but not all, Parties have technical issues, but the MO does not have technical issues, impacting on data submission.
- There is also a General System Failure, but this relates to the ability of the MO to carry out settlement rather than relating to the ability for participants to submit balancing market data.

Data Submission and Retrieval Processes (17/18)

Emergency Communications.

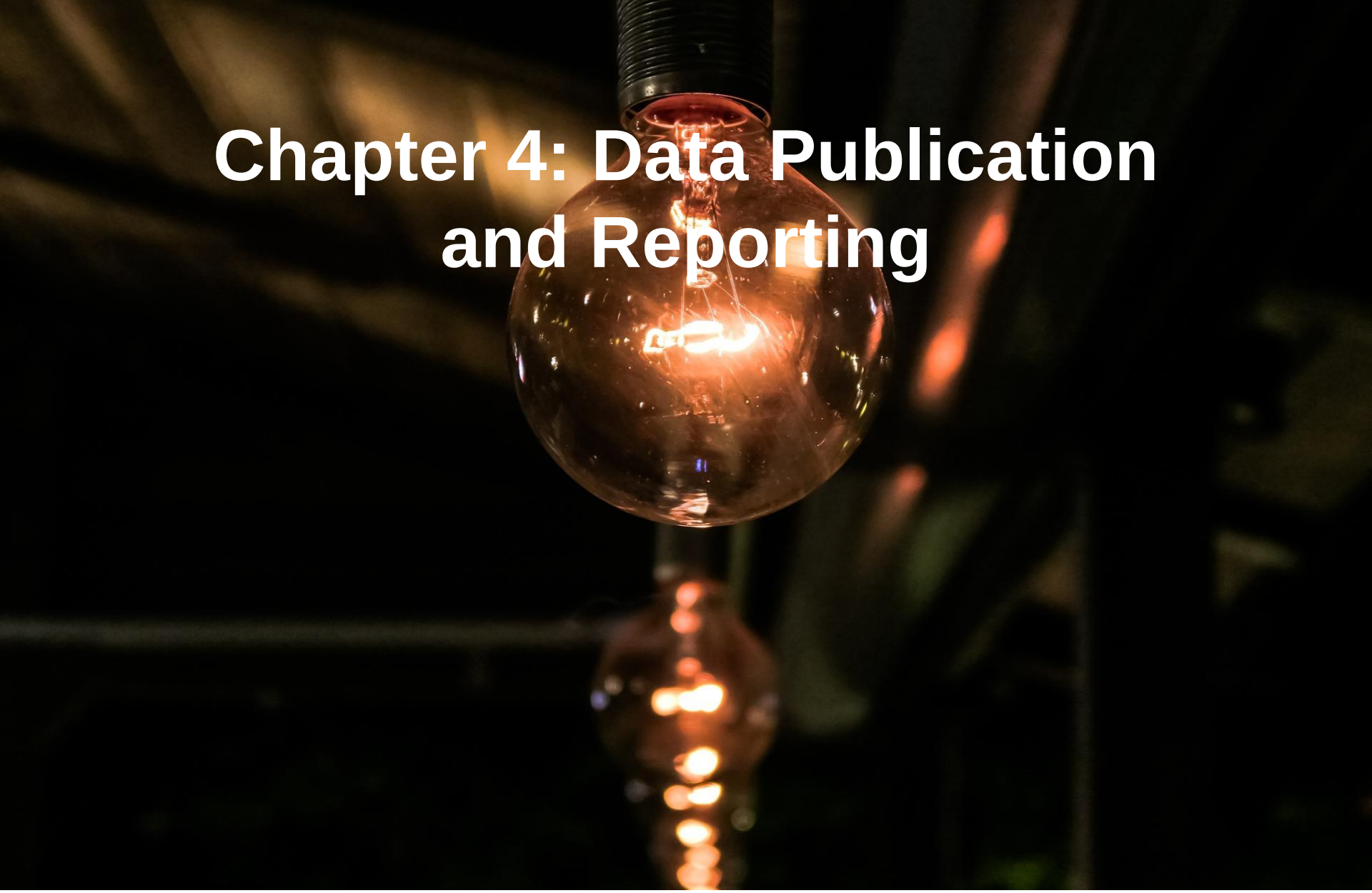
- If there is a GCF:
  - The MO will notify all impacted Parties of alternative communication methods and associated timelines for submitting the relevant Data Transaction(s);
  - The MO will notify impacted Parties of the Emergency Transaction Timeline regarding Data Transactions for Settlement. This may include an extension of the time allowed to submit data outside of the standard Gate Closures, as determined by the MO;
  - If the GCF affects the MO receiving Data Transactions from SOs, the MO will notify the SOs and request Data Transactions asap following the submission deadline;
  - The MO will update impacted parties at least daily of progress on restoring the systems, with estimates of when the system shall be restored if known.

Data Submission and Retrieval Processes (18/18)

Emergency Communications.

- If a Standard LCF occurs:
  - The Participant must inform the MO of their preferred method of communication for the duration of the LCF;
  - A Party's obligations regarding Data Transactions remain during the LCF;
  - The MO will process the Data Transactions from the alternative Communication Channel until the Participant can revert to the normal Communication Channel;
  - The Party must update the MO at least daily of progress in restoring their normal Communication Channel.
- If the LCF occurs to Offer Data for a Gate Window at least 5 minutes prior to Gate Closure:
  - The Participant must notify the MO of the LCF;
  - A Party's obligations regarding Data Transactions remain during the LCF;
  - If the LCF is valid, the Participant must submit their data in a correctly formatted file;
  - The MO will try to submit the data before Gate Closure and will notify the Party if submission to the BMI was successful or not;
  - If the Offer Data is received less than five minutes prior to the Gate Closure, the MO shall not submit it.

Chapter 4: Data Publication and Reporting



Data Publication and Reporting – 1/4

- Participants can access data reports which are published to the BM. These data reports provide numerous data Participants can use to inform their market activities;
- The starting point for what data is published has been the reports/publication in the existing SEM arrangements, then Participant feedback and vendor discussions were incorporated to result in the final list;
- Different data can be useful for different things, including:
  - Ex-Ante Trading and Balancing Bid Offer Formation;
  - Forecast Scheduling and Shadow Scheduling;
  - Operational Planning;
  - Shadow Settlement and Imbalance Price Calculation;
  - Financial Settlement;
  - General Market Information.

Data Publication and Reporting – 2/4

- Publications can be:
  - Member Private via BMI where only the Participant can see information about their own units;
  - Member Public via BMI where all Participants can see information for all units; or
  - General Public via EirGrid or SEMO websites.

- Data published can also be:
  - Forward looking (e.g. wind or load forecasts); or
  - Past-looking (e.g. settlement documents, imbalance prices).

- Sometimes the same data is published privately and publically to different timelines:
  - e.g. Indicative Operations Schedule available to view for participant's own units immediately after schedule completed, but available to view for all units the following day.

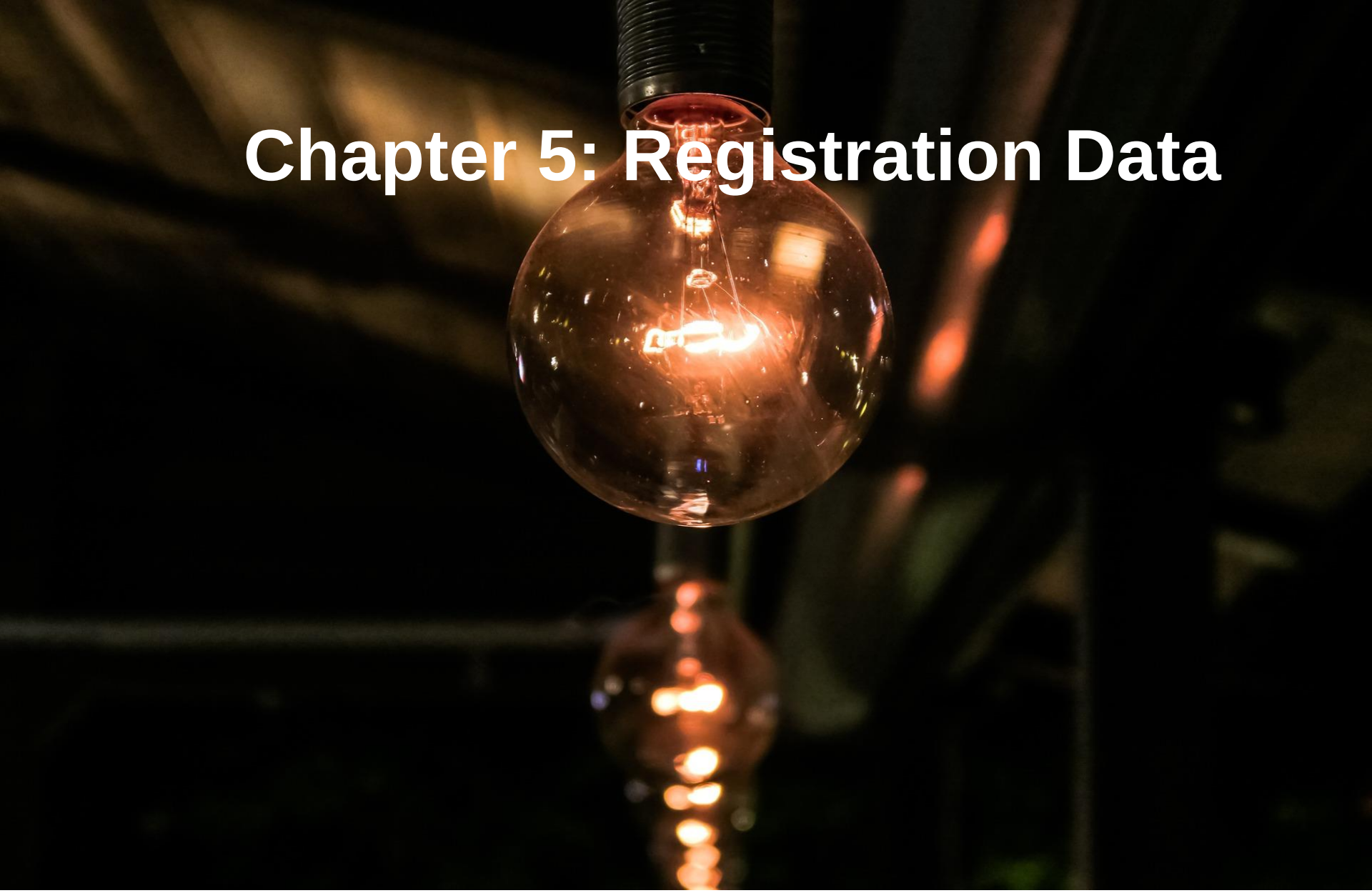
Data Publication and Reporting – 3/4

- The full list of reports and their details can be found in TSC Appendices E and G, Agreed Procedure 6 and Technical Specification Volume C, but some key ones are listed below:
  - Public forecasts for wind, load, and imbalances (forecast Net Imbalance Volume):
    - Multiple times in advance of the Trading Day and some updating during the Trading Day;
    - Different granularities, e.g. by Unit or Jurisdiction, per granular periods (15 or 30 minutes) or whole Trading Day.
  - Public aggregates of Ex-Ante Market Contracted Quantities for Generation, Demand and Wind:
    - Updated hourly during Trading Day.
  - Indicative Operations Schedules published privately and publically to different timeframes:
    - Privately for Participant's Units immediately after schedule approved, looking into future;
    - Publically for all units once a day, looking into past.
  - Imbalance Price Reports published publically ex-post close to real-time:
    - 5 minute and Imbalance Settlement Period granularity, asap after completion of each pricing calculation run, no later than 30 minutes after Imbalance Settlement Period;
    - Includes all supporting data: important interim price calculations, QNIV, all QBOA and PBO, Flags and Tags.
  - COD, TOD and PND:
    - COD, TOD and Technical Characteristics for all units de-anonymised published next day;
    - All PNs available privately within Trading Day, FPNs for all units published publically next day in profile and aggregate form;
    - All Inc/Dec curves aggregated in anonymised form in merit order published publically, updated hourly over Trading Day.

Data Publication and Reporting – 4/4

- Settlement information is published privately, similar to today, in the following formats:
  - Settlement Statement:
    - This is a document outlining amounts calculated daily, published sooner after the Trading Day than the Settlement Document and Report, to give Participants information on the settlement amounts which are being calculated with the information available, which can be used to identify potential issues for queries or disputes prior to being issued a Settlement Document with these amounts, and for information to allow participants better analyse their settlement. It is published daily for business days.
  - Settlement Report:
    - This document outlines in detail the determinants of the Settlement Statement to allow participants to Shadow Settle, identify potential issues for queries or disputes, and for information to allow participants better analyse their settlement. It is published daily for business days.
  - Settlement Document (replaces Invoices and Self Billing Invoices in the existing SEM arrangements):
    - This document is the basis for actual financial settlement, consolidating all sales and purchases for a Billing Period (week), or in the case of some capacity settlement items for a Capacity Period (month) for Trading and Capacity Payments and Charges. Adjustments for Reallocation Agreements are also made, and VAT proportions are reported. It is published weekly.
  - Collateral Report and Collateral Refund Notice:
    - This document provides information to the Participant as to whether sufficient collateral is in place for the Required Credit Cover, which can be used to inform trading, if further collateral needs to be posted, or if a refund of excess collateral can be made. It is published a number of times a business day.

Chapter 5: Registration Data



Registration Data – 1/4

- Most Registration data does not directly affect market schedule and settlement amounts, for example:
  - Data to determine eligibility to enter market, e.g. DUOS agreement, Commission Test Certificate, licence information;
  - Data to allow for data mapping, e.g. NEMO Market Resource Name, and Capacity Market Resource Name, Intermediary flags and information;
  - Data to allow for payment and contact, e.g. addresses, bank details.
- Some data allows units to be categorised, for example:
  - To apply particular scheduling and dispatch approaches, e.g. Combined Cycle Flag, Dual Rated Unit Flag, Priority Dispatch Flag;
  - To apply certain differences in rule sets or functionality, e.g. Dispatchable Generator Unit Flag.
- Some data directly affects market schedule or is used in settlement amounts, for example:
  - Capacities, Firm Access Quantities, information on unit load.

Registration Data – 2/4

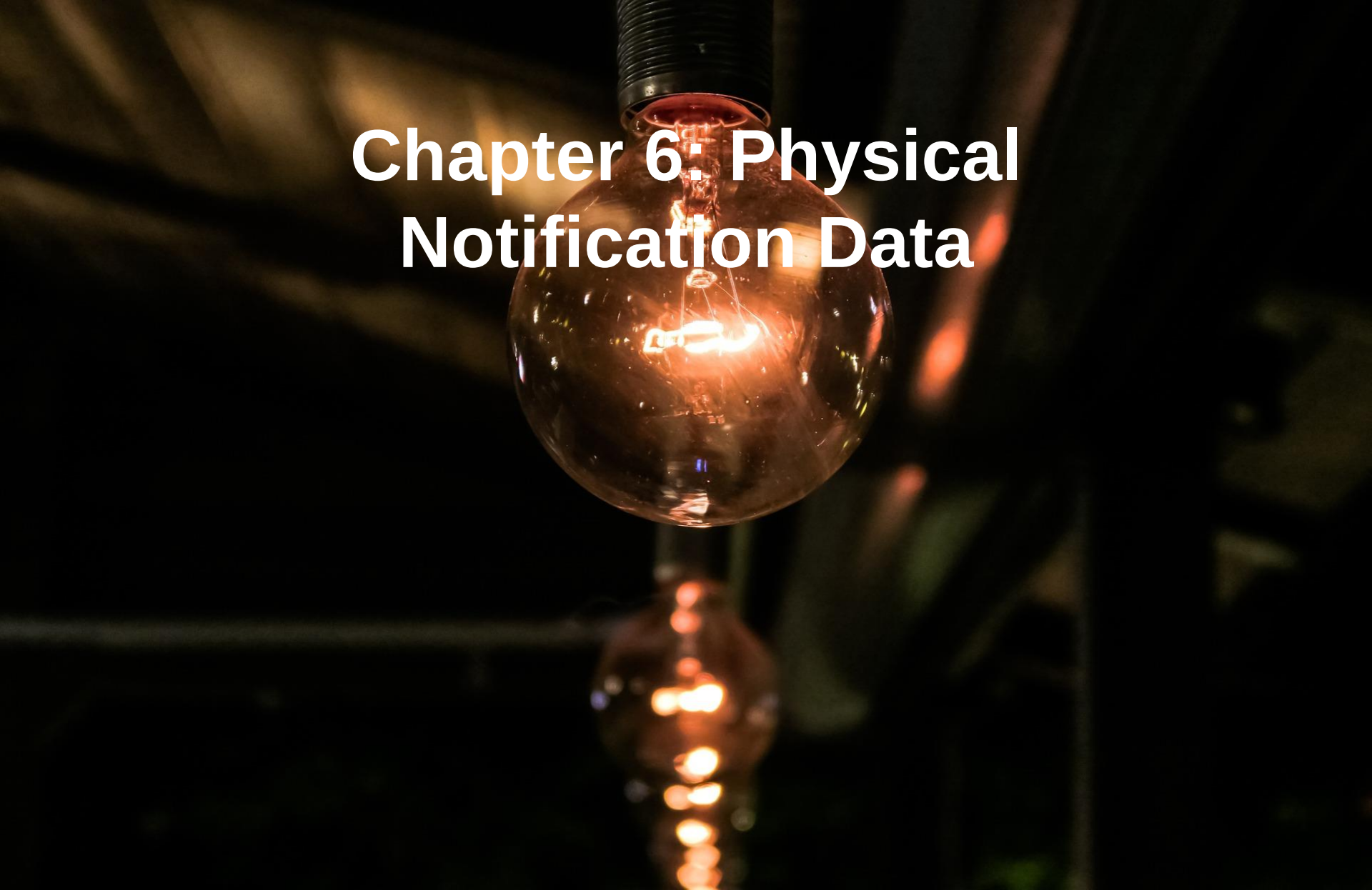
- Some data directly affects market schedule or is used in settlement amounts:
  - Registered Capacity (MW):
    - Maximum Active Power which can be sustainably delivered.
  - Registered Minimum Output (MW):
    - Zero unless storage unit, in which case pumping or charging capability.
  - Maximum Generation (MW):
    - Must be equal to Registered Capacity.
  - Unit Load Scalar:
    - Approximates physical losses on Generator Unit transformers. For use in system operations and data submitted by SOs to MO relating to system operation to determine net output.
  - Fixed Unit Load (MW):
    - Used to calculate net output from Generator Unit. For use in system operations and data submitted by SOs to MO relating to system operation to determine net output.
  - Firm Access Quantity (for site) (MW):
    - Submitted for a Trading Site, and Generator Units are associated with that Trading Site so that the same site-level value is used needs to be submitted for each Generator Unit on a Trading Site.
  - Non-Firm Access Flag and Quantity:
    - Used to identify that the units are not firm, and the amount of their output for which they are not firm.

Registration Data – 3/4

- Supplier Units do not have to provide the same level of detailed data that Generator Units do;
- Not all registration data is required for every Generator Unit. The following would submit an abbreviated application:
  - Interconnector related units (incl. IRCU, IEU);
  - Assetless and Trading Units;
  - Demand Side Units; and
  - Non-Controllable and Non-Dispatchable Generator Units.
- Some Generator Units must provide data specific to their unit type, for example:
  - Pumped and Battery Storage Units provide maximum / minimum storage capacities.

Registration Data – 4/4

- Interconnectors must submit the following Registration data:
  - Similar non-technical and eligibility information to other parties, including addresses, evidence of agreements and licences in place;
  - Aggregate and Minimum Import and Export Capacities;
  - Aggregate Interconnector Ramp Rates;
  - Ability to be dispatched at zero;
  - The identity of the Interconnector Administrator for that Interconnector;
  - The identity of the Participant(s) relevant to the Interconnector Error Unit for that Interconnector;
  - Whether the Interconnector is registered under the Capacity Market Code with a Capacity Market Unit.



Chapter 6: Physical Notification Data

Physical Notification Data – 1/3

- Physical Notifications (PNs) are MW output profiles which act as start point for balancing market operation, pricing, and settlement;

- Submitted PNs need to reflect:
  - The intended output of the unit in the absence of balancing market actions;
  - Physically feasible dispatch according to Technical Offer Data;
  - At GC2, the final net market trade position;
  - For Dispatchable Priority Dispatch units, the output level to which the unit intends for Priority Dispatch to apply.

- Some units may choose to provide PNs but do not have to submit PNs, while some others cannot submit PNs:
  - Suppliers and Non-Dispatchable units do not need to provide PNs, but may provide them only for information to help with the TSOs' forecasting – submitted PNs will not be used in settlement.
  - PNs for Non-Dispatchable Controllable Generator Units (e.g. wind units) used in settlement are taken from their Outturn Availability;
  - Interconnector PNs are created by SOs to reflect ex-ante market cross-border results.

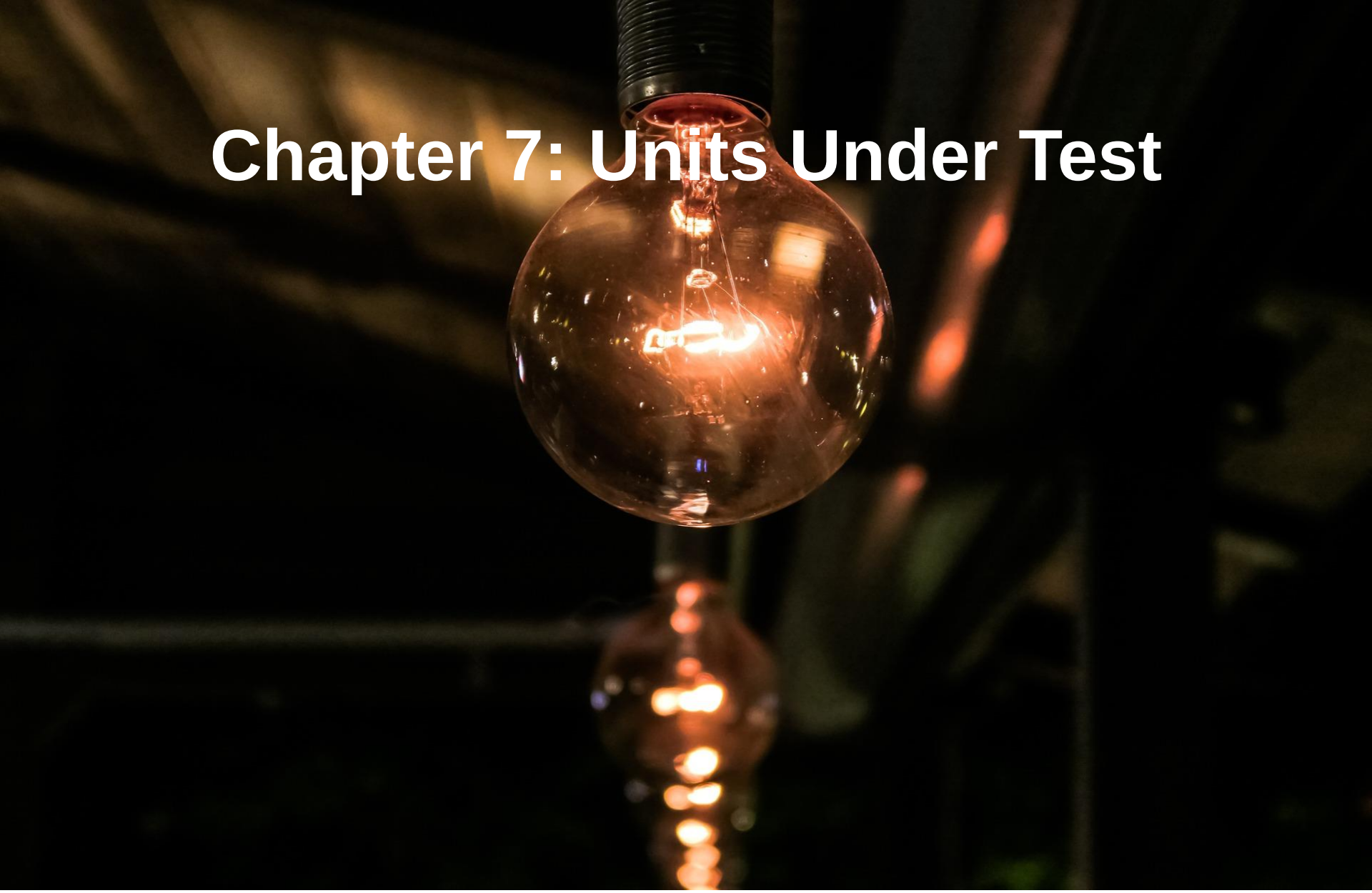
Physical Notification Data – 2/3

- Interconnector PNs are created by SOs to reflect ex-ante market cross-border results:
  - An Interconnector Reference Programme (ICRP) based on latest ex-ante market cross-border results prior to accepting any cross-border SO-SO trades, a minute-by-minute profile reflecting how an interconnector can physically flow, is used as the unit's PND;
  - In calculating this ICRP the objective used is to minimise the difference in volume between the PN curve and the block ex-ante market results;
  - The FPN for interconnectors may be created after GC2, for example if the final cross-border ex-ante market trading has an intraday gate closure which is closer to GC2, meaning that changes to ex-ante market cross-border flow results can happen closer to GC2 while there is still a need to process that block data to form minute-by-minute ICRP profiles – therefore this processing may need to conclude after GC2.

Physical Notification Data – 3/3

- PND format allows units to submit with minute-by-minute resolution:
  - From Time and MW, To Time and MW;
  - Linear interpolation between spot points for most units, 15-minute steps for others.
- An “Under Test Flag” can be submitted with each data entry:
  - This flag allows a unit to indicate it wishes to go under test, with the PN being the test profile to be followed;
  - This is one part of the Unit Under Test process, with steps in advance of this which need to be completed.
- PND can be resubmitted up until GC2 for each Imbalance Settlement Period:
  - The last valid PN submitted becomes the Final Physical Notification (FPN) for pricing and settlement after gate closure.
- If a unit which must submit PND does not submit it such that a value is not available for interpolation between two spot times, a default value of zero is taken.

Chapter 7: Units Under Test



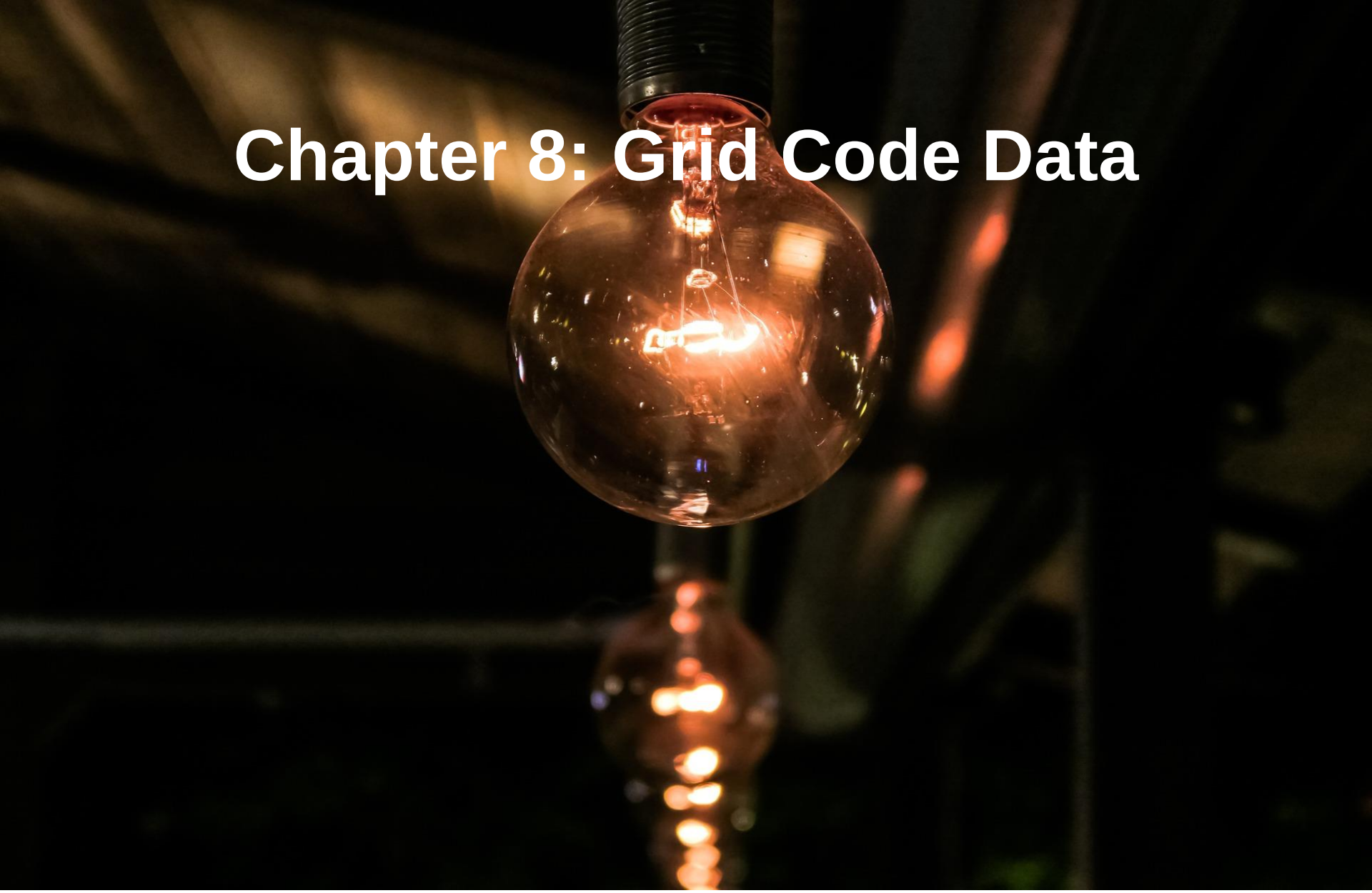
Units Under Test – 1/2

- Unit may desire to follow a particular profile without being dispatched away from it for balancing reasons, or may be required by the TSOs to follow a particular profile, to test some functionality. This is where the Units Under Test processes are used;
- All testing will be visible to the market, following the same process for all unit types (with a slight difference for Interconnectors), and requiring TSO approval;
- Test profiles will be submitted through PND:
  - Interconnectors do not submit PND, therefore a test profile will be agreed with TSOs separately, will be submitted as Interconnector Reference Programme by TSOs.
- Under Test status can be requested for a subset of Imbalance Settlement Periods within a Trading Day;
- Two categories of test have different submission requirements:
  - "Significant" tests are where the test causes increased risk of trip, more stringent process;
  - "Minor" tests are where the test does not cause increased risk of trip, less stringent process.
- Exemptions to being able to be granted Under Test status apply for:
  - Interconnector Residual Capacity Units;
  - Generator Units which are not Dispatchable and not controllable (except for Interconnector Error Units, to whom testing charges apply if an interconnector goes under test); and
  - Generator Units who have priority dispatch which are not dispatchable.

Units Under Test – 2/2

- Being a Unit Under Test drives certain settlement outcomes:
  - The unit is settled at Imbalance Settlement Price for differences between net ex-ante traded position and Metered Quantities (e.g. if test profile different to traded profile, and Metered Quantities follow test profile, or if the unit's Metered Quantities do not follow their test profile without a dispatch instruction from the SOs requiring this to happen);
  - If SOs dispatch the unit away from test profile, Balancing Market action quantities and settlement amounts are calculated as normal, and are included in the Imbalance Pricing process;
  - Testing Charges apply, by applying a tariff to the Metered Quantity of the unit in Imbalance Settlement Periods with Under Test status:
    - As part of the approval process the TSO selects the appropriate testing tariff.
  - Capacity Market settlement is not directly affected.

Chapter 8: Grid Code Data



Grid Code Data – 1/3

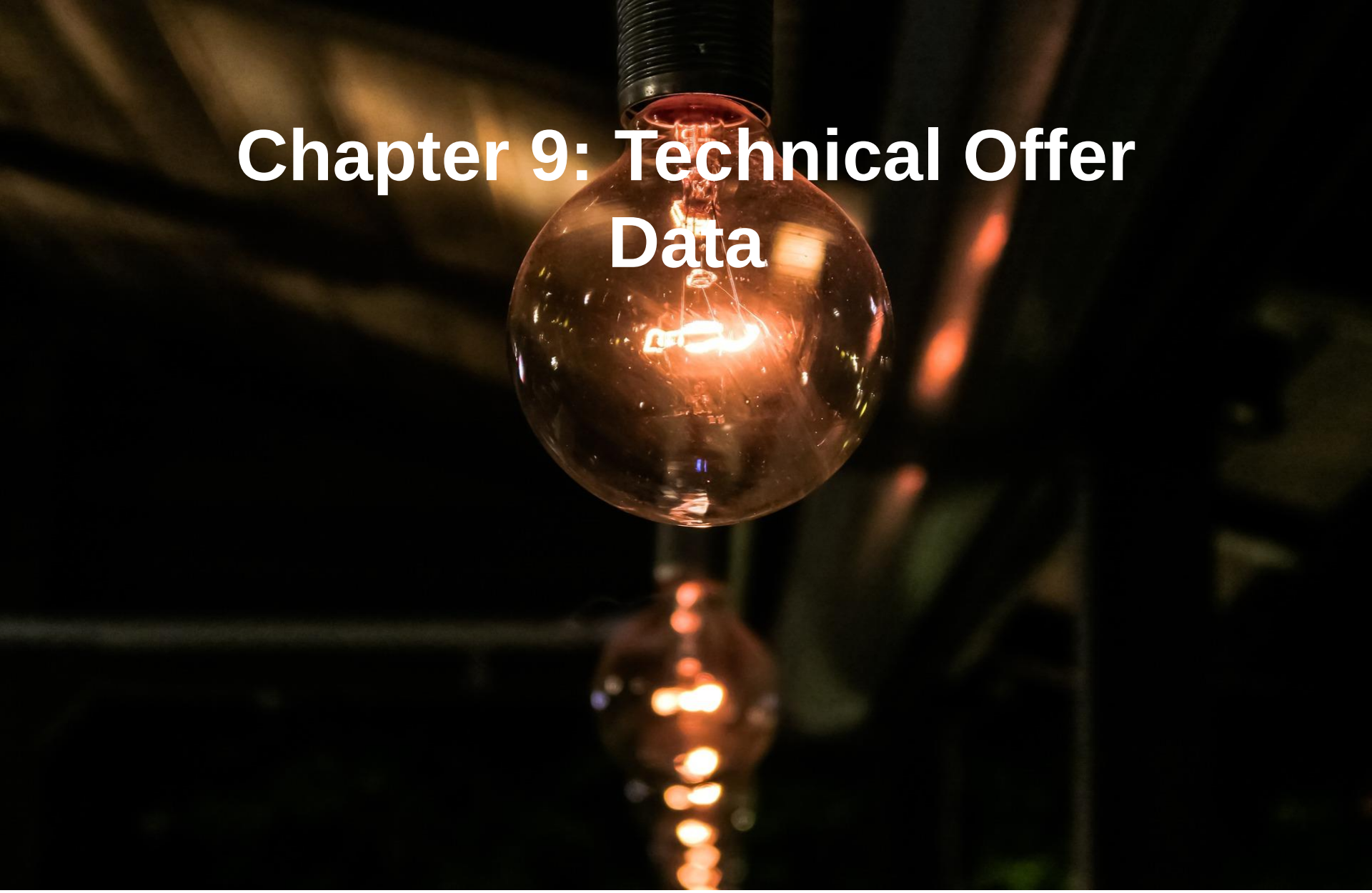
- Most “Technical Parameters” in the Grid Code are submitted by Participants through the BMI VTOD and VDS Number submissions to the MO (and passed from the MO to the SOs);
- However there are some physical and system data additional to VTOD which are submitted directly to the SOs which can affect the scheduling and operation of units despite not being market data, and not being submitted through BMI;
- Since this training is for the BMI, Grid Code data will not be dealt with in detail, however since it impacts the overall data submission for Participants for the Balancing Market, and affects their balancing market scheduling and dispatch, some core aspects are highlighted in the following slides.

Grid Code Data – 2/3

- Examples of Generator Unit Grid Code data include:
  - Availability Notice:
    - Availability data such as real-time spot availability through EDIL and Interconnector availability;
    - In addition to affecting their real-time dispatch and scheduling, this can also affect a unit's outturn availability in settlement.
  - Technical Parameters Notice:
    - Energy Limited plant can update energy limits directly to TSO up to 11:00 on the Trading Day;
    - Dual Rated Units submit availability declarations for both fuels separately to the TSO.
  - Ancillary Services:
    - Declared capability to provide reserves and reactive power;
    - Reserve decrement rates;
    - Black start capability;
    - Governor droop.
  - Other Operating Characteristics and Registered Data as part of project and connection agreement/operational certificate data:
    - Primary and secondary fuel outputs for dual-rated units;
    - Electrical parameters, e.g. rated stator current, power factor, short circuit characteristics, etc.;
    - Maximum and normal generation and export capacities, auxiliary loads;
    - Information about operating modes and changing fuels.

Grid Code Data – 3/3

- Some data for Interconnectors are also not submitted through BMI:
  - Interconnectors interact with Interconnector Management Platform (ICMP) for transfer capacities;
  - qCMAMAXI for Capacity Market (settlement of Difference Charges) is sourced as Total Transfer Capacity from ICMP:
    - TSC requires this for capacity settlement, to represents what the interconnector asset itself is available to do, without taking other transmission system elements into account.



Chapter 9: Technical Offer Data

Technical Offer Data – 1/8

- Validation Technical Offer Data (VTOD) is data which represents how a unit can physically operate:
  - This data also needs to comply with Grid Code requirements on reflecting the real capabilities of the unit.

- VTOD is used for:
  - Scheduling and dispatch (in order to model units in a way which reflects how they can operate so that unit schedules and dispatch instructions are physically feasible according to TOD); and
  - Instruction profiling (calculate the Dispatch Quantity minute-by-minute profile which reflects the generation that the unit should have done to meet its dispatch instruction according to what it stated it could do, used to calculate Balancing Market quantities).

- Up to 6 sets of VTOD can be submitted for a unit through a Validation Technical Offer Data Transaction, with the set to be used for a particular Trading Day being submitted through a Validation Data Set Number Transaction;

- These transactions have different timelines required for validation.

Technical Offer Data – 2/8

- Validation Technical Offer Data (VTOD) Set transaction:
  - Less-regular, submission of a set of all discrete data items to give an updated, or a new alternative, representation of how the unit can physically operate;
  - Requires in-depth validation to ensure the unit can physically operate in this way, including TSO approval time up to 10 Working Days from the date of submission;
  - MO approval time up to 1 Working Day following notification of SO response;
  - Up to 6 Validation Data Sets can be submitted per unit;
  - Each set needs to be reviewed and updated as necessary at least once every three months;
  - Data must be net of Unit Load but not scaled by any Distribution Loss Adjustment Factor.

Technical Offer Data – 3/8

- Validation Data Set (VDS) Number transaction accommodated up to 10 minutes prior to GC1:
  - Discrete data items already validated and approved: this transaction is the more regular submission to the MO and TSOs to state which approved VTOD set to use for a Trading Day;
  - 10 minutes required, like today, to allow for requirements in the system to stagger events to allow for sufficient time for all processes relating to this data in advance of Gate Closure;
  - Some allowances to submit after that for Emergency Communications, e.g. if Day-ahead Market Fallback Procedures are initiated because the Participant could not know their ex-ante trading results until after GC1;
  - Transaction is only submitting the set number from 1 to 6 depending on how many VDS' submitted for the Unit;
  - VDS Number 1 is the "default" set, used if no others chosen for Trading Day.

Technical Offer Data – 4/8

TOD element submission by unit type:

Data Element	Battery/Pump Storage Unit	Demand Side Unit	Other Dispatchable Units
Min On / Off Time, Max On Time.			
Hot / Warm / Cold Start Up Times, Costs, and Boundaries.			
Hot / Warm / Cold Block Load and Flag.			
Deload Rates and Break Points.			
Dwell Time Up and Down Duration and Trigger Points.			
End Point of Start Up Period.			
Hot / Warm / Cold Load Up Rates and Break Points.			
Ramp Up and Down Rates and Break Points.			
Hot / Warm / Cold Soak Time Durations and Trigger Points.			
Restricted Range.			
Hot / Warm / Cold Block Load and Flag.			
Short Term Maximisation Capability and Time.			
Registered Minimum Stable Generation.			
Registered Minimum Output.			
Storage Efficiency and Capacity			
Pump Storage Timings.	Pump, not Battery		
Max / Min Storage Quantity.	Validation Registration Data		
Max Ramp Up and Down Rate.			
Max and Min Down Time.			

Must Submit

Does not Submit

Technical Offer Data – 5/8

TOD element physical meaning:

Data Element	Physical Phenomenon Represented
Hot / Warm / Cold Start Up Times, Costs, and Boundaries.	The number of hours the unit must be off to move between warmth states, and for each warmth state the cost of starting up the unit, and the number of hours notice between the instruction issue and instruction effective time in the synchronise instruction to start up.
Hot / Warm / Cold Block Load and Flag.	For each warmth state, whether or not the unit synchronises at a MW output level other than zero, and if so, the MW output at which the unit is running when it synchronises to the grid.
Deload Rates and Break Points.	When a unit is generating less over time after being issued an instruction to desynchronise, for the output range of the unit between its Minimum Stable Generation level and zero, the rate at which it can decrease its generation over time, and the MW output points at which this rate changes.
End Point of Start Up Period.	The time after which the rate of change of the Generating Unit Output is not dependent upon the initial Warmth of the Generating Unit.
Hot / Warm / Cold Load Up Rates and Break Points.	When a unit is generating more over time after being issued an instruction to synchronise, for the output range of the unit between zero and its Minimum Stable Generation level, the rate at which it can increase its generation over time, and the MW output points at which this rate changes.
Hot / Warm / Cold Soak Time Durations and Trigger Points.	At certain MW output points for the output range between zero and its Minimum Stable Generation level, a unit may not be able to continue increasing their generation, needing to stay at a constant output level for a duration (for example to allow equipment to warm up), these are the MW trigger points at which this needs to happen and the period of time for which output needs to be maintained at this MW output level.

Technical Offer Data – 6/8

TOD element physical meaning:

Data Element	Physical Phenomenon Represented
Min On Time, Min Off Time, Max On Time.	Minimum time a unit must be kept dispatched on (synchronised) before they can have their dispatch ended (i.e. be desynchronised), starting from the time they are synchronised. Minimum time a unit must be kept dispatched off (desynchronised) before they can be dispatched on again (i.e. be synchronised), starting from the time they are desynchronised. Maximum Time a unit can be kept dispatched on (synchronised) before they must be dispatched off (desynchronised), starting from the time they are synchronised and ending at the time they are desynchronised.
Dwell Time Up and Down Duration and Trigger Points.	At certain MW output points for the output range between its Minimum Stable Generation level and Maximum Capacity, a unit may not be able to continue increasing (for dwell time up) or decreasing (for dwell time down) their generation, needing to stay at a constant output level for a duration (for example to allow equipment to warm up or cool down), these are the MW trigger points at which this needs to happen and the period of time for which output needs to be maintained at this MW output level.
Ramp Up and Down Rates and Break Points.	When a unit is generating more/less over time after being issued an instruction to change its output level, for the output range of the unit between its Minimum Stable Generation level and its Maximum Capacity, the rate at which it can increase /decrease its generation over time, and the MW output points at which this rate changes.
Restricted Range.	A part of a unit's output range where they can ramp up or down through, but within which they cannot be dispatched to sustain a MW output level ,for example for operational safety or mechanical reasons.
Max Ramp Up and Down Rate.	Simplified ramping model for DSUs, with a single rate to be met up or down.
Max and Min Down Time.	Minimum / maximum time DSUs can be dispatched down before they can / must have their dispatch ended.

Technical Offer Data – 7/8

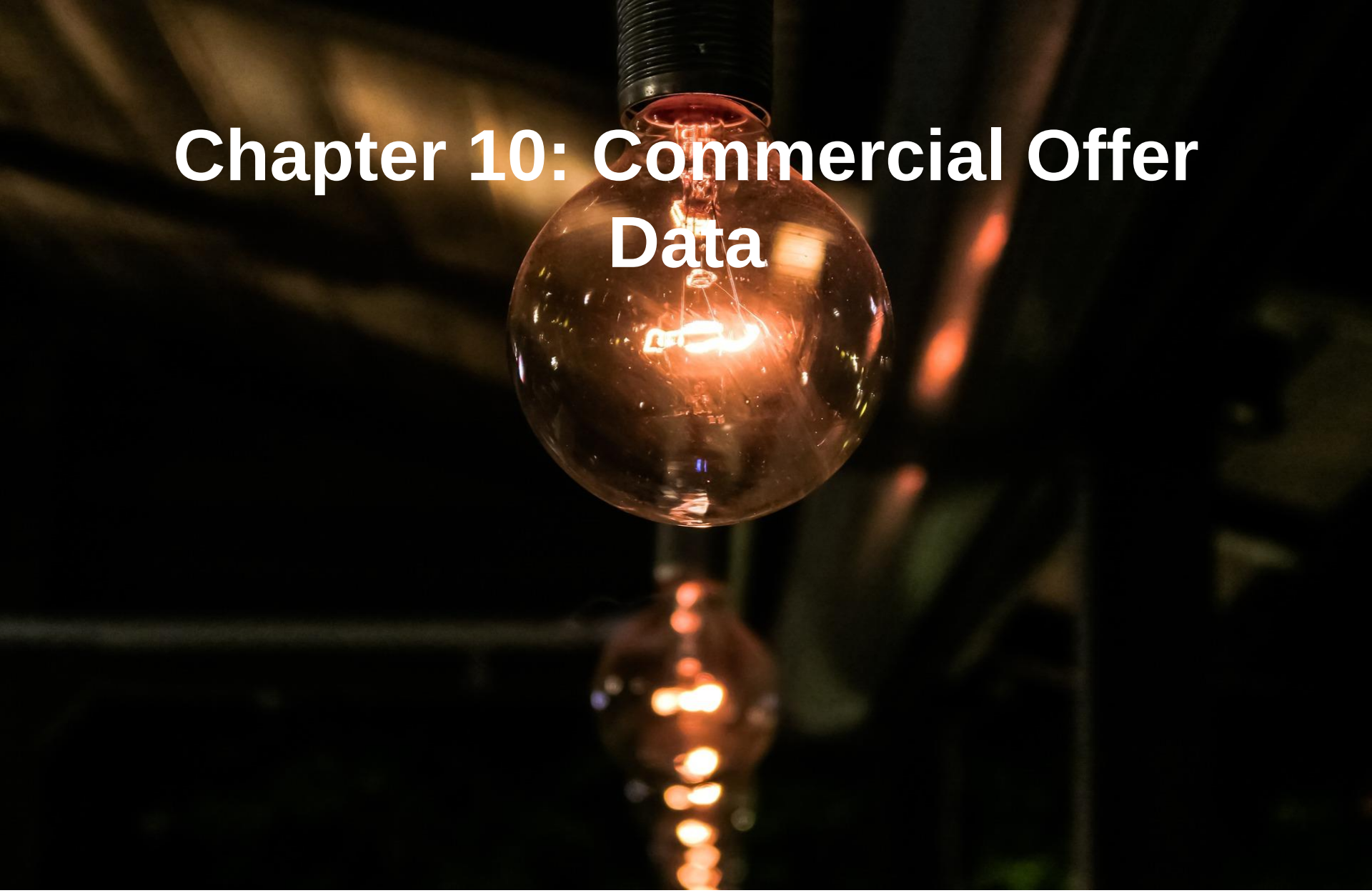
TOD element physical meaning:

Data Element	Physical Phenomenon Represented
Short Term Maximisation Capability and Time.	In rare situations a unit may be issued a Maximisation Instruction, where the unit may be asked to generate above their maximum capacity for a period of time. These variables allow the unit to state to what level can they generate above their stated sustainable maximum, and the time period over which they can sustain it, to feed into the dispatch and instruction profiling when these instructions are needed and issued.
Registered Minimum Stable Generation.	The minimum generation output level which can be sustained by the unit, this value is used as the minimum output level required of a unit when they are committed to synchronise to the system.
Registered Minimum Output.	The minimum possible level of output for the unit, which for most units must be zero unless they are storage units, in which case they can operate in the negative output range when pumping or charging.
Storage Efficiency, Capacity and Max/Min Quantity.	Represent the maximum and minimum storage capacities, and instantaneous output capacities, to prevent scheduling and dispatch to output levels and the increase or decrease in stored energy amounts over time which cannot be safely physically accommodated, e.g. reservoir levels; Efficiency values to reflect the energy amounts lost between the unit storing (through pumping or charging) and generating, allowing the TSO to more accurately track the energy storage remaining in the unit – more energy is needed in pumping or charging to store the water or electric charge than will be available in generation through the discharge that water or electric charge, and this efficiency gives the relationship between those storage and generation energy amounts.
Pump Storage Timings.	Times required to wait between certain events to allow for pumped storage units to be operated correctly

Technical Offer Data – 8/8

- Specific TOD for Battery and Pumped Storage Units:
  - In general, Battery Storage Units are modelled in systems as a Pumped Storage Unit, with the same terminology in the Technical Specification, but in the TSC they are a separate unit category and separate terminology mirroring Pumped Storage Unit data is used;
  - Submit data which represent the maximum / minimum stored energy requirements, and maximum / minimum instantaneous output capacity requirements.
  - The scheduling optimisation takes this data into account by not scheduling the unit to charge or discharge to the extent that it would exceed its energy storage requirements (for example if reservoir levels need to be safely physically accommodated), and not scheduling the unit to instantaneous power generation output or storage consumption levels which are not physically possible;
  - If multiple units use the same storage source, the max storage quantity needs to be submitted as the same value for each unit (all units must have the same value for min storage quantity also);
  - Efficiency values to reflect the energy amounts lost between the unit storing (through pumping or charging) and generating, allowing the SOs to more accurately track the energy storage remaining in the unit, so that they do not discharge the units for more than the actual energy available following the amount of energy lost in the process;
  - For Pumped only, “Off to Generating Time”, “Off to Spin Pump Time” and “Spin Pump to Pumping Energy Time” used in scheduling and dispatch, not in calculation of market quantities.

- Specific TOD for Demand Side Units:
  - More simplified representation of ramping;
  - “Down” time modelled rather than “On” time.



Chapter 10: Commercial Offer Data

Commercial Offer Data – 1/12

- COD is data which represents the cost implications for dispatching a unit differently from its market position (defined through its PND submission);
- This data is one of the primary means by which a unit can interact with the Balancing Market, influencing its schedule, the imbalance price, and its settlement amounts;
- There are three COD submission types, in two format types:
  - Default data:
    - Complex Bid Offer Data format, mandatory, initially submitted as part of registration;
    - (Note that the default data submission in registration is part of the enduring registration process, a slightly different process was undertaken for the transitional registration process pre-go-live).
  - Trading Day Specific data:
    - Complex Bid Offer Data format, optional.
  - Trading Period Specific data:
    - Simple Bid Offer Data format, optional.

Commercial Offer Data – 2/12

The following table outlines which elements of COD must be submitted by unit type:

Data Element	Energy Limited Unit	Demand Side Unit	Other Dispatchable Units
Simple Incremental Price Quantity Pairs			
Simple Decremental Price Quantity Pairs			
Complex Incremental Price Quantity Pairs			
Complex Decremental Price Quantity Pairs			
No Load Costs			
Start Up Costs			
Shut Down Cost			
Energy Limit			
Forecast Availability Profile			
Forecast Minimum Output Profile			
Forecast Minimum Stable Generation Profile			

Must Submit

Does not Submit

Commercial Offer Data – 3/12

	Complex Bid Offer Data	Simple Bid Offer Data
Mandatory?	Yes (default data in registration)	No
Format	Single Start Up Cost per Warmth State (Hot / Warm / Cold) (€ or £) Single No Load Cost (€/hr or £/hr) 10 part Inc and 10 part Dec Price / Quantity Pair curves (MW and €/MWh or £/MWh)	10 part Inc and 10 part Dec Price / Quantity Pair curves in MW and €/MWh or £/MWh
Timeframe covered in submission	Trading Day	Imbalance Settlement Period
Timeframe covered in resubmission	All open Imbalance Settlement Periods for the relevant Trading Day after time of resubmission	Imbalance Settlement Period if still open at time of resubmission
Balancing Market Principles Code of Practice	Applies	Does not apply
Treatment of Fixed Costs	Explicitly submitted as separate data	Implicitly in prices submitted
Use in Scheduling and Dispatch	For Unit Commitment decisions, and Economic Dispatch decisions if no Simple data submitted	For Economic Dispatch decisions
Use in Imbalance Pricing	For actions taken before GC2, and PQ Pair elements for actions taken after GC2 if no Simple data submitted	For actions taken after GC2
Use in Imbalance Settlement	For non-energy actions, for actions taken before GC2, and PQ Pair elements for actions taken after GC2 if no Simple data submitted	For energy actions taken after GC2

Commercial Offer Data – 4/12

- Which set of COD is used for pricing and settlement is based on:
  - The timing of the Balancing Market actions taken;
  - What formats of COD are submitted; and
  - The reason for which the action was taken (energy vs non-energy) – this only influences the COD used for settlement, not for pricing.
- This is covered in more detail in Instructor Led Training.

Commercial Offer Data – 5/12

- Inc and Dec Price Quantity Pairs have an Absolute MW Quantity format:
  - This is different from the approach in the BETTA market in GB, which considers quantities as being relative to the PN profile;
  - The quantities in Price Quantity Pairs (whether Inc or Dec, complex or simple) cover the entire operating range of the Generator Unit from zero (or less than zero if storage unit):
    - Fixed MW quantities for whole Imbalance Settlement Period representing a generation output level (not cumulative);
    - Negative quantities for Decs taken care of in Accepted Bid Quantity calculation, not in submission of bidding data.
  - In the same range of a unit's output, the prices submitted in the Dec curve must be less than or equal to the prices submitted in the Inc curve;
  - Prices must be monotonically increasing for increasing quantity.

Commercial Offer Data – 6/12

- An Inc curve must be submitted, and a separate Dec curve may be submitted:
  - If no separate Dec curve submitted then Dec curve is taken to be equal to Inc curve submitted;
  - Quantities cover the same output range in both curves, but the quantities submitted may be different in each curve;
  - In the same range of a unit's output, the prices submitted in the Dec curve must be less than or equal to the prices submitted in the Inc curve.

Commercial Offer Data – 7/12

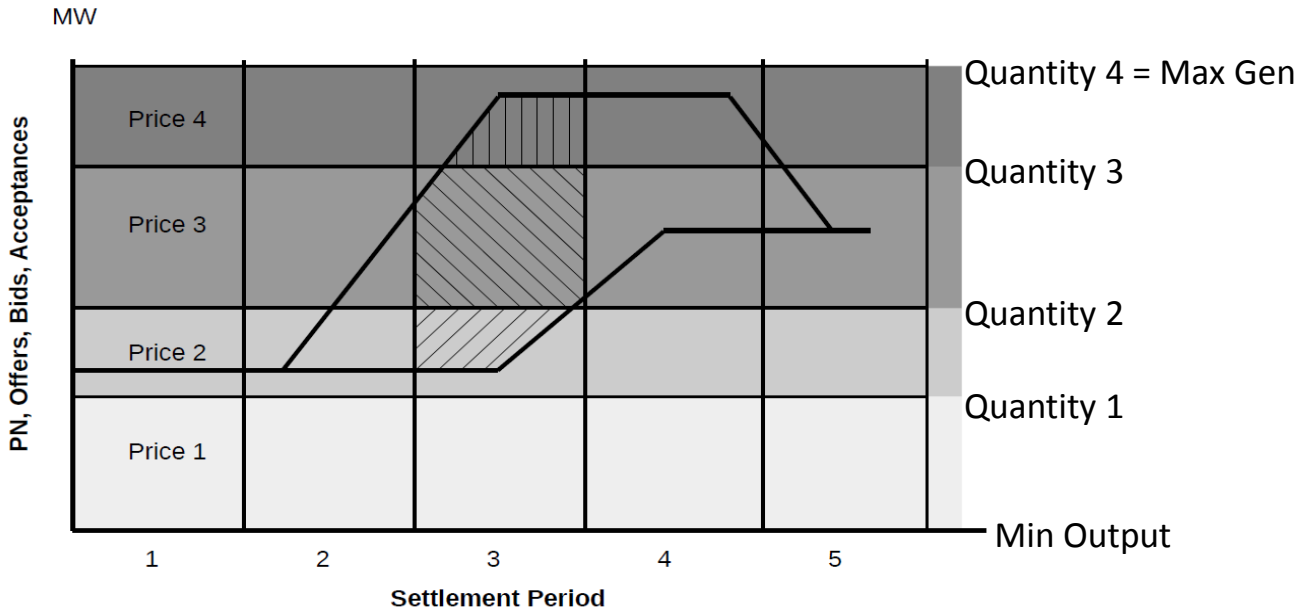
- Format of Inc and Dec Price Quantity Pair curves – Quantities:
  - Quantities can be submitted at a resolution of 0.001MW;
  - Quantities cover the whole output range of a unit, if quantities submitted don't cover this range then prices from those submitted are taken for the missing range:
    - The price associated with the highest Price Quantity Pair submitted is used for all volumes above that quantity;
    - Similarly the lowest Price Quantity Pair submitted is used for all volumes below that quantity;
    - Ensures prices are available for whole operating range even when unit does not submit prices for quantities up to maximum capacity / availability, if Maximisation Instruction issued, etc.
  - Storage units submit negative quantities in the Price Quantity Pairs to represent their pumping / charging range, as well as the positive quantities which represent their generation range.

Commercial Offer Data – 8/12

- Format of Inc and Dec Price Quantity Pair curves – Prices:
  - Prices are in Participant's home currency specified to resolution of €0.01/MWh or £0.01/MWh;
  - Prices must be monotonically increasing for increasing quantity.
  - Price applies from the quantity "downwards" until the next lowest quantity:
    - E.g. if a unit has submitted prices as follows:
      - 50€/MWh at 25MW;
      - 60€/MWh at 50MW;
      - 70€/MWh at 75MW.
    - Then a price of 70€/MWh applies for output between 50MW and 75MW, a price of 60€/MWh applies for output between 25MW and 50MW, and a price of 50€/MWh applies for output between 0MW and 25MW.
- The diagrams in the following slides highlight some of the features of the Price Quantity Pair format described.

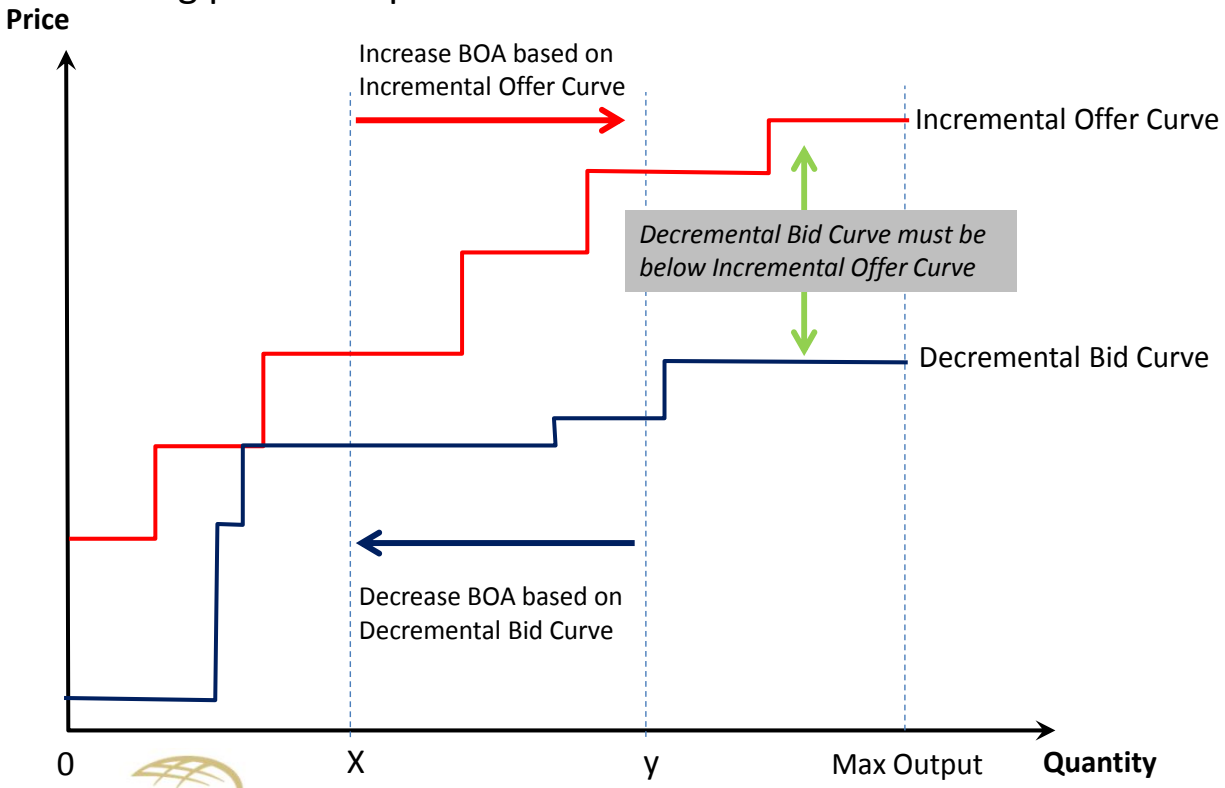
Commercial Offer Data – 9/12

- This figure gives an example of the same COD Price Quantity Pairs applying in multiple periods, and how pricing and Bid Offer Acceptance Quantities could be calculated considering a Final Physical Notification profile (bottom line) and Dispatch Quantity profile (top line);
- The absolute MW quantities submitted (1 to 4) are seen as straight lines representing points on the output range of the unit, covering the whole range. The prices submitted alongside those quantities are applicable for all points below that quantity until the previous quantity. The Bid Offer Acceptance Quantities calculated are split into each PQ band so that the individual price applies.



Commercial Offer Data – 10/12

- This figure gives an example of the relationship between the prices in the Inc PQ Pair curve and the Dec PQ Pair curve for a single COD submission;
- The quantities submitted for each curve are different, but for the same output range the price in the Dec curve is always less than or equal to that of the Inc curve. Each curve is used for considering different situations: Inc prices for increasing power output above PN, Dec prices for decreasing power output below PN.



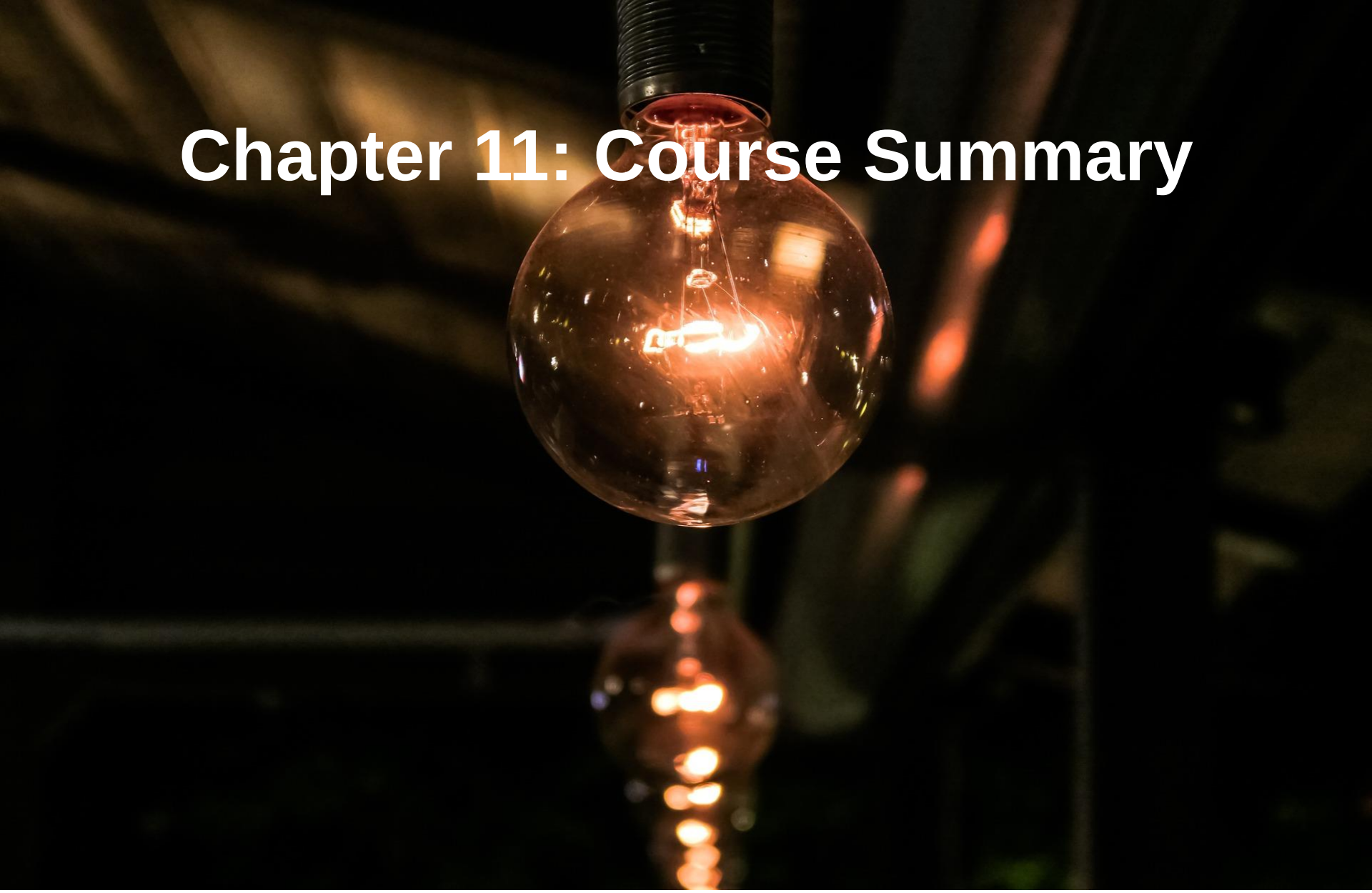
Commercial Offer Data – 11/12

- Forecast Availability, Minimum Output, and Minimum Stable Generation Profiles part of COD:
  - Used in Scheduling and Dispatch, in particular in longer term schedules – EDIL real-time spot availability used for shorter term schedules nearer real time;
  - Imbalance Settlement Period resolution;
  - Can be updated up to GC2 for an Imbalance Settlement Period;
  - Forecast Minimum Output must be zero unless Pumped or Battery Storage.
- Validation of Forecast Availability:
  - The first Imbalance Settlement Period in a submission must be at the start of the earliest Open Imbalance Settlement Period in the relevant Trading Day;
  - The final Imbalance Settlement Period in a submission must be at the later of the final Imbalance Settlement Period in the relevant Trading Day, or the final Imbalance Settlement Period in the latest Trading Day for which the gate for the submission of offers to the Day-ahead Market has closed.

Commercial Offer Data – 12/12

- More unit specific rules:
  - Energy Limit:
    - Applies to small subset of Energy Limited Units such as run-of-river hydro or units with physical limits on the energy they can generate in a day;
    - Represents energy the unit is capable of providing in a Trading Day;
    - Used in scheduling and dispatch to ensure the limit is not exceeded;
    - Default value if none submitted for a Trading Day is the previous day's Energy Limit (from Grid Code).
  - Pumped Storage Units will participate on a more commercial basis than in the current SEM:
    - No longer optimised to be scheduled to a Target Reservoir Level – Participants must take this into account in their ex-ante market trading, PND and COD submissions.
  - Pumped and Battery Storage Units submit Start Up and No Load Cost information with values equal to zero;
  - Dispatchable Priority Dispatch Units with zero marginal costs must submit a price of zero for their Decremental Price Quantity Pairs:
    - No formal Code definition of "zero marginal costs", it must be considered in the context of the Balancing Market Principles Code of Practice.
  - Demand Side Units submit a single Shut Down Cost instead of Start Up Cost (same functionality), and do not submit No Load Cost.

Chapter 11: Course Summary



Review of Learning Objectives

After completing self learning and instructor-led training for this course, you should understand:

- How to access SEMO balancing market (BM) systems ✓
- Timelines for data submission for the BM ✓
- Process for technical data requirements for the BM ✓
- Process for commercial data requirements for the BM ✓
- The application of complex and simple commercial offer data in the BM ✓
- Default data requirements and how these are used in the BM ✓
- The Validation Technical Offer Data process ✓
- How to access data publications ✓

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Rules of Reference – 1/2

The following table lists the subject areas covered in the Self Learning Training and Instructor Led Training Materials for Balancing Market Bidding and Data Submission, with the primary areas in the market rules related to these areas highlighted. This is not intended to be an exhaustive list of the only rules relating to these areas, but can be used as a reference of which parts of the rules trainees should have an understanding of from this training, and can be used as a guide for further reading on the details of these areas.

Subject Area	Rules Reference
Submission Rights, Requirements and Timing	TSC B.7.2, B.10.1, Chapter C, D.2, D.3.1, D.3.2, D.3.3, D.3.4, D.4.2, D.4.3, D.4.4, D.4.5, D.5.1, D.5.3, D.5.5, D.6.5, D.7.1, D.7.3 TSC Appendix I TSC Agreed Procedure 4: 2.3.5, 2.4, 2.8.
Data Submission and Retrieval Processes	TSC Appendix I, Appendix J TSC Agreed Procedure 1: 2.2, 2.6.2-4, 3.2.1-4; Agreed Procedure 4: 2.2, 2.3.2, 2.3.4, 2.4, 2.7, 2.9, 2.10; Agreed Procedure 6: 2.4, 2.5; Agreed Procedure 7
Data Publication and Reporting	TSC Appendix E, Appendix G TSC Agreed Procedure 4: 2.10; Agreed Procedure 6: 2.1, 2.2, 2.3, 2.4, Appendix 2
Registration Data	TSC B.7.2, B.7.6, B.9.3, B.10.1 TSC Appendix H TSC Agreed Procedure 4: 2.6, 2.7, Appendix 2

Rules of Reference – 2/2

Subject Area	Rules Reference
Physical Notification Data	TSC D.7.1, D.7.2 TSC Appendix I TSC Agreed Procedure 4: 2.4, Appendix 2
Unit Under Test Process	TSC D.7.3 TSC Appendix F, Appendix I
Grid Code Data	Grid Code SDC1.4.1, SDC1.4.2, SDC1.4.3, SDC1.4.4.1-4, SDC1.4.5, SDC1.4.6, SDC1.4.8.11 Appendix Part 1 and Part 2
Technical Offer Data	TSC D.5.1, D.5.2, D.5.3, D.5.4, D.5.5, D.6.5 TSC Appendix I TSC Agreed Procedure 4: 2.4, 2.9, Appendix 2
Commercial Offer Data	TSC D.4.2, D.4.3, D.4.4 TSC Appendix I TSC Agreed Procedure 4: 2.4, Appendix 2