

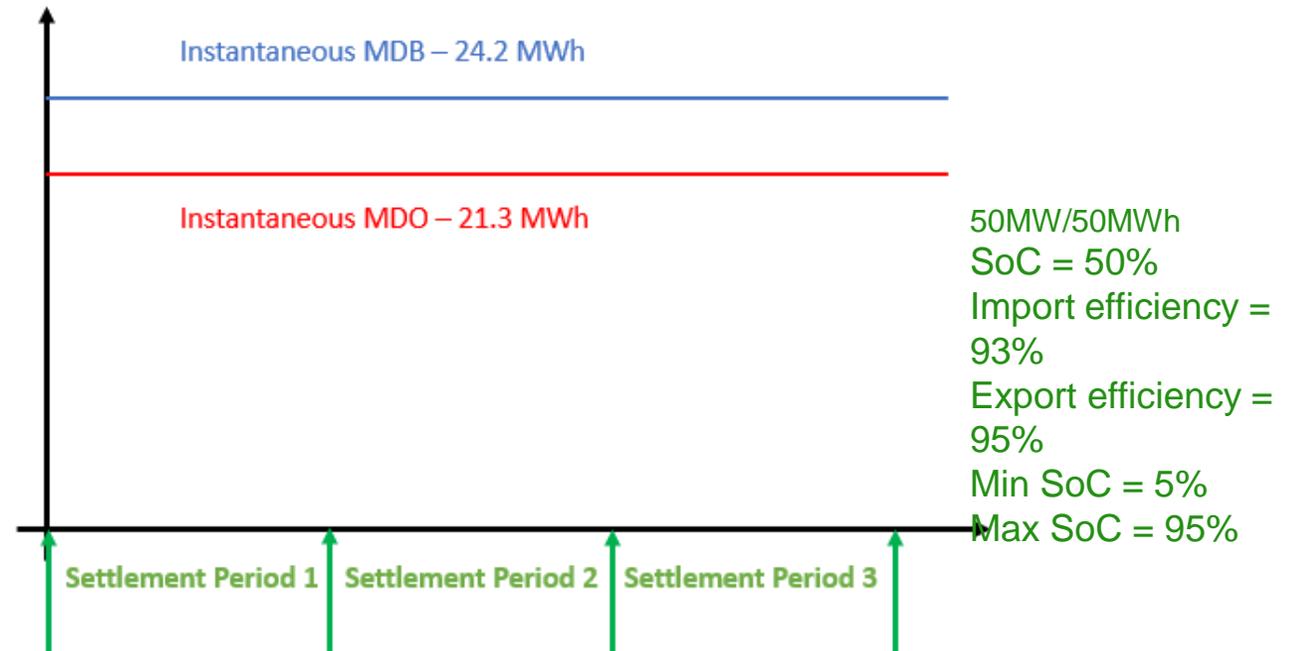
GC0166 Work Group – Example Scenarios

Important Definitions for what follows

- On the following examples we use the term **“Instantaneous MDO”** and **“Instantaneous MDB”**
- These are the values that the BMU has as a function of time (on a minute-by-minute basis), assuming that the BMU has no other commitments (e.g., PN) within gate
- For example – if the BMU has a State of Charge = 50%, this means the BMU has 25MWh of energy stored. To satisfy an Offer taking all of this charge it would discharge from 50% down to 5% (its lower stable limit) with an efficiency of 95% meaning it could provide 21.3MWh if NESO requested this via a Bid-Offer Acceptance (BOA)
- A BMU **may not always be capable of declaring these instantaneous values to NESO because it may have to hold back some charge for later obligations** – these are explored in the examples below
- In the following examples we imagine a single BMU with the following characteristics
 - Maximum Import Limit = Maximum Export Limit = 50MW
 - The maximum charge on the BMU is 50MWh
 - For stable operation we assume the BMU State of Charge must be between 5% and 95%
 - Import efficiency = 93%
 - Export efficiency = 95%
- MDO = Maximum Deliverable Offer
- 2 • MDB = Maximum Deliverable Bid

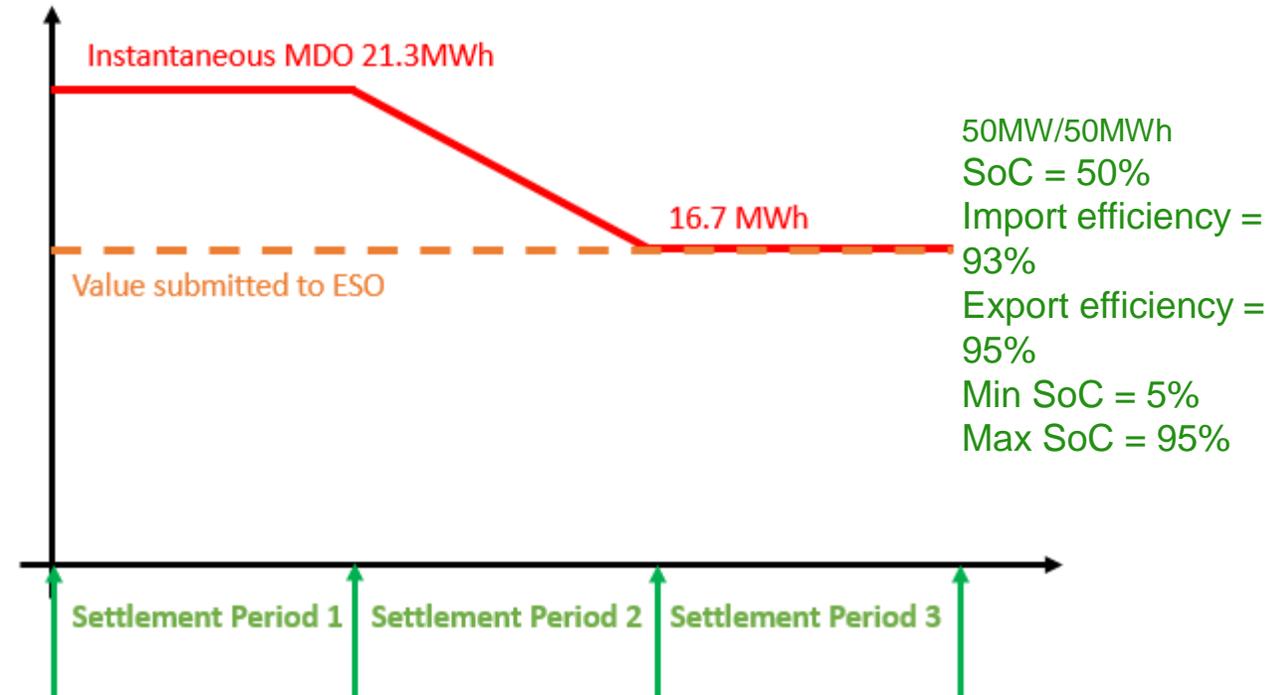
Case 1 - Physical Notification (PN) = 0, No ancillary contracts

- The instantaneous values of MDB and MDO are expected to be modelled by the BMU and would be derived from State of Charge at given instance
- In this case the MDB and MDO declared to NESO will be the same as the instantaneous values, as the BMU has no other commitments within gate
- (Note we are showing MDB as positive but it would be better to be a negative number)
- Assuming NESO could issue a BOA at any time in these three settlement periods with the following
 - An offer, 50MW, 25 mins flat top, energy = 20.8MWh (as this is less than the MDO)
 - Or an offer, 25MW, 51 mins flat top, energy = 21.2MWh (as this is less than the MDO)
 - Or a bid, -50MW, 29 mins flat top, energy = 24.1MWh (as this is less than the MDB)



Case 2 - Positive Physical Notification (PN), No ancillary contracts

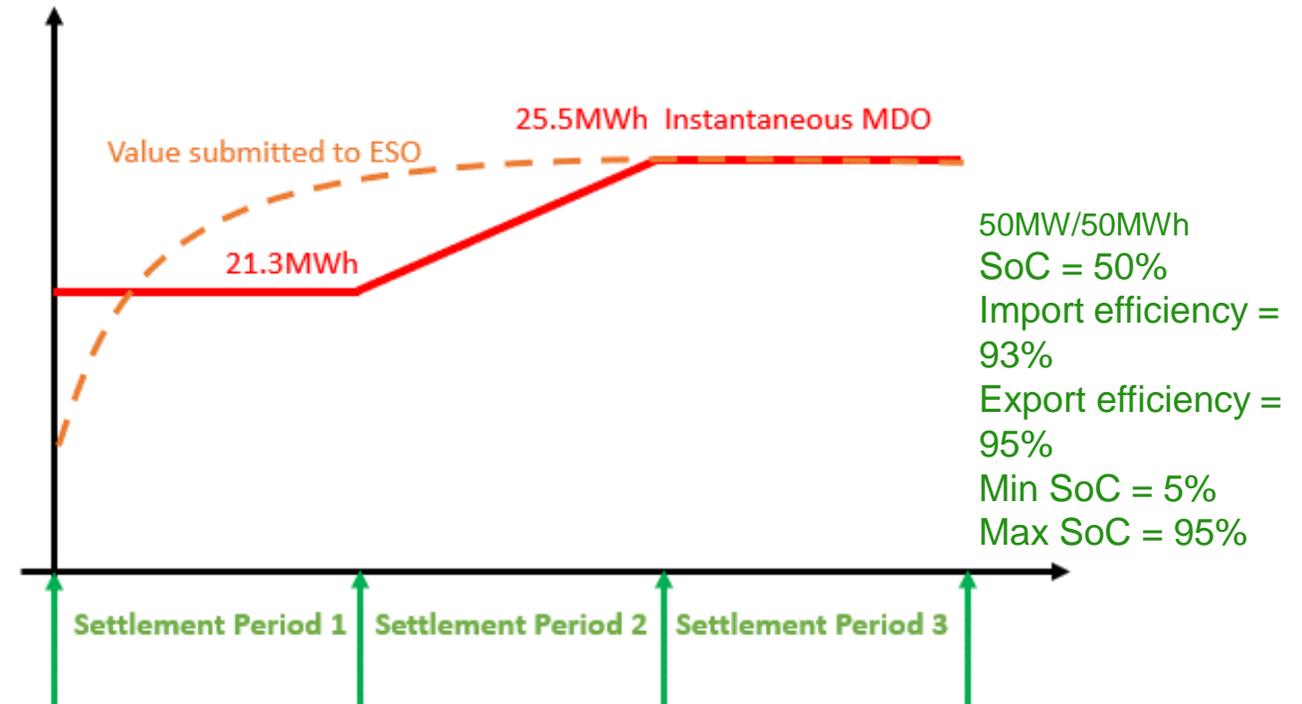
- In this case the MDO declared to NESO must be the lowest value within the BM Window, as the BMU has a commitment within gate (i.e. a positive PN)
- So, for MDO, the BMU would declare 16.7MWh for all three Settlement Periods (SP), assuming PN ramps in SP2 at 2MW/min, stops at 20MW for 5 mins, then ramps down at 2MW/min
- If the BMU was to declare MDO = 21.3MWh in SP1 NESO could take a BOA and reduce its charge to 5%
- Then it would not have enough charge left to honour the positive PN in SP2
- So, it must protect some charge by declaring MDO = 16.7MWh in SP1, this value could change at the next gate closure as the BMU may have a new commitment in that SP.



Case 3 - Negative Physical Notification (PN), No ancillary contracts

- In this case, the MDO declared to NESO can increase in value within the SPs
- So, for MDO, the BMU would declare a value that increases from 20.8MWh to 25MWh (assuming PN ramps down in SP2 at 2MW/min, stops at -20MW for 5 mins, then ramps up at 2MW/min)

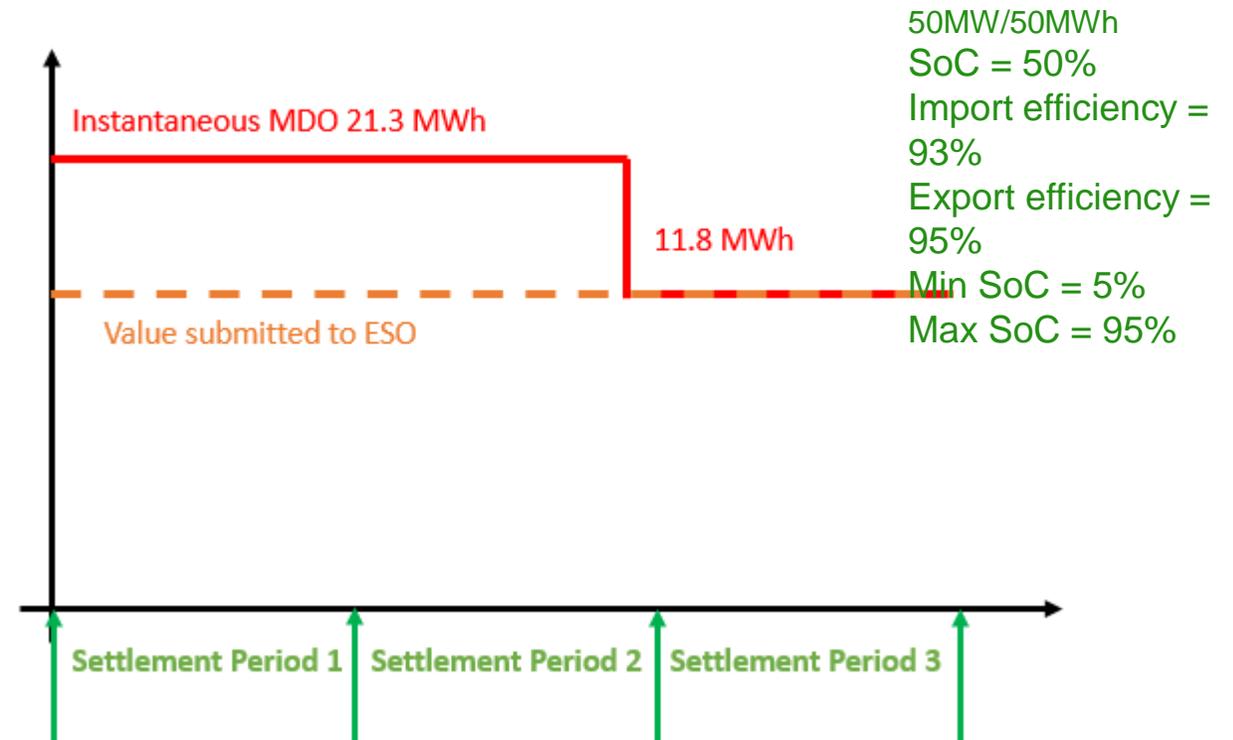
Time	Declared MDO	Instantaneous MDO
23:00	20.8	21.3
23:10	21.6	21.3
23:15	24.1	21.3
23:30	25.0	21.3
23:45	25.0	24.4
24:00	25.5	25.5



- In this case the BMU is charging during SP2 and so it can increase its MDO to NESO
- It would correspondingly reduce its MDB

Case 4 - Physical Notification (PN) = 0, Dynamic Reserve service starting in SP3

- In this case the BMU is expected to provide a Dynamic Reserve (DR) service
- DR is given in EFA blocks so this graph explains the case when we are coming up to the start of the DR period
- The BMU declares how much capacity it must hold back for, in this case, to satisfy a 10MW Dynamic Containment (DC) low contract
- We expect the MEL for the unit to stay as 50MW but NESO should be aware that the max BOA that can be issued during SP3 is MEL – Contract Quantity (in this case 50MW – 10MW = 40MW)
- There may be instances where the LDA uses all capacity to satisfy its DR contract. In this case the BMU will redeclare its PNs and MDO in later SPs (as governed by gate closure)



Case 5 – Mixture of asset types

- The BMU now comprises the BMU as described above and a conventional generator which is not of limited duration asset
- Assume the conventional generator is uni-directional and has a stable lower limit of 0MW, with a maximum of 50MW
- Assume the BMU and conventional generator are configured to run at the same time, so the BMU MEL is 100MW
- The generator has no duration limit and so its energy in the BM Window is $50\text{MW} \times 1.5\text{hours} = 75\text{MWh}$ (being slightly lazy and treating the BM Window as 90 mins)
- So, in Case 1 the MDO of this BMU will be $75\text{MWh} + 21.3\text{MWh}$ (the MDO of the BMU, based on the previous characteristics)
- Similar adjustments would be needed for cases 2, 3 and 4
- NOTE – if the BMU was made up of just the conventional generator then the BMU could have the single default value of 9999.9 MWh and this would be defaulted every day – the fact that it is part of a BMU with a limited duration asset means it must be declared in an appropriate way