Upgrading Design and Implementation of Energy Battery Storage Market Mechanism of the Philippines Electricity Market

Summary Report

15 September 2023

Prepared for:

ENERGY TRANSITION PARTNERSHIP
Powering Prosperity and Enabling Sustainability in South East Asia

Philippine Electricity Market Corporation

LIST OF ACRONYMS

AS	Ancillary Service
BESS	Battery Energy Storage System
CAES	Compressed Air Energy Storage
DER	Distributed Energy Resource
DOD	Depth of Discharge
DOE	Department of Energy
ECO	Enforcement and Compliance Office
EPIRA	Electric Power Industry Reform Act
ERC	Energy Regulatory Commission
ESS	Energy Storage System
ETP	Southeast Asia Energy Transition Partnership
FES	Flywheel Energy Storage
IEMOP	Independent Electricity Market Operator of the Philippines
MDOM	Market Dispatch Optimization Model
MO	Market Operator
MW	Megawatt
MWh	Megawatt-hour
NGCP	National Grid Corporation of the Philippines
PEMC	Philippine Electricity Market Corporation
PGC	Philippine Grid Code
RE	Renewable Energy
SO	System Operator
SOC	State of Charge
VRE	Variable Renewable Energy
WESM	Wholesale Electricity Spot Market

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SUMMARY

1.1 INTRODUCTION

The Philippines is embarking on an ambitious program to scale up renewable energy (RE) and phase out investments in new coal-fired power plants. In the National Renewable Energy Program 2020-2040, the target share of RE in the generation mix would increase from 35% by 2030 to 50% by 2040.

To facilitate the transition to clean energy, a paradigm shift is needed in the governance of the sector to facilitate this transition. Policies, regulations, and institutions must change to enable the rapid transformation that is currently underway in the energy sector— greater digitalization, reduction in the cost of distributed RE, advancements in Battery Energy Storage Systems (BESS - fast acting energy storage), electric mobility, and flexible demand.

Energy Storage Systems (ESS) can be applied centrally, serving more than one RE power plant, or can be distributed at each RE power plant. The international trend is towards the distributed model as the approach is (i) technology neutral, (ii) financed by the Variable Renewable Energy (VRE) plant owner, and (iii) offers the VRE plant owner flexibility of operation. The AES Los Alamitos BESS is one of many examples around the world of an ESS that provides a capacity reserve.

Los Alamitos 100MW / 400MWh BESS

1.2 MARKET PRINCIPLES & ESS

In the case of markets allowing private sector participation, such as the Wholesale Electricity Spot Market (WESM) in the Philippines, the market rules that govern the behavior of market participants must be designed in such a way that competing objectives are balanced.

Investor Confidence and Flexibility: ESS technology brings flexibility to a power system by efficiently storing and releasing energy as needed. As battery prices continue to decrease, BESS is becoming a viable option for various services including fast acting stabilization of the grid, and the firming variable renewable energy sources. To encourage investment in BESS infrastructure, market rules need to accommodate the unique characteristics of bi-directional energy flows and technical performance. Clear and well-defined market rules that support full cost recovery provide BESS investors with the confidence to invest, knowing that their investments are protected and that they can operate effectively within the market. This confidence in turn drives greater deployment of BESS, contributing to grid stability, reliability, and the integration of renewable energy sources, all of which are essential for achieving net-zero emissions.

Market Power Regulation: Prescriptive market rules, coupled with a robust compliance monitoring system, help curb undesirable market conduct that may not necessarily constitute a harmful exercise of market power. While confirmed market power abuses are typically addressed through broader antitrust laws, specific ESS rules can help prevent actions that might distort competition or hinder market efficiency. By setting clear limits and guidelines for ESS participation, market rules ensure fair competition and reduce the potential for market power abuse. This encourages investors to engage in the market in good faith, as they can expect a level playing field and fair treatment, ultimately promoting the transition to cleaner energy technologies, and advancing the net-zero goal.

Competitive Electricity Markets and Consumer Benefits: Well-designed electricity spot markets, including those that incorporate ESS rules, promote competitiveness among market participants. This competition drives innovation, efficiency improvements, and cost reduction, leading to cleaner and more affordable electricity options for consumers. By enabling ESS to participate effectively in the market, electricity systems can better accommodate the variable nature of renewable energy sources, ensuring reliable supply and reducing the need for more costly and polluting backup generation. As a result, consumers benefit from a greater availability of clean and cost-effective electricity in both the short and long term, aligning with the overarching goal of achieving net-zero emissions.

1.3 PHILIPPINES WHOLESALE ELECTRICITY SPOT MARKET

The WESM is a centralized market where buyers and sellers engage in the trading of electricity as a commodity. The objectives of the WESM are enshrined in the WESM rules. It is to establish a competitive, efficient, transparent and reliable market for electricity where:

- A level playing field exists among WESM Participants

- Trading of electricity is facilitated among WESM Participants within the spot market
- Third parties are granted access to the power system in accordance with the Electric Power Industry Reform Act (EPIRA)
- Prices are governed as far as practicable by commercial and market forces
- Efficiency is encouraged.

There are various models of electricity markets, and the WESM can be characterized as a self-commitment market. A self-commitment market allows participants to self-commit resources rather than having a market operator choose which units to run.

The future role of ESS is well-recognized by the Department of Energy (DOE). In August 2019, the DOE issued Department Circular No. DC2019-08-0012 entitled, "Providing a Framework for Energy Storage System in the Electric Power Industry", establishing a policy on the operation, connection, and application of BESS among others. The circular recognized that ESS technologies can be applied to serve a variety of functions in the generation, transmission, and distribution of electric energy, including ancillary services, energy generation and peak shaving. In April 2023, the DOE published a Department Circular 2023-04-0008 entitled, "Prescribing the Policy for Energy Storage System in the Electric Power Industry". The final circular of the DOE built on DC2019-08-0012, envisioning four types of ESS: stand-alone or configured with other generating facilities (generating plant + ESS, integrated RE plant + ESS, and integrated non-RE + ESS).

No.	Energy Storage System Category	Pmax and Ramp Rate
1	Stand Alone ESS	ESS capacity and ramp rate
2	Generating Plant + ESS	Generating Plant Capacity and ESS Capacity and Ramp Rate
3	Integrated RE + ESS	RE Capacity and Ramp Rate
4	Integrated Non-RE + ESS	Conventional Plant's Capacity and Ramp Rate

Pmax is the maximum power output of the facility
A 'ramp rate' is the defined as the rate of change of power, typically over a 1-minute interval

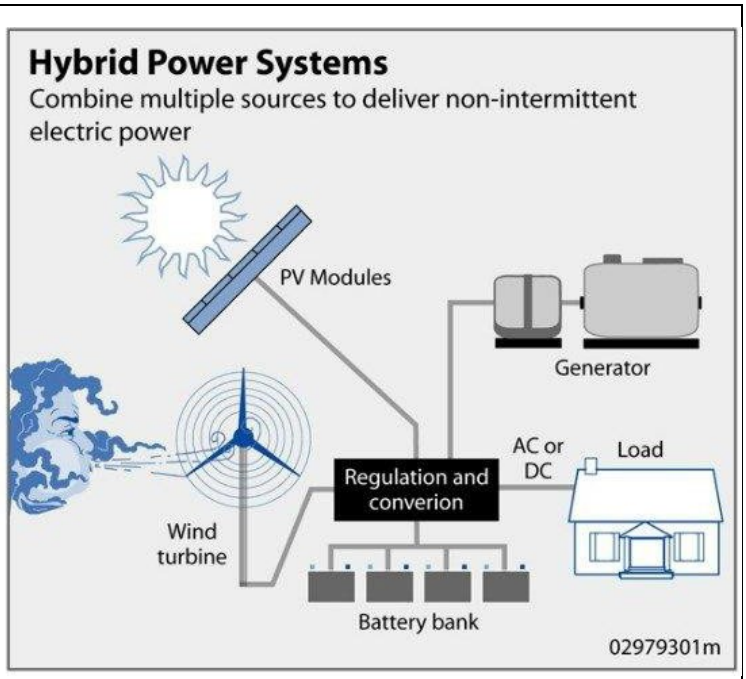
In the context of a self-commitment market, ESS dispatch policy has implications for the form of the market rules. Consultation was undertaken with key market stakeholders – Philippine Electricity Market Corporation (PEMC), DOE, Energy Regulatory Commission (ERC), Independent Electricity Market Operator of the Philippines (IEMOP), and the National Grid Corporation of the Philippines (NGCP) – System Operation (SO) – regarding the intended treatment for each of the four options was confirmed. In the WESM

- The dispatch of a stand-alone ESS or a generator + ESS is determined according to a 2-way bid/offer (the ESS charges or discharges in each 5-minute market interval)
- Grid-connected intermittent RE is dispatched ahead of all other generation resources; an Integrated RE Plant + ESS is treated in the same way, but the owner can opt instead to register this hybrid scheme as a scheduled generating unit.

Combinations of generation, RE and storage resources are commonly referred to as ‘hybrid’ schemes.

Figure 1: Hybrid Power Systems

- A Hybrid Resource is a facility that comprises a mixed-fuel type power generation facility or a combination of different generation technologies physically and electronically controlled by a single owner/operator
- Some schemes may involve only co-located systems; however, some may span multiple connection points in a power system
- BESS are increasingly being used to enable VRE to be more reliable



1.4 ENERGY TRANSITION PARTNERSHIP

PEMC has partnered with the Southeast Asia Energy Transition Partnership (ETP) to help PEMC prepare the electricity market for the entry of ESS. A project was created with the following aims:

1. To broaden and strengthen the PEMC’s governance functions to encompass emerging technologies participating in the WESM, which include BESS and other ESS as part of the country’s energy transition program

2. To determine the completeness of market policies with respect to BESS and other ESS

3. To recommend possible enhancements to the market design and protocols with respect to BESS and other ESS, as and where applicable, and specifically in the four categories below according to the project scope

The outputs of the project were defined as follows:

- Output 1: Conformance standards applicable to BESS and other ESS; and inception planning and preparation of the reports

- Output 2: Introduction of protocols for BESS and other ESS for their scheduling and dispatch in the energy-only, and eventually in the co-optimized market for energy and reserves

- Output 3: Achievement of satisfactory compliance rating by the market participants who operate BESS and other ESS, determined by PEMC’s Enforcement and Compliance Office (ECO).

- Output 4: Increased levels of competitiveness in the spot market in terms of BESS and other ESS ownership

The approach to the Project was staged in two phases. The first phase of the study focused on stand-alone ESS, in line with DC2019-08-0012. The second phase focused on hybrid ESS schemes, i.e., schemes combining ESS with other technologies, as defined in DC2023-04-0008.

As the schemes defined in DC2023-04-0008 include the stand-alone case, the recommendations presented in this Summary Report are those developed in Phase 2 (building on Phase 1 recommendations).

1.5 CATEGORIES OF MARKET REGISTRATION

The categories of registration under the final circular of the DOE are set out in the table that follows. Some general comments on treatment in the market are provided in the table. These categories will be added to the other WESM categories of: (1) Scheduled Generator, and (2) Intermittent RE Generator.

Table 1: DC Categories of ESS and General Comment on Market Treatment

ESS Type	Definition from DC	Parameters Registered (Pmax and Ramp Rate)	General Comments on Market Treatment
Stand-Alone ESS	Facility capable of absorbing energy generated from an RE plant or from a generation facility connected to the grid or distribution system and storing it for a period, and injecting stored energy when prompted, needed to ensure reliability and balanced power system.	• Pmax (of ESS) • Ramp Rates (of ESS) • Smax (of ESS) • Registration of controllable demand	• Bidirectional bids / offers suitable for stand-alone BESS, but not PSH – which is better treated via Demand Side Bids and conventional Generation Offers • Measures need to be taken to respect AS allocations by System Operator to ensure energy dispatch will not conflict with AS obligations (under the Interim AS market arrangements)
Generating Plant + ESS	Combination of Conventional Plant/s and/or RE Plant/s, and an ESS, where the ESS is charged either from the Generation Plant/s or from the Grid or Distribution System.	• Pmax = Generator Capacity + ESS capacity • Ramp Rate = would be determined based on ramp rates of individual technology components	• A general category for any kind of hybrid system that may be connected to a single connection point. • IEMOP will require visibility of the sub-components of the technology for dispatch purposes. • As it could be a composite of RE, ESS and conventional generation then individual components will have different requirements. • Note: bidirectional power flow
Integrated RE + ESS	Combination of a Conventional Plant and an ESS, where the ESS will not charge from the Grid or Distribution System and that its Pmax will be limited to the plant capacity.	• Pmax = VRE facility capacity • Ramp Rate = more important to define a minimum ramp rate that the combined generation system should be able to achieve	• This reflects situations where ESS is added to the VRE facility to reduce wind / solar ramps and intermittent output. • Treatment in the electricity market should generally be the same as an intermittent RE facility. • **ESS is only allowed to be charged from the RE farm – unidirectional power flow only.** • Expect that ESS would be small relative to size of RE plant
Integrated Non-RE and ESS	Combination of a Conventional Plant and an ESS, where the ESS will not charge from the Grid or	• Pmax = conventional	• Treatment the same as a conventional generator in the market • **ESS may only be charged from Conventional Plant – unidirectional power flow only.**

ESS Type	Definition from DC	Parameters Registered (Pmax and Ramp Rate)	General Comments on Market Treatment
	Distribution System and that its Pmax will be limited to the plant capacity		

The final circular of the DOE defines the main categories, but some additional provisions be added to the categories to guide their treatment in the WESM. The following table describes these additional provisions – for discussion and mutual agreement.

Table 2: Additional Provisions / Constraints on ESS Categories

Category	No.	Additional Provisions / Constraints for ESS Categories
Stand Alone ESS	1	To enable ESS to encompass storage technologies that may not be able to instantly go from generating to loading and vice-versa from one 5-minute dispatch period to the next, it is recommended that ESS technologies belong to this category be allowed to have the option of either (1) bidirectional bids, or (2) be allowed to use separate generation offers and demand-side bids. The latter would make it easier in some situations for a trader / plant operator to be able to manage the issue (technically, the issue can be managed via a bidirectional offer, but including the flexibility for participants to select either model is a no-regrets policy).
Generating Plant + ESS	2	As this relates to a composite of numerous technologies with a common connection point, then the individual technology components would need to be separately registered and their treatment in the market determined by the treatment of the category that the individual components are treated. Some illustrative examples are provided below.
Integrated RE + ESS	3	Recommend that if the ESS is greater than a certain size (to be determined) it is required for the ESS to be registered separately to the RE facility, but still subject to a policy that requires the ESS to only be charged from behind the station-gate. If the ESS for example is very large relative to the RE facility, then the ESS component would be better treated as a Stand-Alone ESS and the RE component as an Intermittent RE Facility. An example of such a policy would be that if ESS >= 20% RE Farm Capacity then it is necessary to separately register the ESS, and for the ESS to be treated as a Stand-Alone ESS and the RE facility as an Intermittent RE facility. The combined facility can still be required to adhere to the ESS charging policy (i.e., ESS can only be charged by the RE facility).
	4	Require the facility to be able to not go minimum
Integrated non-RE + ESS	5	As with Integrated RE + ESS, recommend that limitations on the relative size of the ESS compared to the non-RE generator be included – the same rule / provisions could be adopted and if it were not satisfied then it does not prevent registration, it would just require separate registration of the ESS to the non-RE generator, and for the individual components to be separately dispatched, but still subject to an “injection only” rule.

1.6 IMPACTS OF ESS ON THE WESM

The areas of the WESM that are impacted, and the principles addressed in the WESM market rules, follow:

- Registered capacity (Pmax): how the capacity that is registered in the market is determined
- Max Ramp Rate Up for registration: principle for determination of facility’s maximum rate
- Max Ramp Rate Down for registration: principle for determination of the facility’s rate down, if one is to apply
- Charging Policy: whether the facility is allowed to charge from grid / distribution network or not,

- Forecasting Requirement: whether generation forecasts are to be provided for the facility,
- Forecasting penalty: whether the facility owner is subject to forecast penalties,
- Must-Run / Priority Dispatch: whether the facility is treated in the dispatch process with must-run priority,
- Must-Offer Rule: whether the facility is subject to the must-offer rule,
- Bidding: policy for submission of offers (and/or bids where applicable),
- Dispatch: approach for IEMOP to dispatch the facility in the market clearing engine (MDOM),
- Dispatch – special cases: any special cases or provisions,
- Price for (Net) Generation: price the facility receives in the market if it is a net generating,
- Price for (Net) Demand: price the facility is charged in the market if it is a net demand,
- Settlement: approach to market settlements,
- Metering: requirements for market metering,
- Ancillary Services (Interim AS market): treatment under the Interim AS market rules, and
- Dispatch Compliance: approach for the monitoring of dispatch compliance.

*Table **3*** sets out the proposed treatment of the ESS categories in the WESM to address the above impacts.

Table 3: WESM Treatment by Category of Market Participation

Parameter	Existing WESM Categories		New WESM Categories of Market Participant			
	Scheduled Generator	**Intermittent RE Generator**	**Stand Alone ESS**	**Generating Plant + ESS**	**Integrated RE + ESS**	**Integrated Non-RE + ESS**
Registered Capacity (Pmax)	Pmax = Generator max	Pmax of RE Generator	Pmax of ESS Facility	Pmax of generating plant(s) + ESS (that is the total capacity of the components making up the facility)	Pmax of RE farm	Pmax of generating plant
Capacity Requirements for Registration	Certificate of Compliance (COC) Capacity	Certificate of Compliance Capacity (COC) for RE farm	None – but registration of load and generation components needed, as per the COC	Individual components should be separately registered as per COC of the other categories: (1) scheduled generator, (2) Intermittent RE Generator, or (3) Stand-Alone ESS.	Pmax of RE farm. The capacity of the ESS is not considered because the ESS purpose is to improve the performance of RE farm.	ESS in place to improve performance of existing generator only. The ESS capacity is not considered because the purpose of the ESS is to improve the performance of the generating plant.
Max Ramp Up Rate for registration	As per physical facility ramping capability	Not applicable at present	ESS Ramp Rate ("Rmax")	Each individual unit's ramp rates would be registered as per the requirements of relevant category of the facility's component.	Not applicable as it is treated as an Intermittent RE generator.	Ramp rate of conventional plant as enhanced by having the ESS to enhance its performance
Max Ramp Down Rate for registration	As per physical facility ramping capability	Not applicable at present	ESS Ramp Rate ("Rmax")	Each individual unit's ramp rates would be registered as per the requirements of relevant category of the facility's component.	Not applicable as it is treated as an Intermittent RE generator.	Ramp rate of conventional plant + ESS performance improvement
Charging Policy	Only injects	Only injects	Bidirectional (injects / withdraws)	Bidirectional (net injections / net withdrawals)	Only injects	Only injects
Forecasting Requirement	Not applicable	Yes – as defined in PGC	Not applicable	Yes, but applicable to RE components of the facility only.	Yes – as defined in PGC, except for the combined output of RE & BESS	Not applicable
Forecasting penalty	Not applicable	Subject to forecasting accuracy monitoring & penalties	Not applicable	Subject to forecasting accuracy monitoring & penalties for RE components only.	Subject to forecasting accuracy monitoring & penalties	Not applicable
Must-Run / Priority Dispatch	None	Yes	None	Only for RE components	Yes	None
Must-Offer Rule	Yes – applies	Rules on Submission of	Yes – applies (noting that SOC is	Yes – applies to non-RE components	Rules on Submission of Nomination applies	Yes – applies

Parameter	Existing WESM Categories		New WESM Categories of Market Participant			
	Scheduled Generator	**Intermittent RE Generator**	**Stand Alone ESS**	**Generating Plant + ESS**	**Integrated RE + ESS**	**Integrated Non-RE + ESS**
		Nomination Applies	accounted for in dispatch)			
Bidding	10 x prices / quantities submitted	Submits generation forecast and is must-run	Bidirectional Bid or a Generator Bid + Demand Side bid (up to facility owner / trader to choose)	Recommend submission of bids for each component – need DS bids to add flexibility	Submits generation forecast and is must-run	10 x prices / quantities submitted – as for a conventional generator
Dispatch	Dispatched based on generation offer	Must-run	Dispatched for charging or discharging based on 2-way bid/offer	Dispatch individual units	Must-run	Dispatched based on generation offer
Dispatch – special cases	None	Can be curtailed if there is a surplus	None – except SOC must be accounted for	Treated as individual units	Can be curtailed if there is a surplus - SOC management is the generator's responsibility	None – SOC management is the generator's responsibility
Price for (Net) Generation	Nodal Price	Nodal Price (unless exempted under FIT rules)	Nodal Price	Nodal Price	Nodal Price (unless exempted under FIT rules)	Nodal Price
Price for (Net) Demand	Not applicable	Not applicable	Nodal Price	Nodal Price	Not applicable, because can only inject electricity	Not applicable, because can only inject electricity
Settlement	As per WESM rules for settlement of scheduled generator.	Exempted if on a FIT otherwise a per WESM rules for settlements.	In Stage 1 part of project, it was recommended to be both paid and charged based on the nodal price.	Paid or charged based on net injection/withdrawal at connection point – individual components within the facility may offset a deficit / surplus of generation against a dispatch target.	Exempted if on a FIT otherwise a per WESM rules for settlements.	As per WESM rules for settlement of scheduled generator.
Metering	At connection point	At connection point	At connection point	Individual units should be metered	At connection point	At connection point
Telemetry	At connection point	At connection point	At connection point	At connection point, for aggregate / net output of facility as well as individual components – example: to assess RE facility forecast accuracy.	At connection point	At connection point
Allowed to provide Ancillary Services?	Yes	No	Yes	Yes – but only for sub-components that are non-RE.	No	Yes

Parameter	Existing WESM Categories		New WESM Categories of Market Participant			
	Scheduled Generator	**Intermittent RE Generator**	**Stand Alone ESS**	**Generating Plant + ESS**	**Integrated RE + ESS**	**Integrated Non-RE + ESS**
Ancillary Services (Interim AS market)	NGCP-SO declares AS quantities to IEMOP on day-ahead basis, and AS quantities netted out of energy market.	Not applicable	NGCP-SO declares AS quantities to IEMOP on day-ahead basis, and AS quantities netted out of energy market.	NGCP-SO declares AS quantities to IEMOP on day-ahead basis, and AS quantities netted out of energy market, but done on a component-by-component basis.	Not applicable	NGCP-SO declares AS quantities to IEMOP on day-ahead basis, and AS quantities netted out of energy market. (i.e., same as for a conventional generator.)
Dispatch Compliance	As per existing rules / procedures	As per existing rules / procedures (including forecasting accuracy)	As per existing rules / procedures, with some adjustments as recommended in our final report.	Based on conformance of aggregate dispatch instructions to aggregate output of the facility (since the facility is allowed to manage its internal dispatch to satisfy a dispatch target.)	As for Intermittent RE Generators	As per existing rules / procedures for a Scheduled Generator.

1.7 PROPOSED CHANGES TO THE WESM RULES

The purpose of this section is to document proposed changes to the WESM rules to make them consistent with the final circular of the DOE (DC 2023-04-0008). This includes the rationale of the changes, and the list of clauses and records any important decisions that were made.

1.7.1 Definitions

The WESM rules contains terminology for the categories of generator that is slightly different to the DC 2023-04-0008's definitions. The first step of enhancing the WESM rules has been to align terminology so that it is consistent or at least make it clear what the equivalent definition in the WESM rules is against the definition that is given in the final circular of the DOE. The glossary primarily relates to a classification of energy storage systems including hybrid facilities. This needs to be consistent with the existing classification of generators in WESM.

The list of plant definitions is set out in *Table **4***, which includes the existing definitions in the WESM rules, the new definitions required to satisfy the requirements of the final circular of the DOE, and some supplementary definitions that were necessary to ensure that the full "hierarchy" of technologies could be represented. The table indicates the definitions that are new compared to existing definitions. To show the full set of technologies that need definition in the WESM, the hierarchy is illustrated in *Figure **2***.

Table 4: Plant Definitions (Both Current and New Definitions)

No.	Term	Definition	New Term
1	Plant	Any equipment involved in generating, utilizing, or transmitting electrical energy.	
2	Embedded Generator (EG)	Refers to Generating Units (or Generating System) that are indirectly connected to the Grid through the Distribution Utilities' lines or industrial generation facilities that are synchronized with the Grid.	
3	Generation System	A system comprising one or more generating units capable of generation with its own metering facility.	
4	Non-RE Plant	A Generating Unit or Generating System that is not defined in Section 4 (uu) of the Renewable Energy Act.	Yes
5	Renewable Energy Resource	An energy resource as defined in Section 4 (uu) of the Renewable Energy Act.[1]	
6	Non-Intermittent RE Resource	An energy resource defined in Section 4 (uu) of the Renewable Energy Act, but which is not classified as being an Intermittent RE Resource (see Intermittent RE Resource definition)	Yes

[1] RE Act defines Renewable Energy Resources as energy resources that do not have an upper limit on the total quantity to be used. Such resources are renewable on a regular basis, and whose renewal rate is relatively rapid to consider availability over an indefinite period of time. These include, among others, biomass, solar, wind, geothermal, ocean energy, and hydropower conforming with internationally accepted norms and standards on dams, and other emerging renewable energy technologies.

No.	Term	Definition	New Term
7	Intermittent RE Resource	A Renewable Energy Resource specified in Section 20 of the Renewable Energy Act, those being: wind energy, solar energy, run-of-river hydro, ocean energy or any other Renewable Energy Resource designated as such by the DOE.	
8	Energy Storage System	Refers to a facility capable of absorbing energy generated from an RE Plant or from a generation facility connected to the Grid or Distribution System, and injecting stored energy when prompted, needed to ensure reliability and balanced power system: ESS technologies shall include, but not limited to: Battery Energy Storage System (BESS) or Pumped-Storage Unit.	Yes
9	Load	The amount of energy consumed in a defined period via a node.	
10	Generating Unit	A conversion apparatus including auxiliaries and associated equipment functioning as a single unit, which is used to produce electric energy from some other form of energy.	
11	Integrated Resource with ESS	A Generation System - such as a RE Plant, Non-RE Plant or a Generating System that has integrated an ESS.	Yes
12	Stand-alone Energy Storage System	Refers to an ESS that is connected to and stores energy sourced from the Transmission or Distribution System.	
13	Scheduled Generating Unit	A generating unit so classified in accordance with clause 2.3.1.2 (a)(1). A generating unit or a group of generating units connected at a common connection point with a nameplate rating or a combined nameplate rating of greater than or equal to the regional thresholds provided in Clause 2.3.1.3.	
14	Non-Scheduled Generating Unit	A generating unit or a group of generating units connected at a common point with a nameplate rating and a combined nameplate rating less than the regional thresholds provided in Clause 2.3.1.3.	
15	Must Dispatch Generating Unit	A Generating Unit or Generating System so designated by the Market Operator under Clause 2.3.1.5 and is provided Must Dispatch.	
16	Priority Dispatch Generating Unit	A generating unit or Generating System so designated by the Market Operator under Clause 2.3.1.5 and is provided Priority Dispatch.	
17	Intermittent RE Resource with ESS	Refers to a combination of Intermittent Renewable Energy Resource and an ESS, where the ESS is solely charged by the Intermittent RE Resource.	Yes
18	Non-RE Plant with ESS	Refers to a combination of a Generating Unit or Generating System and an ESS, where the ESS may not be charged from the grid and that its Pmax will be limited to the Generating Unit or Generating System's capacity.	Yes
19	Generating System with ESS	Refers to a combination of conventional generating unit and/or RE Plant, and an ESS, where the ESS may be charged either from the Generating Unit/s or from the Grid.	Yes
20	Battery Energy Storage System	A system with all related equipment essential to its functioning as a single entity which can store electrical energy through chemical reactions from which it is able to charge or discharge electrical energy to the power system.	
21	Pumped-Storage Unit	A facility or group of facilities that act as load while using energy to pump water to higher elevation reservoirs, and then act like generators by producing electric energy when water is release back to lower reservoir.	
22	Dispatchable Load	A load which can respond to dispatch instructions and so may be treated as a scheduled load' in the dispatch process.	
23	Scheduled Load	A load which can respond to dispatch instructions, and instructions and has been bid into the spot market using a demand bid and so may be scheduled and dispatched via the scheduling and dispatch procedures.	

No.	Term	Definition	New Term
24	Interruptible Load	Means load that a customer can interrupt at very short notice in response to: (a) A frequency deviation; or (b) A request of the System operator, to meet applicable ancillary service requirements, subject to the requirements of the Grid Code and Distribution Code.	

The full set of changes to the WESM Rule glossary of definitions is set out in *Table 5*. Note that this table contains the definitions that only relate to defining technologies and the categories of WESM plant that can be registered and has been organized to match the final circular of the DOE.

There is also a recommendation to change the name of the “Battery Energy Storage System Offer” to “Bidirectional Bid and Offer” because this approach of making bids / offers to the market is not solely tied to batteries only. This is set out in *Table **6***.

Figure 2: Definitions of Plant

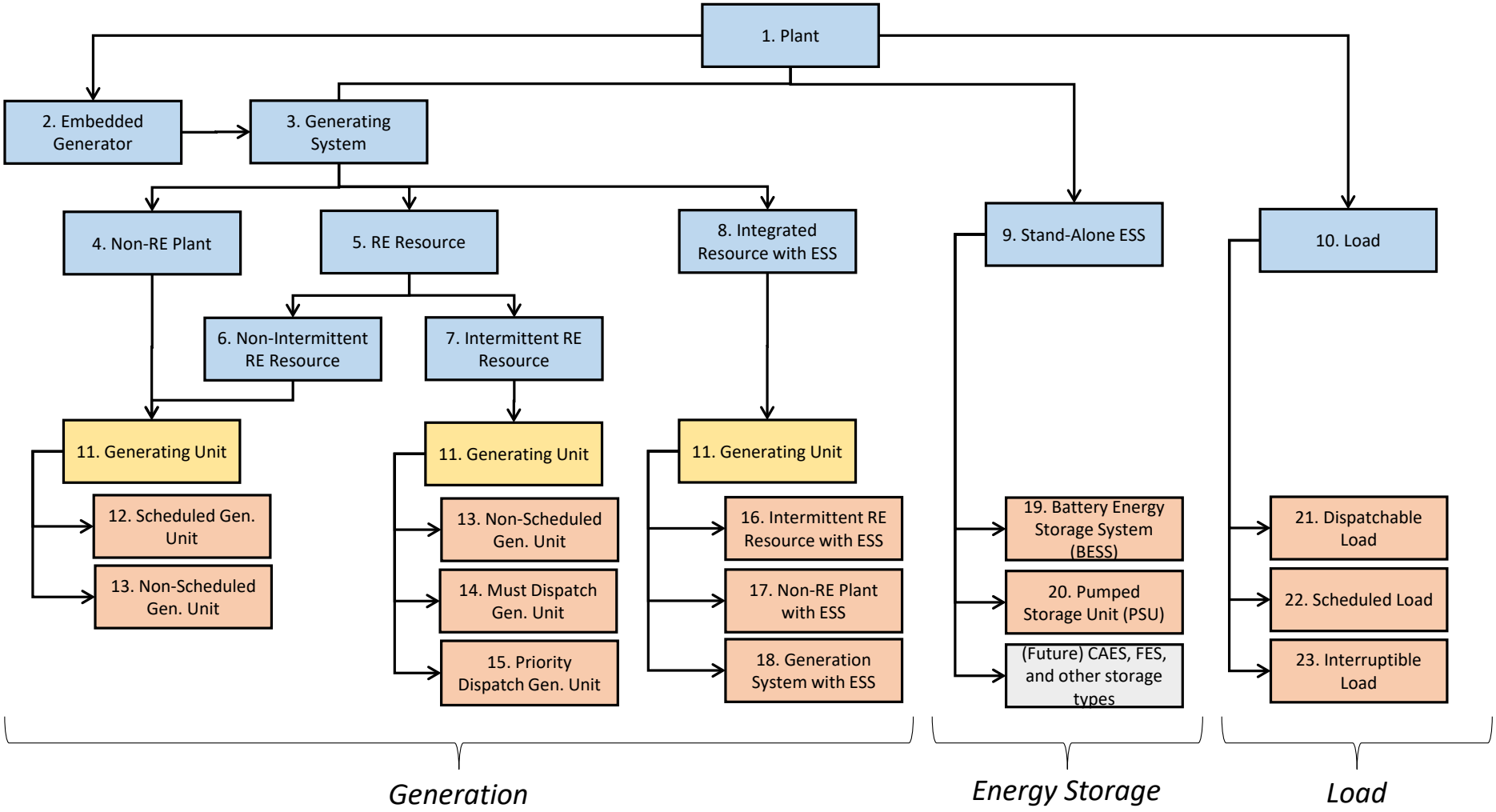


Table 5: WESM Rules Changes: Glossary Definitions – Technology Related Definitions

No.	Term in Final Circular of the DOE (DC2019-08-0012)	Definition in Final Circular of the DOE (DC2019-08-0012)	Term in WESM Rules	Definition in WESM Rules	Term in Revised WEMS Rules	Definition in Revised WESM Rules	Comment
1	Ancillary Services or "AS"	As defined in DOE DC No. DC2021-10-62 0031, refers to services that support the transmission and/or distribution capacity and energy that are essential in maintaining Power Quality and the reliability of the Grid.	Ancillary Services	Those services that are necessary to support the transmission of capacity and energy from resources to loads while maintaining reliable operation of the transmission system in accordance with good utility practice, the Grid Code and Distribution Code.	Ancillary Services or "AS"	Those services that are necessary to support the transmission of capacity and energy from resources to loads while maintaining reliable operation of the transmission system in accordance with good utility practice, the Grid Code and Distribution Code.	Retain original WESM definition (essentially the same)
2	Distributed Energy Resources or “DER”	Refer to power sources connected to the distribution system or electrical system of the End-Users, which could be aggregated to meet a demand.	N/A	N/A	N/A	N/A	WESM does not currently consider DERs
3	Electric Power Industry Participant	Refers to any person or entity engaged in the generation, transmission, distribution or supply of electricity	N/A	N/A	N/A	N/A	WESM rules deal with market participants, which is a subset of "Electric Power Industry Participants"
4	Embedded Generator or “EG”	Refers to generating units that are indirectly connected to the Grid through the distribution system that supplies power to its host DU or the Grid	Embedded Generator	Refers to generating units that are indirectly connected to the Grid through the Distribution Utilities' lines or industrial generation facilities that are synchronized with the Grid.	Embedded Generator or “EG”	Refers to generating units that are indirectly connected to the Grid through the Distribution Utilities' lines or industrial generation facilities that are synchronized with the Grid.	Retain original WESM definition (essentially the same)

No.	Term in Final Circular of the DOE (DC2019-08-0012)	Definition in Final Circular of the DOE (DC2019-08-0012)	Term in WESM Rules	Definition in WESM Rules	Term in Revised WEMS Rules	Definition in Revised WESM Rules	Comment
5	End-User	Refers to any person or entity requiring the supply and delivery of electricity for its own use	End-use	Any person or entity requiring the supply and delivery of electricity for its own use.	End-use	Any person or entity requiring the supply and delivery of electricity for its own use.	No change required.
6	Energy Storage System or “ESS”	Refers to a facility capable of absorbing energy generated from an RE Plant or from a generation facility connected to the Grid or Distribution System, and injecting stored energy when prompted, needed to ensure reliability and balanced power system: ESS technologies shall include, but not limited to: BESS, CAES, FES, or PSH.	N/A	N/A	Energy Storage System or “ESS”	Refers to a facility capable of absorbing energy generated from an RE Plant or from a generation facility connected to the Grid or Distribution System, and injecting stored energy when prompted, needed to ensure reliability and balanced power system: ESS technologies shall include, but not limited to: Battery Energy Storage System (BESS) or Pumped-Storage Unit.	WESM rules does not currently define this "umbrella" term for different types of ESS technology. There are instances in the WESM rules where it is convenient to use this umbrella term, so it has been added to the WESM glossary. Since CAES and FES is not explicitly handled in the WESM, and beyond scope of this project, CAES and FES have been excluded. (They could be readily added as future adjustment to rules.)
7	Battery Energy Storage System or “BESS”	Capable of storing electric energy electrochemically from which it can charge or discharge electric energy	Battery Energy Storage System	A system with all related equipment essential to its functioning as a single entity which can store electrical energy through chemical reactions from which it is able to charge or discharge electrical energy to the power system. (Added per DOE DC No. 2018-08-0022 dated 06 August 2018)	Battery Energy Storage System or “BESS”	A system with all related equipment essential to its functioning as a single entity which can store electrical energy through chemical reactions from which it is able to charge or discharge electrical energy to the power system. (Added per DOE DC No. 2018-08-0022 dated 06 August 2018)	Retain existing WESM definition - final circular of the DOE (DC2019-08-0012) and current WESM rules have very similar definitions for BESS.

No.	Term in Final Circular of the DOE (DC2019-08-0012)	Definition in Final Circular of the DOE (DC2019-08-0012)	Term in WESM Rules	Definition in WESM Rules	Term in Revised WEMS Rules	Definition in Revised WESM Rules	Comment
8	"Compressed Air Energy Storage" or "CAES"	Uses electric energy to inject high-pressure air containers. When energy is required, the pressurized air is heated and expanded in an expansion turbine driving a generator for power production.	N/A	N/A	N/A	N/A	CAES is not in the scope of this project.
9	Flywheel Energy Storage or "FES"	Uses electric energy to accelerate a rotating mass, called a "rotor", to store kinetic energy. Energy is extracted from the system by drawing down the kinetic energy from the rotor.	N/A	N/A	N/A	N/A	FES is not in the scope of this project.
10	Pumped-Storage Hydropower or "PSH"	Uses electric energy to pump water from a lower elevation reservoir to a higher elevation reservoir. When required, the water flows back from the upper to the lower reservoir, powering a turbine with a generator to produce electric energy.	Pumped-Storage Unit	A facility or group of facilities that act as load while using energy to pump water to higher elevation reservoirs, and then act like generators by producing electric energy when water is release back to lower reservoir. (Added per DOE DC No. 2018-08-0022 dated 06 August 2018)	Pumped-Storage Unit	A facility or group of facilities that act as load while using energy to pump water to higher elevation reservoirs, and then act like generators by producing electric energy when water is release back to lower reservoir. (Added per DOE DC No. 2018-08-0022 dated 06 August 2018)	Retain the WESM rules term for PSH, which is Pumped-Storage Unit.

No.	Term in Final Circular of the DOE (DC2019-08-0012)	Definition in Final Circular of the DOE (DC2019-08-0012)	Term in WESM Rules	Definition in WESM Rules	Term in Revised WEMS Rules	Definition in Revised WESM Rules	Comment
11	Generating Plant + ESS	Refers to a combination of Conventional Plant and/or RE Plant, and an ESS, where the ESS is charged either from the Generation Plant/s or from the grid.	N/A	N/A	Generating System with ESS	Refers to a combination of conventional generating units and/or RE Plant, and an ESS, where the ESS may be charged either from the Generating Unit/s or from the Grid.	The WESM rules generally uses the term "Generating System" to refer to a collection of "Generating Units", and the intent of "Generating Plant + ESS" is really a Generating System that has an ESS as part of it.
12	Integrated Non-RE Plant + ESS	Refers to a combination of a Conventional Plant and an ESS, where the ESS will not charge from the grid and that its Pmax will be limited to the plant capacity.	N/A	N/A	Non-RE Plant with ESS	Refers to a combination of a Generating Unit or Generating System and an ESS, where the ESS may not be charged from the grid and that its Pmax will be limited to the Generating Unit or Generating System's capacity.	Note: the definition has used another definition that is in the WESM rules already, "Generating System", which is used here.
13	Integrated RE Plant + ESS	Refers to a combination of RE Plant and an ESS, where the ESS is solely charged by the RE Plant/s.	N/A	N/A	Intermittent Renewable Energy Resource with ESS	Refers to a combination of Intermittent Renewable Energy Resource and an ESS, where the ESS is solely charged by the Intermittent RE Resource.	The WESM rules already defines "Intermittent Renewable Energy Resource" as a type of facility.
14	Stand-alone Energy Storage System	Refers to an ESS that is connected to and stores energy sourced from the Transmission or Distribution System	N/A	N/A	Stand-alone Energy Storage System	Refers to an ESS that is connected to and stores energy sourced from the Transmission or Distribution System	In previous revisions to the WESM rules, BESS and/or PSH were the only examples of ESS technologies and "hybrids" weren't considered. The final circular of the DOE uses "ESS" to effectively be any technology that can absorb or inject electricity; hence it may include

No.	Term in Final Circular of the DOE (DC2019-08-0012)	Definition in Final Circular of the DOE (DC2019-08-0012)	Term in WESM Rules	Definition in WESM Rules	Term in Revised WEMS Rules	Definition in Revised WESM Rules	Comment
							hybrids as well as stand-alone. Therefore, to be consistent with the final circular of the DOE, we have added this term.

Table 6: WESM Rules Changes: Glossary Definitions – Other Definitions

No.	Term	Definition	New Term	Revisions to Existing Term	Comment
1	Battery Energy Storage System Offer	A market offer either to supply or purchase electricity, submitted or revised by a Generation Company in accordance with Clauses 3.5.5, 3.5.9, 3.5.10 or 3.5.11. (Added per DOE DC No. 2018-08-0022 dated 06 August 2018)	Bidirectional Bid and Offer	A market offer either to supply or purchase electricity, submitted or revised by a Generation Company in accordance with Clauses 3.5.5, 3.5.9, 3.5.10 or 3.5.11.	Rationale is to define the style of bid/offer without reference to a technology (as other ESS technologies may use these types of bids/offers).
2	Market Offer	A generation offer, a battery energy storage system offer, or a reserve offer for a particular dispatch interval of a particular trading day in the current market horizon, whether formed from a standing offer in accordance with Clause 3.5.10 or revised by the relevant Trading Participant, in accordance with clause 3.5.11. (As amended by DOE DC No. 2016-10-0014 dated 14 October 2016)	Market Offer	A generation offer, a bidirectional bid and offer, a demand bid or a reserve offer for a particular dispatch interval of a particular trading day in the current market horizon, whether formed from a standing offer in accordance with Clause 3.5.10 or revised by the relevant Trading Participant, in accordance with clause 3.5.11.	Adjusted to reflect changes in 1 above.
3	Demand Bid	A standing bid, or market bid to buy electricity submitted, or revised, by a Customer in accordance with clause 3.5.6, 3.5.9, 3.5.12 or 3.5.13, and containing the information specified in Appendix A1.	Demand Bid	A standing bid, or market bid to buy electricity submitted, or revised, by a Customer or Generation Company in accordance with clause 3.5.6, 3.5.9, 3.5.12 or 3.5.13, and containing the information specified in Appendix A1.	Adjusted because a generation company operating a PSH (or ESS) may elect to use Demand Side bids as well. I.e. removed the association of Demand Bids with Customers to include Generation Companies.

1.7.2 Registration

The market registration process should enable and guide the registration process for each category of plant as illustrated in *Figure 2.* The proposed changes to the WESM rules need to cover the registration of stand-alone ESS and integrated resources with ESS which are defined in *Table **5***. Furthermore, the changes need to fit within the approach that already exists for categories of generator. The changes proposed for Chapter 2 of the WESM rules on registration are set out in *Table **7***.

Table 7: WESM Rules Changes: Chapter 2: Registration

Clause	Sub-Clause	Current Clause(s)	Revised or New Clause(s)
2.3.1.2	(a)	(a) Classify each of the generating units which form part of the generating system it owns, operates or controls or from which it otherwise sources electricity as either a: (i) scheduled generating unit; (ii) non-scheduled generating unit; (iii) must dispatch generating unit; (iv) priority dispatch generating unit; (v) battery energy storage system; (vi) pumped-storage unit.	(a) Classify each of the generating units which form part of the generating system or any stand-alone energy storage systems it owns, operates or controls or from which it otherwise sources electricity as either a: (i) scheduled generating unit; (ii) non-scheduled generating unit; (iii) must dispatch generating unit; (iv) priority dispatch generating unit; (v) battery energy storage system; (vi) pumped-storage unit. Rationale: A generating system or a stand-alone ESS has each of its components classified as these items. This does not cater to the integrated resources with ESS, which are covered in the next (new) clause.
2.3.1.2	(a)(A)	N/A	(a)(A) Classify each integrated energy resource with ESS it owns, operates or controls or from which It otherwise sources electricity as: (i) intermittent RE resource with ESS; or (ii) non-RE plant with ESS; or (iii) generation system with ESS; And subsequently, register the associated intermittent RE resource, non-RE plant, generation system and ESS, in accordance with 2.3.1.2(a). Rationale: The hybrid facility ("integrated energy resource with ESS") has to be assigned / registered as one of these categories, but then the individual technology components must also be registered, so that the MO has full information on the facility.
2.3.1.3	N/A	Subject to Clauses 2.3.1.5 and 2.3.1.6, a generating unit or a group of generating units connected at a common connection point with a nameplate rating or a combined nameplate rating of greater than or equal to the following regional thresholds shall be classified as a	2.3.1.3 Subject to Clauses 2.3.1.5 and 2.3.1.6, a generating unit, a group of generating units connected at a common connection point, a stand-alone ESS, a non-RE plant with ESS, or an generating system with ESS, with a nameplate rating or a combined nameplate rating of greater than or equal to the following regional thresholds shall be classified as a scheduled generating unit: (a) 10 MW for Luzon Grid; (b) 5 MW for Visayas Grid; and (c) 5 MW for Mindanao Grid. Rationale:

Clause	Sub-Clause	Current Clause(s)	Revised or New Clause(s)
		scheduled generating unit: (a) 10 MW for Luzon Grid; (b) 5 MW for Visayas Grid; and (c) 5 MW for Mindanao Grid.	By default, these types of plant are classified as being scheduled generating units. However, it is noted that the MO can make exceptions under the clauses that come later.
2.3.1.4	N/A	Subject to Clauses 2.3.1.5 and 2.3.1.6, a generating unit or a group of generating units connected at a common connection point with a nameplate rating or a combined nameplate rating of less than the regional thresholds provided in Clause 2.3.1.3, shall be classified as a non-scheduled generating unit, but may at its option be classified as a scheduled generating unit.	Subject to Clauses 2.3.1.5, 2.3.1.5(A), 2.3.1.6 and 2.3.1.6(A), a generating unit or a group of generating units connected at a common connection point with a nameplate rating or a combined nameplate rating of less than the regional thresholds provided in Clause 2.3.1.3, shall be classified as a non-scheduled generating unit, but may at its option be classified as a scheduled generating unit. Rationale: Small adjustment to reflect additional clauses that define what is must-run, priority-dispatch, etc. and how they apply to newly added categories of registration.
2.3.1.5(A)	New Clause	N/A	A generating unit, group of generating units connected at a common connection point, or generating system that is intermittent renewable energy resource-based with ESS, whether or not under the Feed-In Tariff system, such as wind, solar, run-of-river hydro or ocean energy with the corresponding DOE certification, shall be classified as a must dispatch generating unit, but may at its option be classified as a scheduled generating unit or a non-scheduled generating unit subject to Clause 2.3.1.4. The Pmax registered shall reflect the intermittent renewable energy resource and not the ESS and the ESS may not be charged from the grid. Rationale: This is required to allow the registration of the final circular of the DOE (DC2019-08-0012)'s category: "Integrated RE Plant + ESS".
2.3.1.6(A)	New Clause	N/A	A generating unit, group of generating units connected at a common connection point or generating system that is an integrated non-renewable energy resource with ESS, shall be classified as a must dispatch generating unit, but may at its option be classified as a scheduled generating unit or a non-scheduled generating unit subject to Clause 2.3.1.4. The Pmax registered shall reflect the non-renewable energy resource and not the ESS and the ESS may not be charged from the grid. Rationale: This is required to allow the registration of the category: "Integrated Non-RE Plant + ESS", a category indicated in the final circular of the DOE (DC2019-08-0012)

Clause	Sub-Clause	Current Clause(s)	Revised or New Clause(s)
2.3.1.11	All	A Generation Company shall operate its battery energy storage system and pumped-storage unit in accordance with the scheduling and dispatch procedures described in Chapter 3, within the dispatch conformance standards specified in accordance with Clause 3.8.5 when it is scheduled to operate as Generation.	A Generation Company shall operate its stand-alone battery energy storage system or a stand-alone battery energy storage system that is part of generating system with ESS in accordance with: (a) The scheduling and dispatch procedures described in Chapter 3, within the dispatch conformance standards specified in accordance with Clause 3.8.5 when it is scheduled to operate as Generation. (b) It will provide bidirectional market offers using the format specified in A1.4. (c) Upon registration of the battery energy storage system, the following will be provided to the Market Operator: (i) rated MW capacity, (ii) rated MWh storage size, (iii) maximum depth of discharge (DOD) (%). Rationale: Specific requirements applicable to BESS (Stand-Alone).
2.3.1.11(A)	New Clause	N/A	A Generation Company shall operate its stand-alone pumped-storage unit in accordance with: (a) The scheduling and dispatch procedures described in Chapter 3, within the dispatch conformance standards specified in accordance with Clause 3.8.5 when it is scheduled to operate as Generation. (Added per DOE DC. No. 2018-08-0022 dated 06 August 2018) (b) A pumped-storage unit may manage its pumping loads by either of the following: (i) a load forecast nomination, or (ii) through the submission of a Demand Bid, in the format specified in A.1.3. Rationale: Specific requirements applicable to PSH (Stand-Alone)
2.3.1.11(B)	New Clause	N/A	2.3.1.11(B) A Generation Company shall register and operate its integrated energy resource with ESS in accordance with: (a) An Intermittent RE Resource with ESS shall: (i) Register its Pmax as the Pmax of the RE resource, and (ii) Operate the ESS so that it is not charged from the grid. (b) A Non-RE Plant with ESS shall: (i) Register its Pmax as the Pmax of the non-RE plant, and (ii) Operate the ESS so that it is not charged from the grid, (c) A generating system with ESS must register and operates its generation system and ESS as a stand-alone ESS as per the requirements in Clause 2.3.1.2 (a). Rationale: Make it clear the treatment of each category of integrated resource with ESS.
2.5.7.1	New Sub-Clause	N/A	Generation Companies are responsible for notifying the Market Operator of any material changes to the technical parameters associated with generating units so that they can be updated by the Market Operator.
2.3.1.14	New Sub-Clause	N/A	The Market Operator reserves the right to require a generation system or generation system with ESS, to individually register its generating units or energy storage systems, if deemed necessary to ensure secure and stable operation of the grid. Rationale: Provide IEMOP with the right to force any generation system or generation system with ESS to be broken down into individual units and registered, if necessary for MDOM to deliver a secure power system.

1.7.3 Market Bids and Offers

The WESM rules need to provide guidance on how each plant connected to the grid is to be treated in terms of making bids and offers. The WESM rules support the following types of bids / offers: (1) generating offer, (2) demand bid, (3) reserve offer, and (4) battery storage energy offer. There is also a collective term "Market Offer" which is used as a collective for (1), (3) and (4), and similarly the term "Market Bid" that refers to (2). Treatment of Reserves is beyond the scope of the market rules changes, hence reserve offers are not discussed further. The following table sets out the general features of WESM bid / offer models (note that proposed changes in Section 1.7.1 are assumed in the table).

Table 8: WESM Options for Bids & Offers

No.	Type	Definition	WESM Ref	Description
1	Generating Offer (GO)	A market offer to supply electricity, submitted or revised by a Generation Company in accordance with Clauses 3.5.5, 3.5.9, 3.5.10 or 3.5.11.	A.1.1	10 price and quantity bands Subject to requirements specified in WESM rules A.1.1.
2	Bidirectional bid and offer (BBO)	A market offer either to supply or purchase electricity, submitted or revised by a Generation Company in accordance with Clauses 3.5.5, 3.5.9, 3.5.10 or 3.5.11.	A.1.3	Note that this was previously termed "Battery Storage Energy Offer" but has been proposed to be renamed (see section 1.7.1). It is proposed to comprise 20 price / quantity bands.
3	Demand Bid (DB)	A standing bid, or market bid to buy electricity submitted, or revised, by a Customer in accordance with clause 3.5.6, 3.5.9, 3.5.12 or 3.5.13, and containing the information specified in Appendix A1.	A.1.4	Comprises 10 price and quantity bands to purchase electricity.

The three types of Market Offer / Market Bid from *Table 8 w*hen matched to the registration categories for each type of plant that a Generation Company may register are set out in *Table 9.* It should be noted that the following categories of technology during the registration process, will have to have its facilities ultimately registered to one or more of the categories in this table: (1) Plant, (2) Embedded Generator, (3) Generation System, (4) Non-RE Plant, (5) RE Resource, (6) Non-Intermittent RE Resource, (7) Intermittent RE Resource, (8) ESS, (9) Load, (10) Integrated Resource with ESS, (11) Generating Unit, and (12) Stand-Alone ESS.

The table also indicates what registration categories are required to provide a nomination schedule and which are required to provide projected outputs. The former is a set of loading levels that are supplied in advance of dispatch as an alternative to a market offer / bid, while the latter is a forecast of the output that is provided. The projected outputs are typically provided by solar and wind farms, however, since the category of intermittent RE resource with ESS, is also to be treated in this way, it must be accommodated in the same way.

Table 9: Registration Categories and Bid / Offer Options

No.	Registration Category	Must Offer Rule Applies?	Submits Bids / Offers?	Type of Bids / Offers			Nomination Schedule?	Projected Output?
				GO	BBO	DB		
1	Scheduled Generating Unit	Yes	Yes	Yes	-	-	X	X
2	Non-Scheduled Generating Unit	No	No	X	X	X	Yes	X
3	Must Dispatch Generating Unit	No	No	X	X	X	X	Yes
4	Priority Dispatch Generating Unit	No	No	X	X	X	X	Yes
5	Intermittent RE Resource with ESS	No	No	X	X	X	X	Yes
6	Non-RE Plant with ESS	Yes	Yes	Yes	-	-	X	X
7	Generating System with ESS	Yes	Yes	Yes	Yes	Yes	X	X
8	Battery Energy Storage System	Yes	Yes	-	Yes	-	X	X
9	Pumped-Storage Unit	Yes	Yes	Yes	Yes	Yes	X	X
10	Dispatchable Load	No	Yes	-	-	Yes	X	X
11	Scheduled Load	No	No	X	X	X	Yes	X
12	Interruptible Load[2]	No	Yes	X	X	X	X	X

The full set of proposed revisions / additions to the WESM rules in relation to market bids and offers (WESM Chapter 3.5) have been set out in *Table 10.*

Table 10: WESM Rules Changes: Chapter 3.5 on Submission of Offers, Bids and Data

Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
3.5.5	Generation Offers and Data	Generation Offers, Bids and Data	To be consistent with allowing some generators to submit bids, propose to rename this subsection.
3.5.5.1	Each Generation Company including Generation Companies with bilateral contracts shall submit a standing market offer for each of its scheduled generating units, battery energy storage systems and pumped-storage units for each dispatch interval in each trading day of the week in accordance with the timetable. The standing market offer shall apply until revised or updated by the Generation Company.	Each Generation Company including Generation Companies with bilateral contracts shall submit a standing market offer and market bid (where applicable) for each of its scheduled generating units, non-RE plant with ESS, generating system with ESS, battery energy storage systems and pumped-storage units for each dispatch interval in each trading day of the week in accordance with the timetable. The standing market offer shall apply until revised or updated by the Generation Company.	Needs to cater to the full range of technologies that the WESM rules must now handle - including hybrid facilities.
3.5.5.2	Each scheduled generating unit and pumped-storage unit operating on generation mode shall submit a Generation Offer that includes the information specified in Appendix A1.1	Each scheduled generating unit, non-RE plant with ESS, generating system with ESS, and pumped-storage unit (where applicable) operating on generation mode shall submit a Generation Offer that includes the information specified in Appendix A1.1	Needs to be expanded to cater to the technologies in in the WESM rules that are required to submit generation offers.

[2] Interruptible loads in the WESM rules are exclusively dedicated to providing reserves, hence they have not been considered further in this document.

Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
3.5.5.2(A)	n/a (new clause)	Each pumped storage unit and generating system with ESS that has registered a dispatchable load operating in load mode shall submit a demand bid that includes the information specified in Appendix A1.3.	New clause to put the obligation on any generation resources that need to submit demand bids for their dispatchable loads to submit demand bids.
3.5.5.3	Each Generation Company operating a battery energy storage system shall submit energy storage systems Offer that includes that information specified in Appendix A1.4.	Each Generation Company operating an energy storage system including a battery energy storage system shall submit a bidirectional bid and offer that includes that information specified in Appendix A1.4.	Corrected reference to the bidirectional bid / offer in A1.4
3.5.5.4	Each Generation Company shall submit check data to be used by the Market Operator, in accordance with Clause 3.5.12, to assist in determining the validity of any generation offer which may be submitted by the scheduled generator.	Each Generation Company shall submit check data to be used by the Market Operator, in accordance with Clause 3.5.12, to assist in determining the validity of any market offer or market bid that has been submitted by the Generation Company under Clauses 3.5.5.1, 3.5.5.2, 3.5.5.2A, and 3.5.5.3	Require generators to submit check data for all types of market offers and market bids that they may submit.
3.5.5.4 (note: there were two 3.5.5.4 sections)	Each Non-Scheduled Generation Company shall submit a standing nomination of loading levels for each of its non-scheduled generating units for each dispatch interval in each trading day of the week in accordance with the timetable. The standing nomination of loading levels shall apply until revised or updated by the Non-Scheduled Generation Company.	Each Generation Company shall submit a standing nomination of loading levels for each of its non-scheduled generating units for each dispatch interval in each trading day of the week in accordance with the timetable. The standing nomination of loading levels shall apply until revised or updated by the Generation Company.	Corrected, because Non-Scheduled Generation Company is not defined or referenced anywhere else in the WESM rules. However, more importantly, it relates to any non-scheduled generators that the Generation Company may have registered.
3.5.5.5	Generation Companies shall provide to the Market Operator and the System Operator standing projected outputs in respect of their must dispatch generating units and priority dispatch generating units for each dispatch interval in each trading day of the week in accordance with the relevant Market Manuals and provisions of the Grid Code. The standing projected outputs shall apply until revised or updated by the relevant Generation Company.	Generation Companies shall provide to the Market Operator and the System Operator standing projected outputs in respect of their must dispatch generating units, priority dispatch generating units and intermittent RE resources with ESS for each dispatch interval in each trading day of the week in accordance with the relevant Market Manuals and provisions of the Grid Code. The standing projected outputs shall apply until revised or updated by the relevant Generation Company.	Adjust so that the same applies to Intermittent RE Resources with ESS.
3.5.5.6	A Trading Participant who fails to submit projected outputs for its must dispatch generating unit or priority dispatch generating unit as provided under Clause 3.5.5.5 may be liable for sanctions imposed under Clause 7.2.	A Trading Participant who fails to submit projected outputs for its must dispatch generating unit, priority dispatch generating unit or intermittent RE resources with ESS as provided under Clause 3.5.5.5 may be liable for sanctions imposed under Clause 7.2.	Adjust so that the same applies to Intermittent RE Resources with ESS.
3.5.5.7	Each Generation Company shall submit check data to be used by the Market Operator, in accordance with the relevant Market Manuals, to assist in	Each Generation Company shall submit check data to be used by the Market Operator, in accordance with the relevant Market Manuals, to assist in	Adjust so that the same applies to Intermittent RE Resources with ESS.

Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
	determining the validity of any projected output submitted in respect of a must dispatch generating unit or a priority dispatch generating unit under Clause 3.5.5.5	determining the validity of any projected output submitted in respect of a must dispatch generating unit, a priority dispatch generating unit or intermittent RE resources with ESS under Clause 3.5.5.5	
3.5.5.8	Must dispatch generating units shall comply with forecast accuracy standards, in respect of their projected outputs submitted under Clause 3.5.5.5, consistent with the Grid Code.	Must dispatch generating units and intermittent RE resources with ESS shall comply with forecast accuracy standards, in respect of their projected outputs submitted under Clause 3.5.5.5, consistent with the Grid Code.	Intermittent RE Resources with ESS are treated the same as must run generating units in regard to forecasts. Note that the Grid Code reference may need checking for consistency. (Grid Code is out of scope in this project.)
3.5.5.9	The Enforcement and Compliance Office shall evaluate annually the forecast accuracy standards complied with by must dispatch generating units in accordance with Clause 3.5.5.8.	The Enforcement and Compliance Office shall evaluate annually the forecast accuracy standards complied with by must dispatch generating units and intermittent RE resources with ESS in accordance with Clause 3.5.5.8.	Adjust so that the same applies to Intermittent RE Resources with ESS.
3.5.5.10	A Trading Participant who fails to meet the requisite forecast accuracy standards set out in accordance with Clause 3.5.5.8 in respect of projected outputs for a must dispatch generating unit submitted under Clause 3.5.5.5 may be liable for sanctions imposed under Clause 7.2.	A Trading Participant who fails to meet the requisite forecast accuracy standards set out in accordance with Clause 3.5.5.8 in respect of projected outputs for a must dispatch generating unit or intermittent RE resource with ESS submitted under Clause 3.5.5.5 may be liable for sanctions imposed under Clause 7.2.	Adjust so that the same applies to Intermittent RE Resources with ESS.
3.5.5.11	The Enforcement and Compliance Office shall report to the PEM Board and the DOE the monthly and annual compliance of each must dispatch generating unit to the forecast accuracy standards with respect to its projected outputs.	The Enforcement and Compliance Office shall report to the PEM Board and the DOE the monthly and annual compliance of each must dispatch generating unit or intermittent RE resource with ESS to the forecast accuracy standards with respect to its projected outputs.	Adjust so that the same applies to Intermittent RE Resources with ESS.
3.5.5.12	The Market Operator shall report to the PEM Board and the DOE the monthly and annual compliance of each must dispatch generating unit to the forecast accuracy standards with respect to its projected outputs.	The Market Operator shall report to the PEM Board and the DOE the monthly and annual compliance of each must dispatch generating unit or intermittent RE resource with ESS to the forecast accuracy standards with respect to its projected outputs.	Adjust so that the same applies to Intermittent RE Resources with ESS.
3.5.11.1	Each Trading Participant which has submitted standing offers or bids for each of its scheduled generating unit, battery energy storage system and pumped-storage unit may revise any of its market offers or market bids for any dispatch interval in any trading day of the current week-ahead market horizon in accordance with the timetable, and subject to Clause 3.5.11.4 and each revised market offer or	Each Trading Participant which has submitted standing offers or bids for each of its scheduled generating unit, non-RE plant with ESS, generating system with ESS, battery energy storage system, pumped-storage unit and dispatchable load may revise any of its market offers or market bids for any dispatch interval in any trading day of the current week-ahead market horizon in accordance with the timetable, and	Expanded to cover the new categories of resource that must submit market bids / offers.

Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
	market bid submitted shall provide the information set out in Appendix A1.	subject to Clause 3.5.11.4 and each revised market offer or market bid submitted shall provide the information set out in Appendix A1.	
3.5.11.3	Each Generation Company which has submitted projected outputs for its must dispatch generating units or priority dispatch generating units shall revise its projected outputs if it reasonably expects that any of its projected outputs will differ materially from those previously submitted.	Each Generation Company which has submitted projected outputs for its must dispatch generating units, priority dispatch generating units or intermittent RE resources with ESS shall revise its projected outputs if it reasonably expects that any of its projected outputs will differ materially from those previously submitted.	Adjust so that the same applies to Intermittent RE Resources with ESS.

1.7.4 Market Dispatch Optimization Model

The Market Dispatch Optimization Model (MDOM) model must reflect any important constraints related to the operation of ESS. In the case of hybrid facilities, the constraints have been made more general to ensure that any important critical constraints that impact charging and discharging of an ESS in general, or an integrated resource with an ESS, are accounted for. Note that once the clauses in the WESM rules applicable to the MDOM are addressed, this is immediately reflected in the market dispatch projection rules.

Table 11: WESM Rules Changes: Chapter 3.6 on Market Dispatch Optimization Model (MDOM)

Clause	Sub-Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
3.1.6.4	(m)	New Clause	Any additional constraints that impact the operational characteristics of energy storage systems or integrated RE with an energy storage system – such as constraints on charging, discharging, or storage level.	Reflect the requirement that the IEMOP's MDOM needs to reflect energy storage system constraints.

1.7.5 Scheduling and Dispatch Implementation

Section 3.8 of the WESM rules defines the responsibilities of the MO. The treatment of each registration category in terms of dispatch is summarized in *Table 12.* The corresponding proposed changes to the WESM rules Section 3.8 are set out in *Table 13* below.

Table 12: Registration Categories and Treatment in Dispatch

No.	Registration Category	Submits Bids / Offers?	Determination of Dispatch Targets	Charging Source Restrictions	Subject to Curtailment?	Must Run
1	Scheduled Generating Unit	Yes	Least Cost Dispatch of Offers	Generation Only	No	Yes
2	Non-Scheduled Generating Unit	No	Nomination Schedules	Generation Only	Yes	No

No.	Registration Category	Submits Bids / Offers?	Determination of Dispatch Targets	Charging Source Restrictions	Subject to Curtailment?	Must Run
3	Must Dispatch Generating Unit	No	Output Projection (Forecast)	Generation Only	Yes	No
4	Priority Dispatch Generating Unit	No	Output Projection (Forecast)	Generation Only	Yes	No
5	Intermittent RE Resource with ESS	No	Output Projection (Forecast)	Generation Only	Yes	No
6	Non-RE Plant with ESS	Yes	Least Cost Dispatch of Offers	Generation Only	No	Yes
7	Generating System with ESS	Yes	Least Cost Dispatch of Offers / Bids	Generation or Loading	No	Yes
8	Battery Energy Storage System	Yes	Least Cost Dispatch based on Bidirectional Offer	Generation or Loading	No	Yes
9	Pumped-Storage Unit	Yes	Least Cost Dispatch based on Bids / Offers	Generation or Loading	No	Yes
10	Dispatchable Load	Yes	Least Cost based on Bids	Loading	No	No
11	Scheduled Load	No	Nomination Schedules	Loading	Yes	No

Table 13: WESM Rules Changes: Chapter 3.8 on Scheduling and Dispatch Implementation

Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
3.8.1.(e)	Use the market dispatch optimization model to determine the target loading level in MW for each scheduled generating unit, battery energy storage system, pumped-storage unit, must dispatch generating unit, priority dispatch generating unit, non-scheduled generating unit, scheduled load and reserve facility for the end of that dispatch interval using the latest data from the System Operator and Trading Participants;	Use the market dispatch optimization model to determine the target loading level in MW for each scheduled generating unit, battery energy storage system, pumped-storage unit, must dispatch generating unit, priority dispatch generating unit, non-scheduled generating unit, scheduled load, intermittent RE resource with ESS, non-RE plant with ESS, generation system with ESS, dispatchable load and reserve facility for the end of that dispatch interval using the latest data from the System Operator and Trading Participants	Expand the MO's responsibility to cover the other types of registered generators / ESS's etc.
3.8.1.	Send to all Trading Participants a dispatch schedule that contains target loading levels in respect of their scheduled generating unit, battery energy storage system, pumped-storage unit, must dispatch generating unit, priority dispatch generating unit and non-scheduled generating units calculated under Clause 3.8.1(e) for each dispatch interval prior to the commencement of that dispatch interval in accordance with the relevant Market Manuals	Send to all Trading Participants a dispatch schedule that contains target loading levels in respect of their scheduled generating unit, battery energy storage system, pumped-storage unit, must dispatch generating unit, priority dispatch generating unit, non-scheduled generating units, intermittent RE resource with ESS, non-RE plant with ESS, generation system with ESS and dispatchable load calculated under Clause 3.8.1(e) for each dispatch interval prior to the commencement of that dispatch interval in accordance with the relevant Market Manuals	Expand the MO's responsibility to cover the other types of registered generators / ESS's etc.

Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
3.8.2.1	New Clause	Monitor the state of charge of battery energy storage systems against any dispatch or ancillary service obligations and advise the Market Operator and Trading Participant if this is not the case.	Monitoring requirement imposed on MO for BESS.
3.8.2.2.	the following information in respect of must dispatch generating units and priority dispatch generating units: (i) any output restrictions imposed by the System Operator or Market Operator on must dispatch generating units and priority dispatch generating units; (ii) the compliance of those units with those output restrictions; (iii) the compliance of must dispatch generating units and priority dispatch generating units with the other operating parameters imposed by the Grid Code; and (iv) any other information prescribed in the relevant Market Manuals.	the following information in respect of must dispatch generating units, priority dispatch generating units and intermittent RE resources with ESS: (i) any output restrictions imposed by the System Operator or Market Operator on must dispatch generating units and priority dispatch generating units; (ii) the compliance of those units with those output restrictions; (iii) the compliance of must dispatch generating units and priority dispatch generating units with the other operating parameters imposed by the Grid Code; and (iv) any other information prescribed in the relevant Market Manuals.	Expand to include intermittent RE resources with ESS.
3.8.2.4	New Clause	Before each dispatch interval, the System Operator under situations where charging of energy storage systems must be ceased should notify the Market Operator, to impose appropriate constraints in MDOM that will ensure that the energy storage systems and dispatchable loads will not be scheduled to consume electricity.	Requirement from stage 1 of the project - to have facility to stop charging of BESS, PSH and other dispatchable loads if the System Operator has notified the MO to do so.
3.8.3.5	The System Operator shall instruct a must dispatch generating unit or a priority dispatch generating unit to restrict its output or constrain its ramp rate to a level specified by the System Operator, but only while the grid is not operating in normal state, in accordance with the Grid Code and the relevant Market Manuals.	The System Operator shall instruct a must dispatch generating unit, a priority dispatch generating unit or an intermittent RE resource with ESS to restrict its output or constrain its ramp rate to a level specified by the System Operator, but only while the grid is not operating in normal state, in accordance with the Grid Code and the relevant Market Manuals.	Expand to cover intermittent RE resource with ESS
3.8.3.6	If the System Operator has instructed a must dispatch generating unit or a priority dispatch generating unit to restrict its output, the System Operator shall instruct the generating unit to remove the restriction as soon as practicable after the actual or potential system security issue has been resolved.	If the System Operator has instructed a must dispatch generating unit, a priority dispatch generating unit or an intermittent RE resource with ESS to restrict its output, the System Operator shall instruct the generating unit to remove the restriction as soon as practicable after the actual or potential system security issue has been resolved.	Expand to cover intermittent RE resource with ESS
3.8.4.1	Scheduled generating units and priority dispatch generating units that are dispatched shall reach the target loading level by the end of that dispatch interval	Scheduled generating units, priority dispatch generating units , battery energy storage systems, pumped-storage units, intermittent RE resource with ESS, non-RE plant	Expand to cover the new generation types.

Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
	and generate in accordance with the dispatch schedules communicated pursuant to Clause 3.8.1 (g) and in accordance with the dispatch conformance standards specified in Clause 3.8.5 unless required to respond to a direction in accordance with Clauses 6.3 and 6.5.	with ESS, generation system with ESS and dispatchable load that are dispatched shall reach the target loading level by the end of that dispatch interval and generate in accordance with the dispatch schedules communicated pursuant to Clause 3.8.1 (g) and in accordance with the dispatch conformance standards specified in Clause 3.8.5 unless required to respond to a direction in accordance with Clauses 6.3 and 6.5.	
3.8.4.3	If the projected output of a must dispatch generating unit has been restricted, as communicated in accordance with Clause 3.8.1(h), the must dispatch generating unit shall ensure its output does not exceed the value included in the dispatch schedule.	If the projected output of a must dispatch generating unit or an intermittent RE resource with ESS has been restricted, as communicated in accordance with Clause 3.8.1(h), the must dispatch generating unit shall ensure its output does not exceed the value included in the dispatch schedule.	Adjust clause for intermittent RE with ESS.
3.8.5.2	dispatch conformance standards that will apply to generating units and to scheduled load facilities;	dispatch conformance standards that will apply to generating units and, to scheduled load facilities, battery energy storage systems, pumped-storage units, intermittent RE resource with ESS, non-RE plant with ESS, generation system with ESS and dispatchable load;	Adjust to cover the various new generation categories.

1.7.6 Treatment of Load Shedding, Excess Generation and Reserve Violation

Explicit provisions in the WESM rules are required for trading participants to respond to orders from the SO to cease charging. The change in *Table 14*, addresses this.

Table 14: WESM Rules Changes: Chapter 3.9 on Treatment of Load Shedding, Excess Generation and Reserve Shortfall

Clause	Sub-Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
3.9.1(A)	new	n/a	The System Operator may direct a WESM Member operating a battery energy storage system or a pumped-storage unit to cease charging if deemed necessary to manage power system security and/or reduce (or avoid) load shedding.	Right for System Operator to issue cease charging order (from Stage 1 of project).

1.7.7 Determination of Market Prices

The recommendation is to impose a market price cap and market price floor formally on the market prices. This is to create certainty for ESS operating in the market where an unfloored market price floor could be an unacceptable risk. A maximum price cap assists in understanding the maximum price arbitrage opportunity that could be leveraged in the WESM which is important to the development of a

business case for energy market participation of an ESS. The proposed addition to the WESM rules is set out in *Table **15***.

Table 15: WESM Rules Changes: Chapter 3.10 on Determination of Market Prices

Clause	Sub-Clause	Current Clause(s)	Revised or New Clause(s)	Rationale / Basis of Change
3.10.7	new	n/a	Market Price Cap and Market Price Floor (a) The market price cap is the maximum price that the ex-ante market price is allowed to be and is set by ERC. Ex-ante market prices must be capped at the market price cap. (b) The market price floor is the minimum (negative) price that the ex-ante market price is allowed to be and is set by ERC. Ex-ante market prices are to be floored at the market price floor. (c) Reserve prices must be capped at the market price cap, and floored at 0 PhP/MWh. (d) The market price cap and market price floor should be periodically reviewed by the Market Operator, PEMC and ERC and revised if necessary, based on considerations of systemic price risk, signal for investment and ensuring the spread between market price cap and market price floor is adequate for energy storage devices to operate efficiently.	Recommendation from Stage 1 to have a formal price cap / floor added to market.

1.8 CONCLUSIONS

This summary report contains market treatments for the new categories of generation introduced under the final circular of the DOE (DC2019-08-0012). Changes to the WESM rules have been proposed to accommodate the new categories.

Most of the changes pertain to the registration categories of generators and ensuring that their bid/offer or forecasting arrangements are clarified where it is necessary, and consistently treated throughout the rules.

Areas of pricing and settlement do not need changes as the existing rules apply to any facility once it has been registered by a participant in the WESM.