SECOND INTERIM REPORT

Upgrading Energy Regulations for Energy Regulatory Commission of the Philippines

Report for: Energy Transition Partnership

Ref. AR/THMCO/TH/ETP/2021/011

Ricardo ref. ED 15884 Issue: 2 15 August 2022

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Energy Transition Partnership

Customer reference:
AR/THMCO/TH/ETP/2021/011

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ED 15884

Date:
15 August 2022

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EXECUTIVE SUMMARY

This report (Second Interim Report) covers project implementation activities during the period 1 May 2022 to 31 July 2022, which builds upon the progress achieved during the period 1 January 2022 to 30 April 2022 (as reported in the First Interim Report). Key highlights during this period are summarised below.

Finalisation of project scope of work

During the online debriefing meeting on 20 May 2022, the following changes of project tasks were confirmed:

- Task 5 will be changed from 'sustainable energy initiatives for smarter and greener city' to 'regulations' related to power quality and reliability standards. ERC will issue a new TOR for this task.
- Task 6, the change in scope of work was already expressed during the inception meeting, from 'procurement of consultancy services for the promulgation of the distribution systems loss cap' to review and analysis of new distribution systems loss cap'

Progress in the implementation of project tasks

The implementation status of each task is summarised as follows:

- *Task 1. Revisiting the existing technical, operating and performance standards for renewable energy generators*
    - 2 webinars were carried out to present key concepts and international best practices (for ERC and the Department of Energy) (6 May 2022 and 15 June 2022)
    - Drafts of the updated Philippine Grid Code and Philippine Distribution Code were submitted to ERC (22 June 2022)
    - Line by line discussion of the draft codes was carried out on 12 July 2022.
    - ERC is still reviewing the draft updated codes.
- *Task 2. Rules and regulations for ancillary services responsive with variable renewable energy technology*
    - ERC is currently finalising its draft regulations. ERC has yet to issue this document.
- *Task 3. Rules and regulations for smart grid facilities*
    - A webinar to present key concepts and international best practices was scheduled on 10 August 2022 (results of this webinar will be reported in the Third Interim Report)
- *Task 4. Revisions and amendments on the existing Philippine Small Grid Guidelines*
    - 1 webinar was organised to present key concepts and international best practices was organised on 14 June 2022 which was participated by ERC and DOE.
    - Revised Guidelines was submitted to ERC on 21 July 2022.
- *Task 5. Regulations related to Power Quality and Reliability Standards*
    - ERC has yet to issue the terms of reference for this task
- *Task 6. Review and analysis of new distribution systems loss cap*
    - Preliminary analysis was presented to ERC on 20 July 2022.
    - Revision of analysis is being carried out based on ERC's feedback. ERC provided additional data for further analysis.
- *Task 7. Strategic review of ERC regulatory framework.*
    - Analysis is being carried out.

Project timeline revision

Data provision, feedback provision, analysis and updating of rules and regulations required longer time than anticipated. Project completion is estimated to slide to early 2023.

Contract variation

With above developments, a contract variation is anticipated. The variation covers change in project completion date and additional man-days for increased scope of work. This variation could be finalised between October and December 2022.

1. PROJECT IMPLEMENTATION STATUS

This Second Interim Report covers activities carried out during the period 1 April 2022 to 31 July 2022 and presents the changes in the assignment, the status of project task implementation, and the new timeline.

Ricardo Energy & Environment (REE) joined the Energy Transition Partnership (ETP) mission visit to Manila on 6 May 2022. REE participated as observer to the signing of the cooperation agreement between ERC and ETP in the morning. In the afternoon REE organised the first webinar covering Task 1 best practices and recommendations as well as discussion of the overall project tasks.

Figure 1: Signing of Co-operation Agreement (left) and Task 1 Webinar (right)

1.1 CHANGES IN PROJECT TASKS

Changes in the project tasks were finalised during the online debriefing session held last 20 May 2022. The summary of the discussion and the revised slide presentation is presented in **Appendix 1**. Key changes are in Task 5 and Task 6. The Energy Regulatory Commission (ERC) team requested the change in Task 5 activity during the debriefing session last 20 May 2022. On the other hand, ERC had already expressed the change for Task 6 during the Inception Meeting held in December 2021. The corresponding time change implications will be discussed in the following section.

Table 1: Revised Project Tasks

Original Task	New Task
Task 1. Revisiting the existing technical, operating and performance standards for renewable energy generators	no change
Task 2. Rules and regulations for ancillary services responsive with variable renewable energy technology.	no change
Task 3. Rules and regulations for smart grid facilities	no change
Task 4. Revisions and amendments on the existing Philippine Small Grid Guidelines	no change
Task 5. Sustainable energy initiatives for smarter and greener city	Regulations related to Power Quality and Reliability Standards
Task 6. Procurement of consultancy services for the promulgation of the distribution systems loss cap	Review and analysis of new distribution systems loss cap
Task 7. Strategic review of ERC regulatory framework	no change

1.2 PROGRESS IN THE IMPLEMENTATION OF PROJECT TASKS

Figure 2: Photo shot of one of the webinars

Table 2: Project Status

Project Task	Progress and Current Status
Task 1. Revisiting the existing technical, operating and performance standards for renewable energy generators	
• Update of the Philippine Grid Code	• Best practice review and recommendations were reported in the First Interim Report submitted on **30 March 2022**. • Webinar on the best practice and recommendations was organised on **6 May 2022** (with ERC participants). Presentation slides and summary of discussions are presented in **Appendix 2**. This webinar combines the Philippine Grid Code and Philippine Distribution Code. • Webinar on the best practice and recommendations was organised on **15 June 2022** (with Department of Energy participants). The same presentation slides shown in Appendix 2 were used. • Updated Philippine Grid Code was submitted to ERC on **22 June 2022**. The draft document is shown in **Appendix 3**. • Line by line discussion with ERC on the updated Grid Code was organised on **12 July 2022**. • **We are currently waiting for the written feedback from ERC to finalise the revision of the Philippine Grid Code.**
• Update of the Philippine Distribution Code	• Best practice review and recommendations were reported in the First Interim Report submitted on **30 March 2022**. • Webinar on the best practice and recommendations was organised on **6 May 2022** (with ERC participants). This webinar combines the Philippine Grid Code and Philippine Distribution

Project Task	Progress and Current Status
	Code. The same presentation slides shown in **Appendix 2** were used. • Webinar on the best practice and recommendations was organised on **15 June 2022** (with Department of Energy participants). The same presentation slides shown in Appendix 2 were used. • Updated Philippine Distribution Code was submitted to ERC on **22 June 2022**. The draft document is shown in **Appendix 4**. • Line by line discussion with ERC on the updated Distribution Code was organised on **12 July 2022**. • **We are currently waiting for the written feedback from ERC to finalise the revision of the Philippine Distribution Code.**

Key points discussed during the 6 May 2022 webinar with participants from ERC:

- ERC outlined its process for amendment of grid code and distribution code/ ERC resolutions/rules.
- The definition of large generators in PGC and PDG should be aligned.
- A separate chapter on BESS will be written PGC. Definition of ESS will be aligned with those in DOE DC 2019-08-0012.
- HVDC will be included in PGC.
- The penetration of variable RE varies in each national power system, hence it may not be practical to set a maximum RE penetration in PGC.
- Pumped storage definition will be considered once DOE's policy is issued. BESS can provide voltage regulation while charging.
- ERC recommends Ricardo to revise the recent version of the ancillary services regulation. ERC will share the final version of the regulation once approved.
- ERC is flexible to adopt a Smart Grid Framework which is different from the current DOE Circular on Smart Grids. The USAID is currently supporting a project on Rules for Advanced Metering Infrastructure. A technical committee for smart grid standards with Bureau of Philippine Standards could be considered.
- Under small grids, the new law on microgrids should be considered. The IRR currently being drafted by DOE in coordination with the ERC (ERC staff part of TWG). New net metering rules (that allow net metering in off-grid areas) should also be included in the revised Small Grids Guidelines.
- Under energy efficiency, amorphous distribution transformers are not included in the DOE energy efficiency manual. ERC is considering replacing this task to a review on the rules related to CAPEX guidelines for private DUs and ECs.
- For system loss reduction, the focus would be for private distribution utilities.
- ERC is unsure as to specific output for this task. ERC suggested that the references for this task are the national policy targets (in addition to NDC) such as National Renewable Energy Plan (NREP) 2020-2030 and EV targets.
- For the project tasks, ERC recommended to change the project 'Phases' to 'Components'.

Key points discussed during the 15 June 2022 webinar with participants from the Department of Energy (DOE):

- The current PGC and PDC is overdue for review and amendments. Ricardo will prepare the draft revisions of the codes. The revisions will go through the ERC process of rulemaking.
- DOE is currently reviewing existing regulations. In the RA 11646, the IRR included a statement requiring ERC to issue a resolution on the performance standards for VRE. In the recent revision of PDC, VRE facilities were already included.
- The use of VRE and battery energy storage are increasing and their impacts on the grid are becoming significant. It is important on how to regulate the use of these technologies. Interaction with ERC is important.
- DOE had already issued policies related to VRE and BESS. DOE will share the policy documents as well as the IRRs for the Microgrid Act.

Project Task	Progress and Current Status
• Off-grid areas soon to be connected to on-grid areas include Mindoro (Mindoro-Batangas interconnection), Palawan (Palawan- Mindoro-Batangas interconnection). NGCP has already applied to ERC the interconnection of Marinduque to Quezon. Transco is also considering interconnection of Catanduanes via Camarines Sur. • Small grids are onerous to be interconnected. But there should be an automatic compliance once connected to the grid. There should be consistency with the PGC, the PDC and the PSGG to ensure compliance and seamless interconnection.	
Task 2. Rules and regulations for ancillary services responsive with variable renewable energy technology	
• Update of the ancillary services rules and regulations	• Best practice review and recommendations were reported in the First Interim Report submitted on **30 March 2022**. • **We are currently waiting for ERC's draft regulations for updating.**
Task 3. Rules and regulations for smart grid facilities	
• Rules and regulations for smart grid facilities	• Best practice review and recommendations were reported in the First Interim Report submitted on **30 March 2022**. • Presentation of best practice review and recommendations is scheduled on **10 August 2022**.
Task 4. Revisions and amendments on the existing Philippine Small Grid Guidelines (PSGG)	
• Updated Philippine Small Grid Guidelines	• Best practice review and recommendations were reported in the First Interim Report submitted on **30 March 2022**. • Webinar to present the best practice review and recommendation was organised on **14 June 2022**. Presentation slides and summary of discussions are presented in **Appendix 5**. • The draft updated Philippine Small Grid Guidelines was submitted to ERC on **21 July 2022**. The draft document is shown in **Appendix 6**. • **We are currently waiting for the written feedback from ERC to finalise the revision of the Philippine Small Grid Guidelines.**
Key points discussed during the 14 June 2022 webinar with participants from ERC and DOE: • The existing PSGG was issued in 2013 based on the older version of PGC and PDC. The focus was conventional generators and there was no categorisation of RE generators during that time. The objective of the current review is to integrate recent modifications in PGC to PSGG. • The dispatch operators when the PSGG was developed were distribution utilities. But now TRANSCO/NGCCP is the designated system operator. Small grids need to be guided in terms of integrating VRE and BESS. • DOE is happy to be invited to be part of the revision process. The consultant needs to review related policies to align ERC regulations with DOE policies. This includes the Microgrid Systems Act which was recently passed into law and its IRRs are already prepared and available for consultation. There is a need to harmonise the policy and regulation. • The functions, operations and requirements in the PGC and PDC should be the same in PSGG but differs in sizes. The current trend is to create generation connection conditions regardless of whether generation is embedded or not. Sizes are important for both grid and off-grid systems, but the harmonics, frequency and voltage would be the same. The requirements must be aligned with international standards. • The IEEE 1547 series and IEC TS 62257 will be reviewed and considered when revising the PSGG. • The PSGG will incorporate reserves for the VRE.	
Task 5. Sustainable energy initiatives for smarter and greener city	

Project Task	Progress and Current Status
• Regulations related to Power Quality and Reliability Standards	• **We are still waiting for the task TOR from ERC**. Activities related to this task will commence once we receive the TOR.
Task 6. Distribution System Loss Cap Review	
• Distribution loss cap review and analysis	• ERC sent the data to Ricardo on 5 May 2022. • Draft analysis was presented on **20 July 2022**. The slides used in the presentation is presented in **Appendix 7**. • **Revision of analysis is being carried out with new data provided by ERC.**
Key points discussed during the online meeting held last 20 July 2022 with ERC participants: • Data provided by utilities to ERC are inconsistent. ERC will review and request for better quality data from private utilities. Non-technical losses do not include PDU's own uses. • Utilities under EPZs (LEZ and PEZA) will not be considered as PDUs. • There are additional data submission from private utilities for 2021. ERC will forward this information to Ricardo E&E. • ERC proposed to cluster private DUs in terms of targets. Clustering could be based on key technical characteristics (consumer density, feeder network, etc). ERC will forward this information to Ricardo E&E. • ERC Resolution 12 series of 2021 (as additional reference).	
Task 7. Strategic review of ERC regulatory framework	
• Assessment of ERC's regulatory framework and options for regulatory areas	• Reference studies, reports, regulatory information are being collected and analysed. • The enlargement of scope of work in Task 6 above (as a result of ERC's modification of tasks) slightly impacted the focus of Task 7. But this this will be achieved within the overall project time schedule.

1.3 OTHERS

In the context of this project, our legal and regulatory expert was invited to moderate a session of a workshop organised by another ETP/UNOPS funded project on 20 July 2020.

1.4 POTENTIAL PROJECT EXTENSION

The change in project scope and the longer time requirement from ERC to collect data and information and provide feedback on the draft submissions entail potential slipping of project deliverables to end of this year until early next year. The next section presents new target dates for tasks deliveries.

1.5 CONTRACT VARIATION

Based on the above developments, we propose that a contract variation will be issued. The variation includes the following:

- New project completion date
- Increase number of days allocation for Task 6
- Increase number of days allocation for Task 5 (the increase can be estimated once we receive the TOR from ERC)

2. REVISED PROJECT TIMELINE

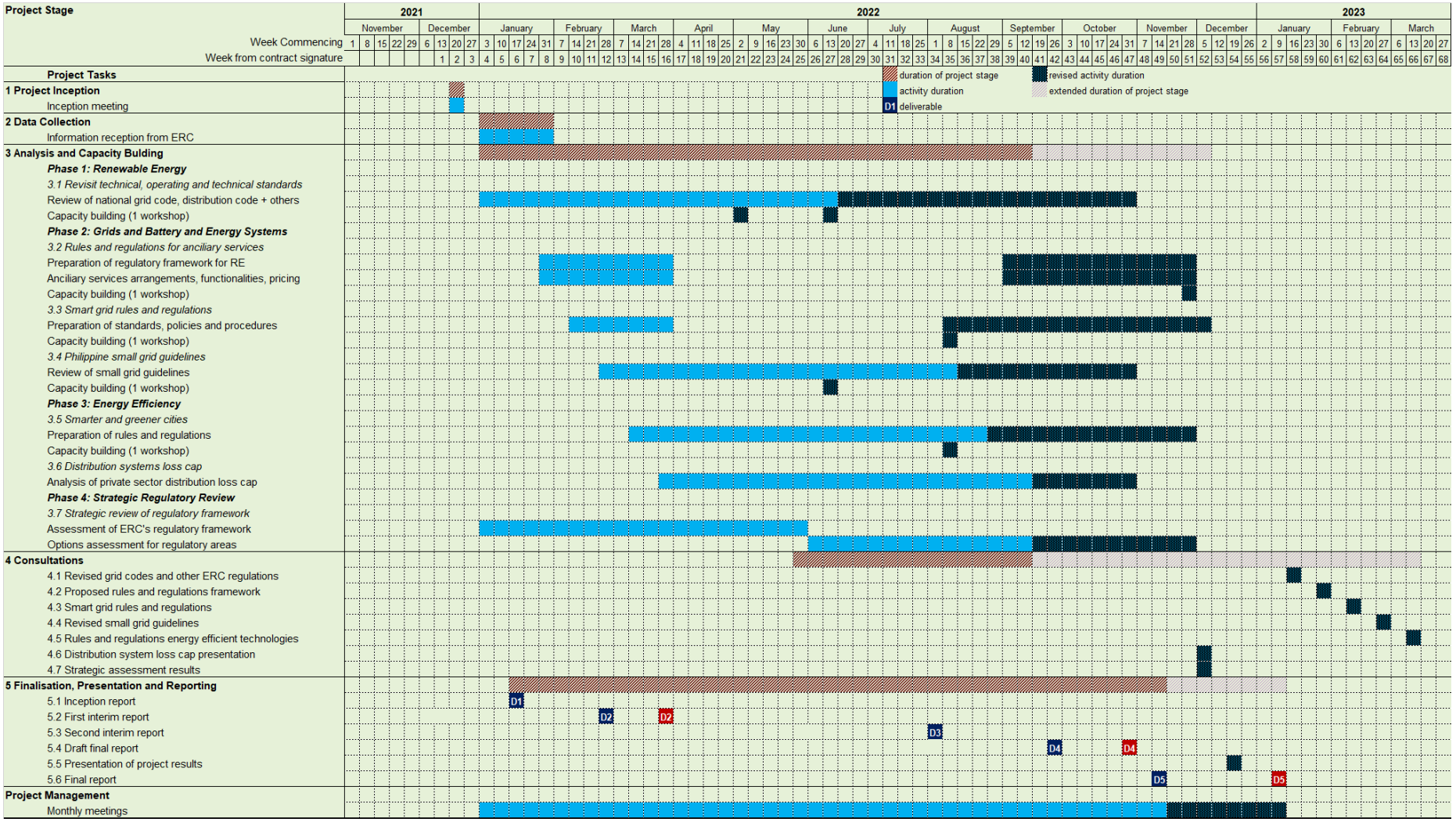

Figure 3: Revised Project Work Plan

3. UPDATED RESULTS BASED MONITORING FRAMEWORK

ETP Results Based Monitoring Framework

Project:	**Upgrading Energy Regulations for the Energy Regulatory Commission of the Philippines(ERC)**					
Impact Level: Increased deployment of renewable energy in Southeast Asia						
Long-Term Outcome: Smooth integration of renewable energy, enery storage and demand management in Philippines electric grid						
Intermediate Strategic Outcomes	**Project Indicator**	**Baseline**	**Target**	**Actual/Accomplishment**	**Data sources**	**Means of Verification**
Select Outcomes applicable to your project and indicate your project-specific output.	Indicate the project-specific indicators for the selected outcome	Indicate the baseline for your specific output	Set target (quantitative preferably)	Provide the actual as part of the progress report	Specify data sources for project results	Specify means to verify the target
Strategic Outcome 1. Strengthened Enabling Policy Environment						
Short-Term Outcome 1.1 National RE and EE policies, regulations, standards, and energy plans reflect a clear commitment to Energy Transition agenda and integrated into sectoral plans to contribute to the achievement of Paris Agreement	Updated regulations to ensure achievement of RE and EE targets stipulated in the Government's NDC	NA	IN 1.1-03: Integration of RE technologies • 2 Grid Codes updated (National and Distribution) • x number of resolution, rules and regulations updated Ancillary services • 1 updated rules and regulations Smart grid facilities • 1 updated rules and regulations Small grids • 1 amended Philippine small grid guidelines Energy efficiency • 1 draft rules and regulation on energy efficiency Distribution System Loss Cap • 1 analysis reviewing the system loss cap for private distribution companies Regulatory Framework • 1 analysis on strategic review of ERC regulatory framework	IN 1.1-03: Integration of RE technologies • draft revisions of the Philippine Grid Code and the Distribution Code submitted to ERC Small grids • draft amendment of the Philippine small grid guidelines submitted to ERC Distribution systems loss cap • analysis of systems loss cap for private distribution utilities	1. List and documentation of submitted Codes, resolutions, rules and regulations to ERC Board for approval 2. Project report 3. TOR and RfP documents	1. Number of draft amendemnts in legislative framework including electricity regulatory codes, resolutions and rules 2. Number of amendements finalised and approved by ERC 3. Report on systems loss cap for private distribution utilities 4. Report on strategic review of the regulatory framework
Short-Term Outcome 1.3 Energy transition agenda is centrally led and coordinated effectively at a National-level agency/institution that is tasked to champion the cause with right level of authority	Alignment of ERC regulatory framework with national NDC and low-carbon energy system targets	NA	Strengthened ERC with comprehensive outlook on RE and EE		1. New and amended ERC regulations 2. Project report	2. Number of electricity regulatory codes, resolutions and rules issued/proposed by ERC
	Indicator 2					
Strategic Outcome 2. De-risking Investments in RE and EE projects						
Strategic Outcome 3. Extending Smart Grids						
Strategic Outcome 4. Knowledge and Awareness Building						
Short-Term Outcome 4.1 Stakeholders (relevant Government entities, Public sector companies, Financial institutions, Private entities, Academia, and Consumers) involved in the RE/EE value chain, are knowledgeable and better informed to advance the energy transition agenda	Capacity developed at ERC and key stakeholders on RE, battery storage, ancillary services, and EE		5 weminars and 5 regulation drafting consultations.	• 3 webinars organised to present and discuss the theory, best practices and proposed modifications of the Philippine Grid Code and Distribution Code (1 for ERC, 1 for Philippine DOE, 1 combined) • 1 webinar organised to present and discuss the theory, best practices and proposed modifications of the Philippine small grid guidelines (participants both from ERC and Philippine DOE) • 1 online meeting presenting the preliminary results of the distribution loss cap for distribution utilities	Implementation report	1. Webinar proceedings - attedance, participation duration 2. Feedback survey
	Indicator 3					
	Indicator 4					
	Indicator 5					
	Indicator n					

Project Assumptions

1. ERC stakeholders are willing to participate in consultation process
2. ERC stakeholders approve recommendation and draft amendments to regulations provided by the implementing partner
3. All stakeholders are responsive and follow the proposed timeline
4. ERC stakeholders participate in training workshops
5. ERC personnel share the required data and documents without delay or omission

APPENDICES

Appendix 1 Mission Debriefing Presentation Slides

ENERGY TRANSITION PARTNERSHIP

ERC

RICARDO

Upgrading Energy Regulations for the Energy Regulatory Commission (ERC) of the Philippines

Debriefing Meeting
20 May 2022
9.00-10.00 AM

The ETP brings together a range of partners focused on supporting the energy transition in Southeast Asia including:

UNOPS, Children's Investment Fund Foundation, AFD, IKEA Foundation, Environment and Climate Change Canada, Department for Business, Energy & Industrial Strategy, HIGHTIDE, GROWALD FAMILY FUND, SEQUOIA CLIMATE FUND

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Discussion Results

ERC | ENERGY TRANSITION PARTNERSHIP | RICARDO

Component 1: Renewable Energy

Task 1. Revisiting the Existing Technical, Operating and Performance Standards for RE Generators

- (Update the issued 1) Philippine Grid Code and 2) Philippine Distribution Code as well as other 3) ERC resolutions, rules and regulations on RE technologies)
  - Comments were discussed and addressed during the discussion part of the webinar.
  - Ricardo will integrate its recommendations into the regulatory documents (word files of the documents will be needed). ERC however informed the meeting that they do not have word files of the requested documents.

Component 2: Grid and Battery

Task 2. Rules and Regulations for Ancillary Services Responsive with VRE Technology

- Establish the regulatory framework for the entry of modern RE technologies, aided, its related features, services, functionalities and pricing methodology
  - Ricardo will update the ERC AS draft. The ERC draft will be available by end of 30 June 2022?)

Task 3. Rules and Regulations for Smart Grid Facilities

- Ensure that the technology embedded in smart grid facilities are compliant with international safety standards and technical standards for device specification and network interconnection
  - ERC has flexibility to adopt a framework different from the DOE, if necessary for its regulatory mandate and provided it is not inconsistent with policy.
  - Further discussions will be during the webinar

Task 4. Revisions and Amendments on the Existing Philippine Small Grid Guideline

- Update the issued Philippine Small Grid Guidelines to cover modern technologies used in the electric power systems
  - Key points for considerations: QTP standards, new Microgrid Act, new net metering rules.
  - Small grids are for missionary electrification. Standards will be harmonized with grid codes but could be with wider tolerance.
  - The next webinar will be for this task. Tentatively – mid June 2022.

Discussion Results

Component 3: Energy Efficiency

Task 5. Sustainable Energy Initiatives for Smarter and Greener City (to be replaced)

- Develop streamlined rules and regulations for the utilization of energy efficient technologies
  - ERC proposed to modify this Task to preparation of a new regulation related to Power Quality and Reliability Standards (SAIDI, SAFI, etc).
  - ERC will provide ETP/Ricardo a concept note of this proposed activity. Based on this information, Ricardo and ETP will discuss its implications with respect to timing and time allocations.

Task 6. Promulgation of the Distribution Systems Loss Cap

- Develop a new system loss caps based on the criteria provided in the EPIRA
  - Data was provided by ERC. Focus on private DUs. New sets of data will be sent to Ricardo.
  - If new data will be sent earlier, results will be ready from mid-June. Webinar will be organised towards end of June 2022.

Component 4: Regulatory Review

Task 7. Strategic Review of the Regulatory Framework to Assess Its Pertinence and Pursuit of Energy Transition

- Strategic overview of ERC's regulatory framework in view of the Philippine NDC
  - ETP is particularly looking at the output of this task. Current review and analysis is on-going.

Project Outputs

- ERC clarified that project outputs are finished products (draft regulations) that will be used for public consultations.

Discussion Results

Meeting Participants

Energy Regulatory Commission (ERC)

- Engr. Legario Galang
- Engr. James Roen Soriano
- Engr. Jayson Corpuz
- Engr Ranillo Maatubang

Energy Transition Partnership (ETP)

- Mr John Cotton
- Mr Maria Fritzie Vergel

Ricardo Energy and Environment

- Dr Romeo Pacudan
- Engr Silverio Navarro
- Engr Jessie Todoc
- Atty Miko Lopez

Appendix 2 Philippine Grid Code and Philippine Distribution Code: Best Practice Review and Recommendations

Phase 1. Renewable Energy

Task 3.1. Revisiting the Existing Technical, Operating and Performance Standards for RE Generators

- Specifically: update the issued 1) National Grid Code and 2) Distribution Code as well as other 3) ERC resolutions, rules and regulations on RE technologies
- Methodology
  - Check and update National Grid Code, Distribution Code and other related ERC resolutions to include RE technologies, specifically:
    - **RE generator connection conditions** including fault ride through capability, short circuit fault currents, provision of voltage control and reactive power, synthetic inertia, operating reserves, frequency control and island detection.
    - **System Operations** to include requirements for RE power variability potentially impacting frequency and voltage control
    - **System Planning and Operations** specifically, in the areas of demand forecasting with embedded RE resources, RE forecasting, planning and operating reserve requirements, dispatching a large amount of smaller power plants, maintaining system inertia and maintaining short circuit levels.
  - We will be to **review** the existing **technical, operating and performance standards** and **benchmark** this against best **international practice**.
  - A **draft** with proposed changes will be **presented to ERC and its key stakeholders** with training on the various new requirements for RE.
  - Stakeholders will have **multiple opportunities to comment** on the documents before documents are finalised

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Phase 1. Renewable Energy

1. Introduction to Benchmarking

- The Philippine Grid Code - 2016 Edition (PGC) and Distribution Grid Code 2017 Edition (DGC) generator connection conditions are reviewed and compared to one another.
- The grid code connection requirements are benchmarked against:

1. IEEE 1547-2018 standard for embedded generation,
2. FERC Order 2003a and pro forma Large Generator Interconnection Agreement,
3. NERC Reliability Standards for the Bulk Electric Systems of North America, Updated June 28, 2021,
4. ACER - Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators. This code specifies the generator connection requirements for Europe, Nordic, and Ireland.
5. Great Britain – The Grid Code, 4 September 2019.
6. South African Grid Code – Network Code version 10, Grid Connection Code for Renewable Power Plants (RPPs) Connected to the Electricity Transmission System (TS) or the Distribution System (DS) in South Africa version 3.0, and Grid Connection Code for Battery Energy Storage Facilities (BESF) Connected to the Electricity Transmission System (TS) or the Distribution System (DS) in South Africa version 5.2.

Phase 1. Renewable Energy

2. General Observations

Grid code sections

- Europe and Great Britain have moved away from **specific grid code sections for each technology** and now have requirements for **synchronously connected and non-synchronously connected (inverter) generators**.
- This makes **grid code easier to manage** and there's not misalignment between technologies.
- The question for Philippines is whether this is desired or possible?

Introduction of new grid code requirements

- Most codes are clear that **new requirements only apply to new generators**.
- Europe will give new requirements **a year to come into force** to ensure generators being built have time to comply.
- Without such clauses grid code changes become **difficult to implement** as they impact exiting generators.
- With technology moving so fast it is important that the **latest good international practice** is followed.

Phase 1. Renewable Energy

3. Generator and Power Plant size

Philippines Distribution Grid Code - section 4.4.1 Table 4.1

Category	Installed Capacity and Characteristics
Large Conventional	Conventional Embedded Generating Plant with an aggregated Installed Capacity of **10 MW or more**.
Large VRE	VRE Embedded Generating Plant with an aggregated Installed Capacity of **10 MW or more**.
Medium	Conventional or VRE Embedded Generating Plants with Installed Capacity **larger than 1 MW** which do not qualify as Large Embedded Generating Plant.
Intermediate	Conventional or VRE Embedded Generating Plants with Installed Capacity larger than 100 kW and equal to or less than 1 MW; and Conventional Embedded Generating Plants with Installed Capacity lower or equal to 100 kW connected to MV networks.
Small	Embedded Generating Plant with Installed Capacity larger than 10 kW and equal to or less than 100 kW connected to LV networks.
Micro	Embedded Generating Plants with Installed Capacity lower or equal to 10 kW connected to LV networks.

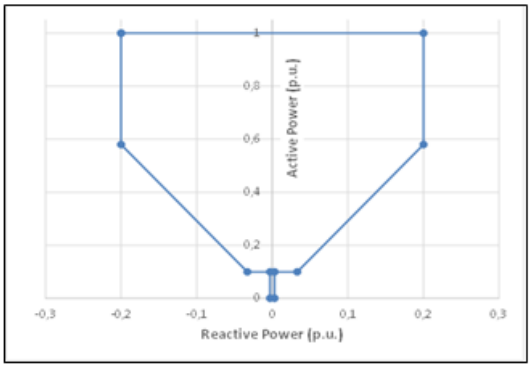
Recommendations for defining plant size

- The Philippines PGC and DGC have used **10 MW as the threshold for a large generator**. This aligns with the Irish code requirements.
- The USA and South African codes have set the large generator at ≥ 20 MW which could be considered for the Philippines.
- The PGC could be clearer that the code applies to **all generators connected to the transmission** system and **clearly define a large generator as being ≥ 10 MW** so the reader doesn't have to look in the DGC.

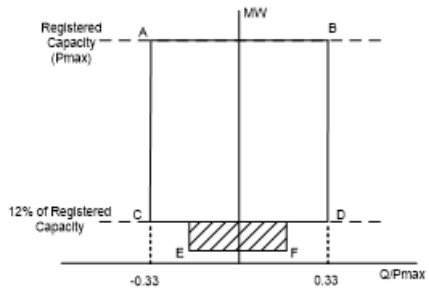
Phase 1. Renewable Energy

4. Reactive Power Range

Philippines reactive power capability for large wind farms and VRE – sections PGC GCR 4.4.3.3.2 and DGC 4.4.3.3.2



Ireland



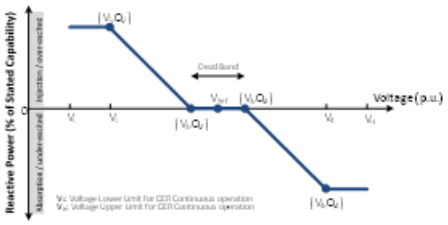
UK, South Africa and IEEE 1547

- Threshold is 20%
- Q/Pmax range of ±0.33, equivalent to 0.95 leading and 0.95 lagging

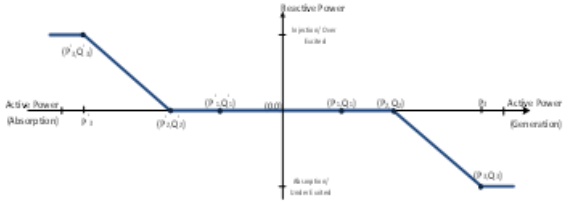
Phase 1. Renewable Energy

5. Voltage Control

IEEE 1547-1018 voltage-reactive power requirements



IEEE 1547-2018 active power reactive characteristic



South African Renewable Connection Code	A1	A2	A3	B1	B2	C
Plant Size	<13.8 kW	≥13.8 kW	≥100 kW	≥1 MW	≥5 MW	≥20 MW
Power factor control	-	-	✓	✓	✓	✓
Reactive power control	-	-	-	✓	✓	✓
Voltage control	-	-	-	✓	✓	✓
Remote control capability	-	-	✓	✓	✓	✓

Phase 1. Renewable Energy

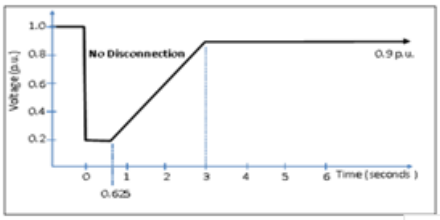
6. Recommendations for specifying reactive power capability and voltage control requirements

- The PGC and DGC are **lenient on non-synchronously connected generators** when it comes to providing **reactive support at low power outputs**.
- It is proposed that full reactive power capability be provided **from 0.2pu of rated power** for **all new large generators** to ensure adequate voltage control.
- Large generator range increased to **Q/Pmax range of ±0.33**, equivalent to 0.95 leading and 0.95 lagging
- The South African grid code conditions are quite recent and reactive power and **voltage control is required from 1 MW**.
- The lower level could be considered for Philippines.

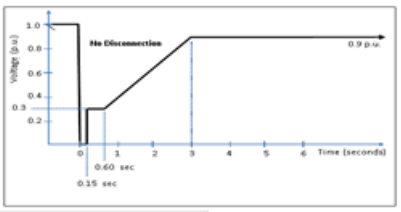
Phase 1. Renewable Energy

7. Fault Ride Through Capability

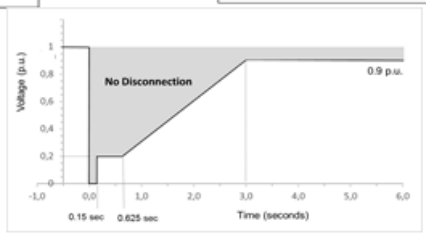
PGC Wind turbine fault ride through capability – section GCR 4.4.3.4.1



PGC Large PV fault ride through capability – section GCR 4.4.4.4.3



DGC Large, medium and intermediate VRE fault ride through capability – section 4.6.6.1



Phase 1. Renewable Energy

8. Recommendations for Fault Ride Through Capability

- The fault ride through capabilities for small and micro embedded generators is aligned to IEEE 1547-2018 requirements.
- The fault ride through capabilities requirements for large, small and intermediate embedded VRE generators and large PV in the PGC are **more or less** the same. These fault ride through requirements are aligned to internal practice.
- However, **wind turbines requirements in the PGC are lenient**.
- It is proposed that the requirements for **large wind turbines in the PGC** be the same as for **large VRE in the DGC** for all new wind turbines.

Phase 1. Renewable Energy

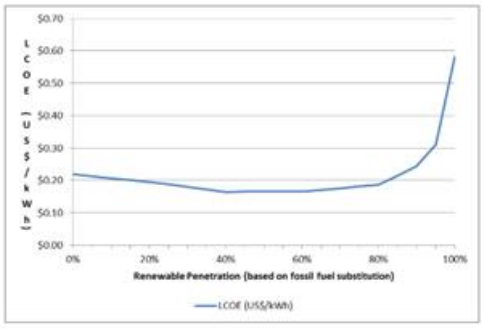
9. Recommendations for Frequency Tolerance and Control

- The PGC and DGC requirements for frequency tolerance are reasonably aligned with each other and with the practice in the USA. However, the **continuous frequency range is very small for** the Philippines for synchronous generators – section GCR 4.4.2.1.1.
- The **steady state frequency in each interconnection is common** and system operator has to thus control to the frequency to the tightest requirement.
- IEC standards and international practice is that synchronous generators should be designed to able to continuously tolerate up to ±2% change in frequency
- The **continuous range could easily be extended to a continuous range of ±2% of nominal frequency** or 58.8 Hz to 61.2 Hz for a 60 Hz system.
- The PGC and DGC **mandatory high frequency response starts at 61 Hz**.
- Most systems start the **mandatory high frequency response** much earlier and this could be adjusted to start at **60.6 Hz** (1% deviation).

Phase 1. Renewable Energy

10. Battery Energy Storage Systems (BESS) examples

- VRE with BESS are economically viable solutions



- Voltage Source Inverters with BESS and or VRE can provide frequency and voltage control without synchronous generation

Phase 1. Renewable Energy

11. Battery Energy Storage Systems (BESS)

- The South African Grid Connection Code for Battery Energy Storage Facilities (BESF) Connected to the Electricity Transmission System (TS) or the Distribution System (DS) in South Africa version 5.2 has recently been developed and promulgated. The code is the same as for non-synchronous connections in the renewable code except primary frequency control (up and down) is mandatory for all BESS > 20 MW.
- There are significant omissions specifically:
  1. Reactive power and voltage control don't include the fact that this service can be provided from full consumption to full production
  2. Fast frequency control (or inertia) is not required. This is a key future service that BESS can provide
  3. There is no black start or islanding requirements which could be a key service for BESS to provide
- The development of the PGC and DGC codes to include BESS will be done under this assignment. The key requirements will be based on our experience as there are very few grid codes to reference.

Phase 1. Renewable Energy

12. Key Differences noted in Benchmarking

- The key differences noted are:
  1. The PGC only applies to generators greater than 10 MW and DGC has definitive requirements for categories of power plants
  2. The PGC and DGC connection requirements for power plants greater than 10 MW are different. DGC code is more up to date compared to international practice
  3. Reactive power provision for embedded, wind and solar power plants is lenient compared to recent international practice
  4. Synchronous generator continuous range frequency tolerance settings are tight for a network the size of Philippines
  5. The mandatory high frequency response starts at 61 Hz which is much higher than equivalent networks
  6. Fault ride through capability for wind farms in PGC is lenient

Questions:

1. Is there agreement for the proposed changes?
2. Does the Rules Revision Subcommittee have a formal process to change current regulations?
3. Who do we engage with to discuss potential new values?

Phase 1. Renewable Energy

13. Key New Requirements for PGC and DGC

- Key new requirements for PGC and DGC are:
  1. Inclusion of BESS connection requirements
  2. Inclusion of HVDC connection requirements (to be discussed)
- Key new requirements from other phases of this project are:
  1. Inertia / fast frequency response (sub second response) to prevent to high rate of change of frequency
  2. 3-5 hour ahead operating reserve – to cater for VRE forecast errors
  3. Islanding and black start requirements to be refined
  4. …..

Questions:
1. Should BESS connection requirements be a new chapter in the PGC Regulation?
2. Are HVDC connection requirements required and if so, should this be a new chapter in the PGC Regulation?

Phase 1. Renewable Energy

14. Updating other Relevant ERC Resolutions

- Identified Regulations that might require updating are:
  1. ERC Resolution No. 13, Series of 2021 entitled "*A Resolution Adopting the Rules for the Monitoring of Variable Renewable Energy (VRE) Generating Facilities Performance*".
  2. ERC Resolution No. 9, Series of 2012 "*A Resolution adopting the Rules and Procedures to Govern the Monitoring of Compliance of Grid User to the Philippine Grid Code*".

Questions:
1. Are there any other Regulations that might need updating?

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35) Lesly Kim A. De Vera, lkdevera@doe.gov.ph, SWEMD

Meeting Statistics

These statistics are for 15 June 2022 meeting. There were no statistics recorded for 6 May meeting since the meeting venue was moved to UNOPS office in Manila and the meeting host was changed to UNOPS.

Meeting ID	Topic	Start Time	End Time	User Email	Duration (I	Participants		
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DOE - Melanie Papa (Franchesca Perico)		06/15/2022 08:02:40 AM	06/15/2022 08:59:36 AM	57	Yes	Yes	No	
enapala		06/15/2022 08:02:49 AM	06/15/2022 08:11:27 AM	9	Yes	Yes	No	
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Mary Anne Fernando		06/15/2022 08:03:17 AM	06/15/2022 09:02:03 AM	59	Yes	Yes	No	
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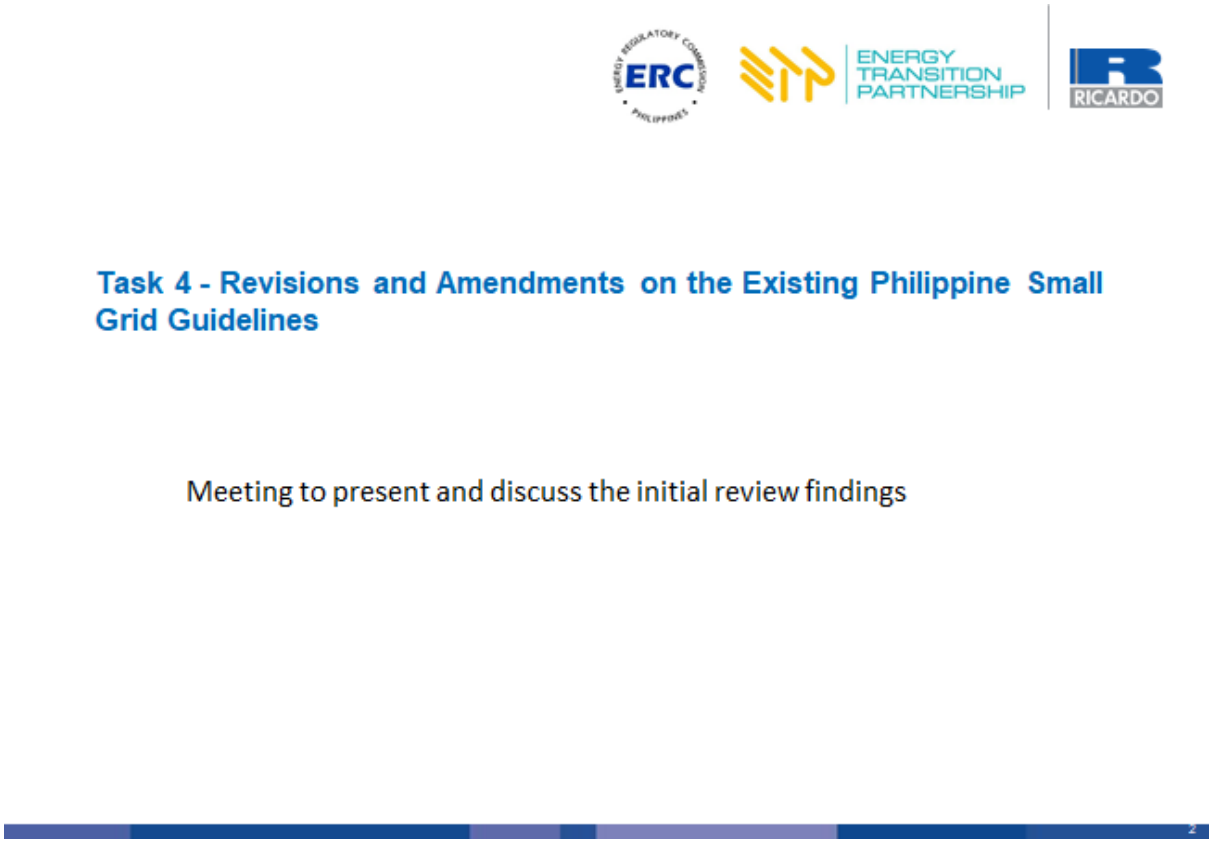
Appendix 3 Updated Philippine Grid Code

See attached PDF file.

Appendix 4 Updated Philippine Distribution Code

See attached PDF file.

Appendix 5. Recommendations for Revisions and Amendments on the Existing Philippine Small Grid Guidelines



Philippine Small Grid Guidelines Resolution No 15 Series of 2013

- The existing Philippine Small Grid Guidelines Resolution No 15 Series of 2013 and are **comprehensive for the connection of conventional synchronous generators** to a small grid.
- The guidelines are **silent on the connection of VRE (wind, solar PV) and BESS**.

The objectives of the Philippine Small Grid Guidelines are to:

1) Set a standard for Small Grid Operations;
2) Describe the planning and operational responsibility of all Small Grid Users;
3) Facilitate the monitoring of compliance with these Guidelines at the operations
4) Ensure that the Small Grid will be operated in a safe and efficient manner;
5) Ensure that the basic rules for connection to the Small Grid or to a Small Grid User System are fair and non-discriminatory for all Small Grid Users;
6) Specify the operating states, operating criteria and protection scheme that will ensure the safety, reliability, security and efficiency of the Small Grid.

3

The Philippine Small Grid Guidelines cover a range of topics including:

1) Performance standards for small grid and generators specifically:
   a. Frequency variations
   b. Voltage variations
   c. Voltage unbalance
   d. Reliability standards
   e. Reliability reports and performance targets
2) Safety standards for small grid and generators specifically:
   a. Compliance to Philippine Electrical Code (PEC) Part 1 and Part
   b. Compliance to Philippine Occupational Safety and Health Standards (OSHS)
   c. Submission of Safety Records and Reports
3) Small grid technical, design and operational criteria, including
   a. Frequency variations
   b. Voltage unbalance
   c. Grounding requirements
   d. Equipment standards
   e. Maintenance standards
4) Procedures for small grid connection or modification, including
   a. Connection agreement
   b. Amended connection agreement
   c. Processing of application
   d. Submissions prior to the commissioning date
   e. Commissioning of equipment and physical connection
5) Requirements for generators, including:
   a. Generating unit power output capability
   b. Frequency withstand capability
   c. Unbalance loading withstand capability
   d. Speed governing system capability
   e. Excitation control system capability
   f. Black start capability
   g. Fast start capability
   h. Protection requirements, coordination and arrangements
   i. Transformer connection and grounding

4

The Philippine Small Grid Guidelines cover a range of topics including:

6) Requirements for distributor and other small grid users, including:
   a. Connection point requirements
   b. Protection arrangements
   c. Transformer connection and grounding
   d. Underfrequency relays for automatic load dropping
7) Communication equipment requirements and methods, including:
   a. Communication systems for monitoring and control
   b. Methods of transmitting dispatch instructions
   c. Contents of dispatch instructions
   d. Acknowledgement of dispatch instructions
8) Fixed asset boundary document requirements
9) Electrical diagram requirements
10) Connection point drawing requirements
11) Small grid data registration
12) Small grid planning, including:
   a. Small grid planning studies
   b. Standard planning data requirements
   c. Detailed data planning requirements
13) Small grid operation, including:
   a. Small grid operating states, operating criteria and protection
   b. Operational responsibilities
   c. Operation notices and report
   d. Operating and maintenance programs
   e. Frequency and voltage control
   f. Emergency procedures induding islanding, black start and restoration
   g. Safety coordination
   h. System tests
   i. Generating unit capability tests
   j. Site and equipment identification and labelling
14) Scheduling and dispatch, including:
   a. Scheduling and dispatch responsibilities
   b. Responsibilities of other grid users
   c. Dispatch principles, scheduling and implementation
15) Metering
   a. Metering requirements
   b. Metering equipment standards
   c. Metering equipment testing and maintenance
   d. Metering reading and meter data
16) Small grid transitory provisions
   a. Transitional compliance plans

5

Summary of Review

The Philippine Small Grid Guidelines Resolution No 15 Series of 2013 are a combination of a grid code, connection agreement and connection process all captured in one document.

Some concerns are:

1) The document is only a **guideline** and not binding on generators and users
2) The guideline applies to **all generators regardless of size**
3) The guideline **does not have all the requirements** captured in the **Philippine Distribution Code**, specifically:
   a. Fault ride through requirements
   b. Harmonic emission levels

6

Philippine Small Grid Dispatch Protocol Resolution No. 15 Series of 2014

The purpose of the Philippine Small Grid Dispatch Protocol Resolution No. 15 Series of 2014 is to:

1) Implement those sections of the Philippine Small Grid Code which involves **normal and emergency operations of the small grid**
2) Establish relevant information that would be necessary for the system operator to prepare **week ahead and day ahead schedule**
3) Describe the operational activities such as **scheduling and dispatch procedures** to be adopted in operating the small grid
4) Describe the **operational procedures** and **responsibilities of the small grid user**
5) Describe the **small grid monitoring** and **communication facilities**

The protocol was **amended** in to specifically mandate that TRANSO to be the small grid system operator for small grids having:

1) More than one distribution utility utilizing a high voltage line to transmit power generated by more than one generating company.
2) Only one distribution utility utilizing a high voltage line to transmit power generated by more than one generating company.
3) Only one distribution utility utilizing its medium voltage line to transmit power generated by more than one generating company.

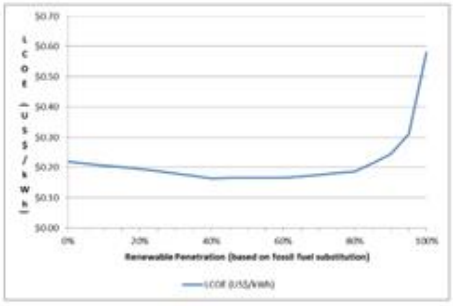
Philippine Small Grid Dispatch Protocol Resolution No. 15 Series of 2014

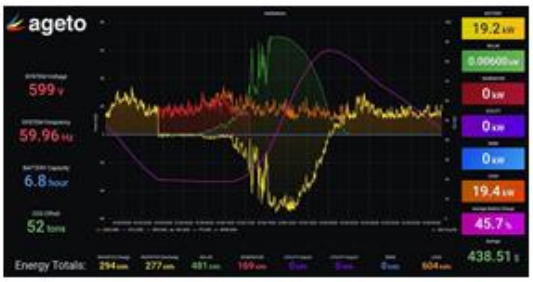
The protocol describes the activities of the small grid owner, the generator and distribution utilities.

1) The concern is there is **no limit on generator size**, so all generators are required to provide its capability and availability, follow dispatch instructions and emergency instructions. **All generators** have to submit a quarterly report on its operation to the DOE and ERC. These requirements are **impractical and probably unnecessary** for **small scale wind, solar PV and BESS**. A size limitation will need to be agreed.
2) The dispatch protocol will also require **strengthening** to include:
   a) wind and solar forecasting,
   b) managing reserve levels,
   c) short circuit levels monitoring and
   d) maintaining inertia / fast frequency control.

VRE and BESS in Small Grids

VRE with BESS are economically viable solutions





Voltage Source Inverters with BESS and or VRE can provide frequency and voltage control without synchronous generation

International regulations and standards

IEC TS 62257 series – recommendations for renewable energy and hybrid systems for rural electrification

1) IEC has published a comprehensive set of standards for renewable energy and hybrid systems for rural electrification.
2) The series consists of 22 publications covering wind, solar PV, energy storage and micro power controls systems.

Gambia

The Gambian Standards Bureau has adopted the full set of IEC 62257 series.

Tanzania

Tanzania Standard is in the process of adopting the International Standard IEC 62257-9-8:2020 Renewable energy and hybrid systems for rural electrification - Part 9-8: Integrated systems - Requirements for stand-alone renewable energy products with power ratings less than or equal to 350 W

Mozambique Decree No. 93/2021 – Key features

1) Concessions for mini grids are to go out to public tender and the concession will be for 30 years
2) Mini-grids are classified according to the following categories:
   a. category 1: mini-grid with installed capacity between 1,001 MW – 10 MW;
   b. category 2: mini-grid with installed capacity between 151 kW – 1 MW;
   c. category 3: mini-grid with installed capacity up to 150 kW.
3) Technical-financial studies, including financial plan and business model, are required
4) Concessions are to be validated by the Energy Regulator, including:
   a. Approve the submission forms
   b. Verify certification of equipment
   c. Managing and supervising installation
5) A detailed list of the contents of the concession agreement, including:
   a. Energy source, capacity and technology
   b. Rules for suspension, modifications and termination
   c. Schedule for execution of the project
   d. Rights and obligations
   e. Applicable tariffs, prices and fees
   f. Environment licensing
6) Operation and maintenance of the mini grid, including Plan, design, finance, build, possess, insure, operate, maintain, manage and subcontract the operation of the respective electrical installations
7) Concessionaire must comply with the principles and standards of quality, safety and reliability in relation to electrical energy supply activities
8) The consumer is responsible to pay fees for goods and services provided
9) The tariff principles are defined in the regulation
10) Complaints and dispute resolution process

Recommendations for Revisions and Amendments on the Existing Philippine Small Grid Guidelines

The Existing Philippine Small Grid Guidelines are comprehensive but do not include VRE or BESS.

The following two items are of concern:

1) The Existing Philippine Small Grid Guidelines have some typical 'grid code' compliance requirements but these do not include all the requirements. This needs to be clarified in the guidelines. In essence the relevant grid code takes precedence.
2) The guidelines seem to apply to all power plants regardless of size. The requirements will be able to be met by home PV and BESS systems.

There are two options to include VRE and BESS for discussion:

1) Update the existing Philippine Small Grid Guidelines, or
2) Adopt the IEC TS 62257 series which has a comprehensive recommendation for renewable energy and hybrid systems for rural electrification

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Task 3.2 Rules and Regulations for Ancillary Services Responsive with Variable Renewable Energy Technology		
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32) Jasmine Grace D. Tuason, jgtuason@doe.gov.ph, SWEMD
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35) Lesly Kim A. De Vera, lkdevera@doe.gov.ph, SWEMD

Meeting Statistics

Meeting ID	Topic	Start Time	End Time	User Email	Duration (I	Participants		
86977995025	Webinar on Revisions and A	06/14/2022 06:56:41 AM	06/14/2022 08:26:42 AM	Webinars.ee@	91	61		
Name (Original Name)	User Email	Join Time	Leave Time	Duration (Minu	Guest	Recording	In Waiting Room	
Ricardo Zoom 1	webinars.ee@ricardo.com	06/14/2022 06:56:41 AM	06/14/2022 08:26:42 AM	91	No	Yes	No	
John Paulo Castro		06/14/2022 06:56:55 AM	06/14/2022 07:01:21 AM	5	Yes		Yes	
DOE - Lemuel Alvarado		06/14/2022 06:56:55 AM	06/14/2022 07:01:24 AM	5	Yes		Yes	
Mary Anne Fernando		06/14/2022 06:56:59 AM	06/14/2022 07:01:22 AM	5	Yes		Yes	
REMB HOEMD_Marga Rivera		06/14/2022 06:56:59 AM	06/14/2022 07:01:23 AM	5	Yes		Yes	
Franchesca Perico		06/14/2022 06:56:59 AM	06/14/2022 07:01:25 AM	5	Yes		Yes	
Miko		06/14/2022 06:57:01 AM	06/14/2022 07:01:21 AM	5	Yes		Yes	
Dennis Umlas		06/14/2022 06:57:02 AM	06/14/2022 07:01:27 AM	5	Yes		Yes	
DOE-TSMD Andrea Urquiola		06/14/2022 06:57:05 AM	06/14/2022 07:01:23 AM	5	Yes		Yes	
DOE - Mari Josephine C. Enriquez		06/14/2022 06:57:07 AM	06/14/2022 07:01:23 AM	5	Yes		Yes	
Alicia de Guzman		06/14/2022 06:57:10 AM	06/14/2022 07:01:24 AM	5	Yes		Yes	
RP26		06/14/2022 06:57:13 AM	06/14/2022 06:57:51 AM	1	Yes		Yes	
Graeme Chown		06/14/2022 06:57:16 AM	06/14/2022 06:58:34 AM	2	Yes		Yes	
DOE_Asst. Director Irma C. Exconde (ICE)		06/14/2022 06:57:22 AM	06/14/2022 07:01:21 AM	4	Yes		Yes	
DOE - Leny Beth Agravante		06/14/2022 06:57:37 AM	06/14/2022 07:01:21 AM	4	Yes		Yes	
Rannie Maatubang - ROS		06/14/2022 06:57:39 AM	06/14/2022 07:01:27 AM	4	Yes		Yes	
RP26		06/14/2022 06:57:52 AM	06/14/2022 08:26:41 AM	89	Yes	Yes	No	
DOE-Dan Wilbur Labagnoy		06/14/2022 06:58:16 AM	06/14/2022 07:01:23 AM	4	Yes		Yes	
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PPDD SMEDS		06/14/2022 06:58:54 AM	06/14/2022 07:01:24 AM	3	Yes		Yes	
Jane May Mea		06/14/2022 06:59:25 AM	06/14/2022 07:00:27 AM	2	Yes		Yes	
UNOPS - Fritzie Vergel		06/14/2022 06:59:37 AM	06/14/2022 07:01:23 AM	2	Yes		Yes	
Melvin Mea		06/14/2022 07:00:19 AM	06/14/2022 07:01:21 AM	2	Yes		Yes	
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DOE - Maureen Artais		06/14/2022 07:00:57 AM	06/14/2022 07:01:22 AM	1	Yes		Yes	
DOE-EPIMB-PPDD-Madonna Naling		06/14/2022 07:01:07 AM	06/14/2022 07:01:21 AM	1	Yes		Yes	
ERC - NESTOR V. PADILLA		06/14/2022 07:01:20 AM	06/14/2022 07:01:48 AM	1	Yes		Yes	
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DOE - Leny Beth Agravante		06/14/2022 07:01:22 AM	06/14/2022 07:36:06 AM	35	Yes	Yes	No	
Miko		06/14/2022 07:01:22 AM	06/14/2022 08:25:57 AM	85	Yes	Yes	No	
DOE_Asst. Director Irma C. Exconde (ICE)		06/14/2022 07:01:22 AM	06/14/2022 08:25:07 AM	84	Yes	Yes	No	
ERC | Melvin Mea (Melvin Mea)		06/14/2022 07:01:22 AM	06/14/2022 08:25:25 AM	85	Yes	Yes	No	
DOE-Jane May Mea (Jane May Mea)		06/14/2022 07:01:22 AM	06/14/2022 08:24:55 AM	84	Yes	Yes	No	
Mary Anne Fernando		06/14/2022 07:01:22 AM	06/14/2022 08:25:05 AM	84	Yes	Yes	No	
DOE - Maureen Artais		06/14/2022 07:01:22 AM	06/14/2022 08:25:18 AM	84	Yes	Yes	No	
ERC Franz Xyrlo Tobias (Franz Xyrlo Tobias)		06/14/2022 07:01:23 AM	06/14/2022 08:25:44 AM	85	Yes	Yes	No	
DOE-EPIMB Dan Wilbur Labagnoy (DOE-Dan Wilbur Labagnoy)		06/14/2022 07:01:23 AM	06/14/2022 07:42:00 AM	41	Yes	Yes	No	
REMB HOEMD_Marga Rivera		06/14/2022 07:01:23 AM	06/14/2022 08:25:38 AM	85	Yes	Yes	No	
UNOPS - Fritzie Vergel		06/14/2022 07:01:23 AM	06/14/2022 08:26:41 AM	86	Yes	Yes	No	
DOE | Mari Josephine C. Enriquez (DOE - Mari Josephine C. Enriquez)		06/14/2022 07:01:24 AM	06/14/2022 08:24:52 AM	84	Yes	Yes	No	
DOE-TSMD Andrea Urquiola		06/14/2022 07:01:24 AM	06/14/2022 08:24:45 AM	84	Yes	Yes	No	
DOE-Alicia de Guzman (Alicia de Guzman)		06/14/2022 07:01:25 AM	06/14/2022 08:26:42 AM	86	Yes	Yes	No	
DOE - Lemuel Alvarado		06/14/2022 07:01:25 AM	06/14/2022 08:24:40 AM	84	Yes	Yes	No	
DOE Emmanuel C. Talag (PPDD SMEDS)		06/14/2022 07:01:25 AM	06/14/2022 08:23:31 AM	83	Yes	Yes	No	
DOE - Melanie Papa (Franchesca Perico)		06/14/2022 07:01:25 AM	06/14/2022 08:21:36 AM	81	Yes	Yes	No	
Rannie Maatubang - ROS		06/14/2022 07:01:27 AM	06/14/2022 08:24:45 AM	84	Yes	Yes	No	
DOE-EPIMB Dennis Umlas (Dennis Umlas)		06/14/2022 07:01:28 AM	06/14/2022 08:24:43 AM	84	Yes	Yes	No	
DOE_EPIMB Matt Jerel Bautista		06/14/2022 07:01:48 AM	06/14/2022 08:24:50 AM	84	Yes	Yes	No	
ERC - NESTOR V. PADILLA		06/14/2022 07:01:48 AM	06/14/2022 08:25:01 AM	84	Yes	Yes	No	
Graeme Chown		06/14/2022 07:02:43 AM	06/14/2022 07:06:16 AM	4	Yes	Yes	No	
Jessie L. Todoc		06/14/2022 07:02:57 AM	06/14/2022 08:24:58 AM	83	Yes	Yes	No	
Rodel Limbaga		06/14/2022 07:03:14 AM	06/14/2022 08:25:00 AM	82	Yes	Yes	No	
DOE_Julius Alano		06/14/2022 07:03:19 AM	06/14/2022 08:24:47 AM	82	Yes	Yes	No	
DOE_Jacqueline Agarpao		06/14/2022 07:03:23 AM	06/14/2022 08:24:55 AM	82	Yes	Yes	No	
DOE-EPIMB-Zander Louie Villamor (Zander Louie Villamor)		06/14/2022 07:05:44 AM	06/14/2022 07:50:42 AM	45	Yes	Yes	No	
Sydney Requillo		06/14/2022 07:07:48 AM	06/14/2022 08:24:47 AM	77	Yes	Yes	No	
Elaine Diane Catapang		06/14/2022 07:08:58 AM	06/14/2022 08:24:45 AM	76	Yes	Yes	No	
Francis Oliver Jusay		06/14/2022 07:16:34 AM	06/14/2022 08:25:27 AM	69	Yes	Yes	No	
Chermheen Mae Gonzales		06/14/2022 07:16:44 AM	06/14/2022 08:25:40 AM	69	Yes	Yes	No	
John Paulo Castro		06/14/2022 07:22:16 AM	06/14/2022 07:42:57 AM	21	Yes		No	
DOE_Charlene Salazar (DOE_MCCS)		06/14/2022 07:24:47 AM	06/14/2022 08:25:22 AM	61	Yes	Yes	No	
DOE Luningning Baltazar		06/14/2022 07:25:38 AM	06/14/2022 08:26:41 AM	62	Yes	Yes	No	
ERC - Rolando B. Evasco		06/14/2022 07:34:50 AM	06/14/2022 08:25:27 AM	51	Yes	Yes	No	
ERC - Mark Anthony Quero (Mark Anthony Quero)		06/14/2022 07:34:55 AM	06/14/2022 08:26:41 AM	52	Yes	Yes	No	
Michelle Paguel		06/14/2022 07:35:27 AM	06/14/2022 08:26:42 AM	52	Yes	Yes	No	
ERC - Jenny Rose Capistrano (Jenny Rose Capistrano)		06/14/2022 07:35:55 AM	06/14/2022 08:18:45 AM	43	Yes	Yes	No	
ERC - Reynaldo Matias (ERC - Reynaldo Matias)		06/14/2022 07:38:04 AM	06/14/2022 08:24:48 AM	47	Yes	Yes	No	
ERC-Djielo Dayle C. Cabiles (Djielo Dayle C. Cabiles)		06/14/2022 07:41:10 AM	06/14/2022 08:24:45 AM	44	Yes	Yes	No	
ERC - JR Palacio (Jr Palacio)		06/14/2022 07:41:36 AM	06/14/2022 08:25:06 AM	44	Yes	Yes	No	
DOE - Leny Beth Agravante		06/14/2022 07:42:31 AM	06/14/2022 08:12:08 AM	30	Yes	Yes	No	
ERC - Herbert Jesus S. Sendon		06/14/2022 07:43:02 AM	06/14/2022 08:22:25 AM	40	Yes	Yes	No	
ERC - John Lester Matos (John Lester Matos)		06/14/2022 07:44:02 AM	06/14/2022 08:25:21 AM	42	Yes	Yes	No	
DOE-Dan Wilbur Labagnoy		06/14/2022 07:49:53 AM	06/14/2022 08:24:26 AM	35	Yes	Yes	No	
Silver Navarro Jr		06/14/2022 07:59:20 AM	06/14/2022 08:26:42 AM	28	Yes	Yes	No	
John Paulo Castro		06/14/2022 08:00:09 AM	06/14/2022 08:16:12 AM	17	Yes		No	
Joed Barallas		06/14/2022 08:02:21 AM	06/14/2022 08:26:42 AM	25	Yes	Yes	No	
Adrian Roy Pasion		06/14/2022 08:02:28 AM	06/14/2022 08:24:44 AM	23	Yes	Yes	No	
John Paulo Castro		06/14/2022 08:04:07 AM	06/14/2022 08:25:20 AM	22	Yes		No	
ERC - Rendel Arcelo (Rendel Arcelo)		06/14/2022 08:09:22 AM	06/14/2022 08:25:47 AM	17	Yes	Yes	No	
John Paulo Castro		06/14/2022 08:16:19 AM	06/14/2022 08:27:11 AM	11	Yes		No	
DOE - Jasmine Tuason		06/14/2022 08:16:50 AM	06/14/2022 08:26:42 AM	10	Yes	Yes	No	
Graeme Chown		06/14/2022 06:58:38 AM	06/14/2022 07:00:15 AM	2	Yes		Yes	
Graeme Chown		06/14/2022 07:06:36 AM	06/14/2022 08:26:42 AM	81	Yes		No	
John Paulo Castro		06/14/2022 07:32:44 AM	06/14/2022 08:04:06 AM	32	Yes		No	
Ron-Ron Madera		06/14/2022 08:21:13 AM	06/14/2022 08:26:42 AM	6	Yes	Yes	No	

Appendix 6 Updated Philippine Small Grid Guidelines

See attached pdf file

Appendix 7 Distribution Loss Cap Analysis for Private Distribution Utilities

ENERGY TRANSITION PARTNERSHIP

ERC RICARDO

Upgrading Energy Regulations for the Energy Regulatory Commission (ERC) of the Philippines

Distribution Loss Cap Analysis for Private Distribution Utilities (PDUs)

20 July 2022, 1.30 pm (Manila time)

The ETP brings together a range of partners focused on supporting the energy transition in Southeast Asia including:

UNOPS · Children's Investment Fund Foundation · AFD · IKEA Foundation · Environment and Climate Change Canada · Department for Business, Energy & Industrial Strategy · HIGHTIDE · GROWALD FAMILY FUND · SEQUOIA CLIMATE FUND

1

Resolution 10 Series of 2018
A Resolution Clarifying The System Loss Calculation and Providing the Effectivity of the Rules for Setting the Distribution System Loss Cap

ERC · ENERGY TRANSITION PARTNERSHIP · RICARDO

Section 2.3 Distribution System Loss Caps for Private Distribution Utilities (PDUs)

- **Section 2.3.1 … distribution feeder loss cap for PDUs**
  - **2018 – 6.50%**
  - **2019 – 6.25%**
  - **2020 – 6.00%**
  - **2021 – 5.50%**
- **Section 2.3.2**
  - **Distribution feeder loss caps for PDUs shall be reviewed in 2021.**
  - **A private distribution utility *who fails to submit* – minimum of 1 year data, shall be excluded from the review – and assigned a distribution feeder loss cap of 4.75% by 2022 onwards**

Resolution 10 Series of 2018
A Resolution Clarifying The System Loss Calculation and Providing the Effectivity of the Rules for Setting the Distribution System Loss Cap

Section 2.4 Distribution System Loss Recoverable through System Loss Charge

- Section 2.4.1 The level of Distribution System Loss that a Distribution Utility may recover from its Customers through System Loss Charge ($SL_{SysLossCharge}$) shall not exceed the sum of:
  a. The actual Sub-Transmission and Substation Loss (DSL_{ST+SS}), and
  b. The actual sum of Non-Technical Loss (NTL) and Feeder Technical Loss (TL_{fdr}), or the Distribution Feeder Loss cap ($DSL_{fdr,cap}$), whichever is lower.

$$SL_{SysLossCharge} = DSL_{ST+SS} + \text{Min}\{(TL_{fdr} + NTL), DSL_{fdr,cap}\}$$

Key terminologies:

- Feeder Technical Loss – the sum of the technical losses associated with the primary distribution system and the secondary distribution system.
- Distribution Feeder Loss – this is the sum of *feeder technical loss* and *non-technical loss*.

Methodology in Setting the Distribution System Loss Cap
(Appendix B of Resolution 10)

- **The methodology used in setting the DSL cap is robust**
  - A technical feeder loss model was developed taking into account technical parameters and other explanatory variables
  - The model was developed by simulating distribution network grids to determine feeder losses
  - The estimated feeder losses were then linked to key predictor variables
  - With historical data from distribution utilities – a regression analysis was carried out to determine the relationship between feeder losses and predictor variables
- **DSL cap setting model**
  - The equation used to set the DSL cap in Resolution 10 is the following:

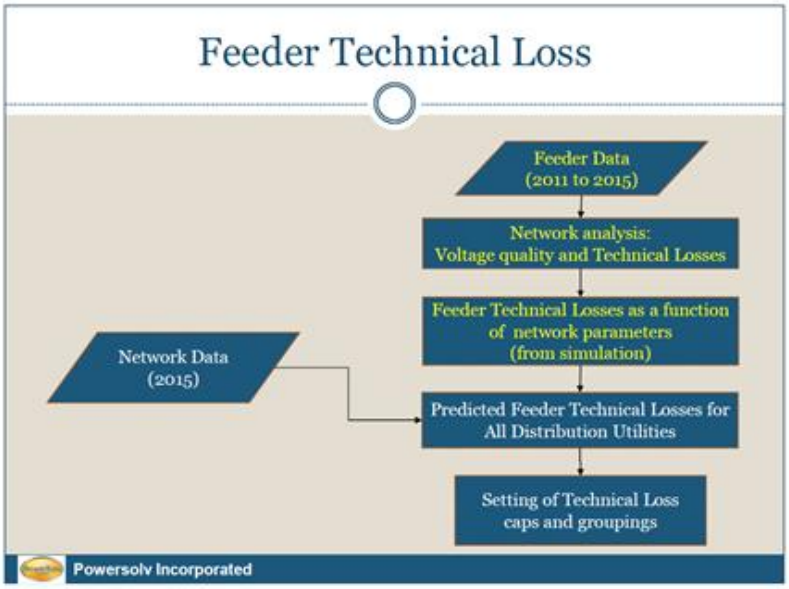
$$TL_{feeder} \approx A1 \times EnergySales_{HV} + A2 \times EnergySales_{LV} + A3 \times Length_{SecLine} \times A4 \times Demand_{Peak,MW}$$

  - The coefficients used in estimating the feeder loss was also provided in Appendix B of Resolution 10.
  - In addition, the feeder technical loss due to non-technical loss was also considered using the following relationship

$$TL_{feeder} \approx TL_{feeder,simulated} \times (1 + NTL)^2$$

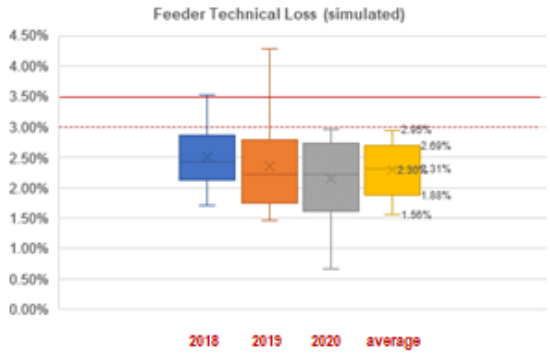
  - The results were used to cluster DUs, and the resulting range of losses of a cluster were used to set the *target* DSL.
- **Gradual DSL improvement target**
  - Resolution 10 aims to achieve the target DSL gradually (within 5 years) and yearly DSL caps were introduced.

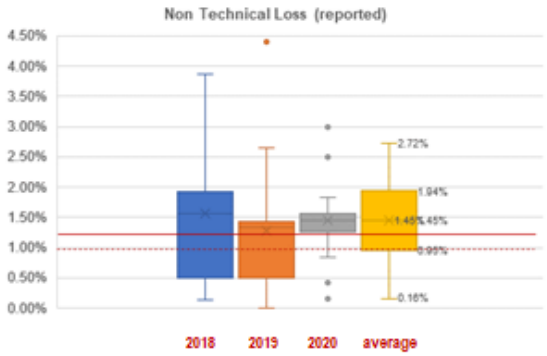
Methodology in Setting the Distribution System Loss Cap
(Appendix B of Resolution 10)



Review of DSL target for PDUs
Feeder technical loss
Non technical loss

$TL_{feeder} \approx A1 \times EnergySales_{HV} + A2 \times EnergySales_{LV} + A3 \times Length_{SecLine} \times A4 \times Demand_{Peak,MW}$





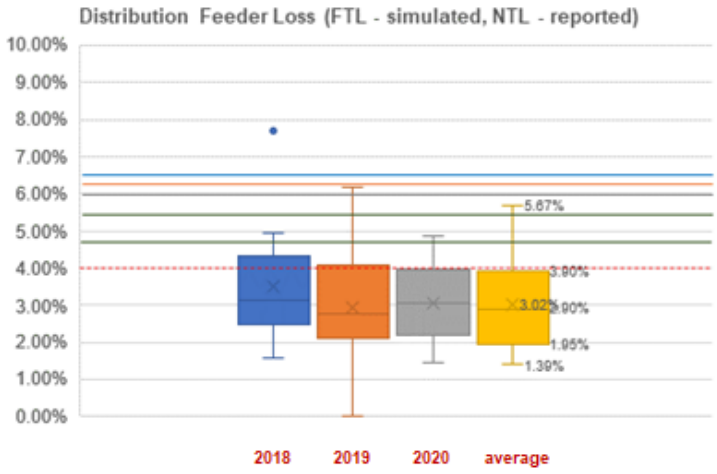
Cluster ID	Feeder Technical Loss Cap	Non-Technical Loss Cap	Total DSL Cap
Cluster 1 (EC)	7.50 %	4.50 %	12.00 % + DSL_{68+07}
Cluster 2 (EC)	5.75 %	4.50 %	10.25% + DSL_{68+07}
Cluster 3 (EC)	3.75 %	4.50 %	8.25% + DSL_{68+07}
Cluster 4 (Private DU)	3.50 %	1.25 %	4.75 % + DSL_{68+07}

Feeder Technical Loss cap could still be lowered down to 3%.
Non Technical Loss cap could be lowered down to 1%.

In total, the Distribution Feeder Loss target could be further reduced to 4%.

Review of DSL target for PDUs

Distribution feeder loss (FTL + NTL)



Distribution Feeder Loss Cap
2018: 6.50%
2019: 6.25%
2020: 6.00%
2021: 5.50%

Non-compliant PDUs
2022: 4.75%

- Gradual approach to meet the DSL target (4.75%)
- How far can we push down the DSL target? (4%? 3% FTL and 1% NTL)
- What are the cost implications to PDUs?

Review of DSL target for PDUs

How far can we push down the DSL cap?

Distribution Losses in the EU

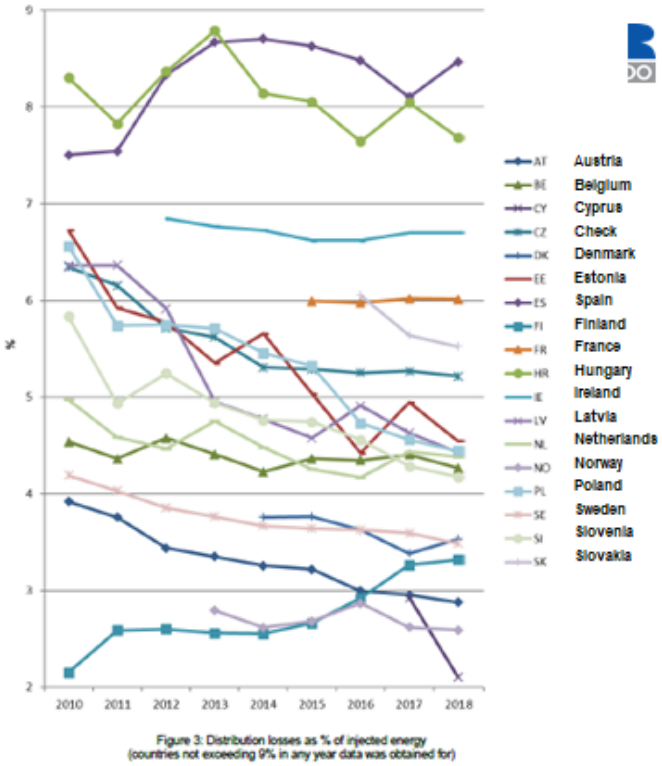
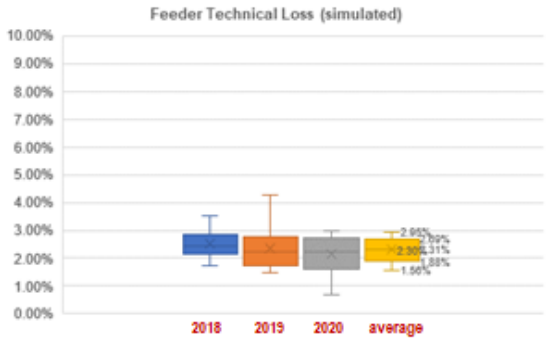
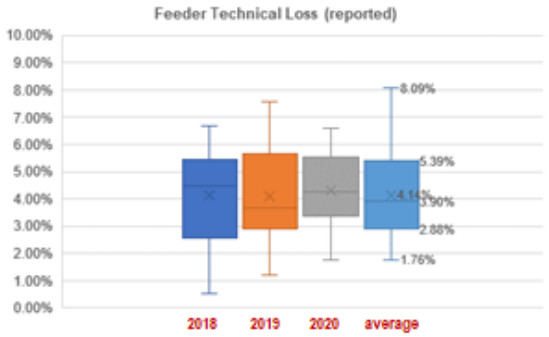


Figure 3: Distribution losses as % of injected energy
(countries not exceeding 9% in any year data was obtained for)

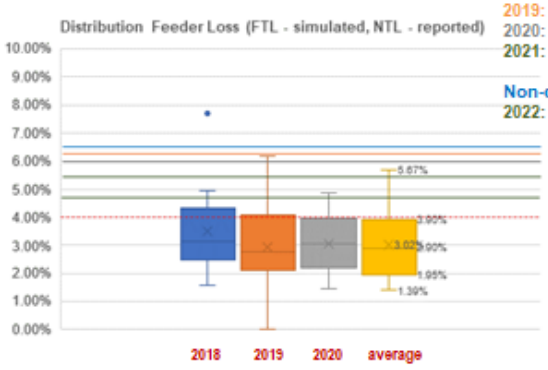
PDUs Performance
Feeder Technical Loss: Simulated vs Actual





What are the possible reasons for this difference?

Review of DSL target for PDUs
Distribution Feeder Loss (FTL + NTL): Simulated vs Actual



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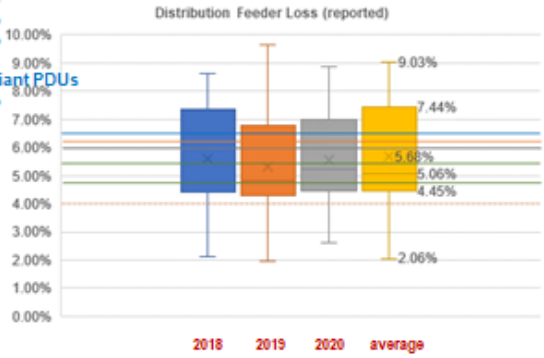

2018: 62.5% of PDU samples met the DSL cap
2019: 68.8% of PDU samples met the DSL cap
2020: 56.3% of PDU samples met the DSL cap

Preliminary Analysis

Methods

- The methodology in setting the DSL cap is robust.
  - DSL short term target is set based on 'standard' technologies and 'reasonable' technical parameters
  - Yearly DSL caps - gradual approach in meeting the short term DSL target
- A review of the method using PDU data from 2018-2020 reveals that
  - The short term DSL target could be further perhaps pushed down to as low as 4%
  - But this needs to be supported by a cost benefit analysis for each PDU

Actual Performance of PDUs

- Over 50% of PDUs met their targets for 2018, 2019 and 2020
  - To be precise: 62.5% in 2018, 68.8% in 2019 and 56.3% in 2020
- Impact of the pandemic – data show that the average DSL started to increase from 2020

Data Quality

- 'Messy' data
- Some PDUs have difficulty in disaggregating the total loss components
- Not very sure if actual measurements were carried out

Preliminary Analysis

DSL target and 'Potential' Yearly DSL cap trajectory

- The DSL target of 4.75% could be retained or perhaps increased to 4.00%
- Due to the effect of the pandemic, the cap for 2022 could be reset and the following are the potential yearly DSL caps:
  - 2022: 5.50%
  - 2023: 5.25%
  - 2024: 5.00%
  - 2025: 4.75%
  - 2026: 4.50%
  - 2027: 4.25%
  - 2028: 4.00%

Definitions	
HV Sales	Energy sales to customers connected to primary distribution side or above 13.8 kV or bulk power supply or wholesale Power or a contestable customer or Industrial
LV sales	Energy sales to residential customers or a customer that is not a residential customer and is connected to and served through the secondary Distribution system or less than 13.8 kV or commercial customer or streetlights or hospital or general power or small industrial

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Task 3.2 Rules and Regulations for Ancillary Services Responsive with Variable Renewable Energy Technology		
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Meeting Statistics

Meeting ID	Topic	Start Time	End Time	User Emai	Duration (I	Participants
83824047267	Distributio	07/20/22 06:17	07/20/22 0	Webinars.	114	15
Name (Original Name)	User Emai	Total Duration (	Guest			
Ricardo Zoom 1	webinars.e	114	No			
Rannie Maatubang		106	Yes			
RP26		104	Yes			
James Roen Soriano		102	Yes			
Melvin Mea		100	Yes			
Ricardo - Claire Newton - UK		74	Yes			
Vicente P. Moral# Jr.		91	Yes			
Malvin M. Melgar		90	Yes			
Aira Samantha Tantoco		89	Yes			
ERC - NESTOR V. PADILLA		87	Yes			
Noel Joseph Wenceslao		46	Yes			
Fritzie Vergel		62	Yes			
ERC - Gerard D. Bobis		23	Yes			

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