

IRENA's support to Eastern Africa Regional Model Analysis & Planning
Support Programme

Concept note and agenda

Training #2 – Basics of power supply modelling with SPLAT-MESSAGE

Venue: Park Inn by Radisson Kigali, Rwanda

22 – 25 April, 2025

Background

The **Eastern Africa Regional Model Analysis & Planning Support Programme** is a strategic initiative aimed at strengthening the power sector across East Africa through comprehensive capacity building on long-term energy planning. Recognizing this as a key priority, the Eastern African Power Pool (EAPP) identified capacity building in its ten-year strategic plan (2018–2027). EAPP has collaborated with AUDA-NEPAD in developing the Continental Power System Master Plan (CMP), enhancing the ability of its General Secretariat to integrate accurate and up-to-date data into a regional energy roadmap framework.

The **CMP serves as a framework** for aligning the long-term electricity sector strategies of regional power pools, acting as a blueprint for the establishment of the African Single Electricity Market (AfSEM). In the EAPP region, current power generation capacity is dominated by natural gas plants (54 GW) and large hydro (17.8 GW). CMP results indicate a shift towards a more diversified energy mix, emphasizing renewable energy opportunities. Additionally, increased regional integration is expected to enhance renewable energy penetration, leading to lower system unit costs (~0.067 USD/kWh) and reduced CO₂ emissions intensity (0.07 ton CO₂/MWh) compared to the baseline scenario. To ensure alignment between the EAPP Regional Master Plan and the CMP, institutional capacity development remains a fundamental requirement.

The **CMP is groundbreaking in two ways**. First, all technical work behind the CMP—including scenario definition, data collection, modelling, and analysis—is led by African experts, with modelling support from global partners, ensuring ownership and knowledge transfer. Second, it provides a unified strategic framework for the five African power pools, guiding their regional energy planning activities and aligning them with continental aspirations. The CMP development follows a phased approach, with Phase I focused on developing the CMP baseline study, Phase II on building African expertise and establishing a CMP platform for data management and modelling, and Phase III on capacity building at regional and national levels. This approach fosters alignment and ownership of planning processes while facilitating investment in power generation and transmission infrastructure.

Building upon the foundation of the CMP, this programme leverages synergies with ongoing initiatives within the region to strengthen energy planning and capacity development. It is further supported by key partners, including the **International Atomic Energy Agency (IAEA), AUDA-NEPAD, Get. Transform, the World Bank, and EU-TAF**, whose expertise and resources enhance technical assistance and knowledge exchange. By aligning with regional efforts and fostering collaboration, these partnerships contribute to the development of comprehensive regional power sector studies and analyses, promoting sustainable energy solutions and long-term energy security across the region.

To **achieve EAPP's strategic goals**, the programme is designed to enhance institutional capacity by training member utilities and the EAPP Planning Committee in energy planning tools. Through practical training, participants will develop joint planning scenarios that inform regional energy strategies. The programme is planned for a 12-month duration, comprising six workshops of five days each, targeting 50 participants from EAPP member utilities. The MESSAGE-SPLAT tool, developed by IAEA and IRENA, will be used to optimize generation and transmission capacity expansion.

The **SPLAT-MESSAGE framework** includes key components such as the MESSAGE software and SPLAT-Africa model, defining national power systems and cross-border transmission links. The framework also consists of a **SPLAT database** and Excel utilities for energy system configuration, as well as **renewable resources databases** and an **online repository hosted on GitHub** for version control and collaborative modelling.

This programme directly **addresses institutional capacity gaps** by equipping EAPP technical committee members with skills in energy planning and scenario development. Additionally, it aims to facilitate the systematic adoption of SPLAT-MESSAGE as a standard tool for advancing clean energy transitions in the region. By strengthening the capabilities of EAPP's technical committee, the programme will support the long-overdue update of the EAPP Regional Master Plan, which has remained stagnant for nearly a decade. This updated plan will play a critical role in integrating power systems across EAPP member countries, while aligning with AfSEM and the CMP's pan-African vision.

This training will be joined by the Rwanda national energy planning team under the national project on energy planning, offered as part of the **Accelerated Partnerships for Renewable Energy (APRA) initiative**. By integrating local expertise with regional best practices, the project is designed to enhance Rwanda's domestic energy planning capabilities while contributing to the broader goals of the IRENA-EAPP Regional Model Analysis and Planning Programme. This provides a practical platform for knowledge exchange, technical capacity building, and collaborative improvement.

This workshop builds upon the MESSAGE E-learning course, which was held virtually from 17 to 24 March 2025, providing participants with a fundamental grasp of the MESSAGE modelling tool. By expanding on these concepts through practical training, the workshop will support the development of the regional power sector masterplan. This in-person training aims to enhance participants' expertise by reviewing key concepts of the MESSAGE Reference Energy System (RES), **the SPLAT-MESSAGE tools**, and essential software installations, including the SPLAT interface, solver, and CMP model. Participants will also learn how to run a single-country model, enabling them to apply SPLAT-MESSAGE for national planning, review model results, and interpret key outputs effectively.

Following the training, consultative data validation sessions will be held with respective national teams, led by EAPP's technical modelling team. These sessions will allow participants to share training insights, discuss national-level CMP results, and refine key outcomes to ensure alignment with regional energy strategies.

Day 1: Introduction to IRENA's SPLAT models

Tuesday 22 April 2025

Time (CET)	Session	Speaker / participants
8:30 – 9:00	Coffee	
9:00 – 9:30	Opening remarks	Remarks: TBD (Rwanda (Ministry of Energy), EAPP, AUDA-NEPAD, Get. Transform, IRENA)
9:30 – 9:45	Self-introduction of the participants	Intervention: All
9:45 – 10:15	Overview of the programme and preview of the agenda <ul style="list-style-type: none"> Objectives of this training Recap of previous training 	Presentation: Nolwazi Khumalo, IRENA Samwell Opana, EAPP
10:15-10:30	Coffee break	
10:30 – 11:30	Energy planning – experience from CMP (methodologies, process, purpose and use of regional and national energy master plans)	Presentation: Tonderai Gumunyu, AUDA-NEPAD
11:30-13:00	Presentation on scope/methodology/outcomes/applications of the System Planning Test model <ul style="list-style-type: none"> What does SPLAT do? How is the model used? How was the model built? National, CMP & RETO applications 	Presentation: Nolwazi Khumalo, IRENA
13:00 – 14:00	Lunch break	
14:00 – 14:45	Concept of Reference Energy System (RES) in MESSAGE (a recap of e-learning) <ul style="list-style-type: none"> Key concepts and terminologies How broadly can RES be defined Some RES examples 	Presentation: Yunshu Li, IAEA
14:45 – 15:15	Getting started with SPLAT-CMP model <ul style="list-style-type: none"> Overview of CMP RES; Energy flows and conversion processes represented in SPLAT SPLAT/CMP technology naming conventions Navigating the model in MESSAGE; looking at various country representations 	Presentation: Bilal Hussain, IRENA Hands on session
15:15 – 17:15	Getting started with SPLAT interface <ul style="list-style-type: none"> Introduction to SPLAT interface Exercise-1: <ul style="list-style-type: none"> Setting up SPLAT interface and solvers Navigate SPLAT-CMP model with SPLAT interface Exercise-2: <ul style="list-style-type: none"> Run a country model within SPLAT-CMP Navigate optimization results 	Presentation: Bilal Hussain, IRENA Hands on session

17:15 – 17:30	Conclusion and program for the following day	Remarks: Nolwazi Khumalo, IRENA
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Day 2: Navigating model file system and SPLAT Excel utility

Wednesday 23 April 2025

Time (CET)	Session	Speaker / participants
8:30 – 9:00	Coffee	
9:00 – 9:15	Recap of previous day	Remarks: Nolwazi Khumalo, IRENA
9:15 – 10:30	SPLAT run process <ul style="list-style-type: none"> ▪ Overview of MESSAGE file system ▪ Exercise: <ul style="list-style-type: none"> ○ Detailed overview of SPLAT run procedure ○ Run your country model with SPLAT interface and learn what different files are generated in the underlying directory ○ Typical problems that break the run process 	Presentation: Himalaya Bir Shrestha, IRENA Hands on session
10:30 – 10:45	Coffee break	
10:45 – 13:00	Overview of how MESSAGE describes a model in text files <ul style="list-style-type: none"> ▪ Different sections of model text file ▪ Common technology parameters; Techno-economic data on generation (transmission, interconnection, costs), ▪ Data on demand ▪ Review country data 	Presentation: Bilal Hussain, IRENA & Yunshu Li, IAEA
13:00 – 14:00	Lunch break	
14:00 – 15:30	Navigating optimization results <ul style="list-style-type: none"> ▪ Introduction to SPLAT results data structure ▪ Introduction to Excel pivot tables and navigating your country model results ▪ Exercises: Modify technology characteristics and interpret the impact on results 	Presentation: Himalaya, Bir Shrestha, IRENA Hands on session
15:30 – 15:45	Coffee break	
15:45 – 17:15	Exercise Contd.	Presentation: Himalaya Bir Shrestha, IRENA Hands on session
17:15 – 17:30	Conclusion and program for the following day	Remarks: Nolwazi Khumalo, IRENA

Day 3: Managing model development process

Thursday 24 April 2025

Time (CET)	Session	Speaker / participants
8:30 – 9:00	Coffee	
9:00 – 9:15	Recap of previous day	Remarks: Nolwazi, Khumalo, IRENA
9:15 – 10:30	Introduction, installation and setup of Git hub account and Source Tree software	Presentation: Bilal Hussain, IRENA Hands on session
10:30 – 10:45	Coffee break	
10:45 – 13:00	Source tree basic tutorials <ul style="list-style-type: none"> ▪ Establishing local repository, ▪ Committing edits on text files ▪ Establishing cloud repositories, push and pull operations ▪ Repeat previous day exercises in a tracked repository 	Presentation: Bilal Hussein, IRENA Hands on session
13:00 – 14:00	Lunch break	
14:00 – 15:30	Controlling time resolution in SPLAT models <ul style="list-style-type: none"> ▪ Overview of SPLAT-CMP time resolution ▪ Exercise: Modify model time resolution and interpret the impact on results 	Presentation: Bilal Hussain, IRENA & Yunshu Li, IAEA Hands-on session
15:30 – 15:45	Coffee break	
15:45 – 17:15	Controlling time resolution in Splat models cont'	Hands-on session
17:15 – 17:30	Conclusion and program for the following day	Remarks: Nolwazi Khumalo, IRENA

Day 4: CMP reference Scenarios, interconnections and national model results

Friday 25 April 2025

Time (CET)	Session	Speaker / participants
8:30 – 9:00	Coffee	
9:00 – 9:15	Recap of previous day	Remarks: Nolwazi Khumalo, IRENA
9:15 – 10:30	IRENA SPLAT-RETO <ul style="list-style-type: none"> Methodology and results 	Presentation: Himalaya Bir Shrestha, IRENA
10:30- 10:45	Coffee break	
10:45 – 11:30	SPLAT-Africa: Introduction to CMP ref scenario link to national results <ul style="list-style-type: none"> Theoretical background Connecting various country models into a Power Pool model Connecting Power Pools for Continental Masterplan RES representation of interconnections Imports and exports 	Presentation: Tonderai Gumunyu, AUDA-NEPAD
11:30 – 12:45	SPLAT: country representation <ul style="list-style-type: none"> Introduction to next pre-training exercise Data review by national teams 	Presentation: Bilal Hussain, IRENA <i>Hands-on exercise: IRENA</i>
12:45 – 13:30	Group discussion and steps forward <ul style="list-style-type: none"> Goal for next training: fully configured base case Data needed to create / validate SPLAT-EAPP model base case Follow-up update national sessions and home work 	<i>Discussion: Patrice Manirakiza, EAPP</i>
13:30 – 14:30	Lunch	
14:30 – 17:15	Group feedback and closing	<i>Discussion: Patrice Manirakiza, EAPP</i>
17:15 – 17:30	Conclusion of the training	Remarks: EAPP, IRENA