

South African power system planning and operations training

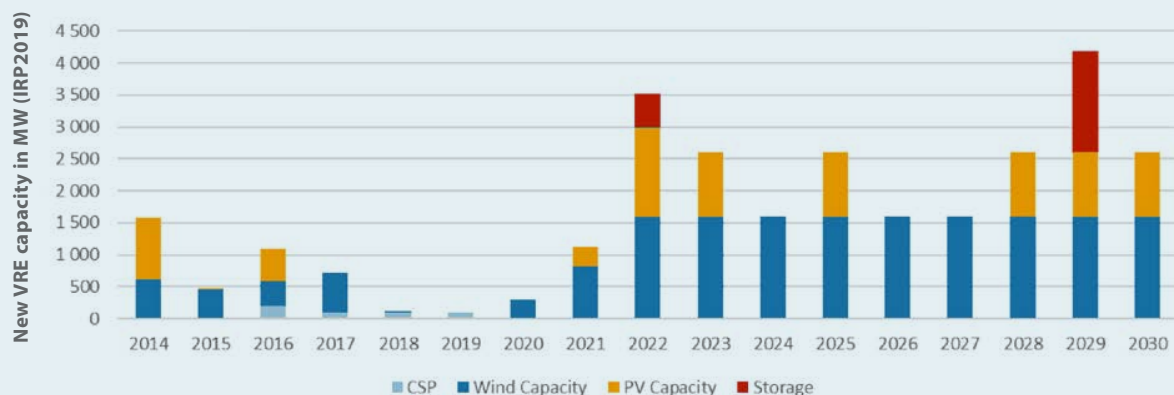
An overview of short learning modules and
academic programmes offered through the
EPPEI-GIZ capacity building initiative.



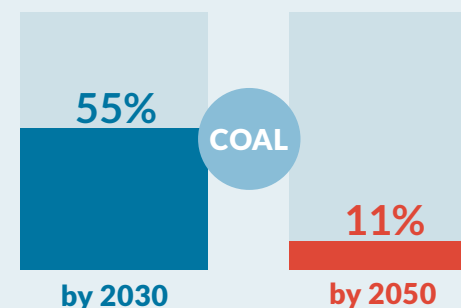
Background

Variable renewable energy (VRE) will increase significantly in the future South Africa power system.

Planned wind and solar PV generation represent around a third of total installed capacity by 2030 (1). In the same future, **traditional carbon-based generation like coal is likely to significantly decrease.**

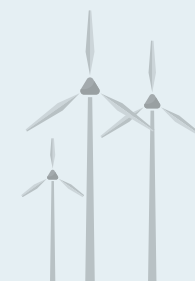


In certain planning scenarios (2) coal represents only 55% of installed capacity by 2030 and 11% by 2050.



From a technical perspective, central will become distributed, with bi-directional power flow, and dispatchable in response to demand will become variable in response to weather.

Given these changes, **planners, operators, managers, and regulators will need to be capacitated in the planning and operation of this changing power system.** EPPEI responded to this need by developing this programme to build power system planning and operation capacity within South African industry and government, specifically acknowledging a future power system with significantly increased amounts of VRE generation. The programme is funded by the [Deutsche Gesellschaft für Internationale Zusammenarbeit \(GIZ\)](#), and is coordinated by the EPPEI Specialisation Centre for Renewable Energy at Stellenbosch University.



(1) Wright & Calitz 2020 (2) DME 2019

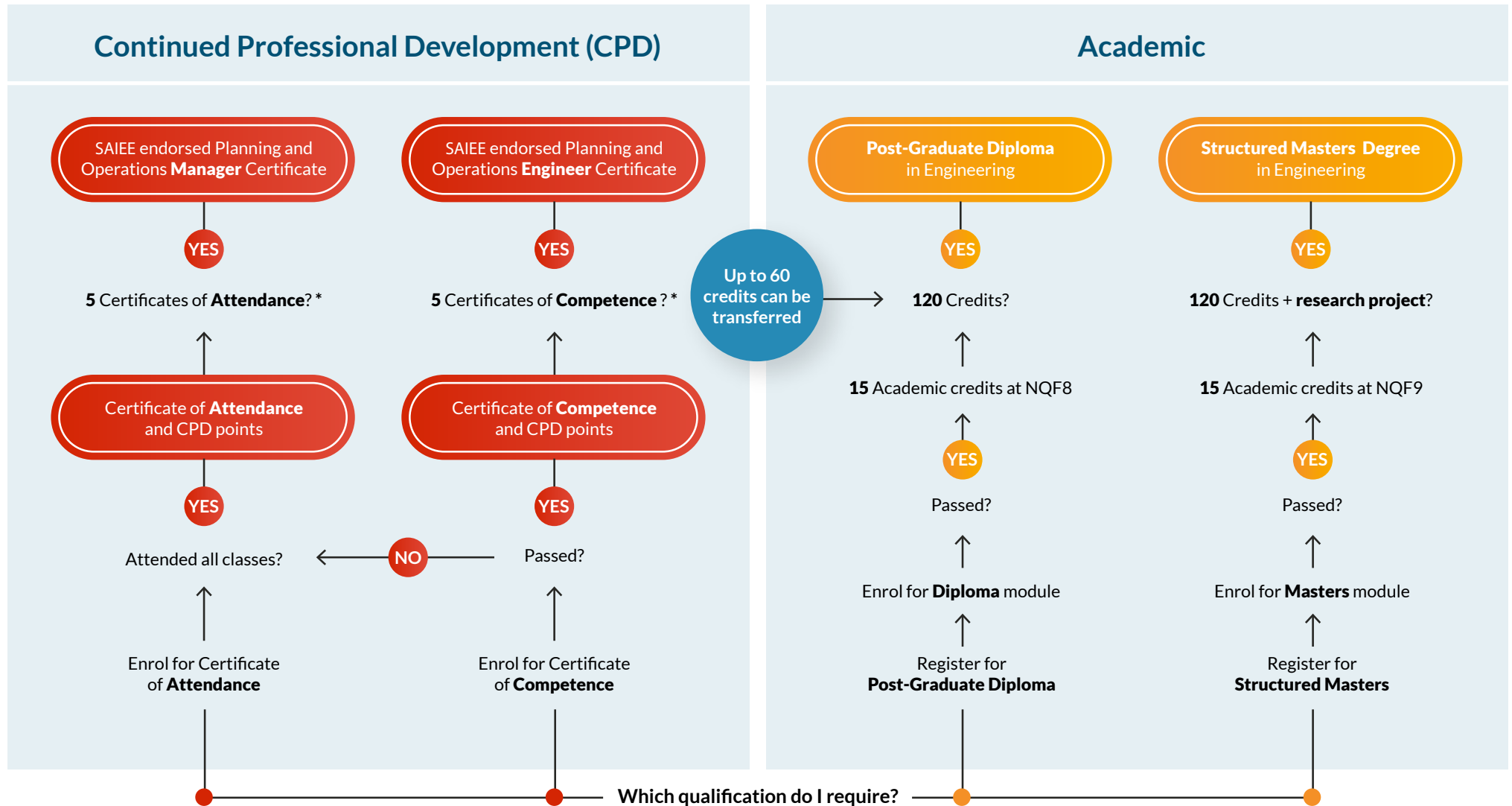
Capacity building learning paths

The capacity building offers two learning paths:



It is **structured around three- to five-day learning modules** closely aligned to real-world industry applications, to cater for the varied requirements of the intended capacity building audience. The modules are designed in such a way that **candidates can obtain a variety of qualifications while attending the same contact session**, with the differentiation between qualifications determined through the additional assessments, assignments and projects.

Capacity building learning paths (continued)



* Certificates for at least one overview, one technology and three planning and operations modules would need to have been received.



Training format

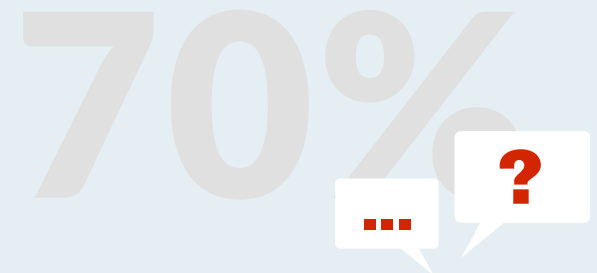
In preparation for the capacity building, a survey was conducted amongst potential attendees in order to inform the training format. Based on this survey, the **learning modules will ideally be delivered over five days distributed over two consecutive weeks**, with two to three full days per week (this might not always be possible for academic modules due to scheduling constraints).



A blended classroom/online model will be followed, with attendees being offered the options to attend in person (covid dependent), online only, or a mixture of these.



At least **70% of the module's contact sessions will be synchronous** (i.e. live interaction between lecturer and students either in person or online), with recordings of the contact sessions made available to students at the end of each day (i.e. enabling an asynchronous option for those students with connectivity challenges). The **training aims to be discussion-rich and applicable to the South African context.**



Modules

Overview

Overview of the Power Industry	COMING SOON	A systemic view of the traditional and future electrical power industry within a broader societal energy context.	UCT
Smart Grid Technology Overview	BROCHURE	Introduction to the key concepts of the Smart Grid, including information and communication technologies and their application and integration.	SU
Power System Analysis	BROCHURE	The fundamentals, models and applications of power system load flow, short-circuit analysis, stability and control.	WITS

Planning & Operations

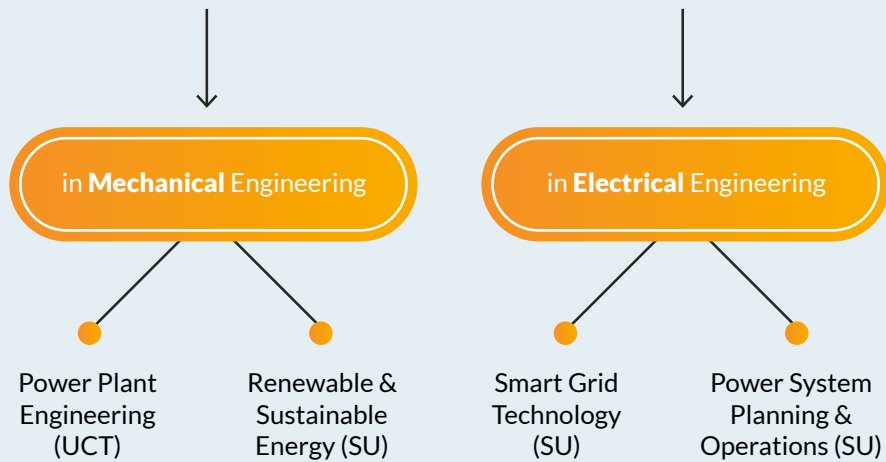
Power System Asset Management	BROCHURE	Strategic and tactical approaches to asset management principles and practices applied to a power system with increasing renewables.	UP
Power System Data Analytics	BROCHURE	The data analytics life cycle applied to solve power system problems, with special focus on demand and renewable energy short-term forecasting.	SU
Long-term Power System Planning	BROCHURE	The principles and techniques informing optimised long-term generation capacity planning, and transmission expansion planning.	SU
Distribution Customer Concepts	BROCHURE	Understanding the concepts inherent in the end use of electricity, including load modelling, pricing, technologies, and mini- and microgrids.	SU
Distribution Network Planning & Operations	BROCHURE	Distribution network technical planning fundamentals, codes and regulations, and applications, and protection and technical operations.	NWU
Power System Operations	BROCHURE	The fundamentals of power system operations in a future with high shares of VRE, and the processes and technologies that support such operations.	SU
Power System Flexible Operations	BROCHURE	Operational power system flexibility optimisation where technical systems and electricity markets interact, and flexibly operating power plants.	UCT

Technology

Advanced Photovoltaic Systems	BROCHURE	Fundamentals, financial modelling, technical design, installation and maintenance of PV systems.	SU
Wind Energy	BROCHURE	Fundamentals, resource and feasibility modelling, technical design, project development and grid-integration of Wind Energy systems.	SU
Energy Storage Systems	BROCHURE	Fundamentals, applications, technologies, modelling and design, and economics of Energy Storage systems.	SU
Solar Thermal Energy Systems	COMING SOON	Fundamentals of solar thermal energy systems, specifically CSP, including concentrator principles and thermal storage applications.	SU
Smart Grid Communications	BROCHURE	Communications fundamentals, applications and technologies within the context of the power system.	SU
Bioenergy	BROCHURE	The practical and commercial application of various technologies for biomass conversion into bio-energy, ranging from bio-fuels to electricity.	SU
Hydro and Ocean Energy	BROCHURE	Ocean and hydro energy associated with the elevation or movement of water, including resources, conversion technologies, and implementation.	SU
Renewable Energy Systems	BROCHURE	The scientific, engineering, resource and integration aspects of various types of renewable energy systems at introductory level.	SU

Academic programmes

Post-Graduate Diploma



Structured Masters

