



SUSTAINABLE
ENERGY
AFRICA



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Introduction to Distributed Generation

*DG Support Workshop for Regulators and Utilities
Cape Town, South Africa – 22–26 June 2026*

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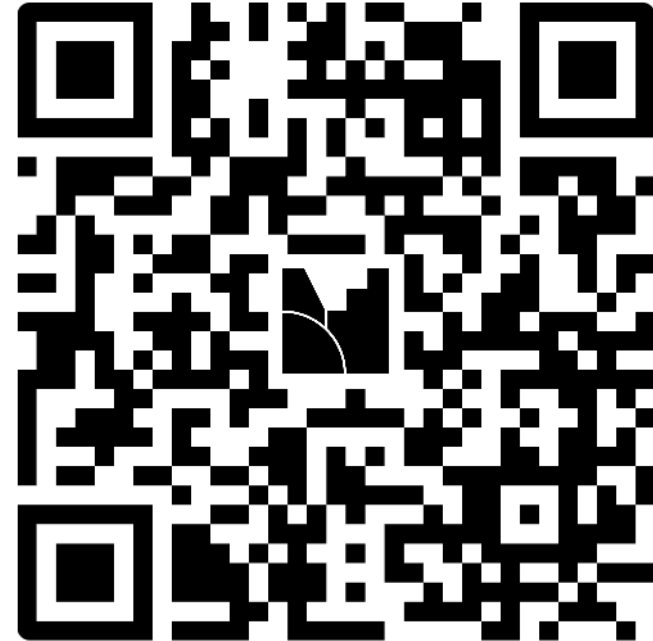
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INTRODUCTION

Key Definitions and Concepts

Key Concepts and Definitions

- **Distribution Network:** The part of a country's electricity grid that delivers electricity to end customers, typically operating at voltages lower than the transmission network.
- **Distributed Generation (DG):** Electricity generated at or near where it's consumed. Typically solar PV, wind, biomass and others, up to 50kW, 100kW, 500kW 1MW or 5MW.
- **Small-Scale Embedded Generation (SSEG) / Embedded Generation (EG):** Generation embedded in and operating in parallel with the utility's distribution network.
- **Independent Power Producer (IPP) / "Pure" generator:** A generator built to sell all its output, with no self-consumption. Dealt with under a different, more involved approval process than self-consumption DG.

Key Concepts and Definitions

- **Grid-tied system:** Connected to and synchronised with the utility grid; can export when generation exceeds the customer's own use; cannot supply power during a grid outage.
- **Off-grid / Stand-alone system:** No electrical connection to the utility grid at all. Not a DG/EG/SSEG.
- **Hybrid grid-tied system:** Combines solar/wind with battery storage; runs in parallel with the grid but can also keep operating during an outage.
- **Alternative Supply:** A backup power source (generator, inverter) that switches in to replace the main utility supply, via a break-before-make switch.

Key Concepts and Definitions

- **Anti-Islanding:** The automatic, instant disconnection of a DG from the grid during a power outage.
- **Isolated:** A section of network fully disconnected from every possible power source
- **Reverse power flow / reverse feed-in:** Electricity flowing from the customer back onto the grid because their generation exceeds their consumption at that moment.
- **Hosting Capacity:** How much DG a given section of network can absorb before it breaches technical operating limits.
- **Simplified Connection Criteria:** Pre-modelled size and penetration limits that let small DG connect quickly without a full grid study.

Key Concepts and Definitions

- **Bi-directional meter:** Measures electricity flowing both ways; either netted into one balance (net metering) or recorded separately (net billing).
- **Net metering vs. net billing:** Net metering nets exports against imports at the same rate; net billing values them separately.
- **Wheeling:** Using the utility's grid to transport electricity from a generator to a customer elsewhere on the network, rather than consuming on-site.
- **Curtailment (Generation Curtailment):** A utility temporarily limiting how much a DG can export, when grid conditions can't otherwise absorb it.

Key Concepts and Definitions

- **Commissioning / Commissioning Report:** The formal testing and sign-off confirming a DG is safe and compliant before it's allowed to operate.
- **Competent Person:** Whoever your country recognises as qualified and/or authorised to sign-off the DG commissioning report.
- **Prosumer:** A customer who is both a producer and a consumer of electricity.

CHAPTER 1

The Global Shift to Distributed Generation

Two Ways to Power a Grid

Centralised Generation

- 1) Traditional power systems
- 2) Centralised, large-scale power plants
- 3) Utility owns the grid and sells electricity
- 4) Long-distance transmission to customers
- 5) Unidirectional power flow

Decentralised Generation

- 1) Smaller-scale, local energy sources
- 2) Reduced transmission needs
- 3) Prosumers, not just consumers
- 4) Rapid growth of DG worldwide
- 5) Potential for bi-directional power flow

Why This Is Happening

Technical & Economic

- 1) Reduced grid congestion and energy losses
- 2) Deferred network investment
- 3) Greater energy security and resilience
- 4) Falling costs: global solar LCOE down ~88% between 2010 and 2021

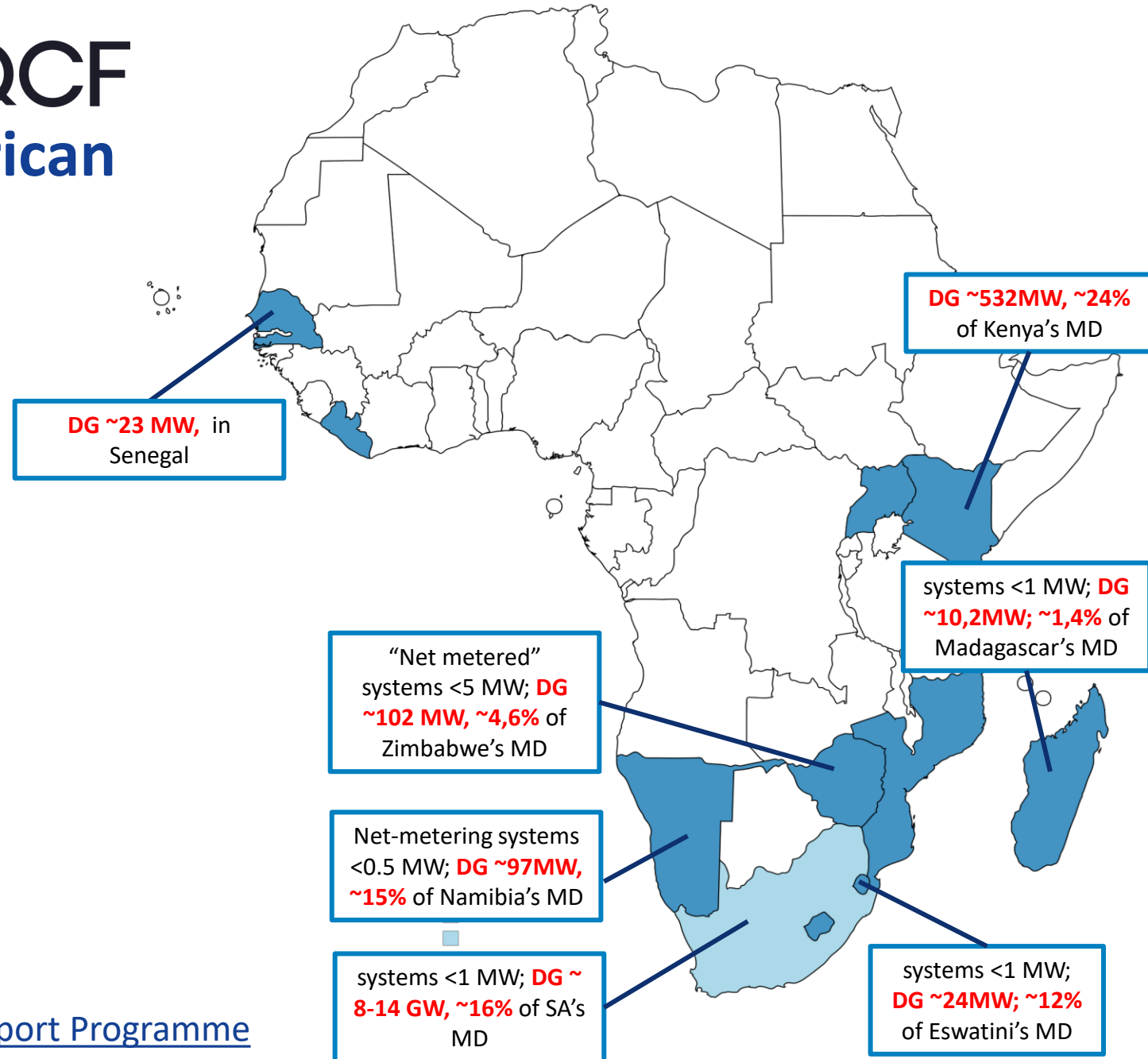
Socio-Economic

- 1) Job creation across the solar value chain
- 2) Consumer choice and control over electricity costs
- 3) Local economic benefits, including for underserved communities
- 4) Environmental and health benefits from reduced emissions



DG penetration in select African countries

- These penetration levels have mostly happened only over 5-6 years,
- To put into perspective, these are similar penetration levels as observed in developed markets.



Source: [DG Support Programme](#)

CHAPTER 2

Why This Matters Now

It's Already Happening

474% growth in South Africa's registered rooftop SSEG capacity, 2022–2026 — from 1,500 MW to over 9,000 MW

- Hawaii and Australia hit this first, with solar curtailment and emergency grid upgrades
- Hawaii froze new solar interconnections altogether, stranding thousands of customers for months
- The pattern is consistent worldwide: growth outpaces planning unless it's built in early

Design Now, or Retrofit in Crisis

Proactive: Built In Early

- 1) Time-of-use and cost-reflective tariffs offset most feared revenue loss
- 2) Fixed-cost recovery built into the tariff structure from the start
- 3) Predictable, gradual adjustment customers can plan around
- 4) Utility keeps visibility and control over the pace of change

Reactive: South Africa's Retrofit

- 1) Fixed charges raised 88% in one step once revenue erosion became unavoidable
- 2) Up to R30,000 in fines, plus forced removals, for unregistered systems
- 3) 278 separate municipal processes, each adding to a national compliance backlog
- 4) Satellite and AI surveillance now needed to find what was never registered



Thank You

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