Renewable Energies Integration into the Namibian Transmission network

SESSION 4A – INTERNATIONAL STUDIES AND EXPERIENCE

24 October 2017

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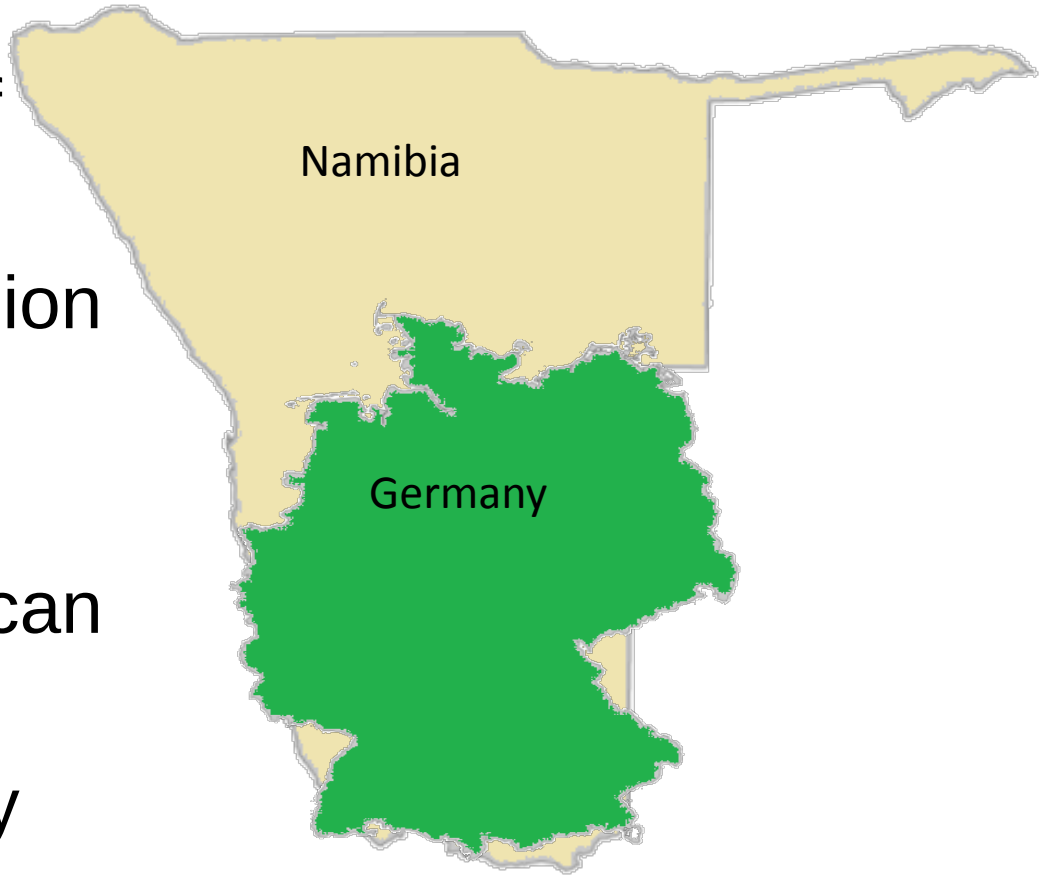
Namibia: Fast Facts

- Area = 825,615 km²

(2.3 x times the area of Germany)

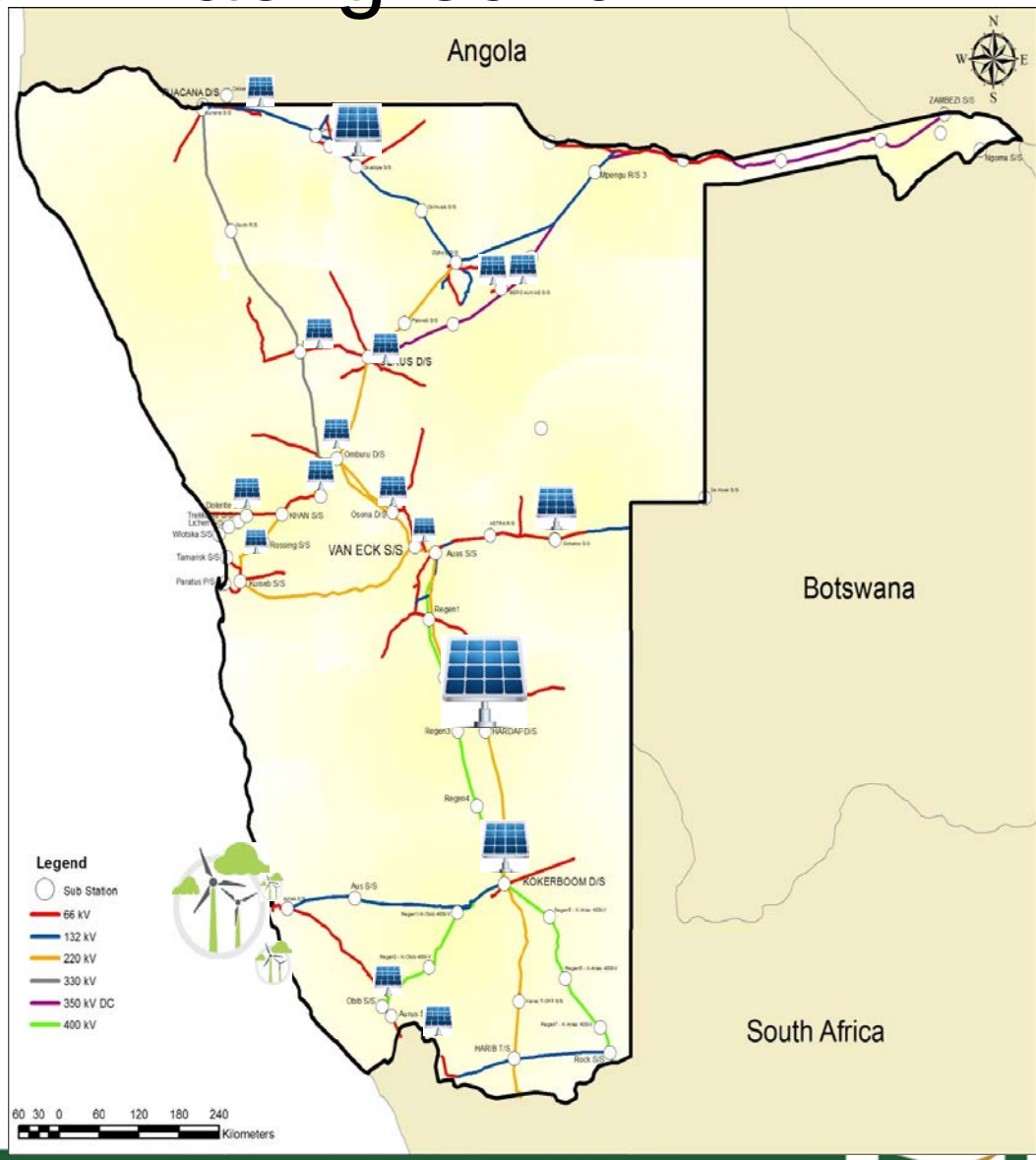
- Population: ± 2.5 Million
- Peak Demand: ± 700MW
- Part of Southern African Power Pool (SAPP)
- National Power Utility and TSO: NamPower



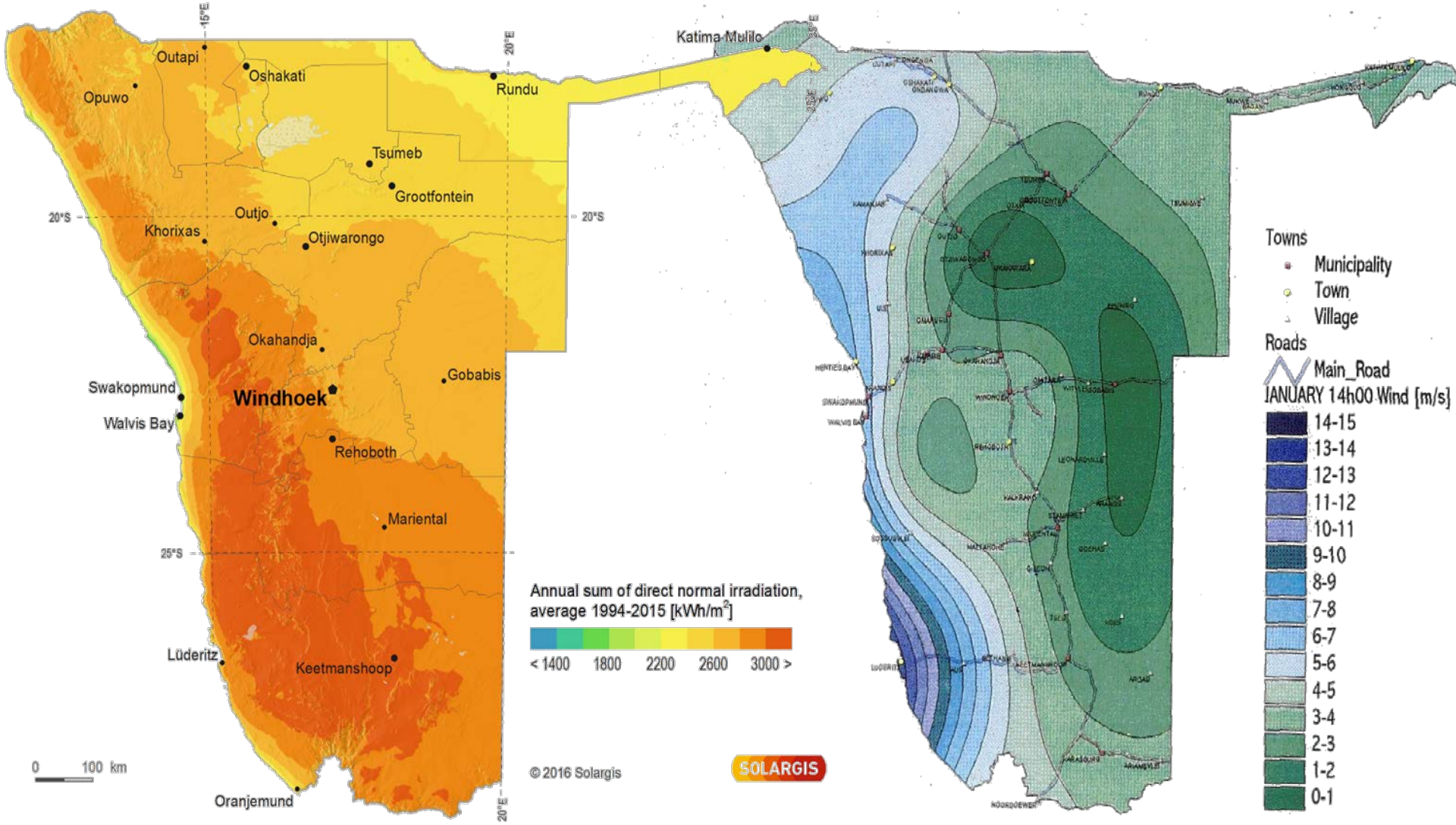
Network Background

Namibian Transmission network characteristics:

- Long (1800km) and radial topology
- Extremely low fault levels with prominent parallel resonant points
- Inherent voltage instabilities
- No spinning reserve available locally
- Voltage levels from 400kV to 66kV, -350kV VSC HVDC
- Near-50Hz resonance phenomena
- Recent distributed RE integration



Solar and Wind Resource



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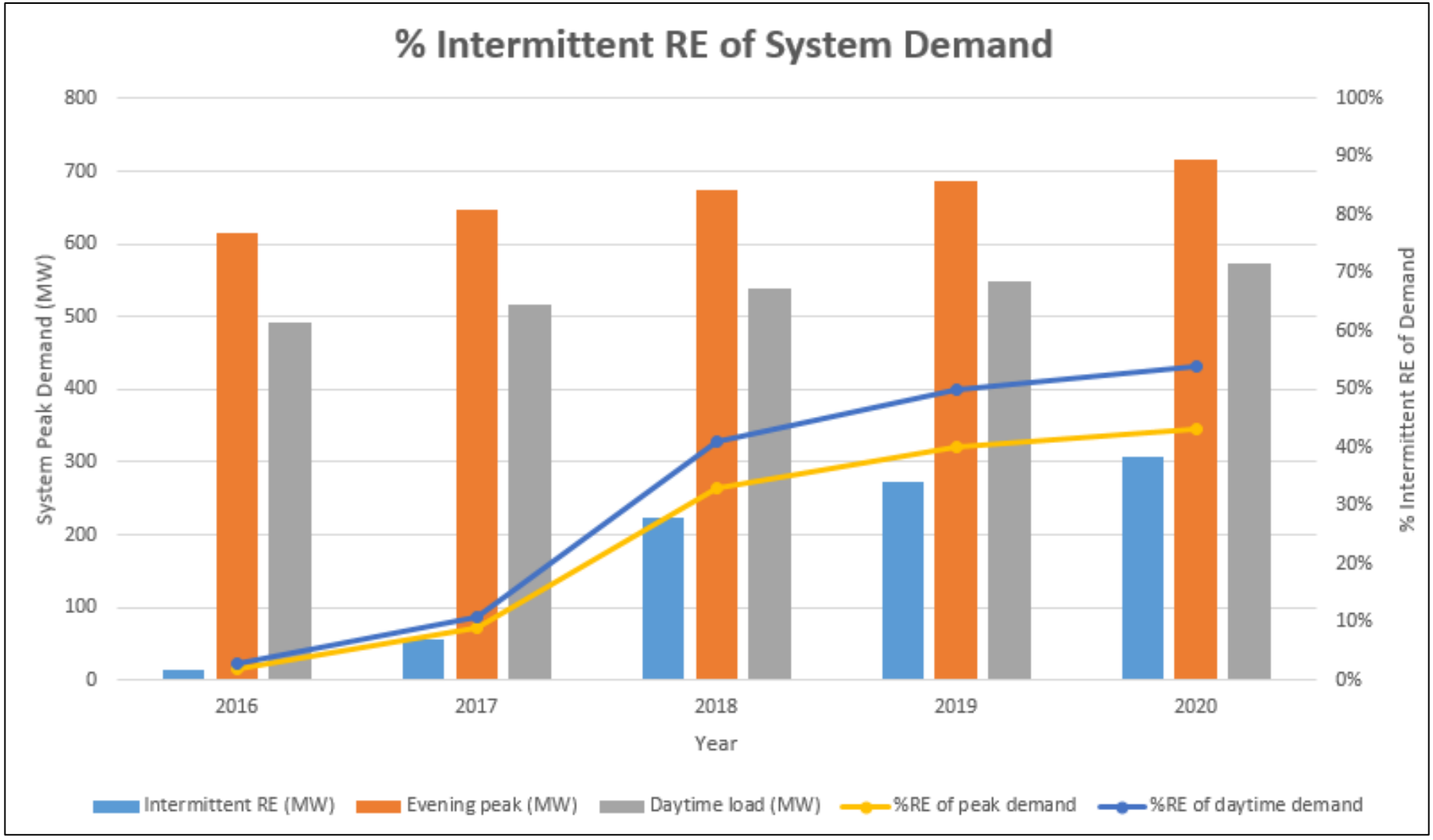
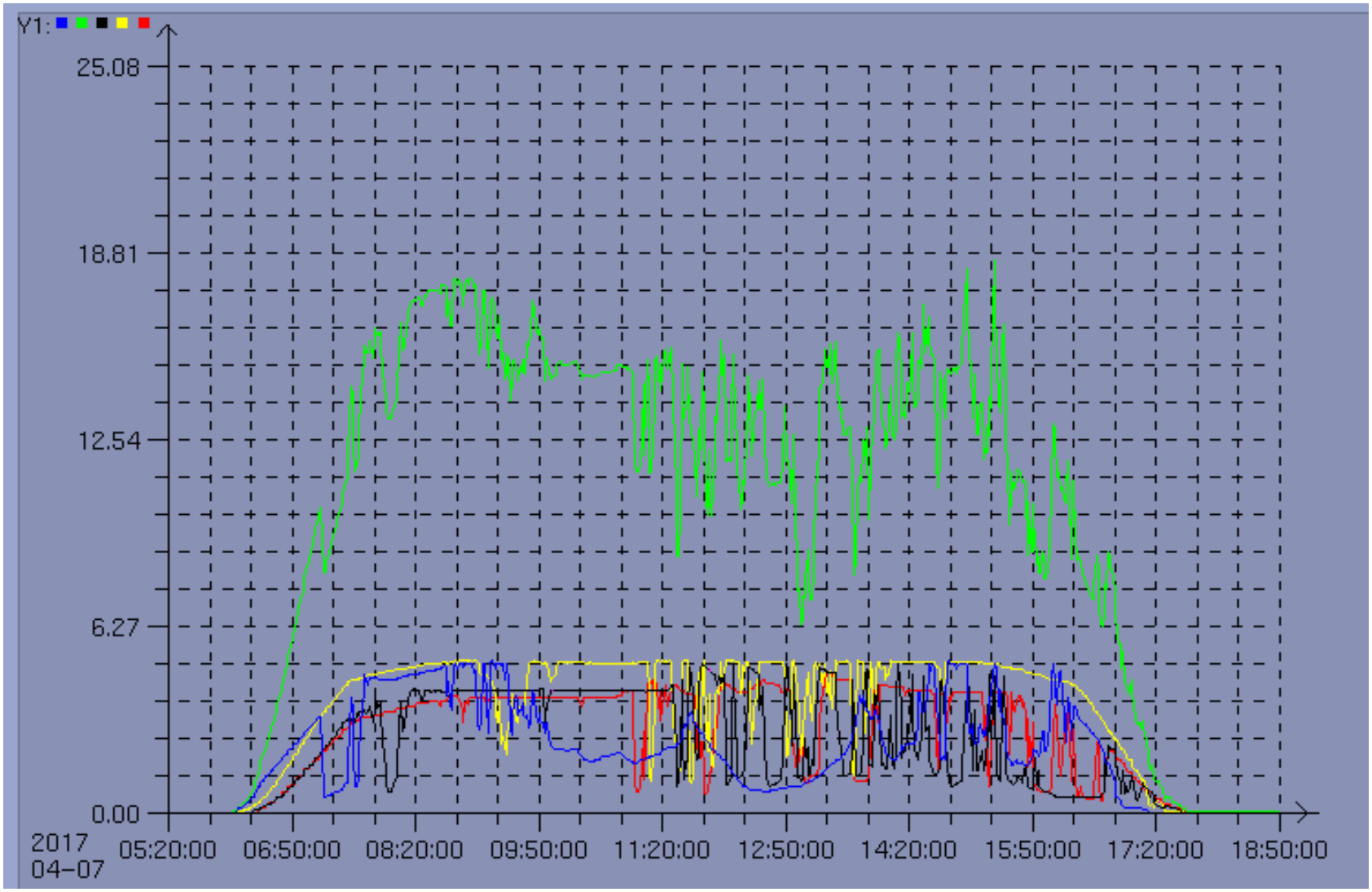
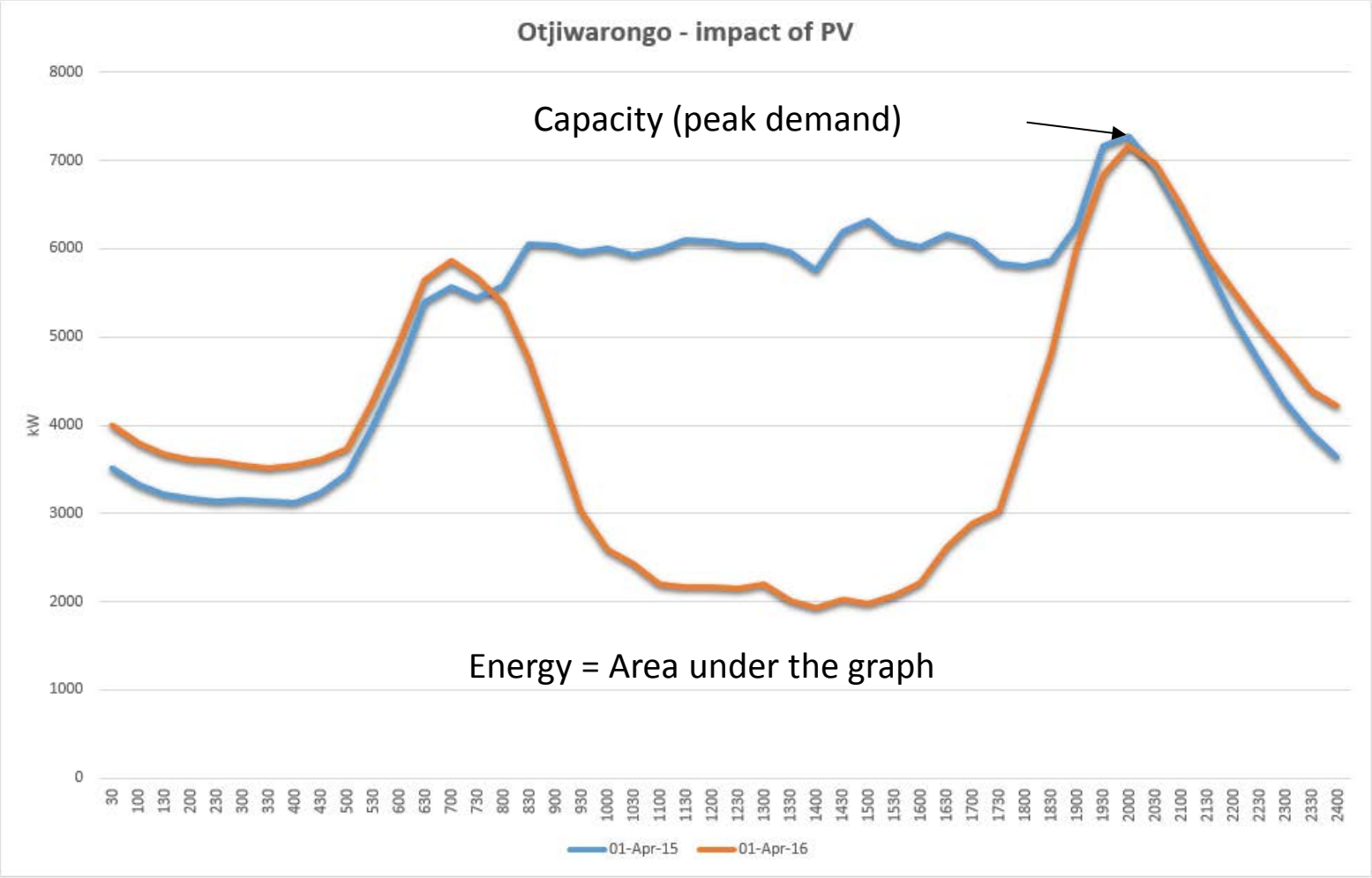
Growth in RE installed capacity



Intermittency of solar Plants



Typical town load with embedded PV



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Strategies to manage intermittency

- Make use of control area ancillary service in the absence of local quick spinning reserve (limited, results in intermittency in tie-line flows to Eskom, backbone voltage fluctuations)
- Cater for more DC-side overcapacity
- Cater for battery storage and the development of an ancillary services market
- Allow existing plants to add battery storage to manage % of own intermittency locally
- Geographic diversification of future intermittent RE plants
- Implement larger generating plant with sufficient quick spinning reserve capacity
- Implement more stringent requirements on forecasting accuracy

Grid Code requirements and Compliancy Testing

- Certified dynamic model required including certified harmonic currents
- Anti-island testing performed under equal load/generation conditions (real and reactive power matched)
- Both voltage control and power factor control are required for all plants larger than 500kVA with set-points controllable from the National Control Centre.
- Power vs frequency response, LVRT, HVRT, QV curve, Iq injection, etc required
- Harmonic performance measured over period of time