Inverting loadshedding with Solar PV and Battery Storage

Dr. Arnold J Rix 26 May 2023 Department of Electrical and Electronic Engineering Stellenbosch University South Africa



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Inverting loadshedding with Solar PV and Battery Storage

- Introduction
- PV system research at Stellenbosch
 - Modelling
 - Measurement & Development
 - Forecasting
- Hybrid systems research
- Inverting loadshedding PV & batteries
 - Terminology inverter, power and energy
 - Determine your load
 - Sizing your battery for loadshedding
 - Generate your own power with PV





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Training sought-after graduate students through industry relevant research projects while providing training and consulting services to the photovoltaic industry.

Train students

Research

Industry support



PV system research at Stellenbosch Modelling PV Systems

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PV system research at Stellenbosch Modelling PV Systems





PV system research at Stellenbosch Modelling PV Systems



































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Induced Currents in PV Module (Open-Circuit, 1.6 m, Diode)













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PV system research at Stellenbosch Forecasting





Figure 1.8: Suggested approach of aggregated low-level PV-system forecasts.







PV system research at Stellenbosch Forecasting

Electronic Engineering 4.32 PV-system clear 3.29 WSWN Inverter clear Inverter Cluster clear 50 3 80 10, to 10, to 10, to 10, to 10, to to to to to to to to to 6.17 PV-system clear-intermit 4.69 W Inverter clear-intermit Aggregated Aggregated Inverter Cluster clear-intermit Inverter model Future Input Sliding 11.10 PV-system intermit Window xh Window Data 10.26 WWN Inverter intermit 0 0 Inverter Cluster intermit 9.42 : 1 C : ÷ 18.16 PV-system overcast 14.52 Way 0 С x_m Inverter overcast ł : Inverter Cluster overcast C 10.88 X_n 50 3 90 tog to tog tog tog tog tog tog 30° 25° 06° 25° 00° 285 24 h Hidden Output Forecast Input Forecast [minute] Horison Layers Layer Layer



Target data



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Hybrid system research





Hybrid system research



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(a) IEEE-14 bus clustering result (K = 4).











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Power (Watt)

Inverter & PV modules

vs. Energy (Watt-hour)







Batteries

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- **Components required**
 - PV modules
 - Battery
 - Inverter (Hybrid can connect to battery as well)

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Charge Controller Solar Radiation Estimate your load Power (W) and Energy (Wh) **Estimation of Required Daily Energy** Load/Appliance Rated Power (W) Hours of Daily Use (h) Daily Energy Required **REAL DATE** Washing Machine 2000 0.75 (45 minutes) 1500 ALALIA I Dishwasher 1500 1.5 2250 **DC Panel** Battery 4000 2 8000 Oven Board Bank 1200 0.1 (6 minutes) Kettle 120 Television 200 3 600 stribution Board (AC) 7 120 Lights 840 Inverter Fridge-Freezer 700 863 -12 24 Wi-Fi Router 288 9732 Total 14461



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Determine the size of the battery

- Efficiencies
- Maximum depth of discharge
- Hours/Days of storage required







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Determine the size of the PV and inverter

- Efficiencies
- Peak loads -> power
- How much sun -> energy



https://re.jrc.ec.europa.eu/pvg_tools/en/







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Thank you

Dr Arnold J Rix

rix@sun.ac.za

https://www.researchgate.net/profile/Arnold_Rix