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MICRO GRID

10 June 2026

IMPLEMENTING MICRO GRID SYSTEMS: REGULATORY AND INSURANCE CHALLENGES WHILE MAINTAINING A VIABLE IRR

IMPLEMENTING MICRO GRID SYSTEMS

Agenda

1. Introduction and Context
2. What Is a Hospital Microgrid
3. Regulatory Landscape
4. Insurance Requirements – The Hidden Gatekeeper
5. Case Study: Mediclinic Milnerton
6. Financial Viability and IRR Protection
7. Key Take Away

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Introduction and Context

Hospitals require **uninterrupted power supply** to protect patient safety, yet they face **rising electricity tariffs**, **carbon reduction targets**, and increasingly **stringent regulatory** and **insurance requirements**.

As well as the wide spread load shedding during 2022 up level 6 required a different view.

In response, Mediclinic Southern Africa has embarked on a Photovoltaic Battery Energy Storage System (PV BESS) microgrid programme to **improve energy resilience**, **optimise operating costs**, and **reduce reliance** on the **national grid**.

During peak load shedding period, Group provisionally approved R 2,5 billion to role out PV BESS systems across the group.

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Introduction and Context

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The core project intent was to:

- Deliver **arbitrage** (charge cheap / discharge expensive ToU periods)
- Support **peak shaving** / maximum demand management
- Improve grid resilience / **business continuity** during load shedding
- **Reduce carbon** footprint

This all sound perfectly normal, easy peasy engineering solution, however it opened a hornet nest of complexities.

Both internal and external

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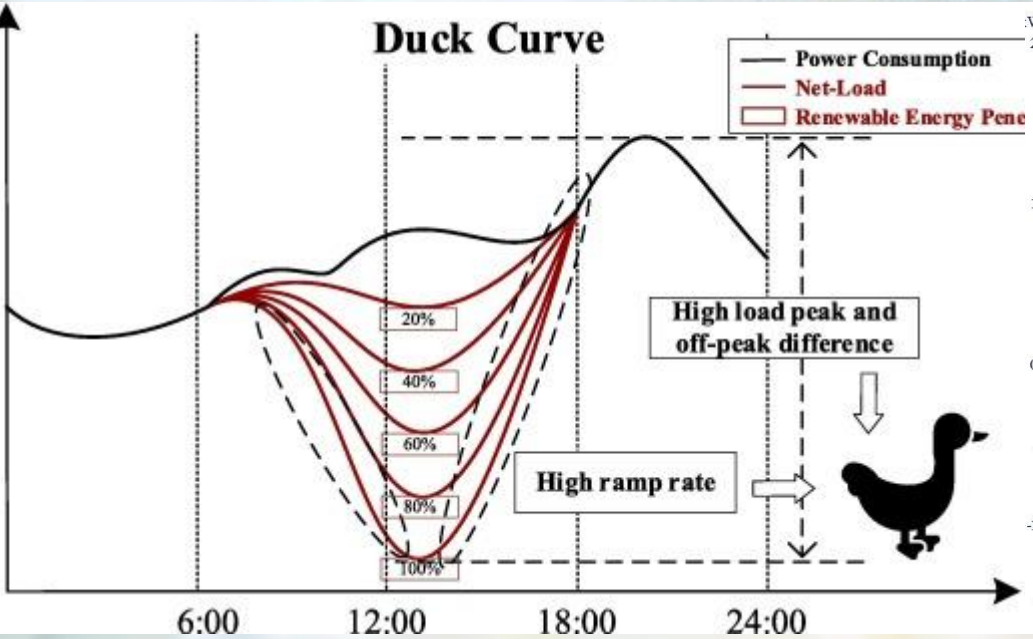
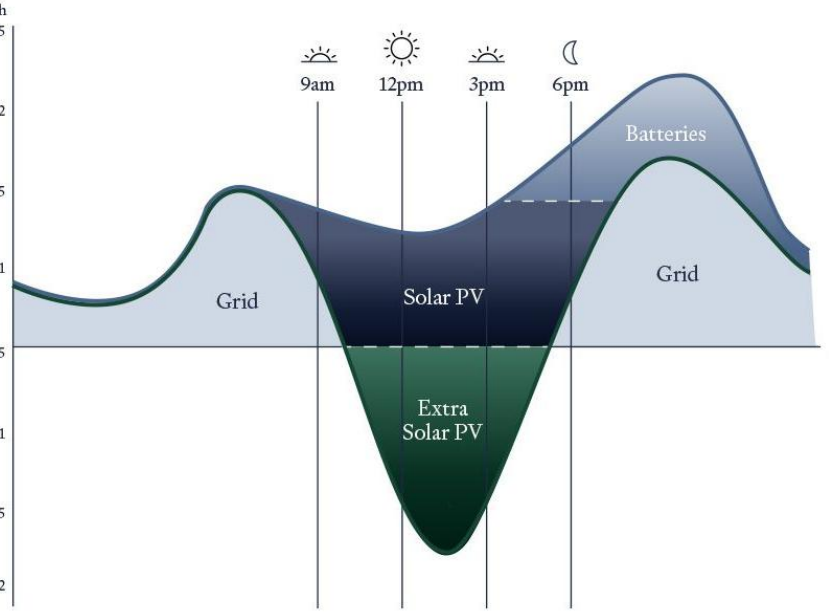
Duck Curve

Share some concepts





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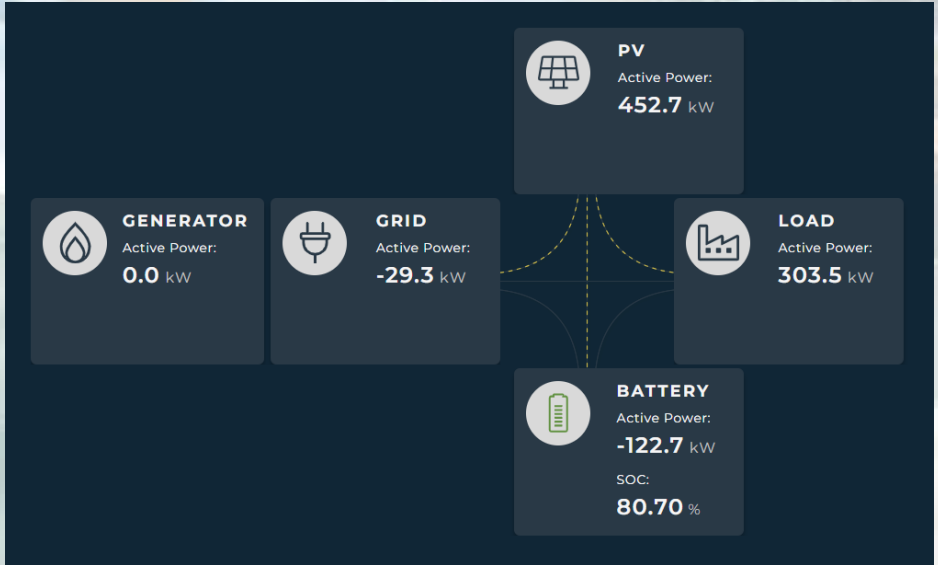
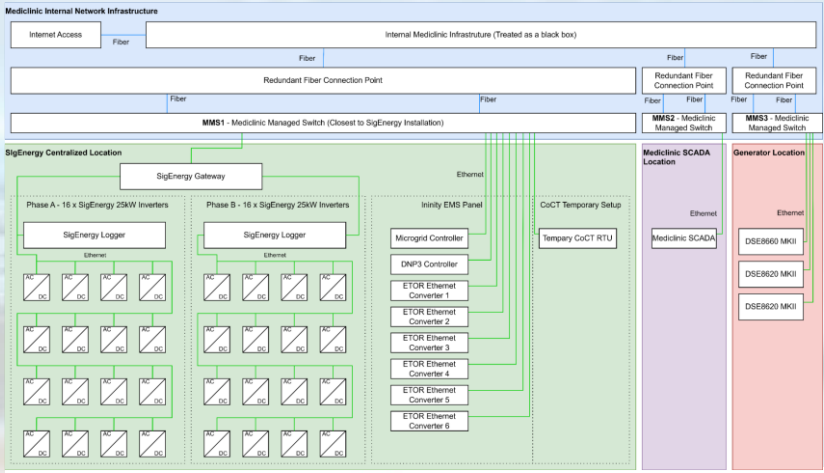
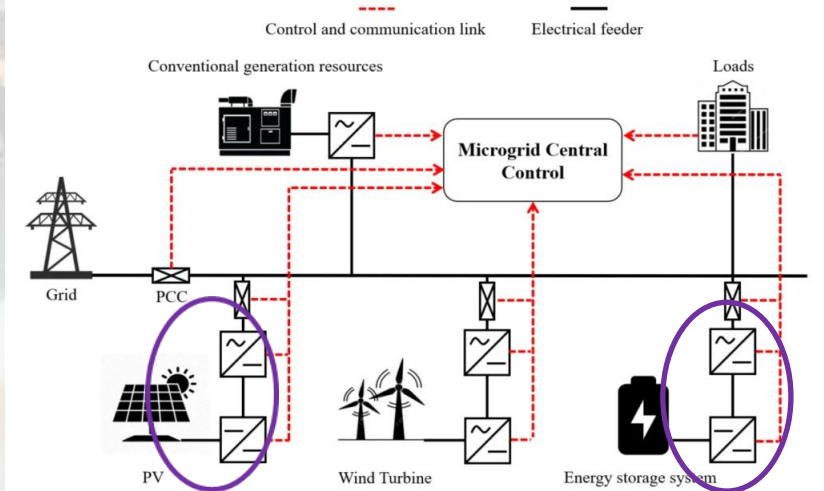
What Is a Hospital Microgrid

The simple answer is that it is a controller, programmed to monitor the load and utilise the cheapest power available at that time to manage the load within certain parameter







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Regulatory Landscape

SSEG, Building Plan and SDP approvals are required

Small-Scale Embedded Generation (SSEG) application, based on the **sum of generation capacity** (total nameplate rating of all inverters), NRS 097-2-3:2023

The interpretation hereof led to multiple debates as council include the PCS (Power Conversion System) in the sum of generation

If sum > 1 000 kW, a class B application is required

Class B application is complex, expensive and time consuming, a work around was designed

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Regulatory Landscape

A scalable hybrid inverter was utilised – not normal practice – Sigenery, Sig and store

C of CT, you need to use an inverter listed on the approved list that is tested inverter is tested according to NRS 097

NRS 097, Ed 3 has additional requirement for built-in double-disconnect switch.

Contrary to document trail, stating that the invertors was tested against Edition 3, and that all documentation have been submitted

Now well fine….the City did not update their list and insisted that a double disconnect is installed although the inverter is compliant with NRS 097 ed 3.

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Insurance Requirements – Risk

Major Risk = Lithium Iron = Thermal Run Away = Self Propagating Fire

Industry standards; UL (Underwriters Laboratory) and NFPA (National Fire Protection Association)

UL and NFPA standard recommended way of extinguishing an BESS is to cool it down with water at a rate of 12mm/minute over the entire room area

In addition, they require a further 946 l/minute hose stream

This equated to roughly 160 kl per hour. Lithium Iron batteries are know to burn for hours.

As council supply is not guaranteed, on site storage is required – Sizes of Lower Steenbras required on site, not practical

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Insurance Requirements – Risk

NFPA 855, Utility-Scale/Large Systems: Often require 30 m from occupied buildings

None of these requirements are practical, space availability, a lot of cash will be buried in the ground

Mediclinic **commissioned** the service of a **risk engineer from WTW**

Main purpose was to develop **Risk Assessment Tool mitigating** all

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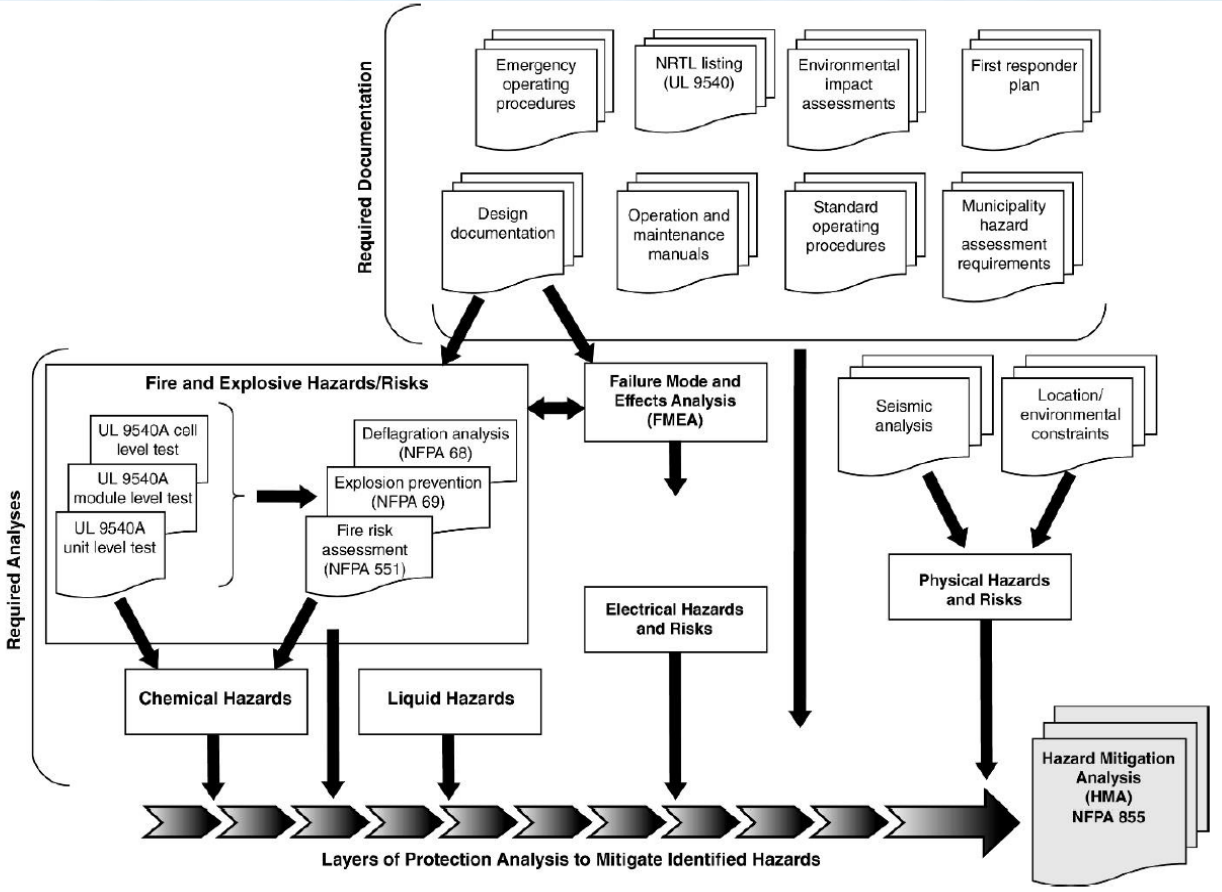
Insurance Requirements – Risk

NFPA 855 – HMA

Hazard Mitigation Analysis

5 Risk Assessment Tool

Total of 257 aspects / standards identified that either had to be met or mitigated



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Insurance Requirements – Risk

The next step, Mediclinic **appointed fire consultant** that specialise on BESS installation

This consultant in previous life work for Insurance Broker as a Risk Assessor

Developed a rational fire design aligned to the insurer frameworks - **Comprehensive Fire Protection Plan**

The main stumbling blocked remained the **12mm/sqm and dam** for storage the insurers required and **distance** from main risk

A **micro mist system** formed part of the fire protection plan.

However, some of the insurers did not accept the micro mist systems as it was not tested on **full scale** level to UL and only test report available is a scaled down system tested to the UL standard

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Insurance Requirements – Risk

To overcome the insurance and council impasses; water, distance, NRS 097-2-3:2023 the following was done;

As with Micro Grid Systems, the technology is fast developing and a modular base system was identified with the following main advantages;

- **Scalable** modular systems
- **Battery packs** connected in **parallel** and **not series** as with standard ESS.
- Each battery pack have **several safety** mechanisms built in, both **mechanical** and **software**.
- Some of the safety aspects of the system are;

1. **Real time monitoring** of battery **cell voltage levels** and adjust charge strategy for overcharge protection.
2. **Set cut off** at 100% SOC.
3. **7 temp. sen**sors for comprehensive temp. detection.
4. Innovative **Decompression Valve Reduce** pressure and prevent pack explosion.
5. Reliable High Temp. **Insulated Pad** Preventing electrical leak and thermal spread to shell.
6. If a major fault is detected, **battery pack is isolated and sealed** with **automatic extinguisher that activates at 170˚C**, that absorbs heat and free radicals to extinguish fire in 4 seconds.

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Insurance Requirements – Risk

This **modular system**, with **multiple safeties** and **built in extinguisher at cell level**, the product present itself as a safer alternative than a standard BESS

It addressed both the insurer requirements and statuary requirements associated with SSEG application

Client and Insurer agreed that the BESS can be within 15 m of the main risk and no sprinkler system is required

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Case Study: Mediclinic Milnerton

A POC was tender for to be installed at Milnerton for a 800 kW, 1 280 kWh with 970 kWp, with 600 kW Export system

Project was managed in terms of the **FIDIC Yellow Book** and taking over certificate issued 18 December 2026

Most of the aspect we discussed earlier manifested throughout this POC

I would rather focus on the projects that followed and share some school fees paid

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Financial Viability and IRR Protection

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Two more hospitals where tender for. During evaluation process the **hurdle rate was not achieved**.

Separate meetings was held with **each EPC to brainstorm** value engineering possibilities

Containers was replaced with purpose built bricks and mortar buildings

Aluminum cables used between mains and gateway for AC

Inverters placed in natural ventilation area – Batteries and Inverters are IP67 rated

Inverter room was positioned as closed as possible to the tie-in point, but still maintaining a minimum safety distance

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Key Take Away

PV BESS systems is a **multi-domain compliance project**, that requires the input of a multiparty professional team

Early Involving of Consulting and **key stakeholders** is paramount for success

Head of electrical services – ultimately **NRS 097 interpretation is guided** by this head

Insurer – **UL and NFPA compliance**

Fire chief – keep him involve throughout

Network and cyber security – the micro grid is a part of Ethernet, on different VLAN with bidirectional communication

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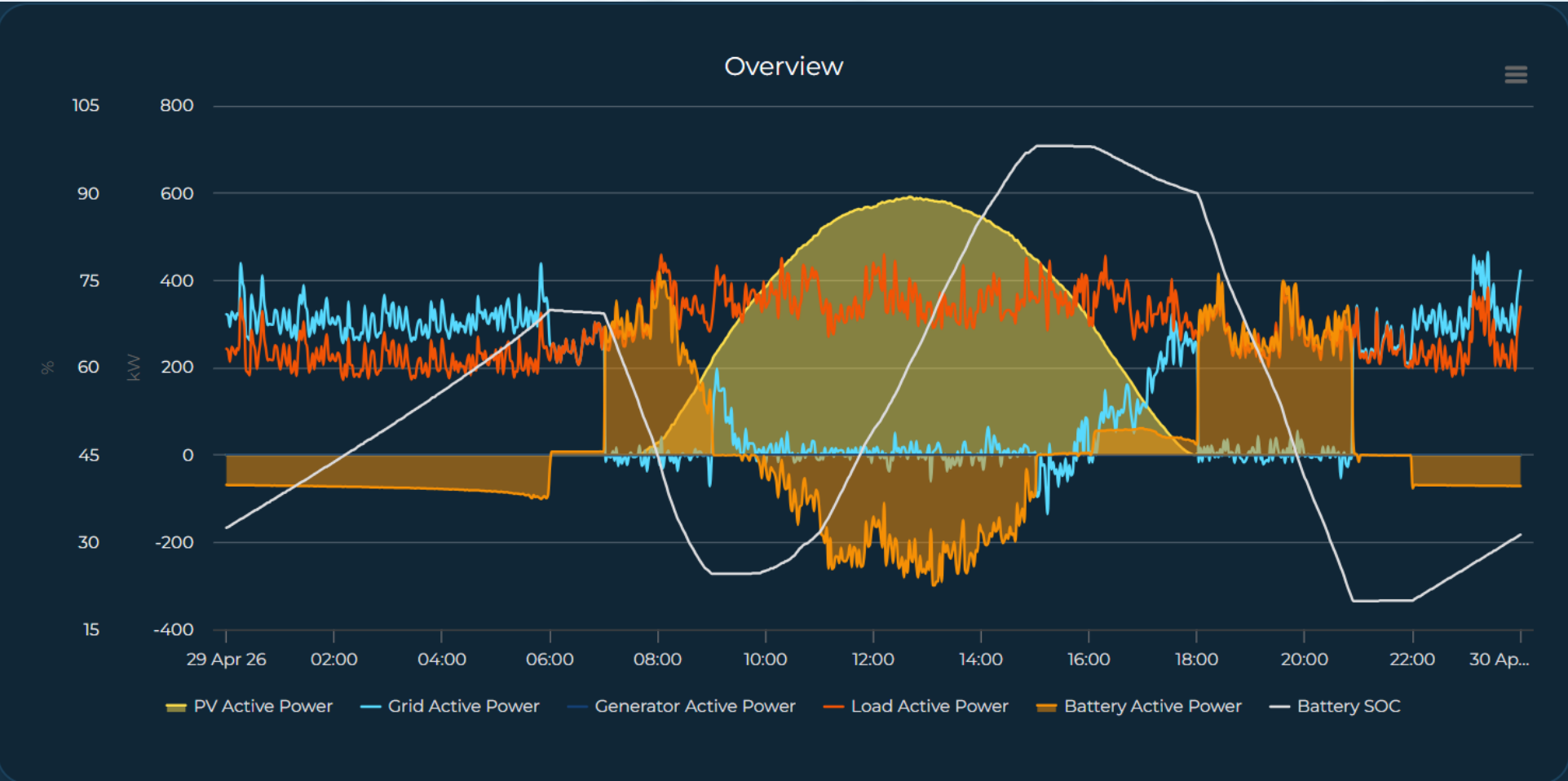

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Closing

UL and NFPA requirements are a given, you can not argue with the insurer that these standards are not applicable as we are complaint with SANS and NBR – if you do not meet certain requirements the insurer is not oblige to insure you if the risk is to high. It is best to sit down with them and agree how best to mitigate the risk with in reason.

NRS 097-2-3:2023 interpretation – Council, EPC, Independent Engineer and client, import that all understand the definitions, point of control, AC and DC volt drops, double disconnect and sum of generation

Project sponsors, **design and execution** is the **only timeframe** that can be managed, approval beforehand is unpredictable. Also that the **original desk top exercise and actual product will differ vastl**y due to many unforeseen

Collaboration between client, suppliers, Engineer and EPC is paramount to ensure a valued engineered product is delivered.

Post installation optimisation is crucial to meet performance guarantees

Summary Questions

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Introduction & Context

What is a Hospital Microgrid?

Integrated Renewable Power System

R3 → R3 → R3 → R3

Ensuring Energy Resilience

Regulatory Landscape

SSEG Approvals & Compliance

SANS 10142-1

NRS 097-2-3

Insurance Requirements

NFPA 855 – HMA – Hazard Mitigation Analysis

✓ **Risk Assessment Tool**

Total of 257 aspects / standards identified that either to be met or mitigated

Insurance Requirements

Cost Optimization

Financial Viability & IRR Protection

Carbon Reduction

IRR Safeguarding

IRR Safeguarding

Early Stakeholder Engagement

Collaboration from Start

Key Takeaways

Compliance Challenges

Risk Management

Regulations

Ensuring Safety Standards

Ongoing Monitoring

Sustained System Performance