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Background

Aligned with Saudi Arabia's Vision 2030, the energy sector faces challenges in reducing methane flaring. Our project addresses this by designing a system that is :

- Reliable
- Sustainable
- Profitable
- Economical
- Efficient

Objective

Our project aims to repurpose methane flared from industrial plants into clean energy by integrating Solid Oxide Fuel Cells (SOFC) for power generation. The system operates under the following scenarios:

- Methane is captured and purified to high standards, enabling efficient use in SOFC while reducing emissions.
- Excess power is directed to support grid demands or stored for later use.

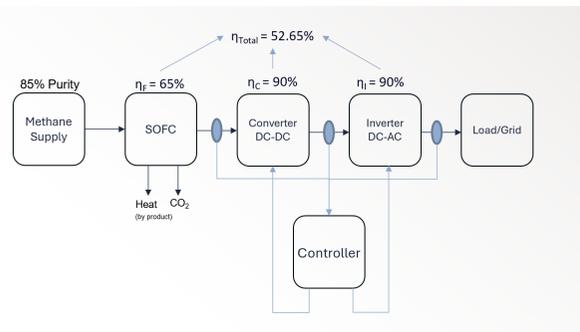
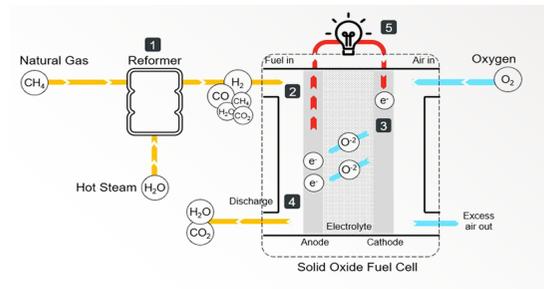
The projects constraint:

- Methane purity: $\geq 85\%$
- SOFC efficiency: $\geq 60\%$
- Total system efficiency: $\geq 50\%$

Specifications:

- 24V DC Battery-powered prototype
- DC-DC and DC-AC converters each achieving 90% efficiency
- Output meeting 230V AC at 60Hz regional standards

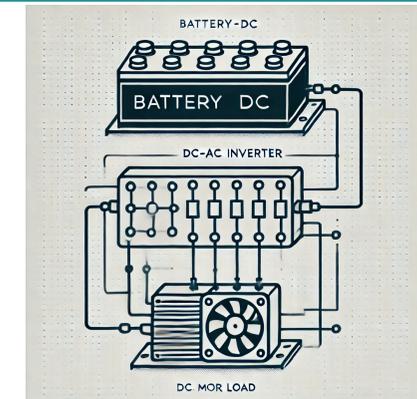
Design



Project Impact:

- Integrating methane recovery and energy efficiency defines our system's innovative edge.
- Efficient methane recovery and clean energy generation significantly reduce greenhouse gas emissions.
- Facilitating the transition of industrial operations to an eco-friendly and economically viable energy solution.

Prototype



- Methane (85% purity) powers a Solid Oxide Fuel Cell (60% efficiency).
- DC-DC and DC-AC converters (90% efficiency each) achieve a total system efficiency of 50%.
- Outputs include grid-standard electricity (230V AC, 60Hz), heat, and CO₂.

Conclusions

- Utilizes 85% pure methane for clean energy conversion.
- Powered by SOFC with 65% efficiency. Generates 230V AC power at 60Hz from flared methane.
- Reduces emissions, enhances energy sustainability.