

Energy Track

The Energy Track focuses on developing sustainable and resilient energy solutions for future cities. It explores renewable integration, smart grids, energy storage, and AI-driven optimization. Participants address real-world challenges, designing scalable systems that enhance efficiency, reduce emissions, and support the transition toward net-zero, smart, and sustainable urban environments.



HEMS Data-driven Demand Response Control

Develop intelligent home energy management optimizing A/C loads, reducing peaks, costs, and maintaining comfort.

Optimizing Battery Energy Storage in Harsh Climates

Design climate-resilient residential battery systems ensuring safety, durability, efficiency, and cost-effectiveness in extreme Saudi conditions.



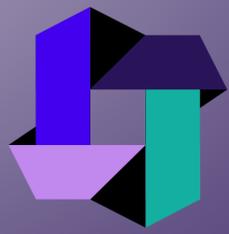
Energy Management for Solar Optimization

Create AI-driven solar monitoring system predicting output, detecting faults, and maximizing residential PV performance

Official partner



Track owners



Energy Track Challenges

The agricultural sector faces critical challenges that directly impact food security and sustainability. This hackathon focuses on three major challenges that require innovative, practical, and scalable solutions aligned with sustainable agriculture goals.

Challenge 1: Optimizing Battery Energy Storage in Harsh Climates

High temperatures and humidity in Saudi Arabia significantly affect the safety, lifetime, and performance of residential battery energy storage systems. Many battery solutions are not designed for such conditions, leading to faster degradation and higher costs for homeowners.

Desired Outcome

Select safe, durable, and cost-effective battery solutions suitable for Saudi hot and humid conditions.

Constraints / Resources

Must operate in extreme climate using commercially available technologies and anonymized data.

Impact

Improves residential energy resilience and long-term storage reliability in Saudi Arabia.

Available support

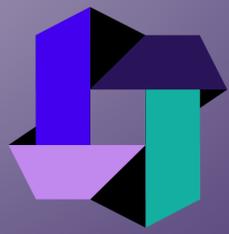
1. Climate data, reference battery/Iot devices specifications
2. Sub-metered A/C energy consumption data
3. Technical mentorship during the hackathon to support: data analysis, demand response logic, and performance evaluation.
4. Anonymized electricity billing data for multiple residential buildings

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Challenge 2: HEMS Data-Driven Demand Response Control

Residential air-conditioning systems dominate electricity demand in Saudi Arabia, especially during hot daytime hours, causing high peak loads and increased electricity costs. Time-of-Use (TOU) tariffs and Demand Response (DR) programs are widely used globally but are not yet implemented locally.

Desired Outcome

Develop smart A/C control strategy reducing peak demand and electricity costs while maintaining comfort.

Constraints / Resources

Based on anonymized residential energy data with limited sensing and no direct utility control.

Impact

Reduces peak loads, lowers bills, and supports future smart-grid integration.

Available support

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2. Sub-metered A/C energy consumption data
3. Technical mentorship during the hackathon to support: data analysis, demand response logic, and performance evaluation.
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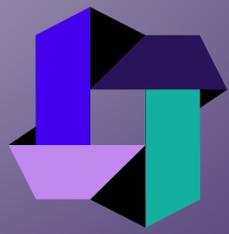
المركز الوطني لأبحاث
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Challenge 3: Energy Management for Solar Optimization

solar PV systems may suffer from underperformance due to soiling, shading, equipment faults, or weather conditions. Homeowners often lack visibility into production losses and their root causes.

Desired Outcome

Design AI system to predict solar output, detect faults, and recommend corrective actions.

Constraints / Resources

Relies on anonymized solar data and realistic residential technology assumptions.

Impact

Maximizes PV performance, improves reliability, and increases homeowner confidence in renewables.

Available support

1. Climate data, reference battery/Iot devices specifications
2. Sub-metered A/C energy consumption data
3. Technical mentorship during the hackathon to support: data analysis, demand response logic, and performance evaluation.
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