



LUMINOUS

**Optimizing Energy Consumption
Using Time-of-Use (TOU) & Time-of-
Day (TOD) Tariffs (ECOSYNC)**

BIG STEPPERS

ANUSHKA SHARMA

ANANYA VERMA

SHREYA



Meet Rajesh, a homeowner who recently installed solar panels to reduce his energy bills and contribute to a more sustainable environment. However, despite his efforts, Rajesh continues to face several challenges that prevent him from fully optimizing his energy usage and maximizing cost savings.

RAJESH’S CHALLENGES:

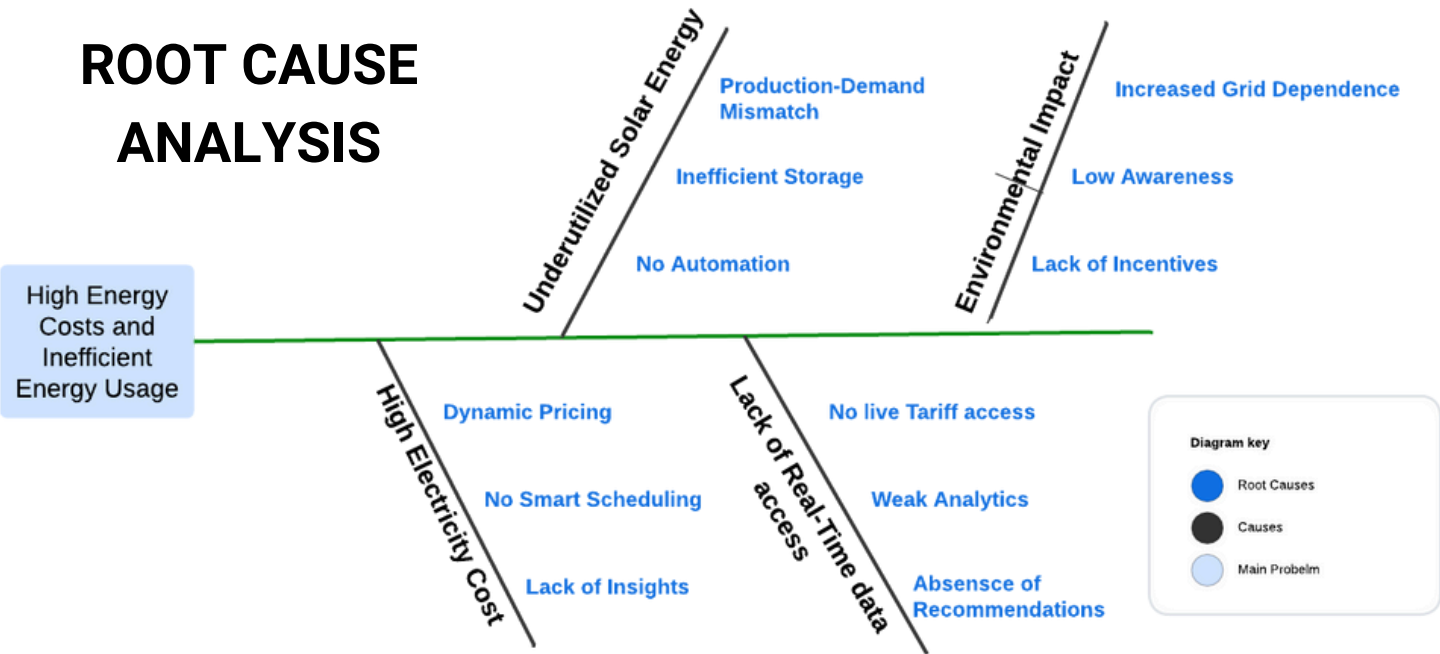
High Electricity Costs: Rajesh faces increased bills due to peak-hour electricity rates, with costs up to 40% higher during these times.me-of-Day (TOD) Tariffs

Underutilized Solar Energy: His solar panels produce excess energy during the day, but without optimized storage or usage, he’s forced to rely on costly grid power in the evening.

Lack of Real-Time Data: Rajesh lacks insights into real-time pricing, usage patterns, and solar production, making it difficult to manage energy use efficiently.

Environmental Impact: Without smart energy management, Rajesh’s energy consumption contributes to higher carbon emissions, undermining his sustainability goals.

ROOT CAUSE ANALYSIS



- 30%

Dynamic pricing impact:
In India, electricity tariffs for residential consumers have increased by 30-40% during peak hours, particularly in urban areas like Mumbai and Delhi (Source: Central Electricity Authority, 2023).
- 25%

Solar Energy Underuse:
Despite having over 40 GW of installed solar capacity, studies indicate that 25-30% of generated solar energy is underutilized due to inefficient storage and management practices (Source: Ministry of New and Renewable Energy, 2023).
- 65%

Consumer Awareness:
A survey revealed that 65% of Indian consumers do not have access to real-time data on electricity pricing and consumption patterns, impacting their ability to make informed decisions (Source: Energy Consumer Survey, 2023).
- 20%

Energy Wastage:
The Bureau of Energy Efficiency estimates that 20-25% of energy consumed in Indian households is wasted due to poor energy management practices (Source: Bureau of Energy Efficiency, 2023).








Our solution is a user-centric platform that optimizes energy consumption for households and businesses with solar panels by leveraging real-time data analytics and machine learning. It maximizes savings through smart scheduling of energy usage during low-tariff periods, enhances solar energy utilization, provides actionable insights, and fosters community power sharing, all while promoting sustainability and reducing carbon footprints.

OUR GOALS:




- **Empower Savings:** Help users lower energy costs through informed usage decisions.
- **Enhance Efficiency:** Maximize the effective use of energy resources.
- **Increase Cost Awareness:** Improve understanding of energy pricing dynamics.
- **Promote Sustainability:** Encourage the use of renewable energy and responsible consumption.
- **Foster Community Sharing:** Build collaboration through energy resource sharing.



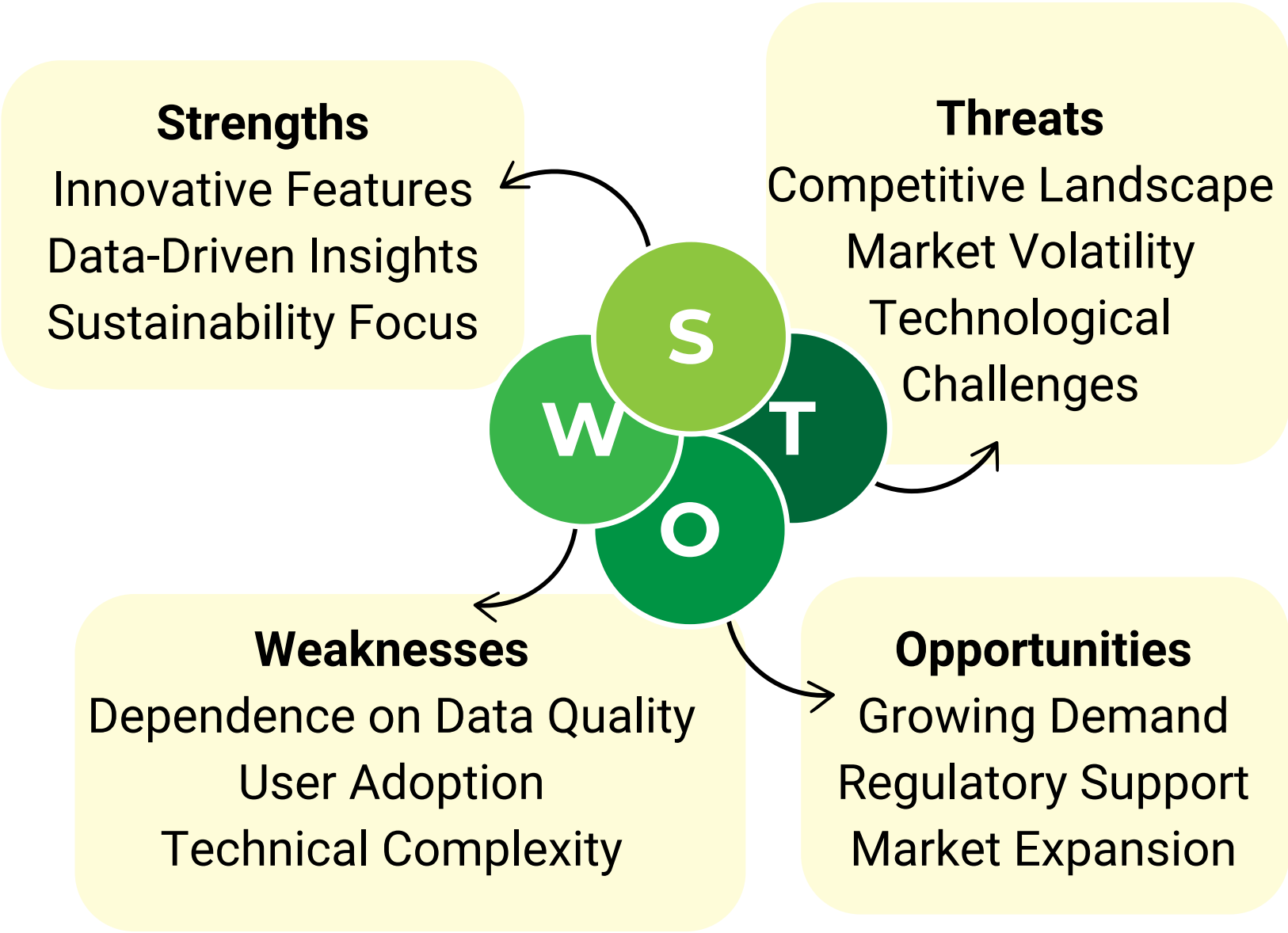
KEY FEATURES

-  • **Real-Time Tariff Monitoring:** Provides live and forecasted TOU tariffs to optimize energy usage.
-  • **Energy Consumption Analytics:** Tracks and analyzes energy usage patterns for peak times.
-  • **Smart Scheduling:** Automatically schedules appliances during low-tariff periods.
-  • **Solar Energy Management:** Manages solar energy and battery storage for peak pricing.
-  • **Forecasting and Recommendations:** Predicts tariffs, usage, and solar output for decision-making.
-  • **User Notifications and Alerts:** Sends alerts for high tariffs or solar opportunities.
-  • **Cost-Benefit Analysis:** Displays savings from optimized energy usage.

NOVELTY

-  • **Community Power Sharing:** Reduced grid dependency through local energy distribution.
-  • **Gamification:** Increased engagement in energy efficiency.
-  • **Sustainability Tracking:** Tangible insights into environmental impact.

SWOT ANALYSIS



PROBLEM
STATEMENT

SOLUTION
OVERVIEW

KEY
FEATURES

NOVELTY

TECHNOLOGY
STACK

NOVELTY UI

PROBLEM
STATEMENT

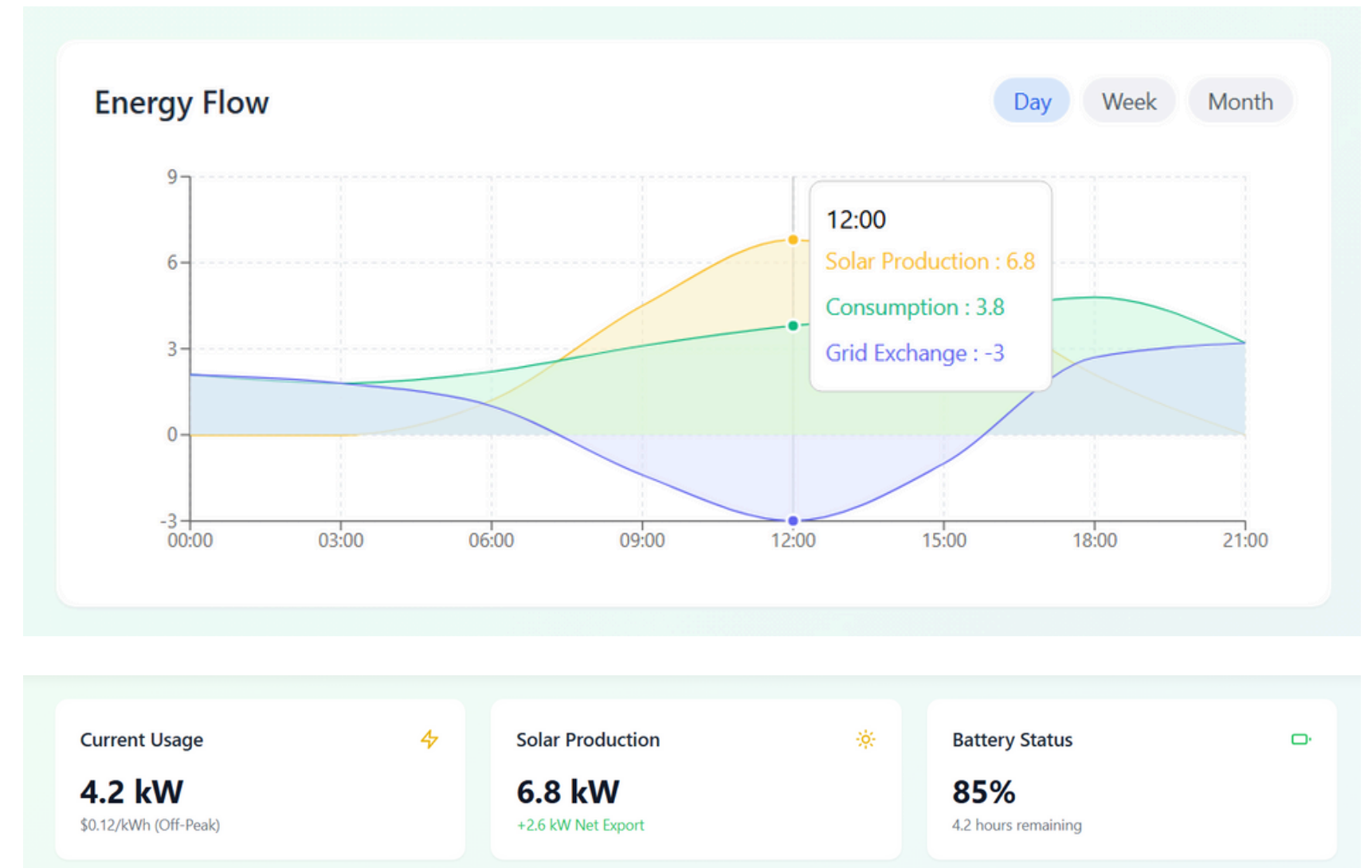
REAL TIME TARIFF MONITORING

- **Feature:** Provides live updates on time-of-use (TOU) electricity rates, enabling informed energy consumption decisions.
- **Data Insight:** In 2023, [40% of households reported higher energy costs due to peak pricing](#); timely tariff updates can mitigate these impacts.

ENERGY CONSUMPTION ANALYTICS

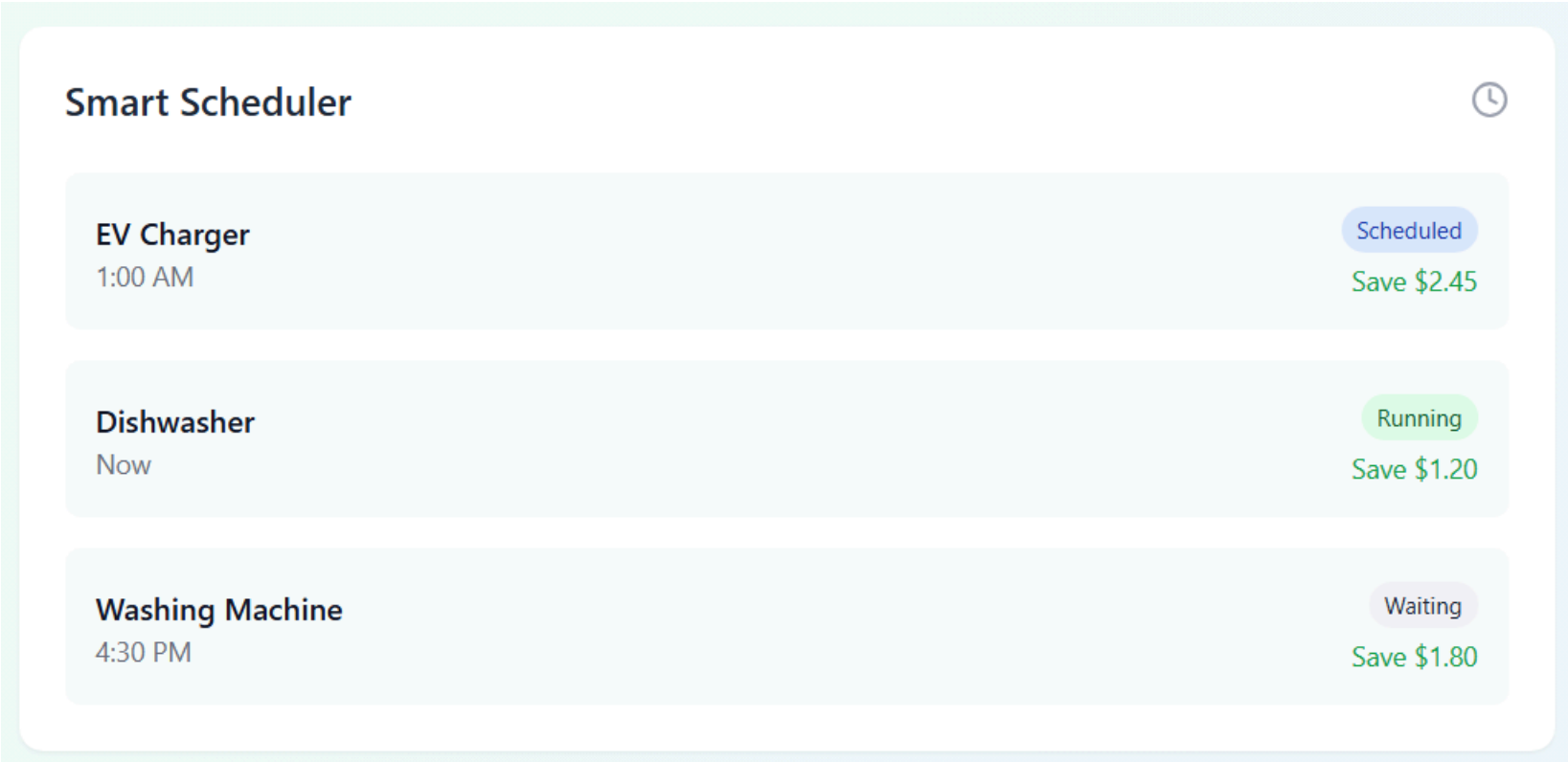
- **Feature:** Analyzes usage patterns to identify peak consumption times and potential savings.
- **Data Insight:** Users who track energy usage can save up to [15% on their electricity bills by adjusting consumption behavior based on analytics](#).

UI



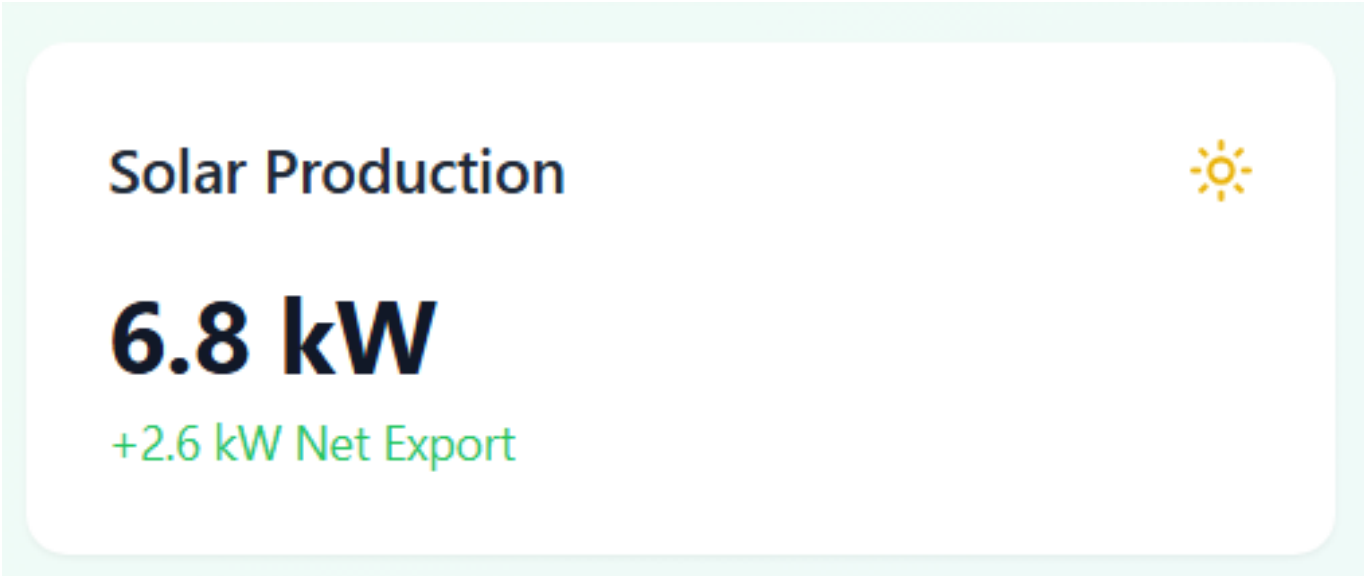
SMART SCHEDULING

- **Feature:** Automatically schedules high-energy appliances to run during low-tariff periods, maximizing savings.
- **Data Insight:** Studies show that optimizing appliance schedules can lead to an average savings of ₹2,000 annually for households.



SOLAR ENERGY MANAGEMENT

- **Feature:** Tracks real-time solar energy production and optimizes battery storage for peak pricing.
- **Data Insight:** Up to 30% of solar energy production is underutilized; efficient management can significantly increase cost savings for solar users.



PROBLEM
STATEMENT

SOLUTION
OVERVIEW

KEY
FEATURES

NOVELTY

USER
INTERFACE

NOVELTY UI

PROBLEM
STATEMENT

FORECASTING AND RECOMMENDATIONS


- **Feature:** Uses machine learning to predict future energy consumption and solar output, providing personalized recommendations.
- **Data Insight:** Accurate forecasting can lead to a **20% reduction in energy** costs by enabling users to align their consumption with lower tariffs.


USER NOTIFICATIONS AND ALERT

- **Feature:** Sends alerts about high-tariff periods and opportunities to sell excess solar energy back to the grid.
- **Data Insight:** Users who act on notifications can realize **savings of ₹1,500** per year on average by shifting usage or selling energy.


COST BENEFIT ANALYSIS

- **Feature:** Displays potential savings from optimized energy usage, reinforcing the platform's value.
- **Data Insight:** Historical performance metrics show that users experience an average annual saving of ₹5,000 through improved energy management.


 **Notifications** Last updated: Just now

 **Peak Pricing Alert** 10 min ago


Peak pricing period starting in 30 minutes. Consider postponing high-energy activities.

 **Optimal Solar Generation** 15 min ago

Perfect conditions for running appliances. Solar production at 95% efficiency.

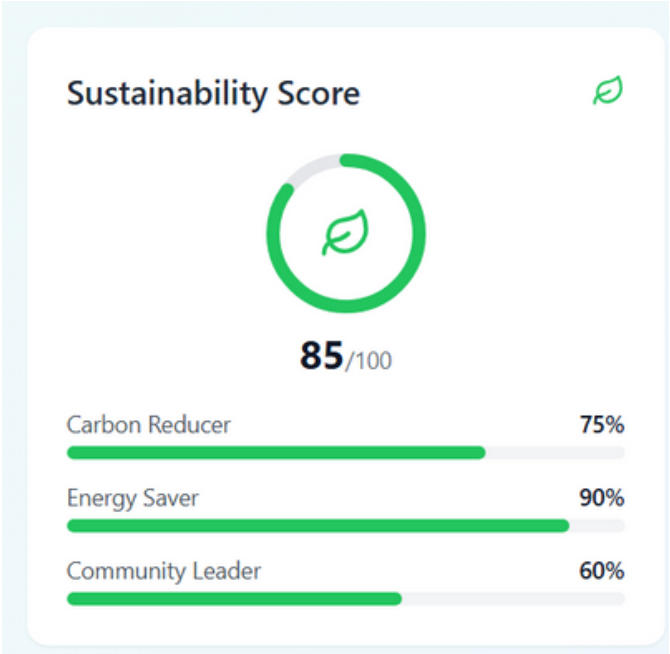
 **Low Rate Period** 25 min ago

Electricity rates are at their lowest. Good time to charge EVs and run appliances.

[View all notifications](#) 

 **842 kWh Saved**

Feature	Impact	Benefits	Data/estimation
Community Power Sharing	Reduced grid dependency through local energy distribution.	Lower energy costs for neighbors, community resilience.	Households with solar sharing 25% of surplus energy could save up to 15% on energy bills while reducing grid energy usage by 20% .
Gamification of Energy Savings	Increased engagement in energy efficiency.	Financial incentives for users, promoting consistent energy-saving behavior.	Users saving 10% on average monthly energy usage could earn approximately ₹4,150/year in discounts, resulting in ~500 tons of CO₂ saved per community annually.
Sustainability Tracking	Tangible insights into environmental impact.	Encourages eco-friendly behaviors by showing CO ₂ reductions.	Each household reducing 100 kg of CO₂ annually could result in 100,000 kg CO₂ savings in a 1,000-home community (~equivalent to planting 1,500 trees).



GAMIFICATION

842 kWh Saved

Level 8

NOVELTY

PROBLEM
STATEMENT

SOLUTION
OVERVIEW

KEY
FEATURES

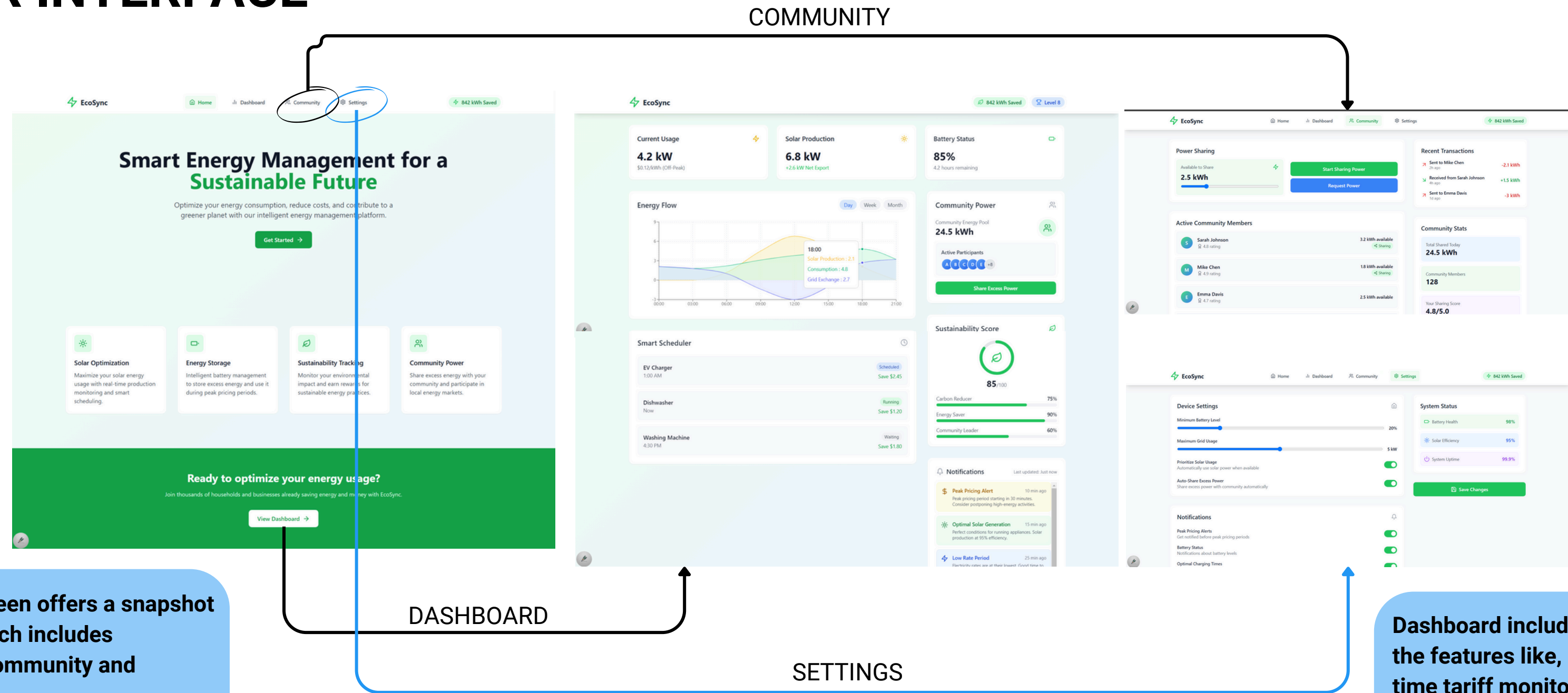
NOVELTY

TECHNOLOGY
STACK

NOVELTY UI

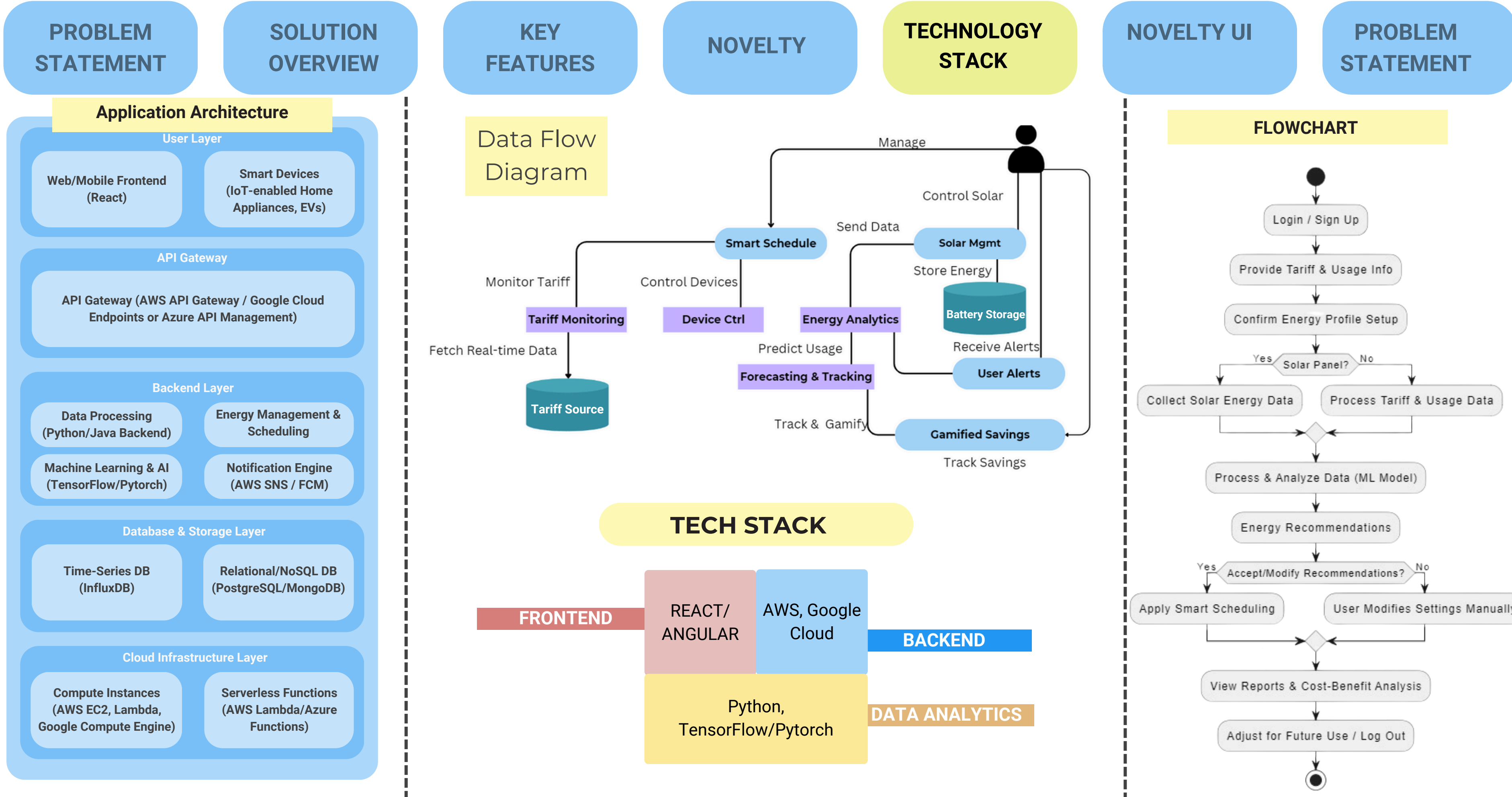
PROBLEM
STATEMENT

USER INTERFACE



The home screen offers a snapshot of nav bar which includes Dashboard, Community and settings. As you Scroll down, It list the features of the app and a CTA (Call to Action) for Dashboard page.

Dashboard includes all the features like, real time tariff monitoring, analytics, user notifications, sustainability tracking and smart schedulling etc.



PROBLEM STATEMENT

SOLUTION OVERVIEW

KEY FEATURES

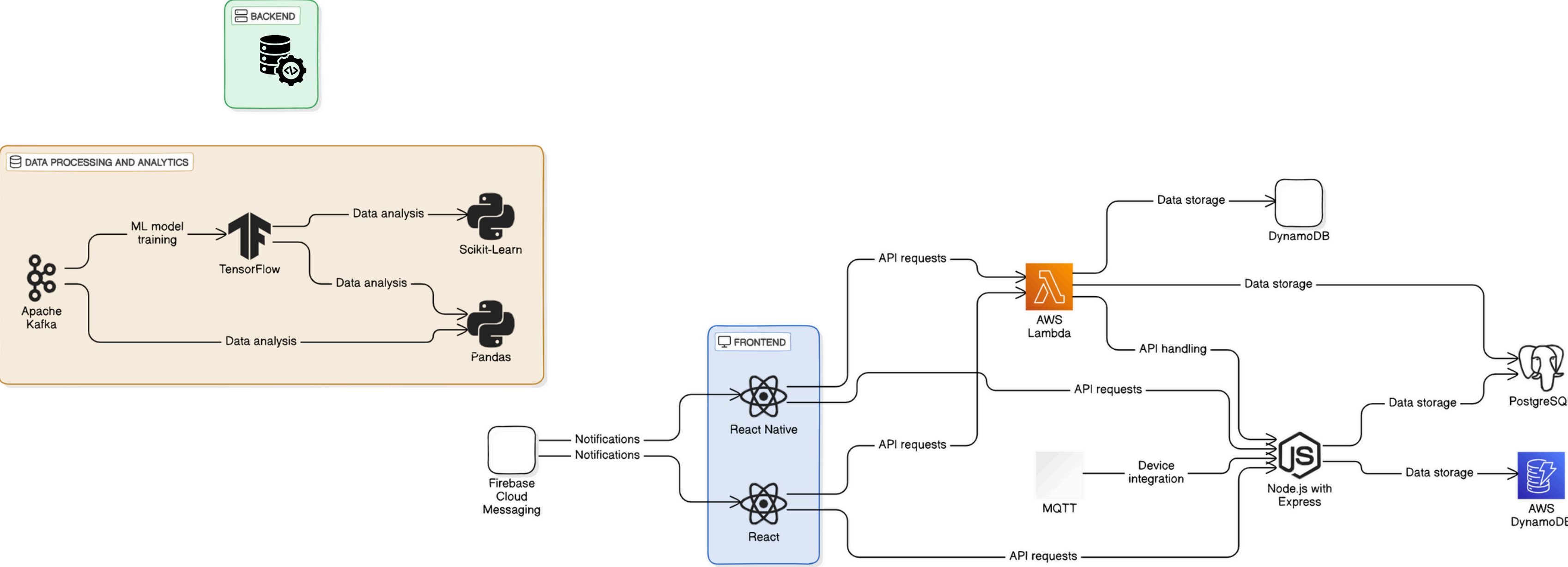
NOVELTY

TECHNOLOGY STACK

CONCLUSION

PROBLEM STATEMENT

Full Stack Application Architecture



PROBLEM
STATEMENT

SOLUTION
OVERVIEW

KEY
FEATURES

NOVELTY

TECHNOLOGY
STACK

CONCLUSION

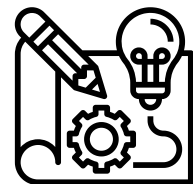
PROBLEM
STATEMENT

By integrating these technologies, the platform can lower energy costs by up to 25% and reduce carbon emissions by 20% for the average household. Leveraging machine learning and real-time data integration, it optimizes energy usage, while its scalable design enables global adaptability.

This robust tech stack and thoughtful design make Ecosync both efficient and sustainable, offering users an effective tool for managing solar energy and supporting a greener future.



[HTTPS://GITHUB.COM/ANUSHKA-SHARMA-SAHARIYA/LUMINOUS](https://github.com/anushka-sharma-sahariya/luminous)



PROTOTYPE LINK

