task-4

May 15, 2025

1 Task 4: Present Business Insight

1.0.1 Objective

Translate technical analysis into clear, actionable insights for decision-makers at Prime Frontier Group, focusing on where and why to launch pilot solar deployment projects.

1.0.2 Top 3 Recommended Regions for Pilot Solar Projects

1. **Region_32**
   - **Solar Irradiance**: 7.35 kWh/m²/day
   - **Electricity Cost**: $0.39/kWh
   - **Grid Access**: 46.4%
   - **Solar Access Score**: **0.78** (highest overall)
2. **Region_7**
   - **Solar Irradiance**: 7.08 kWh/m²/day
   - **Electricity Cost**: $0.38/kWh
   - **Grid Access**: 55.7%
   - **Solar Access Score**: **0.78**
3. **Region_3**
   - **Solar Irradiance**: 6.15 kWh/m²/day
   - **Electricity Cost**: $0.36/kWh
   - **Grid Access**: 28.3%
   - **Solar Access Score**: **0.71**

1.0.3 Why These Regions?

- **Strong Technical Potential**: All three regions have **above-average irradiance** (6.15–7.35 kWh/m²/day), ensuring reliable solar output year-round.
- **High Cost of Electricity**: Each region exceeds the $0.35/kWh mark — making solar not just sustainable, but economically urgent.
- **Underserved Energy Access**: Grid access ranges from **28% to 55%**, meaning solar can leapfrog existing limitations and bring energy equity.

- **Operational Readiness**: Moderate infrastructure scores (0.48–0.68) and low terrain ruggedness (0.19–0.57) suggest installation is feasible without major logistical hurdles.
- **Model & Score Alignment**: These regions consistently ranked at the top of both the **Solar Access Score** and **Random Forest predictions**, reducing risk of misclassification.

1.0.4 Remaining Risks & Unknowns

- **Land Ownership & Legal Barriers**: The current dataset lacks detail on **zoning laws**, **land tenure**, or **environmental clearance** — all crucial for implementation.
- **Planned Grid Expansions**: A region labeled as low-access today may be part of an upcoming **national electrification initiative**, altering its long-term solar value.
- **Community Readiness**: We do not yet account for **energy literacy**, local acceptance, or willingness to adopt solar-as-a-service models.

1.0.5 What Additional Data Would Strengthen the Analysis?

1. **Government Electrification Roadmaps** – to avoid overlap with public utility expansions.
2. **Land Use & Ownership Data** – to identify viable installation zones and reduce legal disputes.
3. **Microeconomic Profiles** – income levels, energy affordability, and willingness-to-pay thresholds.
4. **Seasonal & Climate Data** – to ensure solar performance across dry and rainy seasons.
5. **Access to Logistics Infrastructure** – road conditions, distance from depots, serviceability.

1.0.6 Strategic Recommendation for Prime Frontier

Begin pilot deployments in Region_32, Region_7, and Region_3. These regions are data-backed, strategically underserved, and operationally feasible. Success in these zones can position Prime Frontier Group as a leader in efficient, inclusive solar expansion — and create a blueprint for scalable rollouts across West Africa.

Region	Solar Irradiance (kWh/m²/day)	Grid Access (%)	Electricity Cost (USD/kWh)	Infrastructure Index	Ruggedness	Solar Access Score
Region_32	7.35	46.4%	$0.39	0.48	0.19	**0.78**
Region_7	7.08	55.7%	$0.38	0.68	0.19	**0.78**
Region_3	6.15	28.3%	$0.36	0.49	0.57	**0.71**