**Project Proposal: Solar Energy Potential Assessment**

**1. Project Title:**

Solar Energy Potential Assessment for Residential Areas

**2. Problem Statement:**

The transition to renewable energy sources is critical to combating climate change and reducing dependency on fossil fuels. However, many homeowners lack the tools to assess the feasibility of solar panel installations for their properties. This project aims to address this gap by creating a web-based solution that evaluates the solar energy potential of residential rooftops, helping users make informed decisions about solar adoption.

**3. Study Area:**

The focus of this project will be residential neighborhoods in the suburbs of Colorado, particularly areas with high energy consumption and solar potential, such as Denver County or Boulder County. These regions are ideal due to their abundant sunlight and growing interest in renewable energy.

**4. Data Layers Needed:**

* **Rooftop Area:** LiDAR data or building footprint data to calculate the usable rooftop area.
* **Solar Insolation:** Satellite data or solar radiation models to estimate sunlight exposure.
* **Energy Consumption Patterns:** Typical residential energy use data for the selected region.
* **Land Use:** Data to ensure only residential areas are analyzed.
* **Shading Analysis:** Tree cover or obstruction data to assess shading impacts.

**5. Website Mock-Up Description:**

The website will feature the following components:

* **Interactive Map:** Users can enter an address to visualize their rooftop and its solar potential.
* **Solar Calculator:** A tool that calculates potential energy output, cost savings, and return on investment based on user inputs.
* **Comparison Graphs:** Charts comparing solar energy potential with current energy usage.
* **Recommendations:** Suggestions for solar panel size and installation options.

**6. Steps to Solve the Problem:**

1. **Data Collection:** Gather rooftop, solar insolation, and energy consumption data from reliable sources such as government agencies, satellite providers, and local utilities.
2. **Data Processing:** Use GIS tools to analyze rooftops, calculate solar potential, and identify shading impacts.
3. **Model Development:** Develop a solar energy calculator that estimates energy output and financial benefits based on user inputs.
4. **Web Development:** Build a user-friendly website using technologies like HTML, JavaScript, and GIS libraries (e.g., Leaflet or Mapbox) to visualize and present results interactively.
5. **Testing and Validation:** Validate the model with real-world data and refine the website based on user feedback.

**7. Web Services Needed:**

* **Solar Radiation API:** For retrieving real-time or historical solar insolation data.
* **Mapping API:** Use Mapbox or Google Maps for interactive map visualization.
* **Data Hosting:** Cloud storage services for hosting rooftop and shading analysis data.
* **Energy Calculator API:** To assist with cost and savings estimations.

**8. Expected Outcome:**

The final product will be a functional website that:

* Provides homeowners with accurate and user-friendly solar energy potential assessments.
* Encourages solar energy adoption by demonstrating cost and environmental benefits.
* Serves as a scalable tool that can be expanded to cover other regions or integrate additional features.

**9. Conclusion:**

This project not only contributes to renewable energy advocacy but also empowers individuals to take actionable steps toward sustainability. By leveraging geospatial analysis and web-based tools, this solution can bridge the gap between homeowners and solar technology adoption, making a tangible impact on the environment and energy consumption.