

## **Scope of Work**

The scope of work for the (UTILITY) project involves the development of a comprehensive web and mobile application to streamline and computerize the process of generating energy production reports for SPV solar power plants installed on government buildings in Bihar. At present there are about --- grid tied Solar Power Plant installed on the roof top of various government buildings, this number is expected to reach 1,00,000 nodes in near future. Also, the integration of any kind of Solar/RE application device having RMS/SCADA system shall be required to be done. The detailed breakdown of the expected features and scope of work:

## **Part -A**

### **➤ Project Study**

#### **Module 01**

1. **Hardware Supply and Installation Specifications for Monitoring Infrastructure Development from Cloud.**
2. **Project Management Module.**
  - User Credential Page.
  - Web Application Creation/ Mobile App.
  - Communication/Notifications.
  - Third Party (Application Program Interface) Integration from the RMS (All generation & capacity dashboard) & Mobile App.
  - Work Order Generations.
  - Material Inspect, Dispatch Tracking and Inventory validation.
  - Site Feasibility survey/ Test Report survey/ Test Report upload/ Inspection and Reporting.
  - Net Metering Process.
  - Plant commission.

#### **Module -2**

1. **Finance Module**
  - Bank Guarantee (BG) Management.

- Payment Processing.

## **2. UTILITY Business Module**

- Provisioning of Consultancy Services.
- Status Monitoring, Calculation of service charges of UTILITY.

## **Module 3**

### **1. Comprehensive Management Contract (CMC) of Solar Plant Module**

- Generation: -If  $PR \geq 75$ - Excellent,  $60 < PR < 75$ - Very Good,  $50 < PR < 60$ -Good, below 50- Poor (Performance Ratio).
- CUF- If  $CUF \geq 19\%$ - Excellent,  $15\% < CUF < 19\%$ -Good, below 15%- Poor (Capacity utilization factor).
- Consumer complaints/request generation.
- Site inspection with check list & reporting Travel start to travel end up to Task complete.
- Solar Module Preventive maintenance scheduled Reporting.
- Go - Live deployment and Testing.

### **1. Reporting and Analysis Module:**

- PR (Progress Report) Generation.
- DPR (Daily Progress Report) Management.
- MIS (Management information system) generation.

## **Part – B**

O&M (Operation and Maintenance) (Note: Details of all deliverables and O&M including deployment of 3 Manpower for monitoring).

## **Module – Specifications**

1. Centralised Data Management System: User Interface, Real time data analysis centrally for various sites, Dashboard, Integration, Automated System, Alert system, Reporting, MIS Generation (Daily, weekly, Monthly, Yearly and CUF-Capacity utilization factor) subject to Scada software monitoring system.
2. Project Management: Renewable Energy Project ( Current: Solar Power Plant, Future project like, Biomass, Green hydrogen, Wind Power Plant)
3. Project Monitoring: Ongoing as well as commissioned project monitoring.
4. Application Based Monitoring Comprehensive Maintenance Contract (CMC) for the ongoing and commissioned Solar Power Plant.
5. Internal Communication Solution: Develop a user-friendly interface for the internal communication and communication with vendors.
6. UTILITY Business Module: Provisioning of Consultancy Services, Status monitoring, calculation of service charges of UTILITY.

### **1. User Management:**

**Create multiple user logins:** Develop a system where different user roles can be created, such as administrators, engineers, management, and vendors. Each role should have access to specific functionalities and data within the system based on their responsibilities.

- **User Registration:**

- Allow new users to register for access to the system. This could include government officials, engineers, vendors and other relevant stakeholders.

- **User Authentication:**

- Implement a secure login system where users must authenticate themselves using unique credentials, such as usernames and passwords. Two-factor authentication (2FA) should be added for additional security.

- **User Roles and Permissions:**

- Define different user roles, each with specific permissions. Roles will include administrators, engineers, vendors, and more. For example:
    - Administrators should have full access to all features and data.
    - Engineers should have access to site-related data.
    - Vendors should be able to upload test reports and view specific project-related data.

- **Role-Based Access Control (RBAC):**

- Implement RBAC to assign permissions to roles. This ensures that users only have access to functionalities and data relevant to their responsibilities.

- **User Profile Management:**

- Allow users to update their profiles, including contact information, profile pictures, and password changes.

- **User Activity Tracking:**

- Log user activities, including login/logout times and actions taken within the system. This audit trail will be helpful for security and accountability.

- **User Deactivation:**

- Provide administrators with the ability to deactivate or suspend user accounts when necessary, ensuring that access is terminated for former employees or unauthorized users.

- **Password Management:**

- Implement password policies to enforce strong password requirements.
- Allow users to reset forgotten passwords securely through email verification or security questions.

- **User Notifications:**

- Send notifications to users for various actions, such as account creation, role changes, or important updates within the system.

- **User Search and Filtering:**

- Enable administrators to search for users and filter them by roles or other criteria to efficiently manage large user bases.

- **User On boarding:**

- Provide guidance and documentation to help new users understand how to use the system effectively. This can include tutorials or tooltips.

- **User Access Requests:**

- Allow users to request access to specific functionalities or data areas if they don't have the necessary permissions. Administrators can then approve or deny these requests.

- **Session Management:**

- Implement session management to handle user logins and logouts securely. This includes handling session timeouts and concurrent sessions.

- **User Data Privacy:**

- Ensure compliance with data privacy regulations, by safeguarding user data and allowing users to control their privacy settings.

- **User Communication:**

- Enable users to communicate with each other within the application, fostering collaboration among different roles and teams.

- **Role Changes and Transfers:**

- Allow administrators to change or transfer user roles as needed. For example, an engineer may be promoted to an administrator.

## **2. Dashboard Creation:**

Creating role-based dashboards is a crucial aspect of the project, as it ensures that each user sees information and functionalities that are pertinent to their role and responsibilities. Here are the key features and considerations for dashboard creation:

- **User Role-Based Customization:**

- Allow administrators to configure and customize dashboards for different user roles. This customization should be based on the specific needs and responsibilities of each role.

- **Widgets and Modules:**

- Design the dashboard with widgets or modules that can be added, rearranged, or removed based on user preferences and roles. Widgets can include charts, tables, graphs, and data summaries.

- **Data Visualization:**

- Incorporate various data visualization elements, such as charts (line, bar, pie), maps, and gauges, to present information in a visually informative way.

- **Widgets for Different Data Types:**

- Provide widgets that cater to different types of data relevant to the user's role. For example, engineers will need widgets displaying site-specific data, while administrators will require high-level overviews of all projects.

- **Data Filtering and Sorting:**

- Implement data filtering and sorting options within widgets to allow users to drill down into specific information or sort data according to their preferences.

- **Real-Time Data Updates:**

- Enable real-time or near-real-time data updates so that users can monitor key metrics and information without the need for manual refreshes.

- **Alerts and Notifications:**

- Include alert mechanisms that can be displayed on the dashboard to inform users of critical events or issues that require their attention.
- **User-Defined Dashboards:**
- Allow users to create and save their own custom dashboards with the widgets and data that are most relevant to their work.
- **Mobile Responsiveness:**
- Ensure that the dashboard is responsive and accessible on mobile devices, enabling users to access information while on the go.
- **Drill-Down Capabilities:** -
- Implement drill-down functionality so that users can access more detailed information by clicking on specific widgets or data points.
- **Export and Sharing:**
- Enable users to export dashboard views or specific widgets in formats like PDF or Excel for sharing with colleagues or stakeholders.
- **Security and Access Control:**
- Implement robust security measures to ensure that users can only access the data and functionalities permitted by their roles and permissions.
- **Feedback Mechanism:**
- Incorporate a feedback mechanism allowing users to provide input on the usability and effectiveness of their dashboards, enabling continuous improvement.

### **3. Site Allocation:**

#### **Allow filtered agencies to allocate sites:**

Essential features and considerations for implementing a site allocation mechanism:

- **User Authorization:**
- Ensure that only authorized personnel, such as government agencies or administrators, can access the site allocation functionality.
- **Site Selection Criteria:**
- Define clear criteria and prerequisites that agencies must meet when selecting sites for SPV solar power plant installation. This could include site size, location, land ownership, and other relevant factors.
- **Site Availability Check:**
- Implement a real-time availability check to determine if the chosen site is suitable and available for allocation. Avoid double-booking or allocating the same site to multiple agencies.
- **Geographic Information System (GIS) Integration:**

- Integrate GIS tools or maps to help agencies visualize site locations, boundaries, and geographical features when making allocation decisions.
- **Site Documentation:**
- Allow agencies to upload essential site documentation, such as land ownership records, site surveys, or environmental assessments. This documentation can be critical for compliance and record-keeping.
- **Approval Workflow:**
- Set up an approval workflow where site allocation requests are routed for review and approval by relevant authorities or administrators. Ensure transparency in the approval process.
- **Site Allocation Records:**
- Maintain a comprehensive and searchable database of all site allocation records. This database should include details such as agency, site location, allocation date, and any associated documentation.
- **Conflict Resolution Mechanism:**
- Develop a mechanism to address conflicts that may arise if multiple agencies request the same site. Define rules for resolving such conflicts, such as a priority system or arbitration process.
- **Reporting and Analytics:**
- Provide reporting tools that allow administrators to analyze site allocation data, monitor trends, and assess the efficiency of the allocation process.
- **Historical Data Retention:**
- Retain historical site allocation data for auditing, compliance, and decision-making purposes. Ensure that the system can store a long-term record of allocations.
- **Audit Trail:**
- Create an audit trail that logs all actions related to site allocation, including user interactions, approvals, and modifications. This helps maintain transparency and accountability.

#### **4. Site Feasibility Survey:**

**Enable site feasibility surveys:** Create a feature within the application that allows agencies to conduct site feasibility surveys. The software should perform calculations to determine if a site meets UTILITY's requirements for solar plant installation.

- **Survey Creation:**
- Allow authorized users, typically engineers or surveyors, to initiate site feasibility surveys within the application.

- **Site Selection:**
  - Provide a mechanism for selecting the specific site to be surveyed. Users should be able to choose from a list of allocated sites.
- **Survey Parameters:**
  - Define a set of survey parameters and criteria that align with UTILITY's requirements. These parameters may include sunlight exposure, soil quality, topography, distance to power grid connections, and environmental factors.
- **Data Entry and Collection:**
  - Enable users to input survey data, either manually or through data collection tools integrated with the application. This may include capturing photographs, measurements, and environmental data.
- **Automated Calculations:**
  - Implement algorithms or calculations to assess the site's suitability based on the collected survey data. The software should automatically determine whether the site meets UTILITY's criteria for solar plant installation.
- **Visualizations:**
  - Display survey results through visualizations, such as charts, graphs, or heat maps, to provide a clear overview of the site's feasibility.
- **Geospatial Integration:**
  - Integrate geospatial information, such as maps and satellite imagery, to aid in survey assessments. This can help users visualize the site and its surroundings more effectively.
- **Reporting:**
  - Generate comprehensive feasibility survey reports that include survey findings, calculations, and any recommendations for site preparation or modifications.

## 5. Work Order Generation:

Develop a function to automatically generate work orders for approved projects. These work orders should include comprehensive site details and adhere to a standard format specified by UTILITY.

**Allow for modifications:** Enable UTILITY to make modifications to work orders when necessary, ensuring flexibility in project management.

- **Project Approval Integration:**
  - Integrate the work order generation functionality with the project approval process to ensure that work orders are generated only for approved projects.

- **Automated Work Order Generation:**
  - Develop an automated process that generates work orders with a single click or based on predefined triggers.
- **Comprehensive Site Details:**
  - Include all relevant site details in the work order, such as site location, coordinates, size, topography, environmental considerations, and any specific requirements for installation.
- **Standardized Format:**
  - Adhere to a standardized format for work orders as specified by UTILITY. This ensures consistency and clarity in project execution.
- **Customizable Templates:**
  - Provide customizable work order templates that allow for the inclusion of specific project-related information and details. These templates should align with UTILITY's standards.
- **Revision History:**
  - Maintain a revision history for each work order, tracking any changes or modifications made over time. This ensures transparency and accountability.
- **Modification Authorization:**
  - Define roles and permissions for work order modifications. Only authorized personnel, such as project managers or administrators, should be able to make changes.
- **Reason for Modifications:**
  - Require users to provide a reason or justification for any modifications made to work orders. This helps maintain a record of decision-making.
- **Attachments and Supporting Documents:**
  - Allow users to attach supporting documents, drawings, specifications, or additional information to the work order to provide clarity to contractors and vendors.
- **Workflow Integration:**
  - Integrate the work order generation feature with other workflows, such as site allocation and procurement, to ensure that work orders align with project milestones and resource allocation.
- **Mobile Accessibility:**
  - Ensure that authorized personnel can access and review work orders on mobile devices, especially for field inspections and project management.
- **Approval Workflow:**

- Establish an approval workflow for work orders that require additional review and authorization before implementation. This workflow should include designated approvers and clear approval criteria.

- **Reporting and Tracking:**

- Implement reporting and tracking mechanisms to monitor the status of work orders, including whether they are pending, approved, in progress, or completed.

- **Audit Trail:**

- Maintain an audit trail of all actions related to work orders, including who generated or modified them and when these actions occurred.

## **6. Bank Guarantee (BG) Management:**

**Maintain BG details:** Implement a system to store and manage bank guarantee details associated with work orders and other project-related activities.

- **BG Tracking and Storage:**

- Develop a centralized system to track and store all BG details associated with work orders and other project-related activities. Each BG should be linked to the relevant project or contract.

- **Document Upload:**

- Allow users to upload scanned or digital copies of BG documents directly into the system. Ensure that the system can handle various file formats (e.g., PDF, image files) commonly used for BG documents.

- **BG Expiry Alerts:**

- Implement an automated alert system that notifies relevant stakeholders, such as project managers or finance personnel, of upcoming BG expiration dates. This ensures timely renewal or replacement of BGs to maintain project security.

- **BG Renewal Process:**

- Define a process for renewing BGs when they are about to expire. This may involve sending renewal requests to the issuing bank or financial institution.

- **BG Verification:**

- Integrate BG verification tools or mechanisms to validate the authenticity of BG documents. This helps prevent fraud and ensures that the provided BGs are genuine and enforceable.

- **BG Status Tracking:**

- Track the status of each BG, indicating whether it is active, expired, or released. This information is crucial for project management and financial planning.

- **Multiple BGs per Project:**

- Support multiple BGs associated with a single project, if necessary. Some projects may require multiple financial guarantees to cover various aspects.
- **BG Amount and Currency:**
- Record the BG amount and currency for accurate financial tracking. Ensure that the system can handle different currencies if the project involves international transactions.
- **BG Issuing Bank Information:**
- Capture details of the issuing bank or financial institution, including contact information, branch location, and relevant contact persons.
- **BG Release Process:**
- Define a process for releasing BGs when they are no longer required, such as at the successful completion of a project phase. Ensure that releasing BGs follows established procedures and documentation.
- **Reporting and Audit Trail:**
- Provide reporting capabilities that allow users to generate BG-related reports, including lists of active BGs, expired BGs, BG renewals, and historical BG data. - Maintain an audit trail that logs all actions related to BG management, such as BG uploads, renewals, releases, and verifications.
- **Integration with Project Management:**
- Integrate BG management with project management workflows, ensuring that project managers can easily access BG information and track financial security.
- **User Permissions:**
- Define user roles and permissions to control who can access and manage BG details. Typically, only authorized personnel should have access to this sensitive financial information.

## **7. Item Calculation:**

Develop a feature that calculates the types and quantities of materials and components required for a solar plant based on the site's capacity in KW.

- **Site Capacity Input:**
- Allow users to input the site's capacity in KW, which serves as the basis for item calculations.
- **Materials and Components Database:**
- Maintain a comprehensive database of materials, components, and equipment required for solar power plant installations. This database should include item names, descriptions, unit costs, and other relevant details.
- **Calculation Algorithms:**

- Develop algorithms that calculate the types and quantities of materials and components needed based on the site's capacity. These calculations should consider factors such as panel capacity, wiring, mounting structures, inverters, batteries, and other relevant components.
- **Customization Options:**
- Allow for customization of calculation parameters to accommodate variations in design specifications, regional requirements, and technological advancements. Users should have the flexibility to adjust calculations as needed.
- **Validation and Error Handling:**
- Implement validation checks to ensure that input capacity values are within acceptable ranges and that calculations are accurate. Provide error messages and suggestions for resolving issues.
- **Unit Conversion:**
- Support unit conversions to ensure consistency in item quantities. For example, if one component is measured in meters and another in square meters, the system should handle conversions seamlessly.
- **Price and Cost Estimation:**
- Calculate estimated material and component costs based on unit costs from the database. Provide a breakdown of costs associated with each item.
- **Reporting and Bill of Materials (BoM):**
- Generate a Bill of Materials (BoM) that lists all required items, including item names, quantities, unit costs, and total costs. This BoM is essential for procurement and project planning.
- **Integration with Procurement:**
- Integrate item calculations with procurement workflows to facilitate the seamless ordering and tracking of materials and components.
- **Revision Tracking:**
- Maintain a revision history of item calculations and BoMs, allowing users to review previous versions and understand changes made over time.
- **User Collaboration:**
- Enable collaboration among project stakeholders by allowing them to access and review item calculations and BoMs. This promotes transparency and effective communication.
- **Data Export:**
- Provide options for exporting item calculations and BoMs in various formats, such as PDF or Excel, for sharing with contractors, vendors, and project teams.
- **Mobile Accessibility:**

- Ensure that authorized users can access item calculations and BoMs on mobile devices, which is especially valuable for field assessments and procurement activities.

- **Integration with Project Management:**

- Integrate item calculations with project management workflows to ensure that material and component requirements are aligned with project timelines and milestones.

## 8. Material Dispatch Tracking:

**Document material dispatch:** Track the dispatch of materials and components within the software, providing visibility into the logistics of project implementation.

- **Material Dispatch Recording:**

- Allow authorized users to record material dispatch information within the software. This information should include details such as item names, quantities, dispatch dates, source (warehouse or supplier), destination (project site), and delivery status.

- **Dispatch Confirmation:**

- Implement a confirmation mechanism that verifies the dispatch and receipt of materials. This may involve electronic signatures or acknowledgment from on-site personnel.

- **Barcode Scanning:**

- Enable barcode or QR code scanning for quick and accurate material identification during dispatch and receipt processes.

- **Real-Time Tracking:**

- Provide real-time tracking of dispatched materials, allowing users to monitor the status and location of materials in transit. This enhances visibility and reduces the risk of delays.

- **Shipment Documentation:**

- Allow users to attach shipping documents, such as invoices, packing lists, and bills of lading, to dispatch records. This ensures that all necessary documentation is associated with each dispatch.

- **Alerts and Notifications:**

- Implement alerts and notifications to inform relevant stakeholders (e.g., project managers, procurement officers) about dispatch events, delays, or issues that require attention.

- **Proof of Delivery (POD):**

- Capture proof of delivery, including recipient signatures or photos of delivered materials, to confirm receipt and completion of the dispatch.

- **Delivery History:**

- Maintain a comprehensive history of all material dispatch activities, enabling users to review past dispatch records and track historical trends.

- **Exception Handling:**
  - Develop mechanisms for handling exceptions, such as late deliveries or damaged materials. Ensure that the system can initiate corrective actions when necessary.
- **Reporting and Analytics:**
  - Offer reporting tools that allow users to generate dispatch-related reports, track dispatch performance, and analyze delivery timelines.
- **Mobile Accessibility:**
  - Ensure that authorized users can access and update dispatch records on mobile devices, which is valuable for on-site inspections and coordination.

## 9. Inspection and Reporting:

**Route inspections:** Create a workflow for conducting inspections using checklists provided by UTILITY. This should include assigning inspectors and tracking inspection progress.

**Generate inspection reports:** Automatically generate inspection reports based on checklist results to ensure compliance and quality control.

- **Inspection Workflow:**

- Create a structured workflow for conducting inspections using checklists provided by UTILITY. The workflow should include the following steps:
  - **Initiation:** Initiate an inspection based on project milestones, site readiness, or other triggers.
  - **Assignment:** Assign qualified inspectors to specific inspections.
  - **Checklist Completion:** Allow inspectors to complete checklists electronically, marking items as compliant or non-compliant.
  - **Progress Tracking:** Provide real-time tracking of inspection progress, indicating which inspections are pending, in progress, or completed.
  - **Approval:** Enable designated approvers to review and approve inspection results.

- **Checklist Management:**

- Maintain a library of inspection checklists provided by UTILITY. Ensure that these checklists are up-to-date and align with project standards and regulatory requirements.

- **Inspector Assignment:**

- Assign inspectors to inspections based on their qualifications, expertise, and availability. Allow for easy reassignment if necessary.

- **Checklist Completion:**

- Provide an intuitive interface for inspectors to complete checklists electronically. Offer options for adding comments, attaching photos, and marking compliance status for each checklist item.
- **Automated Report Generation:**
- Automatically generate inspection reports based on checklist results. These reports should include details of inspections conducted, checklist items, compliance status, non-compliance issues, and any comments or supporting documentation.
- **Customizable Report Templates:**
- Create customizable report templates that adhere to UTILITY's reporting standards. These templates should support branding, formatting, and inclusion of specific data fields.
- **Report Approval:**
- Implement an approval workflow for inspection reports to ensure that they are reviewed and validated by authorized personnel before dissemination.
- **Historical Data Storage:**
- Maintain a historical database of inspection reports for auditing, compliance, and decision-making purposes. Ensure that the system can store a long-term record of inspections.
- **Report Accessibility:**
- Make inspection reports easily accessible to relevant stakeholders, including project managers, regulatory authorities, and project partners.
- **Notification System:**
- Implement a notification system to inform inspectors, approvers, and other stakeholders about inspection assignments, progress, and report availability.
- **Reporting and Analytics:**
- Offer reporting tools that allow users to generate summary reports on inspection outcomes, compliance trends, and areas requiring improvement.

## **10. Test Report Upload:**

**Allow agencies to upload test reports:** Enable agencies to upload reports on tests conducted for the items used in the solar power plants. This ensures that materials meet quality standards.

- **User-Friendly Interface:**

- Provide an intuitive and user-friendly interface that allows authorized agency personnel to easily upload test reports within the software.

- **Document Upload:**

- Enable users to upload various types of test reports, including PDF documents, images, or other relevant file formats. Ensure that the system can handle a range of file sizes.

- **Metadata and Tagging:**
  - Include fields for metadata, such as the date of the test, the name of the testing laboratory, and the type of test conducted. Allow users to tag test reports with relevant project, item, or component identifiers.
- **Multiple Uploads:**
  - Allow for the simultaneous upload of multiple test reports for different materials or components to streamline the process.
- **Document Version Control:**
  - Implement version control for test reports, enabling users to upload revised versions when necessary. Maintain a history of all uploaded versions.
- **Inspection Integration:**
  - Link uploaded test reports to inspection records or checklists to provide context and facilitate compliance tracking.
- **Document Review and Approval:**
  - Establish workflows for reviewing and approving test reports. Define roles and permissions for individuals responsible for approving test results.
- **Access Control:**
  - Implement role-based access control to ensure that only authorized personnel can upload, review, and approve test reports. This helps maintain data integrity and compliance.
- **Notifications:**
  - Set up a notification system to alert relevant stakeholders when new test reports are uploaded, require review, or are approved.
- **Search and Retrieval:**
  - Develop a search and retrieval mechanism that allows users to quickly locate specific test reports based on criteria such as item name, date, or project phase.
- **Reporting and Analysis:**
  - Provide reporting and analytics tools that enable users to generate summary reports on test results, identify trends, and assess the quality of materials and components.
- **Mobile Accessibility:**
  - Ensure that authorized users can upload and access test reports via mobile devices, which is valuable for on-site testing and inspections.
- **Integration with Quality Control:**
  - Integrate the test report upload feature with quality control workflows to trigger actions based on test results, such as rejecting substandard materials or components.

- **Data Retention and Archiving:** -
  - Define data retention policies and archiving mechanisms to manage test report data over time, ensuring compliance with data storage regulations.

## 1. Report and Analysis

DPR (Daily Progress Report) Management:

- **Calculate DPR:** Automatically calculate and update daily progress reports to track project advancement.
- **Compare with actual progress:** Compare DPR data with actual progress to monitor project performance.
- **Automated DPR Generation:**
  - Develop an automated mechanism for generating daily progress reports based on project milestones, tasks, or activities. Ensure that DPRs are created regularly and consistently.
- **MIS Management Information System:**
  - Develop an automated mechanism for generating daily, weekly, monthly, yearly MIS based on project milestones, tasks, or activities. Ensure that MISs are created regularly and consistently.
- **Data Sources Integration:**
  - Integrate data sources from various project management tools and systems to collect relevant information for DPR calculations. This may include data on tasks completed, materials used, workforce hours, and more.
- **Calculation Algorithms:**
  - Create calculation algorithms that determine the progress made each day by analyzing the input data. These calculations should provide an accurate representation of daily accomplishments.
- **Real-Time Updates:**
  - Ensure that DPRs are updated in near real-time to reflect the latest project progress. This requires regular data input and synchronization with project management systems.
- **Data Comparison:**
  - Implement a feature that allows for the comparison of DPR data with actual progress. This involves comparing planned versus actual timelines, milestones achieved, and tasks completed.
- **Variance Analysis:**
  - Include tools for conducting variance analysis to identify discrepancies between planned and actual progress. This analysis helps project managers pinpoint areas where adjustments may be needed.
- **Visual Representation:**

- Present DPR data in a visual format, such as charts, graphs, or dashboards, to provide an easily digestible overview of project progress. Different visualization types can be used to highlight key performance indicators.
- **Historical Data Tracking:**
- Maintain a historical record of DPRs to track progress over time. This historical data can be valuable for trend analysis and decision-making.
- **Customizable DPR Templates:**
- Create customizable DPR templates that allow users to specify the content and format of reports based on project requirements and stakeholder preferences.
- **Role-Based Access:**
- Implement role-based access control to ensure that only authorized personnel can view and modify DPRs. Different roles may include project managers, team leaders, and administrators.
- **Mobile Accessibility:**
- Enable authorized users to access and update DPRs on mobile devices, facilitating on-site data input and project monitoring.
- **Reporting and Analytics:**
- Provide reporting and analytics tools that allow users to generate summary reports on project progress, performance trends, and areas requiring attention.
- **Data Export:**
- Allow users to export DPR data in various formats, such as PDF or Excel, for sharing within the organization or with external stakeholders.

## **12. Plant Commissioning:**

**Agencies can mark plants as commissioned:** Implement a feature that allows agencies to mark solar plants as commissioned only when they meet the parameters and standards set by UTILITY.

- **Commissioning Workflow:**
- Develop a structured commissioning workflow that outlines the steps and criteria for marking a solar plant as commissioned.
- **Authorization and Role-Based Access:**
- Implement role-based access control to restrict the commissioning process to authorized personnel, typically including agency representatives or designated inspectors.
- **Pre-Commissioning Checklist:**

- Create a pre-commissioning checklist that outlines the necessary checks, tests, and parameters that must be met before commissioning can take place. This may include electrical, mechanical, safety, and performance criteria.
- **Documentation and Verification:**
  - Allow agencies to upload documentation, test reports, and verification records to demonstrate that the plant meets the required standards.
- **Automated Validation:**
  - Implement automated validation checks that compare the uploaded documentation and test results with the predefined commissioning criteria.
- **Conditional Commissioning:**
  - Allow conditional commissioning in cases where certain criteria are met, but minor issues need to be addressed after commissioning. Define a process for revisiting and completing the commissioning.
- **Commissioning Certificate:**
  - Generate a commissioning certificate or report once the plant has been successfully commissioned. This certificate should include details such as the commissioning date, agency responsible, and confirmation that all criteria have been met.
- **Alerts and Notifications:**
  - Set up an alert system to notify relevant stakeholders, including UTILITY and agency representatives, when commissioning is initiated, completed, or pending approval.
- **Verification Process:**
  - Establish a verification process to ensure that commissioning records are accurate and complete. This may involve audits or random inspections by UTILITY or third-party inspectors.
- **Commissioning Records:**
  - Maintain a historical record of all commissioned plants, including commissioning certificates and related documentation. These records are crucial for compliance, audits, and reporting.
- **Reporting and Analytics:**
  - Provide reporting tools that allow users to generate summary reports on the status of commissioned plants, compliance with standards, and any outstanding commissioning tasks.
- **Mobile Accessibility:**
  - Ensure that authorized users can initiate, review, and complete the commissioning process using mobile devices, which is valuable for on-site commissioning activities.

### **13. Net Metering Process:**

**- Handle Net Metering:** Develop functionality to manage the entire Net Metering process, including data recording and reporting.

- **Data Recording:**

- Implement a system for recording data related to energy generation, consumption, and the flow of electricity to and from the grid.

- **Real-Time Monitoring:**

- Provide real-time monitoring of electricity consumption and generation, enabling users to see how much electricity is being supplied to the grid and how much is being drawn from it.

- **Billing and Settlement:**

- Calculate bills and settlements based on net metering data. This involves calculating the net energy consumption and generation and determining compensation or charges accordingly.

- **Data Validation:**

- Implement data validation checks to ensure the accuracy and integrity of recorded data. This includes identifying and rectifying discrepancies.

- **Customer Portal:**

- Create a customer portal where solar power plant owners can access their net metering data, view bills, and monitor their overall energy performance.

- **Exportable Reports:**

- Enable users to generate and export reports that provide a comprehensive view of net metering data, consumption patterns, generation trends, and financial summaries.

- **Compliance with Regulatory Standards:**

- Ensure that the net metering process adheres to regulatory standards and requirements set by relevant authorities.

- **Historical Data Retention:**

- Maintain historical net metering data to support trend analysis, compliance verification, and auditing.

- **Mobile Accessibility:**

- Ensure that consumers and utility operators can access net metering data and related information through mobile devices, facilitating remote monitoring and management.

- **Integration with Billing Systems:**

- Integrate with billing systems to streamline the process of generating bills and invoices based on net metering data.

## **14. Payment Processing:**

- **Manage payments:** Implement a system for processing payments to agencies and vendors in accordance with UTILITY's guidelines and project milestones.

- **Payment Management System:**

- Develop a payment management system that allows authorized personnel to initiate, track, and process payments.

- **Payment Scheduling:**

- Create a scheduling system that aligns payments with project milestones, contractual agreements, or predefined payment timelines.

- **Invoice Verification:**

- Implement an invoice verification process to ensure that invoices submitted by agencies and vendors match the agreed-upon terms and pricing.

- **Approval Workflow:**

- Define an approval workflow for payments, involving multiple layers of authorization based on payment amounts and project roles. This includes approvals by project managers, financial officers, and administrators.

- **Payment Methods:**

- Offer multiple payment methods, such as bank transfers, electronic funds transfer (EFT), or check payments, to accommodate the preferences of agencies and vendors.

- **Payment Recording:**

- Maintain a comprehensive record of all payment transactions, including details of the payee, payment amount, payment date, and payment purpose.

- **Compliance with Guidelines:**

- Ensure that all payments adhere to UTILITY's guidelines, policies, and regulatory requirements.

- **Payment Reminders:**

- Set up payment reminders and notifications to ensure that payments are initiated and processed on time.

- **Payment History:**

- Maintain a historical record of all payments, which can be used for auditing, reporting, and compliance purposes.

- **Mobile Accessibility:**

- Ensure that authorized users can initiate and track payments on mobile devices, providing flexibility for on-site payment management.

## **15. AMC (Annual Maintenance Contract) Data:**

- **AMC Data Management:**

- Develop a module that allows agencies to input, update, and manage data related to annual maintenance contracts. This module should include fields for contract details, terms, renewal dates, and other relevant information.
- **Link to DPR vs. Actual:**
- Establish a link between AMC data and daily progress reports (DPR) vs. actual progress comparisons. This linkage allows for monitoring and reporting on the impact of AMC activities on project progress.
- **AMC Report Generation:**
- Implement AMC report generation, which includes the compilation of contract data, service history, and performance metrics.
- **Performance Analysis:**
- Analyze AMC reports to assess the performance of maintenance contractors. This analysis may include factors like response times, issue resolution, and cost-effectiveness.
- **Renewal Management:**
- Develop tools to manage the renewal of AMC contracts, including notification systems for renewal deadlines.
- **Alerts and Notifications:**
- Set up alerts and notifications to inform relevant stakeholders about AMC renewals, upcoming maintenance activities, and contract compliance issues.
- **Mobile Accessibility:**
- Ensure that authorized users can access and manage AMC data on mobile devices, facilitating on-site contract management and asset tracking.

## 16. **Third-Party API Integration:**

- **API Selection:**
- Choose and integrate relevant third-party APIs that provide data on solar plant performance, weather conditions, energy generation, or any other metrics necessary for monitoring.
- **Data Retrieval:**
- Create a mechanism for retrieving data from the integrated third-party APIs. This may include regular data polling or real-time streaming, depending on the nature of the data.
- **Data Normalization:**
- Standardize the incoming data from various APIs to ensure consistency and compatibility with the system's data structure.
- **Data Validation:**

- Implement data validation checks to verify the accuracy and integrity of the data received from third-party sources.
- **Data Storage:**
- Store the data retrieved from third-party APIs securely within the system's database for historical analysis and reporting.
- **Data Analysis:**
- Develop tools and algorithms to analyze the data collected from third-party APIs, allowing for performance comparisons, trend analysis, and predictive maintenance.
- **Reporting and Dashboards:**
- Integrate the data from third-party APIs into reporting systems and dashboards to provide comprehensive insights to users.
- **Integration Testing:**
- Conduct thorough testing of third-party API integrations to ensure reliability and accuracy of data.

## 17. Communication and Notifications:

- **Event-Based Communication:**
- Develop an event-based communication system that can trigger notifications and messages based on events and milestones. These events may include project milestones, commissioning status, maintenance alerts etc.
- **Role-Based Routing:**
- Implement role-based routing to ensure that notifications are directed to the appropriate recipients. Roles may include agencies, Junior Engineers (JE), Assistant Engineers (AE), and UTILITY administrators.
- **Customizable Notification Templates:**
- Create customizable notification templates that allow for the inclusion of event-specific information and personalized messages.
- **Notification Channels:**
- Offer multiple notification channels, such as email, SMS, in-app notifications, and mobile push notifications, to reach stakeholders through their preferred methods.
- **Notification Scheduling:**
- Allow users to schedule notifications in advance for planned events and activities, ensuring timely communication.
- **Alerts for Critical Events:**
- Set up alerts for critical events that require immediate attention, such as system failures, safety breaches, or performance anomalies.

- **Notification History:**
- Maintain a record of all notifications sent and received, providing a historical reference for stakeholders.

## **18. Data Security:**

The Data Security feature is fundamental to safeguarding sensitive information and ensuring compliance with data privacy regulations within the (UTILITY) project. Key features and considerations for implementing robust data security should include:

- **Access Control:**
- Implement role-based access control (RBAC) to restrict data access based on user roles and responsibilities. This includes defining who can view, edit, or delete data.
- **Authentication Mechanisms:**
- Integrate secure authentication mechanisms, such as multi-factor authentication (MFA) and strong password policies, to verify the identity of users before granting access to sensitive data.
- **Authorization:**
- Define clear authorization policies to determine which users have permission to perform specific actions within the application. This includes restricting access to certain data and functionalities.
- **Logging and Monitoring:**
- Enable comprehensive logging and monitoring of all user activities and system events. This helps in identifying security breaches and tracking unauthorized access.
- **Security Auditing:**
- Conduct regular security audits and vulnerability assessments to identify and address potential security risks and weaknesses.
- **Data Backup and Recovery:**
- Establish automated data backup and recovery processes to ensure data integrity in the event of system failures, data corruption, or security incidents.
- **Data Retention Policies:**
- Define data retention policies that specify how long different types of data should be stored and when data should be securely purged.
- **Compliance with Regulations:**
- Ensure that the data security measures are in compliance with relevant data protection and privacy regulations as per industry-specific requirements.

## **19. PR (Progress Report) Generation:**

**Real-time PR report generation:**

- Automatically generate progress reports in real-time, with alerts for key milestones or issues.

**Generate monthly progress reports:**

- Automatically create and distribute monthly progress reports for all agencies, including identifying top-performing and underperforming agencies based on predefined criteria.

**20. Google Maps Integration:**

**• Google Maps Integration:**

- Integrate the Google Maps API into the application to display solar power plant locations on an interactive map interface.

**• Real-Time Data Feeds:**

- Set up real-time data feeds that provide information on the status, performance, and energy generation of each solar plant.

**• Geolocation Data:**

- Utilize geolocation data to pinpoint the exact locations of solar power plants on the map.

**• Custom Markers:**

- Customize map markers to represent solar plants and provide at-a-glance information, such as plant name, capacity, and real-time performance data.

**• Information Pop-ups:**

- Enable pop-up windows that appear when a user clicks on a map marker, providing more detailed information about a specific solar power plant.

**• Clustered Markers:**

- Implement marker clustering for densely populated areas, which makes it easier to navigate the map and access information on multiple plants in the same region.

**• Filtering and Layers:**

- Add filtering options and map layers to allow users to focus on specific regions, types of solar plants, or data sets.

**• Direction and Routing:**

- Include features for finding directions to solar plant locations and calculating optimal routes for site visits or inspections.

**21. Responsive Web and Mobile Modules:**

- **Develop responsive modules:** Create web and mobile modules that are

- Easily accessible
- User-friendly
- Ensuring compatibility with various devices and screen sizes.

## **22. Mobile App Scope will be limited to following:**

### **Vendor App consisting of features:**

- Site Survey
- Documents upload
- Status of Activities
- Notifications

### **Vendor App consisting of features:**

- Generation Dashboard
- BG notification & details
- Sites Approval
- Communication (Internal)

### **Cert-In Audit**

- Application security Audit by Cert-In empaneled vendor.

## **23. Hosting:**

- **Provide server infrastructure:**

Offer the necessary server infrastructure and hosting services to ensure the software's availability and performance.

## **Testing Procedures**

### **1. Requirement Analysis**

- **Review Client Requirements:** Understand what features and functionalities the client expects from the project management software.
- **Document Requirements:** Create a detailed document outlining these requirements for reference throughout the testing process.

### **2. Test Planning**

- **Define Test Objectives:** Determine what aspects of the software you need to test (e.g., functionality, usability, performance).
- **Create Test Cases:** Develop specific test cases based on client requirements to validate each functionality of the software.
- **Prioritize Tests:** Decide the order of testing based on criticality and dependencies.

### **3. Functional Testing**

- **Feature Testing:** Validate each feature of the project management software against the documented requirements.
- **User Interface Testing:** Ensure the user interface is intuitive and user-friendly.
- **Integration Testing:** Test how different modules or components of the software work together.

## 4. Non-functional Testing

- **Performance Testing:** Evaluate the software's speed, responsiveness, and stability under various workloads.
- **Security Testing:** Check for vulnerabilities and ensure data protection measures are in place.
- **Compatibility Testing:** Verify that the software works across different browsers, operating systems, and devices as required by the client.

## 5. Usability Testing

- **User Acceptance Testing (UAT):** Have actual users from the client's organization test the software to ensure it meets their needs and expectations.
- **Accessibility Testing:** Ensure the software complies with accessibility standards, making it usable for people with disabilities.

## 6. Site Acceptance Testing (SAT)

- The objective of Site Acceptance Testing (SAT) is to verify that the software system meets the specified requirements and functions correctly in the actual operating environment
- This SAT plan covers the testing activities, procedures, and acceptance criteria for software deployment at the target site. It includes the testing of all functional and non-functional requirements, integration with existing systems, and user acceptance.

## 7. Reporting and Documentation

- **Bug Reporting:** Document any defects or issues found during testing using a standardized format.
- **Test Summary:** Provide a summary report highlighting the overall quality and readiness of the software for deployment.
- **Feedback:** Collect feedback from testers and stakeholders to improve the software further.

## 8. Deployment Support

- **Assist in Deployment:** Offer assistance during the deployment phase to ensure a smooth transition from testing to production use.

## 9. Post-Deployment Monitoring

- **Monitor Performance:** Keep an eye on the software after deployment to catch any unforeseen issues and ensure ongoing functionality.

## 10. Training and Support

- **Training Sessions:** Provide training sessions to help users understand and maximize the use of the project management software.
- **Ongoing Support:** Offer ongoing support to address any questions or issues that arise after deployment.

By following this structured approach, you can systematically test the project management software, ensuring it meets the client's expectations for functionality, usability, performance, and security.