Proposal

For

REMOTE MONITORING SYSTEM for SOLAR POWER PLANTS

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1 Organization/Company Profile

K-DISC is a strategic think-tank and advisory body constituted by the Government of Kerala. It aims at bringing out path-breaking strategic plans that reflect new directions in technology, product and process innovations, social shaping of technology, and creating a healthy and conducive ecosystem for fostering innovations in the State. In the sphere of development, K-DISC is promoting and initiating new projects in Emerging Technologies such as Block Chain, Internet of Things, Machine Learning, Artificial Intelligence, and Robotics, and soon that would enable transparent and cognitive advances in various departments of the state Government and deliver the ultimate benefit to the citizens. K-DISC would facilitate different government departments that may need any of these technological advances to solve their critical problems and to arrive at the proof of concepts stage with adequate technical and financial resources to promote innovation. Also, K-DISC will ease the implementation by overseeing the same.

2 Introduction

2.1 Business Case for the Project

Agency for New and Renewable Energy Research and Technology (ANERT) is an autonomous organization established in 1986 under the Societies Act by the Government of Kerala now functioning under the Power Dept, with its Head Quarters at Thiruvananthapuram. ANERT is mandated to gather and disseminate useful knowledge in the various fields of Non-conventional Energy, Energy conservation, and Rural Technology, conduct studies, demonstrate, Implement and support the implementation of schemes and projects in these fields, thereby dealing with the problems arising out of the rapid depletion on Nonrenewable energy sources, update the technologies used in rural areas as well as introduce appropriate new technologies to reduce drudgery, increase productivity and improve the quality of life.

ANERT has implemented more than 2000 Grid connected solar power plants across Kerala. The Grid-connected solar plants generate electricity and provide them to the consumers for their daily requirements. The surplus electricity generated is fed back into the Grid after the consumption needs of the consumers are met.

The architecture of the existing implementation of the Grid connected solar power plants is as below:

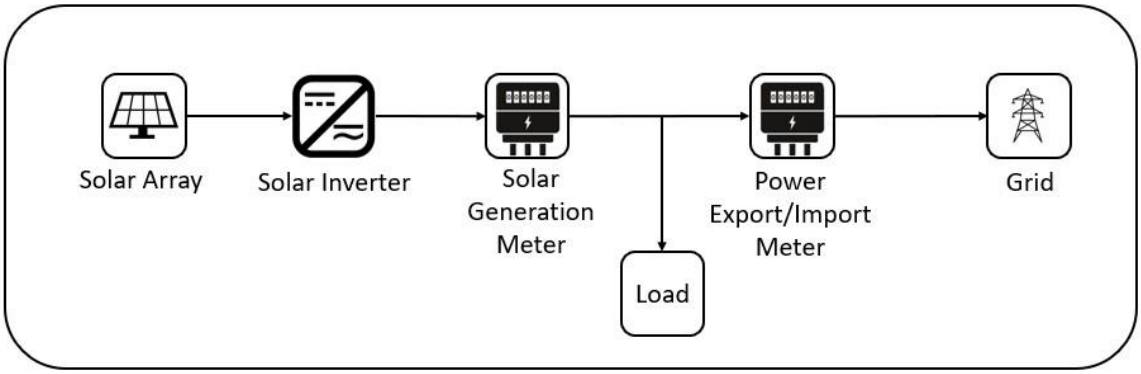

Figure 1: Basic architecture of grid tied solar power plants

Each Grid connected solar power plant has three components – Solar Panel connected to the Solar Generation meter, an Inverter, and a Power Export/Import Meter connected to the GRID.

Currently, all these power plants are monitored manually at the site by the officials from ANERT monthly. The officials at the ANERT Head office require a consolidated platform where they can monitor the information on power generation, consumption, and transfer to GRID from all locations, for efficient decision-making and future planning.

2.2 Summary of the Pilot Proposal

This pilot project will provide a scalable platform to monitor the information on power generation, consumption, and transfer to GRID from 27 identified locations by ANERT. This platform should be able to scale and support all the locations across Kerala in the future. For measuring the parameters from the Solar Generation meter, Inverter, and Power Export/Import Meter, IoT (Internet of Things) sensors will be installed at the 27 pilot locations.

3 Project Objectives

The objectives of the project will be to implement a scalable platform that accepts solar power generation information from all EPC developers and presents a consolidated and comprehensive view to all stakeholders.

4 Scope of the Project

The scope of the pilot project involves the following:

1. Install IoT sensors and/or IoT Gateway in each of the 27 solar power installations identified by ANERT, which will send signals to the cloud using an industry-standard protocol through the Wifi /GSM/GPRS network.

Sl No	District	Location	Capacity (kWp)	Inverter Make	Model	Solar Meter		Net Meter	
						Make	Model	Make	Model
1	Ernakulam	TRACO Cables	500	Solis	Solis-100k-5G	Secure	Premier 300	L&T	ER300P
2	Kannur	RUBCO	350	Growatt	MAX 100KTL3-XLV	L&T	ER300P	L&T	ER300P
3	Thiruvananthapuram	KWA - Over-head Service reservoir, Museum, Thiruvananthapuram	100	Fimer (ABB)	PVS-100-TL	Secure	Premier 300	L&T	ER300P
4	Thiruvananthapuram	KWA - Water Tank Storage Reservoir Thirumala, Thiruvananthapuram	100	Fimer (ABB)	PVS-100-TL	Secure	Premier 300	L&T	ER300P
5	Thiruvananthapuram	Transport Bhavan	100	Growatt	MAC 50KTL3-X LV	Secure	Premier 300	L&T	ER300P
6	Thiruvananthapuram	Kerala Govt. Secretariat - Annex I, Thiruvananthapuram	50	Hitachi	HIVERTER-Si-50K	Secure	Premier 300	L&T	ER300P
7	Thiruvananthapuram	Kerala Govt. Secretariat - Annex II, Thiruvananthapuram	50	Hitachi	HIVERTER-Si-50K	Secure	Premier 300	L&T	ER300P
8	Kozhikode	Govt. Mental Hospital, Kuthiravattam	40	Growatt	MID 40KTL3-X	Secure	E3D108	Secure	MT 786
9	Thiruvananthapuram	Govt. Homeopathi Medical College	40	Power One	SGTU-403N	Secure	E3D108	Secure	MT 786
10	Pathanamthitta	Ranni Taluk Hospital	30	KSTAR	KSG-30K	Genus	GTPDM6-18	L&T	ER300P
11	Alappuzha	Govt. HS Mannanchery, Alapuzha	25	Goodwe	GW-25X-SMT	Secure	E3T055	Secure	E3D111
12	Ernakulam	KSINC HQ	24	Sofar	24KTLX-G3	Genus	GTPDM6-18	L&T	ER300P
13	Kannur	KMM Govt. Wimen's College, Pallikkunnu	15	Zeversolar	Eversol TLC 15K	L&T	ER300P	L&T	ER300P
14	Alappuzha	GHSS Kalavoor	10	Sofar	10KTLX-G3	Genus	GTPDM6-18	L&T	ER300P
15	Ernakulam	Pampakuda Grama Panchayath	10	Power One	SGTU-103N	Visiontek	37TM	Secure	E3D108
16	Kasaragod	Block Panchayath Office	10	Goodwe	GW-10K-DT	Secure	E3D108	Secure	E3D108
17	Kottayam	Aymanam Grama Panchayath	10	Power One	SGTU-103B-SM	Secure	E3D108	Secure	E3D108
18	Kozhikode	Mavoor Grama Panchayath	10	Goodwe	GW10KT-DT	Secure	E3D108	Secure	E3D108
19	Idukki	Vigilance and anti- Corruption Bureau, Muttom,	5	Fuji Electric Consul Neowatt	Sunbird 1000/1000E	Genus	01B	SECURE	Sprint 350
20	Kollam	GUPS Chitoor , Karunagapally, Kollam	5	Luminous	NXI 150	Secure	SARAL	Secure	E3D108
21	Thiruvananthapuram	Govt. UPS Chalai	5	Evvo	5000 TLG2	L&T	EM 101+	Secure	Saral
22	Thrissur	GLPS Manalur	5	Sofar	5KTLM-G3	Secure	Saral	Secure	Saral
23	Kannur	AEO Office Madayi	3	KSTAR	KSG-3.2K-DM	Genus	01B	Secure	Sprint 350
24	Palakkad	GHSS Thenkara, Mannarkkad	3	Sofar	HYD - 3000 ES	Genus	01B	Genus	01B
25	Wayanad	Govt HS Panamaram, Wayanad	3	Fuji Electric Consul Neowatt	Sunbird 1000/1000E	Genus	01B	Genus	01B
26	Alappuzha	Govt. HSS Ayaparambu	2	Growatt	MIC 2000TL-X	Genus	01B	Genus	01B
27	Malappuram	Thanaloor Grama Panchayath office building	2	Goodwe	GW-2000D-NS	Secure	Saral	Secure	Saral

Table 1: Pilot locations

2. In each location, IoT sensors shall communicate with the Solar generation energy meter, Net power meter as well Inverter and gather relevant power parameters and communicate to the cloud.
3. Install IoT gateways at each of the locations to communicate sensor information to the cloud server over multiple communication channels like Wifi, GPRS, GSM, etc.
4. IOT gateways shall communicate to the cloud server over a standard protocol
5. Provide a progressive web application to monitor the solar power plant parameters on the web console and mobile devices
6. Provide all health information and statistics via a single platform, filtered based on the locations.
7. Provide MIS reports and Dashboards required for various stakeholders in ANERT and the State Government.
8. Provide a scalable platform hosted on the cloud at the State Data Centre that can be easily customized when more solar power plants are connected to the Net

9. The mobile application should be catering to the need of the stakeholders from ANERT, and other related Departments involved.

4.1 Functional Requirements

1. Login page should be available.
2. Access privileges should be made defined for the various stakeholders involved.
3. Location-wise statistics page should be available. Users should be able to view the statistics of a particular location based on the date selected.
4. Historical information should be available for the user to view, based on the date selected.
5. Consolidated reports – Weekly, Monthly, and Yearly for a particular location should be available.
6. Based on the user access levels, consolidated reports of multiple locations like Panchayat, District, and State levels should be available for any date selected.
7. The reports on the health of the equipment should be available.
8. All reports related to the Energy generated, consumed, and transferred to the GRID should be available.
9. All reports should be downloadable and emailable.

5 Implementation Strategy

5.1 Technical Approach

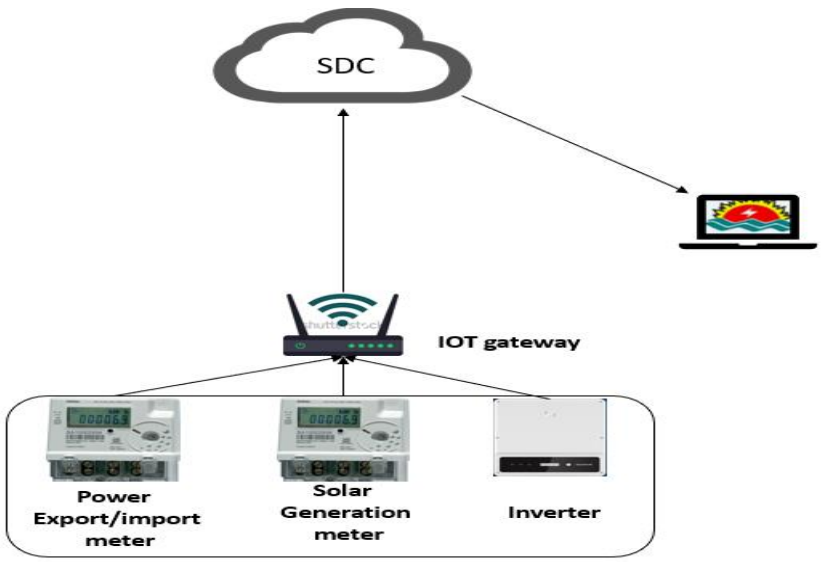

Figure 2: Architecture of remote monitoring system

IoT gateway will be installed at each solar power plant, connecting the Solar Generation meter, Inverter, and Power Export/Import Meter at each location. The gateway can directly communicate with energy meters over multiple RS 232 ports to energy meters and RS 485 ports to inverters. Alternatively, Intermediate IoT sensors can be provided to communicate on wire with energy meters and Inverter and communicate on wireless to the IoT gateway.

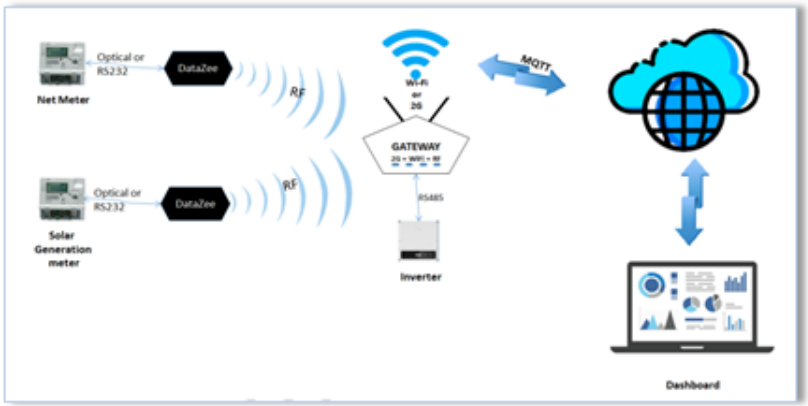

Figure 3: Communication architecture

Information will be gathered from each of the equipment and sent to the Cloud through Wifi or GPRS/GSM.

5.2 Deliverables/Milestones

(Provide a table that mentions the consolidated list of deliverables for the proposed project organized by milestone)

Deliverables	Target Date	Format
SRS Document		
IoT Sensors for 27 locations		
IoT Gateways for 27 locations		
Progressing web application		

Table 2: Deliverables