Madhya Pradesh Urja Vikas Nigam Limited

Invites

Request for Proposal (RFP)

For

Standardization of Rates and Selection of Contractor

for

Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps through suitable software platform and integration of data with State level and National level portals

RFP No: F/UVN/2025/RMS/1467

Dated: 12/06/2025

Issued by:-

Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL)
"Urja Bhawan" Link Road No. 2, Shivaji Nagar, Bhopal – 462016
Telephone No.: +91-755-2553595, 2556566
Fax No: 91-755-2553122

Contents

ADDITIONAL DOCUMENTS (UPLOADED SEPARATELY ON MP TENDERS PORTAL)

A. MNRE GUIDELINES FOR STATE LEVEL SEDM PLATFORM DEVELOPMENT

B. RMS COMMUNICATION AND SECURITY ARCHITECTURE

C. SPECIFICATIONS FOR REMOTE MONITORING SYSTEM

Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL)

Urja Bhawan Link Road No. 2, Shivaji Nagar, Bhopal – 462016
Telephone No.: +91-755-2553595, 2556566; Fax No: 91-755-2553122
website: http://www.mprenewable.nic.in, Email: aee05.mpuvn1982@gmail.com
resco4.mpuvn@gmail.com ajayk.shukla10@mp.gov.in

F/UVN/2025/RMS/1467 **Dated: 12/06/2025**

Madhya Pradesh Urja Vikas Nigam Limited (**Nodal Agency**), invites Bids from the eligible Bidders to participate through this Request for Proposal (RFP) for Standardization of Rates and Selection of Contractor for Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps with provision of SCADA Software License, through suitable software platform and integration of data with State level and National level portals.

For the implementation of above-mentioned work, Bidder should submit their scanned copy of bid proposal along with payment of non-refundable Bid Processing Fee and all requisite documents complete in all respects on or before 17/07/2025 up to 17:00 hours in prescribed format on the MP Tenders Portal. Bid proposals received without the prescribed Bid Processing Fee and Bid Security will be rejected. Technical Bid will be opened on 21/07/2025 at 17:00 hours.

Bid documents which include eligibility criteria, technical specifications, various conditions of Agreement, formats, etc. can be viewed from Nodal Agency's website or downloaded from MP Tenders Portal (https://mptenders.gov.in/nicgep/app) for online bid submission.

DISCLAIMER

1. Though adequate care has been taken while preparing the RFP document, the Bidder shall satisfy themselves that the document is complete in all respects. Intimation of any discrepancy shall be given to this office immediately. If no intimation is received from prospective Bidder on or before pre-bid meeting date, it shall be considered that the RFP document is complete in all respects and has been received by the Bidder.

2. Nodal Agency reserves the right to modify, amend or supplement RFP documents including all formats and annexure up to five (5) days before the Bid submission date. Interested and eligible Bidders are advised to follow and keep track of Nodal Agency's website for updated information. Nodal Agency is not obligated to send/ communicate separate notifications for such notices/ amendments/ clarification etc. in the print media or individually. Nodal Agency shall not be responsible and accountable for any consequences to any party.

3. While this RFP has been prepared in good faith, neither Nodal Agency nor their employees or advisors make any representation or warranty, expressed or implied, or accept any responsibility or liability, whatsoever, in respect of any statement or omissions herein, or the accuracy, completeness or reliability of information and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of this RFP, even if any loss or damage is caused by any act or omission on their part.

4. The capitalized term or any other terms used in this RFP, unless as defined in RFP or repugnant to the context, shall have the same meaning as assigned to them by Applicable Laws, Rules and Regulations applicable within India or State of Madhya Pradesh as the case may be.

BID INFORMATION SHEET

Document Description	Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps through suitable software platform and integration of data with State level and National level portals
RFP No. & Date	F/UVN/2025/RMS/1467 Dated: 12/06/2025
RFP Purchase End Date	17/07/2025 at 16:00 hours
Last date for submission of queries in written form	The queries shall be submitted to aee05.mpuvn1982@gmail.com resco4.mpuvn@gmail.com ajayk.shukla10@mp.gov.in till 21/06/2025
Pre-bid Meetings	Pre-bid meeting shall be held online on 23/06/2025 at 12:00 hours. Online link for the pre-bid meeting shall be provided as corrigendum on MP tenders portal.
Response to Pre-bid Queries	25/06/2025
Online Bid Submission End Date	17/07/2025 at 17:00 hours
Hard Copy Submission Last Date	21/07/2025 at 12:00 hours
Bid Opening (Technical)	21/07/2025 at 17:00 hours
Bid Opening (Financial)	Technically qualified bidders will be informed through e-mail regarding the date and time of opening of financial proposals
Bid Processing Fee (non- refundable)	Bidder shall pay Tender Fee of Rupees 5,000/- (Rupees Five Thousand only) + Rs. 900/- GST through online mode on MP Tenders portal. This Tender Fee is exclusive of portal charges or payment gateway charges. The additional charges beyond the Tender Fee shall be borne by the Bidder. No exemption towards Tender Fee or E-tendering fees is allowed to any type of organizations/ agencies including MSMEs, Startups or any Govt./semi Govt./ PSUs.

Bid Security/Earnest Money Deposit	Bidder shall submit a Bid Security/EMD of Rs 8,00,000/- (Rupees Eight Lakh Only). Bid Security shall be submitted online on MP Tenders portal or scan copy of Bank Guarantee or Demand Draft shall be uploaded on MP Tenders portal. Micro, Small and Medium Enterprises whose place of work and registered office are in the state of Madhya Pradesh as defined under the Micro, Small and Medium Enterprises Development Act 2006 are eligible for exemption from payment of EMD.
Bid Validity	Bid validity shall be for a period of 90 days from the last date of bid submission
Update on this RfP	Bidders are advised to keep track of changes/ updates/ corrigendum regarding this RFP on https://mptenders.gov.in/nicgep/app
Nodal Officer for correspondence	Smt. Vandana Chatterjee/ Sh. Ajay K Shukla Executive Engineer, MP Urja Vikas Nigam Ltd., 'Urja Bhawan', Link Road No. 2, Shivaji Nagar, Bhopal – 462016
Check list of Documents	A check list of documents is given in Table 1, clause 3 of Section I, Instructions to Bidders

SECTION-I

INSTRUCTIONS TO THE BIDDER

1. INTRODUCTION:

1.1. The Bidder is advised to read carefully all instructions and conditions of this RFP and understand the scope of work fully. All information and documents required as per the RFP must be furnished with bid. The Nodal Agency reserves the right to seek clarifications on submitted bids. Failure to provide the information and/or documents as required shall render the Bid(s) unacceptable for further evaluation and may lead to rejection of the bid(s). All bidder qualifying technical stage shall be treated at par. Financial Bid of Bidder qualifying at technical stage only shall be opened.

1.2. Bidder shall be deemed to have examined the RFP, to have obtained information in all matters whatsoever that might affect carrying out of works in line with the scope of work specified in the RFP at the bid price and to have satisfied himself of the sufficiency of his bid. The Bidder shall be deemed to know the scope and nature of the assignment and magnitude of the works and requirement of materials, equipment, tools and labour involved, wage structures and as to what all works Successful Bidder shall have to complete in accordance with the RFP, irrespective of any defects, omissions or errors that may be found in RFP.

1.3. The information and/or documents shall be submitted by the Bidder as per the formats specified in this document.

1.4. Bid(s) that are incomplete in any respect or those that are not consistent with the requirements as specified in this RFP or those that do not adhere to formats prescribed herein, wherever specified, may be considered non-responsive. However, Nodal Agency reserves the right to seek additional information/clarifications from the Bidders, if found necessary, during the course of evaluation / processing of the Bid(s). Non-submission or delayed submission of such additional information or clarifications sought by Nodal Agency may be a ground for rejecting the Bid(s). Each format has to be duly signed and stamped by the authorized signatory of the Bidder.

1.5. The Bidder shall furnish documentary evidence in support of meeting eligibility criteria as indicated in this RFP to the satisfaction of Nodal Agency and shall also furnish unconsolidated/ consolidated audited annual accounts in support of meeting financial requirement, which shall consist of unabridged annual accounts, profit and loss account, profit appropriation account, auditor's report, etc., as the case may be.

1.6. The bidder shall have to provide services required at MPUVN. MPUVN shall not be responsible for allocation of any office setup or space for the bidder with respect to the services under this RFP.

1.7. The firm should not have any pending case with cyber-crimes or be involved in any

illegal cyber activities.

1.8. Instructions to the bidder on e-tendering:

a) For participation in e-tendering module, it is mandatory for Bidders to enrol on the e-Procurement module of the MP Tenders Portal (URL: https://mptenders.gov.in/nicgep/app) by clicking on the link "Online bidder Enrolment" on the MP Tenders Portal. Cost of Enrolment and renewal shall be the responsibility of the bidder.

b) As part of the enrolment process, the Bidders will be required to choose a unique username and assign a password for their accounts.

c) Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the MP Tenders Portal.

d) Upon enrolment, the Bidders will be required to register their valid Digital Signature Certificate.

e) For further information regarding issue of Digital Signature Certificate, the Bidders are requested to visit MP tenders website (https://mptenders.gov.in/nicgep/app). Please note that it may take up to 3 to 5 working days for issue of Digital Signature Certificate. Nodal Agency will not be responsible for any delay in submission owing to any delay in issuance of Digital Signature Certificate.

f) Tender documents can be downloaded from website free of cost. Bidders need to submit the Bid Processing Fee at the time of online submission of the bid.

g) Service and gateway charges shall be borne by the Bidders.

h) The Browser should be Java enabled. Java Runtime Environment (JRE) should be installed in the client system. The browser and system requirements etc. are mentioned on the MP tenders e-portal.

i) If Bidder is participating for the first time in e- tendering, then it is advised to fulfil all formalities, such as registration, obtaining Digital Signature Certificate, etc. well in advance.

j) Bidders are requested to regularly visit MP tenders-tendering website for any clarification and / or extension of due date.

k) Bidder must positively complete online e-tendering procedure at https://mptenders.gov.in/nicgep/app.

l) Nodal Agency shall not be responsible in any way for delay /difficulties /inaccessibility of the downloading facility from the website for any reason whatever.

m) Bid Security/EMD Payment shall be made online on MP Tenders portal as per the amount mentioned in the Bid Information Sheet.

n) After the final submission of bid, Bidder should ensure that he has received the acknowledgment slip and should keep this slip until opening of the Bid. If acknowledgment slip is not generated, it means the Bid is not submitted.

o) The Bidders shall have to submit their Financial Bid and other required relevant documents/ certificates, if any, online only (duly encrypted bids) as per time schedule (Key dates) as mentioned in this RFP. The Technical Bid should be submitted online and shall contain signed copy of RFP along with Annexures, formats, relevant document/ certificates etc. duly sealed and signed and uploaded.

p) For any type of clarification pertaining to e-bidding procedure, Bidders can visit https://mptenders.gov.in/nicgep/app and can call at 24*7 help desk contact numbers and e-mail address mentioned on the website.

q) A Bidder shall not have a conflict of interest. The Bidder shall be considered to have conflict of interest with one or more parties in this bidding process, if:

   a) A Bidder submits more than one Bid in the bidding process, either individually [including bid submitted as authorized representative on behalf of one or more Bidder(s)] or as Member of consortium.

   b) They have a relationship with each other, directly or through common third parties, that puts them in position to have access to information about or influence on the Bid of another Bidder or influence the decisions of Nodal Agency regarding this bidding process.

1.9. Bids will be opened online as per time schedule mentioned in Bid Information Sheet

1.10. Before submission of online bids, bidders must ensure that scanned copy of all the necessary documents have been attached with bid.

1.11. Uploaded documents of valid successful bidder will be verified with the original before signing the agreement.

1.12. All the required information for bid must be filled and submitted online. The nodal agency will not be responsible for delay in online submission due to any reason.

2. ELIGIBILITY CRITERIA:

2.1.GENERAL:

a. The Bidder or, in case of a consortium being the Bidder, its each member should be a body incorporated in India under the Companies Act, 1956 or 2013 including any amendment thereto or a Partnership Firm having executed partnership deed and registered as per sections 58 & 59 of the Partnership Act,

1932, as amended or a Limited Liability Partnership (LLP) Firm registered under section 12 of Limited Liability Partnership Act, 2008, as amended or registered Sole Proprietor. A copy of certificate of incorporation, partnership deed or LLP/ Sole Proprietor registration, as applicable and relevant, shall be enclosed with the bid.

b. In case the bidder is an incorporated Indian Joint Venture company registered in India and incorporated under company's act 1956 and any amendments there under; then the technical as well as financial experience criteria should be met as under.

    i. The Joint Venture Company should meet the experience criteria by itself. OR

    ii. The technical as well as financial qualification of the individual Joint Venture Partner (either an Indian OR a foreign company) can be considered only if the Joint Venture Partner is having a stake of at least 26% in the Joint Venture Company.

c. If the Supplier is a consortium, the members of such consortium shall be jointly and severally liable to the Nodal Agency for the fulfillment of the provisions of the Contract. Only the Lead Member shall have the authority to conduct all businesses for and on behalf of the Consortium during the bidding process. In the event of award of Contract to the Consortium, the composition of the consortium shall not be altered.

d. Consortium shall nominate a member among themselves to be the Lead Member. Such nomination shall be supported by a power of attorney signed by all the Members of Consortium (and duly acknowledged by the Lead Member) and shall substantially be in the form set out in Format V. The Lead Member shall have the authority to represent all the Members of the Consortium during the Bid Process.

e. In a situation, where a consortium that is selected as a Successful Bidder, the Lead Member would be responsible for all the correspondence and documentation. Work Order under this tender shall be issued in the name of the Lead Member, and any payments shall be made in name of Lead Member.

f. Bidder must meet Eligibility Criteria either independently or as consortium. In case Bidder is a Consortium, a consortium agreement shall be required to be furnished along with the Bid.

g. Bidder or any member of consortium or its Affiliate or JV partner having been blacklisted by Nodal Agency or by any Govt./PSU, for whatever reasons, shall not be eligible/ allowed to participate in this RFP.

2.2. ADDITIONAL CONDITIONS FOR ELIGIBILITY

With respect to foreign bidders, the Office Memorandum (OM) dated 23rd July 2020, issued by Department of Expenditure, Government of India prescribes certain conditions of eligibility for Bidders from countries which share land borders with India, except those countries to which Government of India has extended lines of credit or in which the Government of India is engaged in development projects. The conditions of eligibility for such Bidders in line with the aforementioned OM is as follows:

a) Any Bidder from a country which shares a land border with India will be eligible to Bid in this tender only if such Bidder is registered with the Competent Authority.

b) Bidder from a country which shares a land border with India" means:

   i. an entity incorporated, established or registered in such a country; or

   ii. a subsidiary of an entity incorporated, established or registered in such a country; or

   iii. an entity substantially 'controlled' through entities incorporated, established or registered in such a country; or

   iv. an entity whose 'beneficial owner' is situated in such a country; or

   v. an Indian (or other) agent of such an entity; or

   vi. a Consortium where any Member of the Consortium falls under any of the above provisions

c) A "beneficial owner" for the purpose of sub-clause 6.0(b)(iv) above will be the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a 'controlling ownership interest' or who exercises control through other means. 'Controlling ownership interest' means equity ownership of 25% or more, 'control' shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements.

d) Beneficial owner in case of partnership firm, trust or other associations/arrangements shall be the natural person, whether alone or acting together or through one or more juridical person with entitlement of more than 15% of property or capital or profits of such partnership or trust or association of body of individuals

For a foreign bidder participating in this RFP, it would be mandatory to provide declaration as per Format X of this RFP.

2.3. TECHNICAL ELIGIBILITY CRITERIA

a. Bidder should have experience of successful implementation (installation & commissioning) of any of the following systems for Energy Management System of any State Nodal Agency or State Implementing Agency (SNA/SIA) or any Government agencies for at least 1,000 no. of Energy Monitoring Devices such as Meters/Inverters/Controller/Drives/String combiner Box during last 3 (three) years as on date of publishing of this tender: -

   - Supervisory Control and Data Acquisition System (SCADA), or
   - Meter Data Acquisition System (MDAS) with remote operation of device

b. Experience certificates and/or Acceptance reports and Work Order and/or LoA from the owners/client for completion of work done, in support of the qualifying requirements, clearly establishing: the start and end date of the project, scope of work and worth of project, on client letterhead shall be submitted along with the Technical Bid.

2.4. FINANCIAL ELIGIBILITY CRITERIA

a. Average Turnover of the interested bidder during last three financial years shall be Rs. 5 Crore per year. Also, the Bidder must have positive net worth in all last three financial years.

b. The last three financial years for Turnover and positive net worth for above mentioned criteria shall be FY(2022-23), FY(2023-24) & FY(2024-25). In case audited financial statements of FY 2024-25 are not available, turnover and net-worth of FY (2021-22), FY (2022-23) and FY(2023-24) will be considered.

c. Bidder may use net worth and turnover of parent company as well, provided parent company is holding minimum 51% share in the bidding company. Documentary evidence in this regard shall be submitted along with the bid.

3. TECHNICAL BID SUBMISSION

During bid submission, the following documents shall be uploaded on MP tenders portal. In case of non-submission of documents, bid submitted by the bidder may be considered as non-responsive. Further, Nodal Agency shall have the right to seek any additional information for the purpose of evaluation of the bid.

Table 1: List of documents/formats required for submission

S.No	Particulars as per RFP	Documents required	Applicable Formats
1.	Bid responsiveness check	• Receipt of tender document fees paid on MP tenders portal • Receipt of EMD paid on MP tenders portal	–
2.	General Eligibility Criteria	• Certificate of incorporation, partnership deed or LLP/Sole Proprietor registration, as applicable and relevant • In case of Joint Venture, submit proof of 26% shareholding of JV member whose technical and/or financial credentials shall be used • PAN, Income Tax and GST details of the bidder/Lead Member in case of consortium	–
		• Covering letter	Format I
		• Information about the bidder	Format II
		• Format for Statement of Legal Capacity	Format III
		• Power of Attorney authorizing the signatory of the bidder for bid submission and dealing with all related matters pertaining to this RFP	Format IV

		• Power of Attorney in favour of lead member of Consortium (if applicable)	Format V
		• Consortium Agreement (if applicable)	–
		• Blacklisting declaration	Format VI
3.	Technical Eligibility Criteria	• Details of Work Orders as per Format • Scanned copies of work order/LoA and work completion certificates	Format VII
4.	Financial Eligibility Criteria	• Format for net worth and turnover • Audited and Certified copies of the Annual Accounts should be enclosed, and a summarized sheet of turnover certified by practicing Chartered Accountant • For proprietary/partnership companies, copies of Income Tax returns with full details of turn over should be enclosed. A summarized sheet of turnover certified by practicing Chartered Accountant (CA) (Sole proprietor ship/firm) shall also be enclosed	Format VIII
5.	Other documents	• Foreign bidder declaration regarding sharing land border with India • Signed copy of RFP and all corrigenda/documents issued by Nodal Agency shall be uploaded by the bidder	Format X

In the event of selection of the bidder as Successful Bidder, the Bidder shall submit

original copies of the documents for verification by the Nodal Agency.

4. FINANCIAL BID SUBMISSION

4.1. Bidder shall submit the financial bid in the excel format provided on the MP Tenders e-bidding portal. The rates shall be provided **exclusive of GST.** The Format of the Financial Bid is provided in Format IX of the RFP for reference.

4.2. **Bidder shall not provide any information pertaining to rates in the Technical Proposal**. In case Technical/Qualification proposal submitted by the Bidder contains any information on quoted rates, the bid of such bidder shall be summarily rejected.

5. CURRENCIES OF BID

5.1. The unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees (INR).

6. SCHEDULE OF SELECTION PROCESS

Table 2: Schedule of Bid Process

A	Issuance of RFP Document	16/06/2025
B	Last date of receipt of pre-bid queries	21/06/2025
C	Time and date of pre-bid	23/06/2025, 12:00 hours. Online link for the pre-bid meeting shall be provided through corrigendum issued on MP Tenders portal.
D	Response to pre-bid queries	25/06/2025
E	Online Bid Submission	Technical and Financial Bid is required to be submitted in online mode only, on the https://mptenders.gov.in/nicgep/app website on or before 17:00 Hrs of 17/07/2025.
F	Hard Copy Submission	On or before 12:00 Hrs of 21/07/2025
G	Technical bid opening	21/07/2025 at 17:00 Hrs
H	Financial bid opening	To be intimated separately to the bidder
I	Validity of Proposal	Minimum 90 calendar days from Proposal submission deadline.

Any modifications, amendments, or corrigendum in RfP or timelines described above shall be updated only online on MP Tenders portal and shall not be notified to any of interested Bidders individually. It will be sole responsibility and accountability of Bidder to keep itself updated about the RfP and its processes as well as timelines. MPUVNL shall not be answerable or accountable for any implications due to the same.

SECTION-II
BID OPENING AND EVALUATION

1. BID RESPONSIVENESS CHECK

The technical opening of the bids would be carried out by the Nodal Agency on the date specified in the Schedule of Selection Process. During the responsiveness check, Nodal Agency would check for completeness of bid documents and whether the fees, bid security etc. has been submitted by the bidder.

2. TECHNICAL EVALUATION

Nodal Agency will assess whether the bidder has submitted all the documents pertaining to eligibility criteria as mentioned under Clause 2, "Section I – Instructions to Bidders" of this RFP. Only eligible bidders that qualify the General, Technical and Financial Eligibility Criteria specified in Clauses 2.1, 2.2, 2.3 and 2.4 "Section I – Instructions to Bidders" of this RFP, shall qualify for opening of financial proposals.

Non-submission of key documents by the bidder may lead to disqualification or rejection of the bid by Nodal Agency. However, Nodal Agency shall have the right to seek additional documents/clarifications/submissions etc. for purposes of evaluation of the proposal.

2.1. **Proof of Concept (POC)**

The Technically Qualified Bidder shall have to establish **Proof of Concept.**

The proof of concept is the ability to establish successful communication between IoT based Remote Monitoring Systems and the SCADA platform.

2.1.1. Bidder shall deploy his SCADA platform and configure the same for 3 real or virtual clients, i.e. 1 meter, 1 inverter and a virtual client, which could be meter/inverter/ controller/drive/string combiner box, etc. Bidder shall also demonstrate following features:

a. Device provisioning and Connectivity of clients with SCADA platform
b. Process JSON message formats described in MNRE guidelines and display any 10 parameters of required equipment
c. Display of live parameters values on web client
d. Remote Operation using web client
e. Notifications on web client

2.1.2.***Period of the POC:***

a. The bidder shall have to establish the POC within 7 Days period on receiving Intimation for POC.

b. Bidder is required to come along with authorized representative on the date of starting of the POC. **The bidder who is unable to establish the POC within the stipulated timeline or is not present during the period of the POC will be declared as disqualified.**

3. FINANCIAL EVALUATION

3.1. Only the financial bids of technically qualified bidders, which have established the Proof of Concept as described in Clause 2.1 above, shall be opened. The financial bid shall be submitted in the excel BoQ format provided on MP Tenders.

3.2. Where there is a discrepancy between the unit rate and the line-item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

3.3. The bidder shall quote rates **exclusive of GST**, the same would be considered by the Nodal Agency while evaluating the financial proposal.

3.4. The technically qualified bidder who has quoted the lowest rate (L1 bidder) in the financial bid shall be selected as Successful Bidder.

4. AWARD OF CONTRACT

4.1. Nodal Agency shall provide LOA to the Successful Bidder. The date of issuance of LOA shall be intimated by the Nodal Agency to the Successful Bidder.

4.2. The Successful Bidder has to sign the LOA and submit Performance Bank Guarantee (PBG) of required value in favour of Nodal Agency within 15 days from the date of issuance of LOA. Further, the Nodal Agency shall reserve the right to annul/cancel the LOA of the Successful Bidder.

4.3. Nodal Agency shall cancel the LOA issued to successful bidder for non-submission of signed LOA with PBG within the stipulated timeline. In such case, the bidder shall be blacklisted and debarred from participating in Nodal Agency's subsequent tenders for a period of five years.

4.4. In case of non-acceptance of LOA by the L1 bidder or cancellation of LOA by Nodal Agency, the work shall be offered at L1 rate to L2 bidder. In case of non-acceptance of LOA by L2 bidder at L1 rates, the same shall be offered to L3 bidder, and so on, until the LOA is accepted by a technically qualified bidder at L1 rate.

4.5. In case, if none of the other technically qualified bidder(s) is interested in taking the Project, then Nodal Agency will take appropriate action.

4.6. Nodal Agency at its own discretion, shall have the right to reject any or all the Bid without assigning any reason whatsoever.

5. PERFORMANCE BANK GUARANTEE

5.1. Successful bidder shall submit a security deposit @10% of the allotted work order value in the form of Bank Guarantee/DD valid for 3 years, within 15 days from the date of issuance of LOA. In case of non-submission of PBG, the Nodal Agency reserves the right to annul/ cancel the LOA of the Successful Bidder and the EMD/Bid Security submitted by the bidder will be forfeited and the bidder shall be blacklisted and debarred from participation in any subsequent tenders of the Nodal Agency for a period of 5 years.

5.2. Successful bidder may be required to extend the validity of the PBG as required up to handover of SCADA platform to MPUVNL/any party appointed or nominated by MPUVNL as mentioned in Clause 7 of this RFP. The PBG will be returned upon satisfaction of the Nodal Agency with respect to integration of devices, completion of O&M and handover of SCADA platform in accordance with Clause 7(5) of this RFP.

SECTION-III

SCOPE OF WORK AND TECHNICAL SPECIFICATIONS

1. PREFACE

MNRE has issued "Guidelines for State Level SEDM Software Development[1]" for KUSUM A, B and C projects. The guidelines cover various functionalities of business as well as operational requirements including monitoring parameters, system architecture, modules and protocols for communication, etc. As mentioned in guidelines, the remote monitoring systems will capture data from Pump Controllers, Inverters, Energy Meters, String Combiner boxes etc. and connect to State Level SEDM platform using IIoT communication protocol and JSON message format as described in guideline documents. The MNRE Guidelines, Communication and Security Architecture and Specifications for Remote Monitoring System are provided separately on MP Tenders portal for reference.

MPUVNL has already developed an SEDM platform in accordance with MNRE guidelines, for 100, 200 and 7,000 systems under KUSUM A, B and C, respectively. Further, MPUVNL is implementing various renewable energy programs within the state, such as solar rooftops – CAPEX and RESCO models, KUSUM A, B and C, offgrid solar PV systems under PM Janman Scheme, etc. In order to ensure effective monitoring and operation of prospective renewable energy projects/pumps/systems, services are required for RMS integration, supervisory control, data integration, development of portal, dashboards and integration of necessary data with National level SEDM platform.

In view of above, Device Integration (SCADA) platform is required to connect all Remote monitoring systems using IIoT Technology. The selected bidder/firm shall provide scalable IIoT based SCADA platform as well as configuration services to integrate thousands of devices such as Inverters, Energy Meters, controller, drives, string combiner box, etc. It should be an interoperable, scalable SCADA platform to connect any Remote Monitoring System installed at solar rooftop systems, solar pumps, ground mounted solar PV projects or off grid solar PV projects using IIoT protocol and JSON message format with TLS/SSL Security

2. BROAD SCOPE OF WORK

Bids are invited for selection of software solution provider for supply, deployment, integration, testing, configuration and go live of IIoT based SCADA platform for integration of RMS data

[1] The MNRE Guidelines for State Level SEDM Development are provided as a separate pdf file uploaded on e-tendering portal.

from several renewable energy systems such as solar rooftops, ground mounted solar PV, solar pumps and offgrid solar projects, installed under schemes/programmes/tenders of MPUVNL. Bidder shall consider following scope of work as a part of this tender:

2.1. Supply of SCADA Software platform license for integration of IoT based Remote monitoring system as per MNRE Guidelines.

2.2. SCADA Device Provisioning Services for each IoT based Remote Monitoring System which includes TLS/SSL Certificate Generation, Credential generation, Device hierarchy management such as District/DISCOM/Division/Sub division, FTP Server credential and testing for each device.

2.3. SCADA Tag Configuration Services for each IoT based Remote Monitoring System which includes configuration of Hard Tags, Soft Tags, Alarms and Notifications of Each system.

2.4. Configuration Services of User and Role Management: Organization/User Creation, Role Management, Group Creation, Data Access Mapping, Mobile Application User Access Management.

2.5. Integration of data with State Level as well as National Level Platform.

2.6. Impart the required training to Nodal Agency Officers for operation and usage of system

2.7. The SCADA system shall be hosted on cloud platform. The cloud platform will be provided to the bidder through MPSEDC, or such agency as provided by Nodal Agency.

2.8. The period for integration of remote monitoring systems as per the scope of work in this RFP shall be 1 year from the date of issuance of work order by the Nodal Agency. Further, the period shall be extendable up to 1 additional year based on requirement of the Nodal Agency, based on same terms & conditions of this RFP/Work Order and on the same rates discovered through this RFP.

2.9. Further, software maintenance services shall be provided for 2 years from the integration of 100% of remote monitoring systems as mentioned in Clause 7 of this RFP. Further, the maintenance services shall be up to the handover of SCADA platform to MPUVNL or third-party users (nominated by MPUVNL).

2.10. Bidder **shall exclude** following points from scope of work of this tender :-

2.10.1. Supply, Installation, Testing and Commissioning of Remote Monitoring

System Hardware

2.10.2. SIM Card procurement and recurring charges

2.10.3. SMS Gateway

2.10.4. Cloud platform for SCADA services

3. NUMBER OF SYSTEMS TO BE INTEGRATED

The number of systems to be integrated shall be as follows:

S.No	Scheme/Type of Solar PV Systems	No. of Systems to be integrated (Indicative[2])
1.	KUSUM B (Solar Pumps)	1,00,000
2.	KUSUM A (Grid Connected Solar PV)	500
3.	KUSUM C (Grid Connected Solar PV)	400
4.	PM Janman Scheme (Off grid Solar PV)	2060
5.	Solar Rooftop Systems	12,500

4. SOFTWARE DEPLOYMENT AND DEVICE INTEGRATION SCHEDULE

4.1.1. Appointed firm shall supply, deploy and test SCADA software platform as per specifications within 15 days from date of order.

4.1.2. Appointed firm shall successfully integrate the different RMS-Devices installed in field anywhere in Madhya Pradesh under the Component-A, Component-B and Component-C of PM-KUSUM Scheme as well as MPUVNL solar rooftop projects and off grid projects under PM Janman scheme, with SCADA software platform as per specifications within the time mentioned as below from date of e-mail from Nodal Agency intimating the Firm for integrating devices.

No. of Systems reported to be integrated in a day	Time period for integration
Up to 50 Systems	2 days

[2] Exact no. of systems to be integrated may vary depending on no. of installations and may go up to 50% above the indicative capacity.

More than 50 and Up to 100 Systems	3 days
More than 100 Systems	4 days

4.1.3. The platform developed by firm shall ensure interoperability, i.e. the capability to integrate data from various RMS systems installed at solar pump controller, inverters, generation meters and net meters (if required). Further, the SCADA system, web based platform and system modules should be designed in line with MNRE Guidelines. Further, Bidder shall provide source-code, relevant data and software requirements (prior to end of contract/handover) so that even after the completion of contract period, MPUVNL officials (or any party appointed by MPUVNL) can integrate new RMS with the SCADA and web based platform after the completion of existing contract/work order under this RFP.

4.1.4. ***Penalty for delay integration of devices:*** - In case of delay in integrating device with server, penalty @ Rs.10/- per day per system plus applicable taxes on the total order value of the no. of integration of systems subject to a maximum of 50% of total order value of the no. of integration of systems plus applicable taxes would be levied.

4.1.5. Go-Live acceptance Criteria

Following is the indicative list of acceptance criteria to be adopted for the project. The activities below will include but not be limited to the following:

a) Integration of Devices with Central server with at least 90% of devices transferring data to server continuously for at least 15 days
b) Reports generated accurately for different stakeholders viz. Feeder Load curve, Feeder Current trend, Voltage Profile, Power Factor, Outage Report, Seasonal Demand Curve etc.
c) Dashboard successfully displaying real time data

5. SPECIFICATIONS OF DEVICE INTEGRATION (SCADA) PLATFORM REQUIREMENT

5.1. Architecture of State Level Solar Energy Data Management Platform

The architecture of the SEDM platform would be as described in the MNRE Guidelines. The MNRE Guidelines cover inter alia, the High Level and Module Level Software Architecture, device integration modules, system and other modules for KUSUM A, B and C systems. The high-level architecture of the MNRE Guidelines described in the following sections shall also be adopted for solar rooftop, ground mounted solar PV and off-grid solar PV systems. Further, **for systems other than under PM KUSUM Scheme, it would not be required to integrate the data with the National Level SEDM portal**.

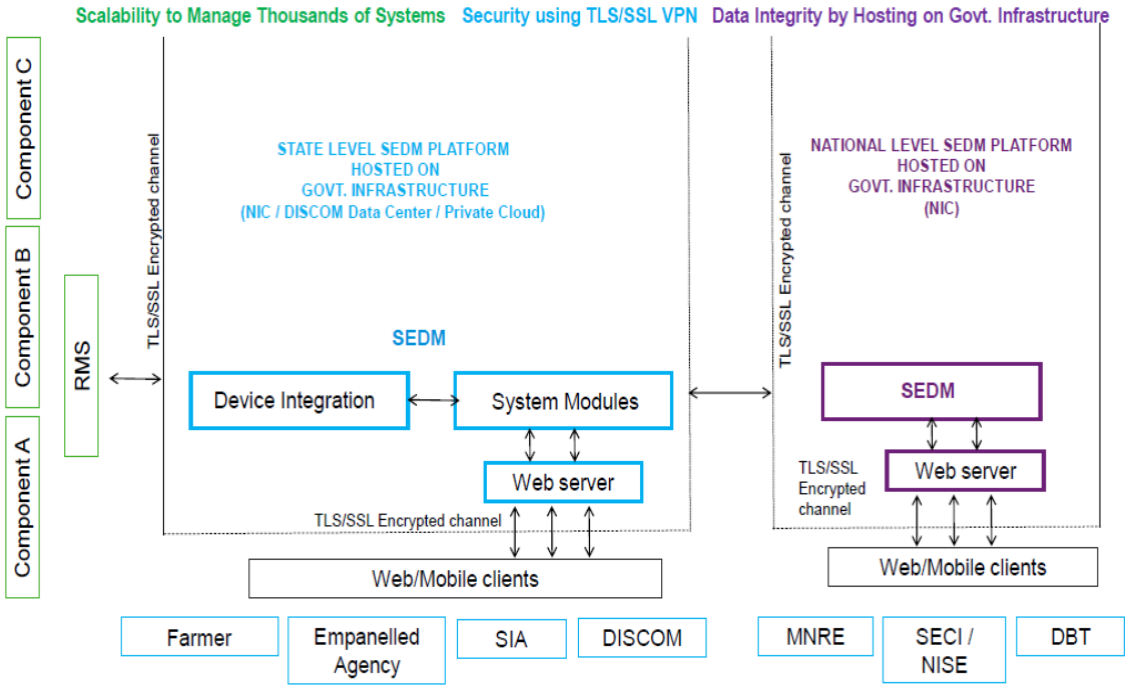
5.1.1. High level Architecture

As shown in high level architecture diagram, all Remote Monitoring systems will connect to State Level Solar Energy Data Management (SEDM) platform. State Level Solar Energy Data Management platform will summarize the data in require format and provide it to National Level Solar Energy Data Management Platform. Data access will be provided to various stake holders from state level SEDM Platform.

The SEDM platform consists of two parts:

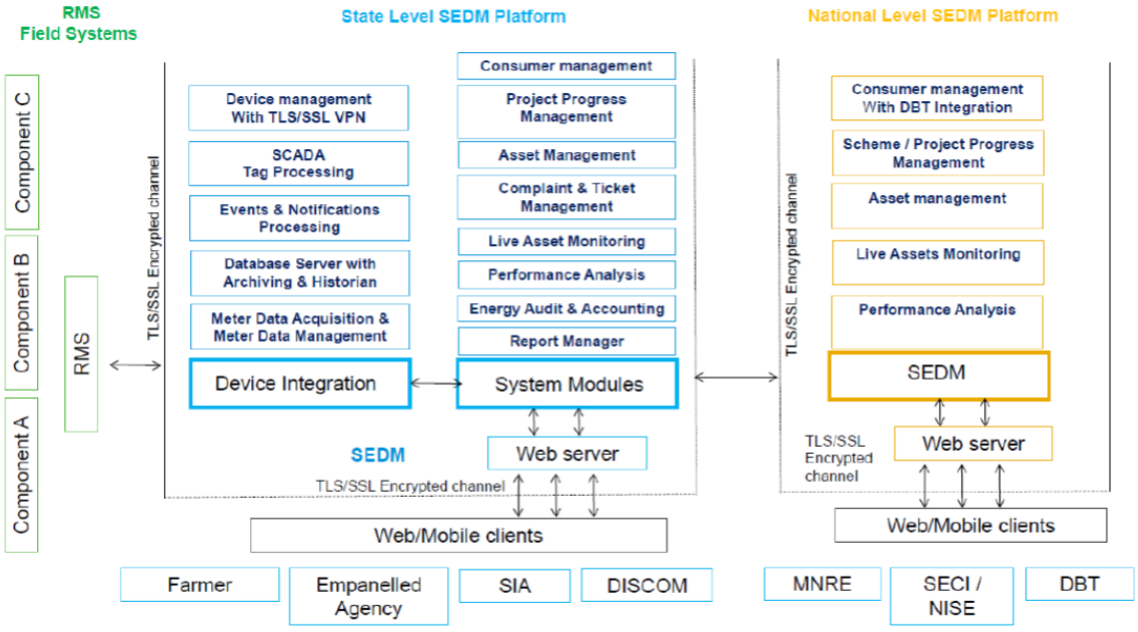
1. Device Integration (SCADA)
2. System Modules (Business Process Modules)

A schematic of the high-level architecture of SEDM platform is shown below for reference.



5.1.2.Detail Module Level Architecture

The detailed module level architecture is shown below. For systems other than under PM KUSUM Scheme, and being implemented by MPUVNL, i.e. solar rooftops, and off-grid solar PV systems, the data integration with National Level SEDM Platform would not be required. However, all the Device Integration Modules and System Modules shall be developed for rooftop and off-grid solar PV systems as well.



5.2. Software Modules Requirement Specifications of Device Integration Part of State Level SEDM Platform

5.2.1.***List of Software Modules required for Device Integration Part of State Level SEDM Platform with Multi layered Software Architecture*** (A multi layered architecture consists of various layers, each of which corresponds to a different service or integration. Because each layer is separate, making changes to each layer is easier than having to tackle the entire architecture)

1. Device Management
2. SCADA Tag Processing
3. Events & Notification Processing
4. Archiving & Historian
5. Meter Data Acquisition (MDAS) & Meter Data Management (MDM)
6. User & Role Management
7. Consumer Mobile Application
8. Report Manager

5.2.2. Device Management with TLS/SSL VPN

Main Functionalities of this module is to ensure **Configuration, Security, Connectivity, Communication, and Availability** of Remote Monitoring Systems.

5.2.2.1. **Device Configuration Details:**

- **Multiple Device Communication Connectivity using** MQTT (IIoT) Server to handle bi-directional communication of up to **10000** devices with single instance
- **Device Registration and Configuration against** Universal Unique ID - IMEI number (Cellular Connectivity) or MAC ID (Ethernet or Wi-Fi Connectivity)
- **Manufacturer Unique ID:** Serial Number, Batch, Manufacturing Date, Model Number etc.
- **VPN Security:** Upload and configure TLS / SSL certificate for AES 256 Bit Encryption
- **Device SIM Card Details:** Mobile Number of Device, Service Provider APN, User Name, Password
- **Server Connection Configuration:** IP, URL, Port, MQTT and FTP server details
- **Server Authentication Credentials:** Token/Username and Password for MQTT and FTP Server
- **OTP Configuration:** Auto Generation and exchange of 32-character random topic for OTP subscription
- **Communication Topics:** Auto Generation and Exchange with Topic authorization against Unique Identification
- **SMS Gateway** Integration and Gateway Mobile Number Configuration for SMS connectivity
- **FTP Server** for updating Device Configuration Files

5.2.2.2. **Communication Architecture & Security Implementation Details:**

- **Communication Connectivity:**

1. **Field Device Connectivity**: Communication between RMS and Inverter / String Combiner Box should be on RS485 MODBUS RTU protocol to ensure interoperability irrespective of make and manufacturer.

2. **Remote Connectivity**: RMS of solar system should be using GSM/GPRS/2G/3G/4G cellular connectivity.
3. **Local Connectivity**: Ethernet/Bluetooth/Wi-Fi connectivity to configure parameters, notifications, communication interval, set points etc. or to retrieve locally stored data
4. **Sensor Connectivity**: RMS should have provision for at least four Analog inputs with 0.1% accuracy for applications such as breaker & transformer health etc. and four digital inputs for breaker status

- **Communication Protocol**

1. RMS should provide data on MQTT Protocol to establish communication with thousands of systems.

- **Data Storage**

1. In case of unavailability of cellular network, RMS should store data locally and on availability of network it should push data to central server. Local data storage should be possible for at least one year in case of unavailability of cellular network

- **IIoT Communication Modes:**

1. Push on Periodic Interval
2. Push on Event
3. On Demand Read Parameter
4. On Demand Command
5. Configuration Read / Write

- **IIoT Communication Analysis:**

1. % Device Connectivity
2. % Data Availability of Different Parameters
3. Number of Messages / Data

- **SMS Communication Modes:**

1. SMS of Periodic Data
2. SMS to Read and Write a Parameter on demand
3. SMS for Configuration Update

- **SMS Communication Security:**

1. Verification of Device Mobile Number, IMEI Number, OTP in each SMS message transaction

- **IIoT Communication Security:**

1. Identification
2. Encryption
3. Authentication
4. Authorization
5. OTP

- Configuration Update Over-The-Air

1. Configuration update over the air of multiple parameters such as IP, APN, Data Logging Interval, Set Points etc. is essential.

Further details related to communication and security architecture are provided in a separate document titled "**RMS Communication and Security Architecture- PM KUSUM SEDM Platform**", the document has been uploaded on the MP tenders portal for kind reference.

5.2.3.SCADA Tag Processing

Device integration (SCADA) Platform should have following Tag Processing functionalities:

Message Processing:

MQTT Messages

Device Push Messages:

- Push on Periodic Interval & Push on Event
- JSON parsing of messages at a speed of **100 messages per second** using multiple threads
- Virtual Device configuration based message parsing: single device may have **10 virtual devices such as Pump Controller / Drive, Bi Directional Meter, Generation Meter, Pump Meter, Health Parameters etc.**

Device On Demand Messages:

- **Send Remote Commands** to Device such as Remote Pump Operation
- **Update single or multiple configuration parameters** such as alarm limits or schedule of operation
- **Bulk Update multiple devices on a single command** such as updating pump operation running hours
- **Auto Update Device Configuration** such as RTC sync with Server Time Stamp
- **Auto Generated M2M (Device-Device) Commands** such as Pump Off for Demand Side Management

SMS Messages:

- Read and Write an individual parameter using SMS messages

Data Processing:

- Processing multiple tags or parameters such as V, I, PF, F, kW, kWh for trend and analysis purpose
- Processing Soft Parameters based on logics and conditions i.e. **Voltage Un Balance / Un Balance Load etc.**

History Back Fill Processing:

- Server side Automatic Processing of mixing data based on missing indexes, periodic interval and time period
- Priority configuration for virtual device, duration, samples to retrieve important missing data on higher priority

Mapping and Group Processing:

- Create multiple group of parameters: Instantaneous, Notifications, Mobile Application Groups
- Map Device against consumer to automatically allow consumers to view groups
- User and Role Management against group processing to restrict user access

5.2.4.Event & Notifications Processing

Device integration (SCADA) Platform should have following Events & Notifications functionalities:

Alarm Configuration & Processing:

- Configuration of Limits for Analog Alarms –H, HH, L, LL Limits and Digital Alarms –V, I, kW, PF, F etc.
- Processing Hard Tags and Soft Tags and generating alarms against it –Pump Status, Inverter Status etc.

Soft Alarm Configuration & Processing:

- Generating logic and calculation based alarms against Hard Tags and soft tags

Alarm against archived parameters:

- Configuration and processing of alarms / events / notifications against archived parameters –Daily / Weekly / Monthly %CUF, Average Pump Running Hours, change of location etc.

Notification:

- Configuration and processing of Notifications against Alarm/Event or schedule basis
- SMS, Mail and Push Notifications to configured users
- Notifications at different intervals on unavailability of Data to Farmer as well as Empanelled Agency
    - Component A : 24 Hours (Farmer & Developer/RPG)
    - Component B : 24 Hours (Empanelled Agency), 24 Hours (Farmer)
    - Component C : 24 Hours (Empanelled Agency), 24 Hours (Farmer)
    - Solar Rooftop: 24 Hours (Vendor), 24 Hours (Beneficiary)
    - Off-grid Solar PV: 24 Hours (Vendor), 24 Hours (Beneficiary)

Notification Groups & Security:

- User and Role Management based subscription of Notifications for User as well as Device

5.2.5.Archiving & Historian

Device integration (SCADA) Platform should have following Archiving & Historian functionalities:

Rule based Archiving: Archiving with Min., Max., Initial, Last, Count, Sum values of configured parameters and time duration

- 15 min. slot wise Archiving
- Daily Archiving
- Monthly Archiving

Archiving configuration:

- Configuration of multiple parameters from multiple devices in a single virtual device

Summary Parameters:

- Deriving Summary of entire district or Feeder or State on Daily and Monthly basis

Archiving Notification:

- Configuration and processing of Notifications against Alarm/Event of Archived parameters

Soft Tag:

- API based logic and calculation processing of integrated parameters

Historian:

- Storage and retrieval of history data in multiple tables, formats derived based on archiving

5.2.6.Meter Data Acquisition (MDAS) & Meter Data Management (MDM)

Device integration (SCADA) Platform should have following MDAS & MDM functionalities:

Meter Information:

- Meter Make, Model Number, Serial Number, Ratings etc.

Meter Instantaneous Data:

-RTC Time Stamp

-Voltage: Line to neutral voltage and Line to Line voltage

-Current: Phase wise current, Total Current

-Power: Active Power, Reactive Power, Apparent Power

-Power off Duration

Meter Billing History Data:

-Active Energy

-Reactive Energy

-MD (kW)

-MD (kVA)

Load Survey Data: 15 minute load survey data

Tamper Data: Tamper events with snap shot of multiple parameters

Rule based Meter Data Verifications and Validation

Meter Replacement Process and Meter Serial Number mismatch report

Integration with existing Billing System

5.2.7.Watchdog transformer monitoring: Device integration (SCADA) Platform should have following functionalities

a. Meter data acquisition features as per clause 5.2.6 above.
b. Real-time Phase wise Contactor & door status monitoring and alert generation.
c. Periodic Fault & Event data monitoring as defined by DISCOM.
d. Display of various running hrs. as per the requirements.
e. Operation of mode selection for WDT & Parameter configuration.
f. Real-time status monitoring of Consumer Display unit (CDU).

5.2.8.User & Role Management

Device Integration (SCADA) Platform should have following User Management functionalities:

Create Multiple Types of Organizations:

National Implementing Agency

State Implementing Agency

State PSUs: DISCOMs, Transmission Companies etc.

Solar Empanelled Agency

RMS and Software Agency

Add Multiple Users under each organization

Assign District Level or Feeder Level or Plant Level Access to Organization

Component A : Plant Level

Component B : District Level

Component C : Feeder Level

Solar Rooftop: District Level

Off-grid Solar PV: District Level

Create Multiple User Roles for Configuration

Admin

Users with Add / Edit / Delete Rights

View Only Users

User Level Access Control:

Assign systems and group of parameters against user

View Only Access of Data

Write Command and Configuration to System

Consumer / Farmer / Owner Mapping:

Add Thousands of consumers in a system

Access control to his particular system only

5.2.9.Report Manager

Device integration (SCADA) Platform should have following report generation functionalities:

Reports generation with multiple duration filters: Last Week, Last Month, Current Week, Current Month, Current Billing Cycle, Between User Configurable Dates

Report Generation for multiple performance indicators:

Running Hours Report,

%CUF, Pump Consumption, Solar Energy Generation Reports

Billing Reports: Net, Import, Export of Energy

Loss Calculations Reports,

Abnormal Electrical System Reports: Over Voltage, Voltage Un balance, Over Load, Un Balance Load, High Temp.,

Instantaneous Parameters: Min., Max., Average values of Voltage, PF, Power etc.,

% Device Connectivity, % Data Availability

Comparison & Correlation Reports: Comparison of two duration/season, comparison of two products etc.

- **SLA Calculations Reports**: - Periodic system generated calculation reports for penalty and SLA. The bidder shall develop required reports to calculate penalty based on various Service Level Agreements of multiple type of systems used in PM-KUSUM Scheme for the component-A component-B and component-C time to time as per the requirement of Nodal Agency.
- The selected firm shall develop various reports related to billing and electrical system performance analysis as per the requirement of Nodal Agency as and when raised during the period of 5 years.
- Automatic reports for monthly and annual energy accounting and commercial settlement as per the requirement of Nodal Agency should be prepared.

5.2.10.Integration with National Level Portal (not required for rooftop and off-grid solar PV systems)

Selected firm shall integrate entire data for KUSUM A, B and C only with existing state as well as National Level Solar Energy Data Management Platform as described in the MNRE Guidelines. The data pertaining to Solar Rooftop and Off-grid systems shall be integrated only with the State Level SEDM platform.

6. REQUIREMENTS OF DEVICE INTEGRATION (SCADA) CONFIGURATION SERVICES FOR EACH RMS DEVICE

6.1.1. ***RMS Device Provisioning Services:***

- RMS Device Registration against Unique IMEI Number
- X.509 Certificate generation
- Generation of unique Client ID, User Name and Password against each device for MQTT Authentication
- Generation of unique topics against each device for MQTT Authorization
- Generation of unique FTP Server user credentials
- RMS Device testing and hand holding of Empanelled agency
- Support for RMS Device installation and go live to empanelled agency
- For grid connected solar PV projects, i.e., under KUSUM A, C, solar rooftop systems under CAPEX or RESCO mode, the RMS device shall be integrated with energy meters (generation meters and grid interface meters) on DLMS/Modbus protocol supported by all leading Meter Manufacturers in India.

6.1.2.SCADA Configuration required for Each Device:

-SCADA **Device configuration** under respective DISCOM, Division, Sub Division, Sub Station / Feeder with IMEI Number mapping in SCADA

- Up to 100 **Hard Tag Configuration** of each device as per Annexures mentioned in "Communication Architecture between RMS and State Level Server"

- Up to 10 **Formula based Soft Tag Configuration** such as unbalance load, single phase detection, three phase detection

- Up to 20 **Archiving Tag Configuration** for integrated parameters required for performance analysis as mentioned below but not limited to

  - Active Energy: Solar Generation, Import, Export, Net Energy etc.

  - Running Hours: Pump Operations, Grid Availability, Three Phase Grid Availability etc.

  - Water Discharge Parameters

  - Performance Parameters: %CUF, Per Day Per kW Generation, Per Day Per HP Consumption etc.

- Up to 20 Event and Notification Configuration

- **Instantaneous Parameters for pumps**

  - Pump Status: Change in pump status to ON, OFF, Protection Operated

  - Over Voltage of Grid as well as Pump: Vrn, Vyn, Vbn,

  - Unbalance Load

  - Over Load: Total kW

  - Low PF: average PF

- **Instantaneous Parameters for grid connected/off-grid solar plants**

  - DC voltage

  - DC current

  - AC voltage

  - AC current

  - Power (kW)

  - String Combiner Box (SCB) Status

  - Inverter Status

- **Archived Parameters**

  - Average Low Generation: Current Week, Current Month

  - Average Low Availability of Grid: Current Week, Current Month

  - Average Low Operation Hours of Inverter or Pump Controller: Current Week, Current Month

  - Average High Running Hours of Pump: Current Week, Current Month

  - Notification Configuration against Event

  - Mobile Push Notification configuration against required events

6.1.3.User & Role Management Configuration

- Creating Group of Parameters against which user access management can be mapped
- Group of Parameters for individual Consumer
    - Instantaneous Parameter Group: to visualize parameters in consumer mobile application such as pump status, grid status, RMS health, solar power, pump power, net power etc.
    - Summary Parameter Group: to visualize daily / weekly / monthly summary indicators such as %CUF, Energy Transaction units
    - Archived Parameter Group: to visualize day wise weekly & Monthly chart in consumer mobile application such as energy generated, consumed, imported and exported from grid, running hours of inverter or pump controller / inverter etc.
    - Notification Groups : to publish push notifications required to be visualized in mobile application
- Group of Parameters for Entire Feeder / District for SIA Analysis
    - Map View Group : to visualize important parameters of all consumers in a particular feeder or district against Geo Location
    - Daily Analytics Group : to visualize day wise bar graph of important archived parameters of all consumers in a particular feeder or district
- Mapping Users against each group
    - Mapping of individual consumer against groups to allow access of data limited to his system only
    - Mapping of multiple SIA users against relevant Feeder or District groups to allow access of data limited to consumers of particular Feeder or District
    - Mapping of multiple user from Empanelled agency against his relevant Feeder or District

7. REQUIREMENTS OF SOFTWARE MAINTENANCE SERVICES FOR 2 YEARS:

Selected firm shall provide Remote maintenance and support services to ensure the proper functioning and optimal performance of the software (SCADA) platform for 2 years which shall include following scope:

1. Ensuring availability of all Multi Layered Software (SCADA) Applications deployed on SIA Servers / NIC Servers / Cloud Servers
2. Ensuring proper functionality of all Multi Layered Software (SCADA) Applications
3. Configuration and integration of devices in case of replacement of the old devices by new devices including IIoT device, Energy meters, Inverters, Controller, Drive, String combiner box, etc. is included in maintenance period and no charge will be applicable for that.
4. Program updates, fixes, security alerts, and critical patch updates created during Support without any additional financial implication to Nodal Agency.
5. Provide O&M services for 2 years from the integration of 100% of remote monitoring systems as envisaged in this RFP with the SCADA platform. Further, the O&M services shall be up to the handover of SCADA platform to MPUVNL or third-party users (nominated by MPUVNL). In this regard, suitable training shall be provided to MPUVNL or any other party appointed/nominated by MPUVNL prior to handover of the SCADA platform along with any associated source code, additional services, relevant data, software requirements etc.

9. OTHER CONDITIONS

1. Web Application must work with all leading browser (like Chrome/Edge/ Firefox/IE etc).
2. Selected firm shall design the backup strategy in consent with Nodal Agency to maintain and restore application and Database tier of the system.
3. Solution should support high availability mode (active-active or active-passive).

SECTION-IV
OTHER TERMS AND CONDITIONS

1. PAYMENT TERMS

1.1. Payment against device configuration will be made within 30 days on receipt of valid invoices. The invoices shall be verified by the Nodal Agency for the number of systems integrated with consistency of data for at least for 15 days.

1.2. Payment shall be made on monthly basis as per actual number of systems made Go-live per month and receipt of invoice thereof.

1.3. The cost of any operation & maintenance works rendered necessary during the Contract period due to defect in software, SIMs etc. shall be borne by the contractor and the Nodal Agency shall not be liable to pay any amount towards such O&M works.

1.4. Payment for software maintenance services of the SCADA system shall be as follows:

Completion of 1st year of O&M from the date of integration	Annual cost of software maintenance per system x no of systems integrated
Completion of 2nd year of O&M from the date of integration along with handover of system to MPUVN along with necessary training, data, software and necessary requirements fulfilled	Annual cost of software maintenance per system x no of systems integrated

1.5. Penalty terms:

Annual Availability for each device	**Deduction as % of the apportioned price for each device**
>99%	NIL
Less than 99%	Deduction of 5% of the apportioned price of the apportioned yearly value of maintenance contract for every 1% or part thereof decrease in availability under 99%.
Less than 95%	Deduction of 10% of the apportioned price of the apportioned yearly value of maintenance contract for every 1% or part thereof decrease in availability under 95%.
Less than 90%	Deduction of 15% of the apportioned price of the apportioned yearly value of maintenance contract for every 1% or part there of decrease in availability under 90%.
Less than 85%	No payment for that device for the year

The Bidder shall be provided relaxation on the non-availability of the system to the extent such non-availability is due to failure or malfunction of any hardware or software not provided by the bidder.

2. CANCELLATION OF WORK ORDER

Nodal Agency will be at liberty to terminate/blacklist in part or full the awarded contract without prejudicing its rights and affecting the obligations of the Contractor by giving 15 (Fifteen) days' notice in writing in the following events:

a) If the contractor/supplier is found defaulter for delays in supply of services to Nodal Agency as per the Scope of Work.

b) If the contractor/supplier fails to comply with the provision(s) of the contract including the responsibilities to fulfill the O&M as per the RFP provisions.

c) If the Contractor/vendor is involved in any action of moral turpitude.

d) If at any time, during the tendering process or after award of work, any of the documents/information submitted by the bidder is found to be incorrect, false or untruthful, the bid and/ or the resultant order may be summarily rejected/cancelled at the risk of the bidder and EMD/PBG will be forfeited and bidder will be blacklisted.

3. MANPOWER REQUIREMENTS

The Bidder should have at least 5 personnel on its rolls with a minimum SCADA implementation experience of 2 years (either in his/her own or other organization). The roles & responsibilities of the personnel should include development and/or customization of SCADA software system. CVs of 5 personnel should be attached with the technical bid.

4. FORCE MAJEURE

Neither Party shall have any liability or be deemed to be in breach of this Agreement for any delays or failures in performance of this Agreement that result from circumstances beyond the reasonable control of that Party. The Party affected by such circumstances shall promptly notify the other Party in writing when such circumstances cause a delay or failure in performance and when they cease to do so.

5. RIGHT TO WITHDRAW THE RFP AND TO REJECT ANY BID:

a. This RFP may be withdrawn or cancelled by the MPUVNL at any time without assigning any reasons thereof. MPUVNL further reserves the right, at its complete discretion, to reject any or all of the Bids without assigning any reasons whatsoever and without incurring any liability on any account.

b. MPUVNL reserve the right to interpret the Bid submitted by the Bidder in accordance with the provisions of the RFP and make its own judgment regarding the interpretation of the same. In this regard the MPUVNL shall have no liability towards any Bidder and no Bidder shall have any recourse to the Nodal Agency with respect to the selection process.

c. Bid(s) that are grossly incomplete in any respect or those that are significantly inconsistent with the requirements as specified in this RFP or those that do not adhere to formats prescribed herein, wherever specified, may be considered non-responsive. However, MPUVNL reserves the right to seek additional information/ clarifications from the Bidders, if found necessary, during the course of evaluation /processing of the Bid(s). Non-submission or delayed submission of such additional information or clarifications sought by Nodal Agency may be a ground for rejecting the Bid(s). Strict adherence to the documents required to be submitted shall be ensured, failure on this account may lead to rejection of Bid.

d. Nodal Agency reserves its right to vary, modify, revise, amend or change any of the terms and conditions of the RFP before Bid Deadline. The decision regarding acceptance of Bid by Nodal Agency will be full and final.

6. COST OF BIDDING

The Bidder shall bear all the costs associated with the preparation and submission of his offer, MPUVNL in any case will not be responsible or liable for these costs, under any conditions. The Bidder shall not be entitled to claim any costs, charges and expenses of and incidental to or incurred by him through or in connection with submission of Bid even though Nodal Agency may elect to modify/ withdraw the invitation of Bid.

7. SETTLEMENT OF DISPUTE

7.1. If any dispute of any kind whatsoever arises between Nodal Agency and the Selected Firm in connection with or arising out of the Agreement including without prejudice to the generality of the foregoing, any question regarding the existence, validity or termination, the parties shall seek to resolve any such dispute or difference by mutual consent.

7.2. If the parties fail to resolve, such a dispute or difference by mutual consent, within 45 days of its arising, then the dispute shall be referred by party by giving notice to the other party in writing of its intention to refer to arbitration conducted under the provisions of the "Madhya Pradesh Madhyastham Adhikaran Adhiniyam, 1983". The decision of MP Madhyastha Adhikaran Adhiniyam shall be final and binding up on the parties. The language of the arbitration proceedings and that of the documents and communications between the parties shall be English. All the disputes will be settled in the High Court of MP. No arbitration proceedings will commence unless such notice is given.

8. FRAUD AND CORRUPTION

8.1. The Bidder, their suppliers and contractors and their sub-contractors under the contracts are required to observe the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this, the MPUVNL defines, for the purpose of this provision, the terms set forth below as follows:

a. "corrupt practice" is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

b. "fraudulent practice" is any act or omission, including a misrepresentation, that knowingly or recklessly misleads or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

c. "collusive practice" is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

d. "coercive practice" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

e. "obstructive practice" is deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a MPUVNL's investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/ or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation;

or

f. acts intended to materially impede the exercise of the MPUVNL's inspection and audit rights.

8.2. Nodal Agency will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt,

fraudulent, collusive, coercive or obstructive practices in competing for the contract in question;

8.3. Nodal Agency will sanction a firm or individual, including declaring ineligible, either indefinitely or for a stated period of time, to be awarded a contract if it at any time determines that the firm has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for, or in executing, a contract.

9. CONFIDENTIALITY

The contractor shall maintain utmost confidentiality of information supplied method of operation, procedure etc. and shall not make or allow to make an unauthorized copy, use, access or other utilization of these materials commercially or otherwise, directly or indirectly except as agreed to by Nodal Agency.

This confidentiality will be maintained by the contractor from the date of service level agreement. The bidder shall follow the standard information systems of security policies and Govt. of India guidelines.

10. OWNERSHIP OF DATA

The entire system (along with all the programs and contents developed to achieve the desired functionality mentioned in the scope of the work or any subsequent communication in this regard) will be the intellectual property right of Nodal Agency and will be sole property of Nodal Agency and no content of the same will be produced or used by the contractor for purpose other than SCADA/Monitoring System without the prior permission of Nodal Agency. The contractor must return all the data to Nodal Agency following expiry or termination of the contract.

11. DEBARMENT FROM PARTICIPATION IN FUTURE TENDERS

Agency reserves the right to carry out the performance review of each Bidder from the time of submission of Bid onwards. In case it is observed that a Bidder has not fulfilled its obligations in meeting the various timelines envisaged, in addition to the other provisions of the RFP, such Bidder may be debarred from participating in any future tender/RFP of MPUVNL for a period of five years.

SECTION-V

FORMATS OF RFP

FORMAT I – COVERING LETTER

(To be submitted on Company's Letterhead)

Date: *(dd-mm-yyyy)*
Letter Ref. No.:

To
Executive Engineer
MP Urja Vikas Nigam Limited,
Urja Bhawan, Near - 5 no. bus stop
Shivaji Nagar, Bhopal – 462016

Sub: Request for Proposal for Standardization of Rates and Selection of Contractor for Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps with provision of SCADA Software License, through suitable software platform and integration of data with State level and National level portals.

Ref: RFP *No.* _____, *Dated:* _____

Dear Ma'am/Sir,

Having reviewed and fully understood in detail all the information provided in the RFP document, hereby submit application in full compliance with the provisions specified in the RFP for Standardization of Rates and Selection of Contractor for Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps with provision of SCADA Software License, through suitable software platform and integration of data with State level and National level portals.

I/We_____(here in after referred to as the Bidder) being desirous of tendering for the rate contract for work under the above mentioned tender and having fully understood the nature of the work and having carefully noted all the terms and conditions, specifications etc. as mentioned in the tender document, DO HEREBY DECLARE THAT,

1) The Bidder is fully aware of all the requirements of the tender document and agrees with all provisions of the tender document.
2) The Bidder is capable of executing and completing the work as required in the tender.
3) The Bidder accepts all risks and responsibilities directly or indirectly connected with the performance of the tender.
4) The Bidder has no collusion with any employee of MPUVNL or with any other person or firm in the preparation of the bid.

5) The Bidder has not been influenced by any statement or promises of MPUVNL or any of its employees, but only by the tender document.

6) The Bidder is financially solvent and sound to execute the work.

7) The Bidder is sufficiently experienced and competent to perform the contract to the satisfaction of MPUVNL.

8) The Bidder does not have any pending case with cyber-crimes or involvement in any illegal cyber activities.

9) The information and the statements submitted with the tender are true.

10) The Bidder is familiar with all general and special laws, acts, ordinances, rules and regulations of the Municipal, District, State and Central Government that may affect the work, its performance or personnel employed therein.

11) The Bidder has not been debarred from similar type of work by any Government Dept. /PSU.

12) The Bidder gives the assurance to execute the tendered work as per specifications terms and conditions.

13) The Bidder accepts that the earnest money shall be absolutely forfeited by MPUVNL if the Bidder fails to undertake the work or sign the contract within the stipulated period.

14) The Bidder understands that the selection shall be as per the details mentioned in the RFP document. We agree to abide by the provisions laid down under the RFP document issued by the RUMSL.

We, declare that the information as submitted in this application is true to the best of my knowledge. In case any information given in this application or attached documents are found to be incorrect at any point of time, we understand that the nodal office may reject my response to TOR/Bid, and/or cancel the order, if issued.

Yours truly,

(Signature of Authorized Signatory)
(Name of Authorized Signatory)
(Designation)
(Company Seal)

FORMAT II – INFORMATION ABOUT THE BIDDER

S.No	Description	Details
1.	Name of the Applicant Registered office address: Telephone no.: Fax no.: e-mail: Correspondence address: Telephone no: Fax no: e-mail id:	
2.	Name of the Chief Executive Officer/ Managing Director	
3.	Type of the Applicant *(Partnership/Pvt. Ltd. Co./Public Ltd. Co./Limited Liability Partnership*)	
4.	Name of directors/partners of the organization *(if applicable)*	
5.	Name and address for correspondence with Authorized Representative of Applicant. Telephone no.: Fax no.: Email:	
6.	Details of current business of the Applicant	
7.	Whether the Applicant or any of its promoter(s)/director(s)/ associates is blacklisted by any central government or state government/ department/ agency in India? *(yes/no). An undertaking shall be provided in specified format along with the technical proposal duly signed by the authorized representative of the bidder.*	

FORMAT III – STATEMENT OF LEGAL CAPACITY

(To be forwarded on the letterhead of the Applicant/ Lead Member of Consortium having valid CIN details)

Date: *(dd-mm-yyyy)*

To
MP Urja Vikas Nigam Ltd,
Urja Bhawan, Near - 5 no. bus stop
Shivaji Nagar, Bhopal – 462016

Dear Sir,

We hereby confirm that we/ our members in the Consortium (constitution of which has been described in the application) satisfy the terms and conditions laid out in the RFP document.

We have agreed that …… (Insert member's name) will act as the Lead Member of our consortium. *

We have agreed that ……. (Insert individual's name) will act as our representative and has been duly authorized to submit the application in response to the RFP. Further, the authorised signatory is vested with requisite powers to furnish such letter and authenticate the same.

Thanking you,

Yours faithfully,
(Signature, name, and designation of the authorised signatory)

***Please strike out if this sentence is not applicable.**

FORMAT IV – POWER OF ATTORNEY

(To be executed on Non Judicial Stamp Paper of value Rs. 500 or as per MP stamp Duty Act, whichever is higher)

POWER OF ATTORNEY

Know all men by these presents, We……*(name and address of the registered office)* do hereby constitute, appoint and authorise Mr / Ms……*(name and residential address)* who is presently employed with us and holding the position of ……. as our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental for the project including signing of all documents in our Response to our application for Request for Proposal for Standardization of Rates and Selection of Contractor for Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps with provision of SCADA Software License, through suitable software platform and integration of data with State level and National level portals, including submission of all documents and providing information / Responses to Chief Executive Officer and other officers of MPUVNL, representing us in all matters before Nodal office/State Government, and generally dealing with Nodal office/State Government in all matters in connection for the said Project.

We hereby agree to ratify all acts, deeds and things lawfully done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

For (Insert name of the Applicant/ Developer on whose behalf PoA is executed)

_____

(Signature)
(Name)
(Designation)
(Accepted)

Specimen signatures of attorney attested

_____

(Signature of Notary Public)
(Name)
(Designation)
(Address of the Attorney)
Place: _____
Date: _____

Note:
The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executants(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

FORMAT V – POWER OF ATTORNEY IN FAVOUR OF LEAD MEMBER OF CONSORTIUM

(to be submitted by each member of the Consortium)

Whereas Madhya Pradesh Urja Vikas Nigam Ltd. (MPUVNL) has invited applications (the "Applications") by its RFP No: ……Dated: _____ for award of the rate contract/ work under "Request for Proposal for Standardization of Rates and Selection of Contractor for Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps with provision of SCADA Software License, through suitable software platform and integration of data with State level and National level portals")

Whereas, ……..., ……..., and …….. (collectively the **Consortium**) being Members of the Consortium are interested in submitting a Bid in accordance with the terms and conditions of the Request for Proposal (**RFP**) and the other Bid Documents, and

Whereas, it is necessary for the Members of the Consortium to designate one of them as the Lead Member with all necessary power and authority to do for and on behalf of the Consortium, all acts, deeds and things as may be necessary in connection with the Consortium's bid for the Unit(s) and its execution.

NOW, THEREFORE, KNOW ALL MEN BY THESE PRESENTS

We, ……..., having our registered office at ……..., and ……..., having our registered office at ……..., (hereinafter collectively referred to as the **Principals**) do hereby irrevocably designate, nominate, constitute, appoint and authorise …….. having its registered office at ……..., being one of the Members of the Consortium, as the Lead Member and true and lawful attorney of the Consortium (hereinafter referred to as the **Attorney**). We hereby irrevocably authorize the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the Consortium, and any one of us, during the Bid Process, including undertaking all acts required for the submission of the Bid in accordance with the terms and conditions of the RFP. Additionally, we also authorise the Lead Member to do any other acts or submit any information and documents related to the above Bid submission, to do on our behalf and on behalf of the Consortium, all or any of such acts, deeds or things as are necessary or required or incidental to the submission of its Bid, including but not limited to signing and submission of all applications, undertakings and other documents and writings, participate in bidders and other conferences and respond to queries, if required. In the event the Consortium is selected

as Successful Bidder, we authorise the Lead Member to submit information/documents, sign and execute contracts and undertakings and generally to represent the Consortium in all its dealings with MPUVNL, and/or any other Government Agency or any Person, in all matters in connection with or relating to or arising out of the Consortium's Bid this RFP.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us/Consortium.

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ……. DAY OF ……, 2025

For ……..

(Signature)

……..

(Name & Title)

For ……..

(Signature)

……..

(Name & Title)

For ……..

(Signature)

……..

(Name & Title)

(To be executed by authorized signatories of the Members of the Consortium, except the Lead Member)

Witnesses:

1.

2.

(Notarised)

Accepted

……

(Signature of the authorized signatory of the Lead Member)

(Name, Title and Address of the Attorney)

Instructions:

(1) *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.*

(2) *Also, wherever required, the Members should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Member of the Consortium.*

FORMAT VI – BLACKLISTING DECLARATION

(Required to be submitted by the Bidder on Original Letter Head of company)

We have carefully read and understood the enclosed Terms and Conditions of the RFP and agree to abide by them.

1. We declare that we have not been Black listed or otherwise for any Supply of Goods / Services / Works by any Ministry / Department / PSU of Central Government / Any of the State Government(s), anytime / anywhere in the Country Debarred or have failed to execute any previous work of Government Agencies.

2. We solemnly undertake that the responsibility of execution of the Work as per the terms and conditions of the RFP/ Contract Agreement shall be entirely ours.

3. If this Declaration is found to be incorrect or if any RFP Condition is found violated by us, then without prejudice to any other action our Bid Security / Security Deposit may be forfeited in full and the Proposal to the Extent of Acceptance / anytime during Execution of Assignment may be cancelled.

(Signature of Authorized Signatory)

(Name & Designation in block letters)

FORMAT VII – TECHNICAL ELIGIBILITY CRITERIA

Date: *(dd-mm-yyyy)*

To
MP Urja Vikas Nigam Ltd,
Urja Bhawan, Near - 5 no. bus stop
Shivaji Nagar, Bhopal – 462016

Dear Sir,
Sub: *Request for Proposal for Standardization of Rates and Selection of Contractor for Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps with provision of SCADA Software License, through suitable software platform and integration of data with State level and National level portals.*

We submit our Bid for which details of Technical Eligibility Criteria Requirements* are as follows,

Experience of successful implementation (installation & commissioning) of any of the following systems for Energy Management System of any State Nodal Agency or State Implementing Agency (SNA/SIA) or any Government agencies for at least 1,000 no. of Energy Monitoring Devices such as Meters/Inverters/Controller/Drives/String combiner Box during last 3 (three) years as on date of publishing of this tender: -

- Supervisory Control and Data Acquisition System (SCADA), or
- Meter Data Acquisition System (MDAS) with remote operation of device

Experience certificates and/or Acceptance reports and Work Order and/or LoA from the owners/client for completion of work done, in support of the qualifying requirements, clearly establishing: the start and end date of the project, scope of work and worth of project, on client letterhead are attached with this format for kind perusal.

Yours faithfully,

_____

(Signature and stamp of Authorized Signatory of Bidder/ Lead Member)

Name:_____

Date:_____

Place: _____

FORMAT VIII – FINANCIAL ELIGIBILITY CRITERIA

[*On the letterhead of Bidding Company*]

Date:

To,
Executive Engineer,
MP Urja Vikas Nigam Ltd,
Urja Bhawan, Near - 5 no. bus stop
Shivaji Nagar, Bhopal – 462016

Dear Ma'am/ Sir,

Sub: *Request for Proposal for Standardization of Rates and Selection of Contractor* for Integration *of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps with provision of SCADA Software License, through suitable software platform and integration of data with State level and National level portals*

We certify that the Bidding Company had an average Annual Turnover of Rs. ----------based on audited annual accounts of the last three financial years ending FY 2025/24.

Sl. No.	**Financial Year**	**Turnover (in Rupees)**
1.		
2.		
3.		
	Average Annual Turnover	

Further, details of Net-worth are as follows

Particulars	**Amount (In Rs.)**
Equity Share Capital	
Add: Reserves	
Subtract: Revaluation Reserve	
Subtract: Intangible Assets	
Subtract: Miscellaneous Expenditure to the extent not written off and carried forward losses	
Net Worth as on 31 March 2025/24	

Authorised Signatory *Statutory Auditor/Chartered Accountant*

(Power of Attorney holder) *(Stamp & Signature)*

FORMAT IX - FORMAT FOR FINANCIAL PROPOSAL

(*Reference Format only*)

S.No	Particulars	No of parameters	Rate per System (INR) (Exclusive of GST)
1.	Integration of Remote Monitoring Systems with SCADA for device such as meter/inverter/ controller/drive/string combiner box etc. for projects under KUSUM A/ B/C/Rooftop Solar Projects/offgrid solar PV projects	50	
		100	
		200	
		300	
2.	O&M services for 2 years from the integration of remote monitoring systems with SCADA software	50	
		100	
		200	
		300	

FORMAT X - REGARDING BIDDER FROM A COUNTRY WHICH SHARES LAND BORDER WITH INDIA

To,
Executive Engineer,
MP Urja Vikas Nigam Ltd,
Urja Bhawan, Near - 5 no. bus stop
Shivaji Nagar, Bhopal – 462016

Dear Ma'am/Sir,

Sub: Request for Proposal for Standardization of Rates and Selection of Contractor for Integration of Remote Monitoring devices of grid connected and off-grid solar PV systems as well as solar pumps with provision of SCADA Software License, through suitable software platform and integration of data with State level and National level portals

I, _____(Authorized Signatory), of M/s _____(Name of Organization), hereby declare that, I/We have read the Office Memorandum of Department of Expenditure, Government of India, regarding restrictions on procurement from a Bidder of a country which shares a land border with India. We,_____ (Bidder's name) certify that we are not from such a country or, if from such a country, have been registered with the Competent Authority. We hereby certify that we fulfil all requirements in this regard and are eligible to be considered for the subject RFP.

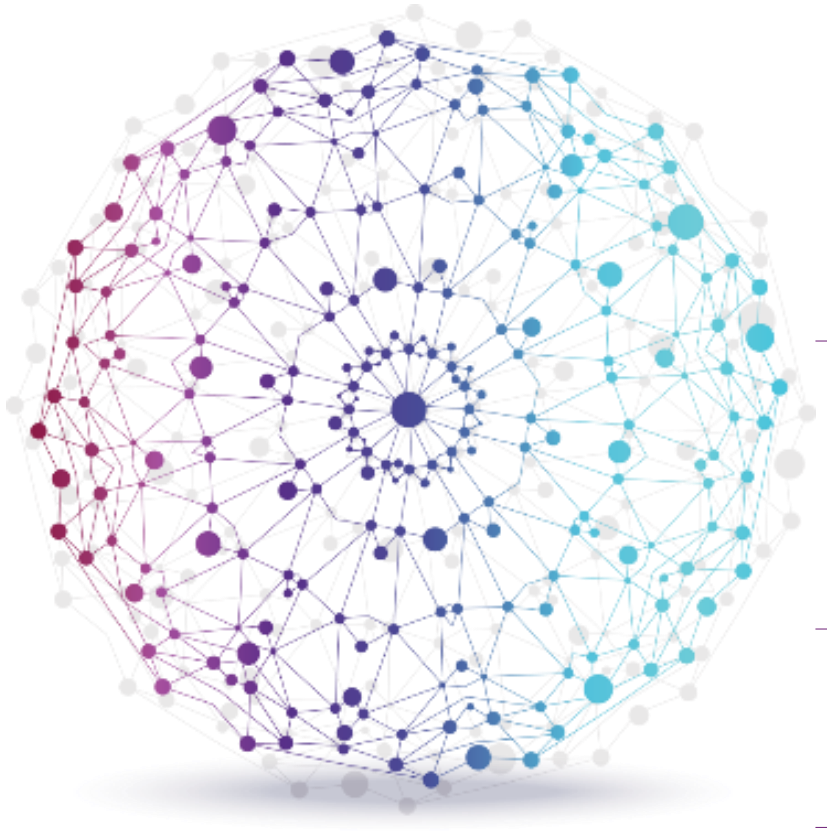
Signature of Authorized Signatory:
Full Name:
Designation:

GOVERNMENT OF INDIA
MINISTRY OF NEW
AND RENEWABLE ENERGY

Ministry of New and Renewable Energy (MNRE)

Guidelines for State Level SEDM Platform Development

Topics Covered



1. **National & State Level Solar Energy Data Management (SEDM) Platform**
   - National Level SEDM : Vision
   - High Level Software Architecture
   - Module Level Software Architecture

2. **State Level SEDM Platform – System Related Software Module Details**
   - Consumer Management
   - Project Progress Management
   - Asset Management
   - Complaint and Ticket Management
   - Live Asset Monitoring
   - Performance Analysis
   - Report Manager

3. **State Level SEDM Platform – Device Integration Software Modules**
   - Device Management
   - SCADA Tag Processing
   - Events & Notification Processing
   - Database Server with Archiving and Historian
   - MDAS & MDM

4. **State Level SEDM Platform – Other Modules**
   - User and Role Management
   - Site Survey Mobile Application
   - Farmer Mobile Application

5. **Annexures**
   - Annexure -1 : RMS Integration with State Level SEDM Platform
   - Annexure -2 : System Component & Architecture for KUSUM Component A, B, C
   - Annexure -3 : List of Consumer Information for Beneficiary Tracking
   - Annexure -4 : Data Integration between National and State Platform

National and State Level SEDM Platform

Overview & Architecture

One Nation - One Solar Energy Data Management (SEDM) Platform for PM-KUSUM

National Level SEDM Platform
(Solar Energy Data Management Platform)

Vision

A Single Platform for : **Multiple Types of Solar Systems of KUSUM**

- Stand Alone Solar Pumps, Grid Connected Solar Pumps, Distributed Solar Plants

A Single Platform for : **Multiple Stake Holders**

- Farmer, Empanelled Agency, SIA, DISCOM, MNRE, DBT Program, Research Institutes

A Single Platform for : **Multiple Processes**

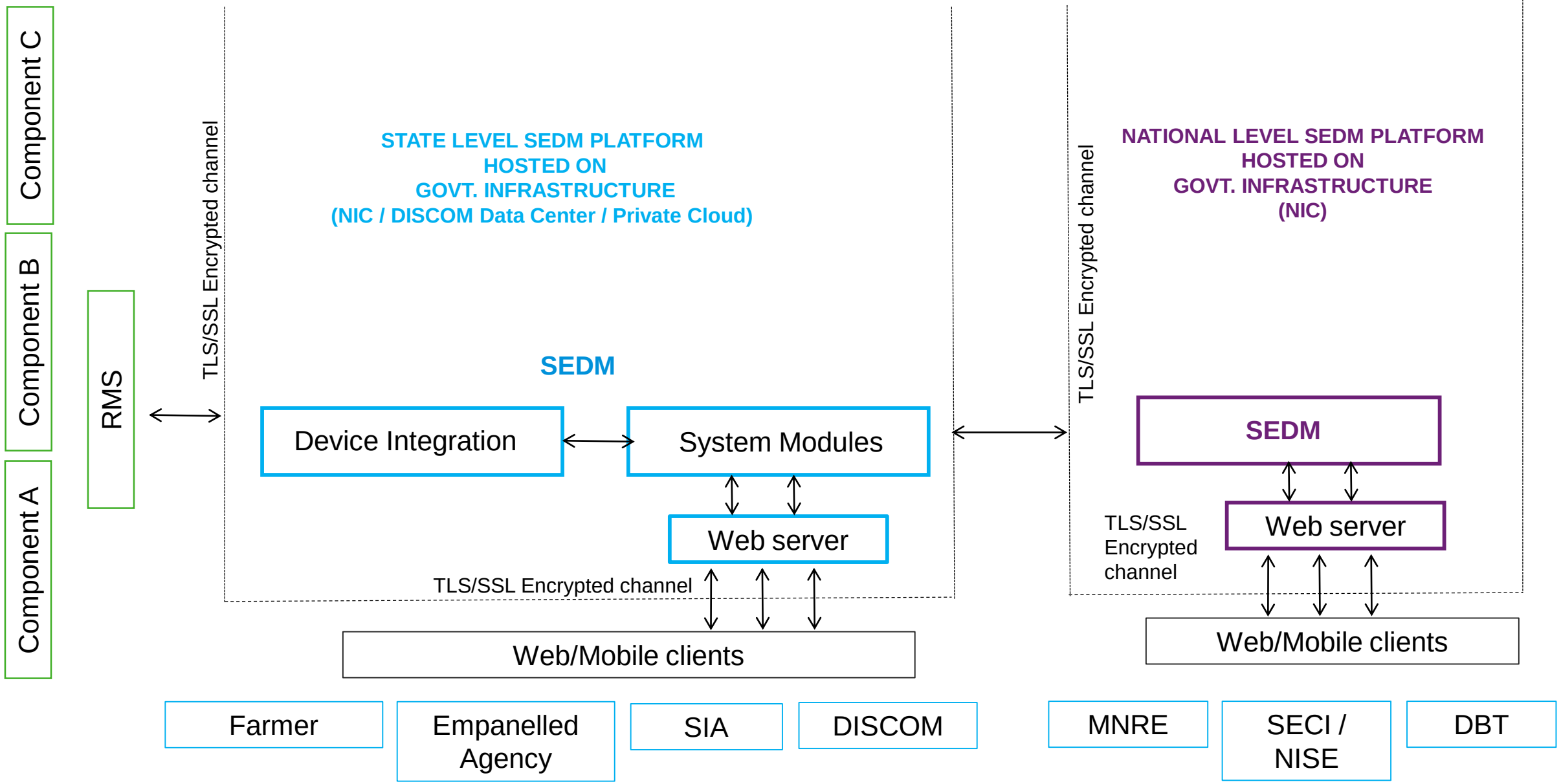
- Consumer Registration, DBT Integration, Project Progress Management, Asset Management, Complaint Management

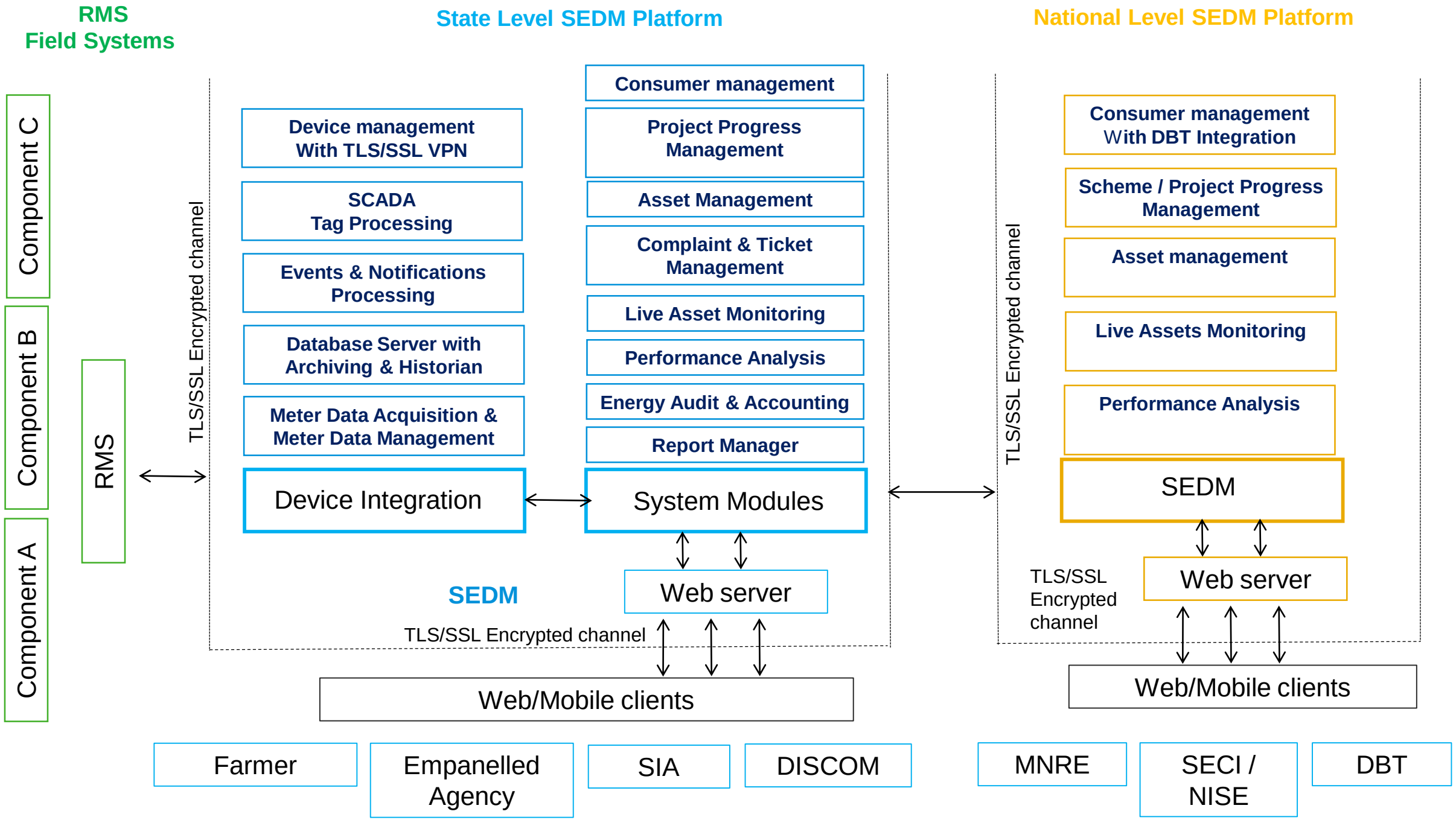
A Single Platform for : **Multiple Types of Devices**

- Pump Controllers, Drives, Inverters, Energy Meters, String Combiner Boxes

High Level System Architecture (with reference to EESL Tender Annexure 8)

Scalability to Manage Thousands of Systems **Security using TLS/SSL VPN** **Data Integrity by Hosting on Govt. Infrastructure**



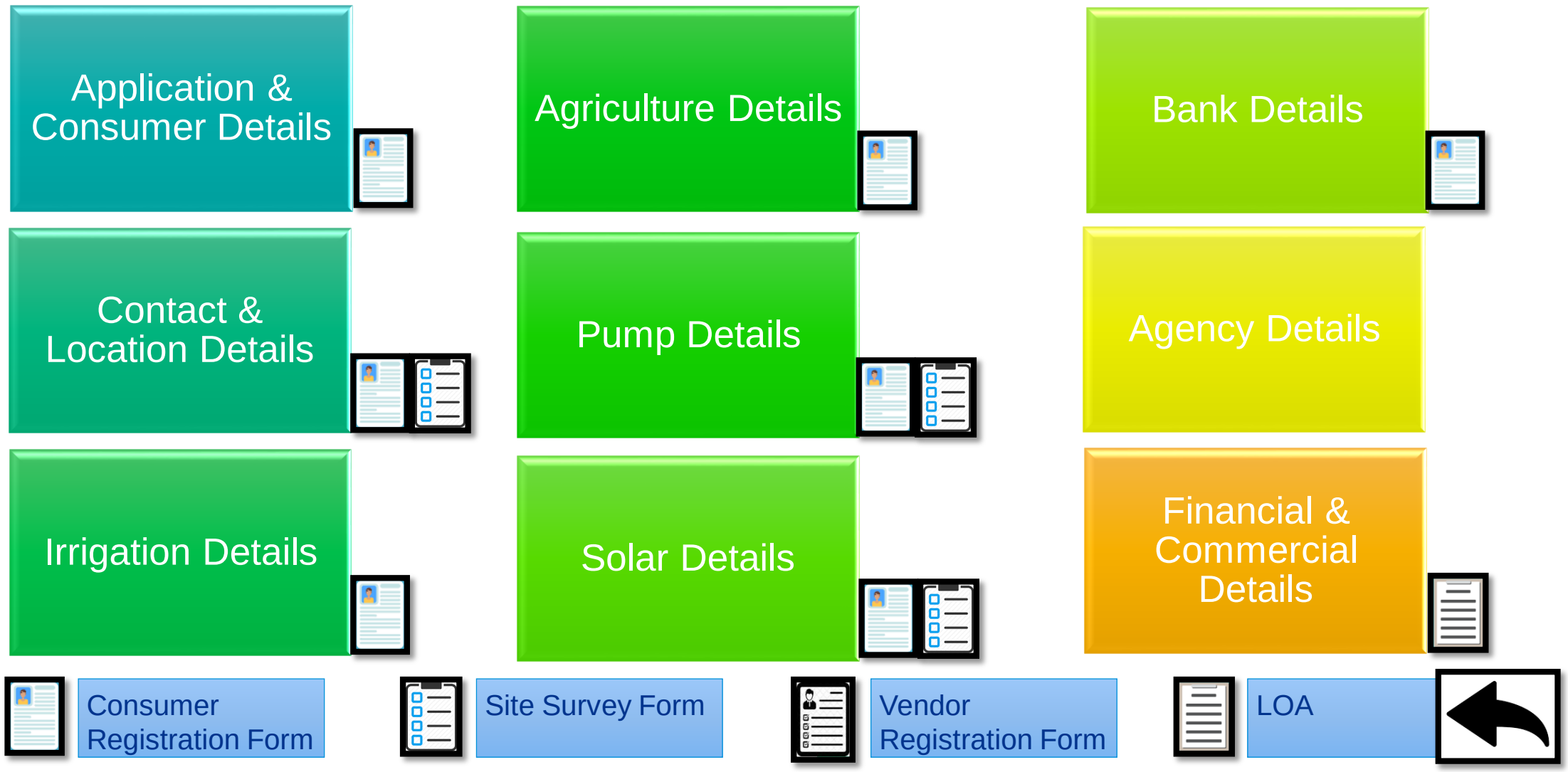

RMS
Field Systems
State Level SEDM Platform
National Level SEDM Platform
Component C
Component B
Component A
RMS
TLS/SSL Encrypted channel
Device management
With TLS/SSL VPN
SCADA
Tag Processing
Events & Notifications
Processing
Database Server with
Archiving & Historian
Meter Data Acquisition &
Meter Data Management
Device Integration
Consumer management
Project Progress
Management
Asset Management
Complaint & Ticket
Management
Live Asset Monitoring
Performance Analysis
Energy Audit & Accounting
Report Manager
System Modules
SEDM
Web server
TLS/SSL Encrypted channel
Web/Mobile clients
TLS/SSL Encrypted channel
Consumer management
With DBT Integration
Scheme / Project Progress
Management
Asset management
Live Assets Monitoring
Performance Analysis
SEDM
TLS/SSL
Encrypted
channel
Web server
Web/Mobile clients
Farmer
Empanelled
Agency
SIA
DISCOM
MNRE
SECI /
NISE
DBT

System Related Software Modules

Consumer Management

- **Consumer Registration Process**
  - **Add/Edit/Delete Consumer with multiple Details**
    - Application and Consumer Information
    - Contact and Location Details
    - Irrigation Information
    - Agriculture Information
    - Pump Information
    - Solar Plant Details
    - Bank Details
    - Service Center Details
    - Financial / Commercial Details
  - **Multiple Options for Registration**
    - Web User Interface for consumer details
    - .csv bulk upload
    - For Component-C, API based integration with existing Utility CRM
- **Consumer Unique Identification**
  - Primary Identification : Mobile Phone Number
  - Secondary Identification : Adhar Number / Consumer Service Number
- **Consumer Profile on Mobile Application**
  - Credentials : Username, Password with SMS based password update
  - Consumer Profile Update

Beneficiary Tracking Details

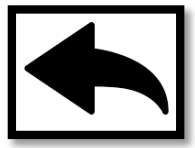


Project Progress Management

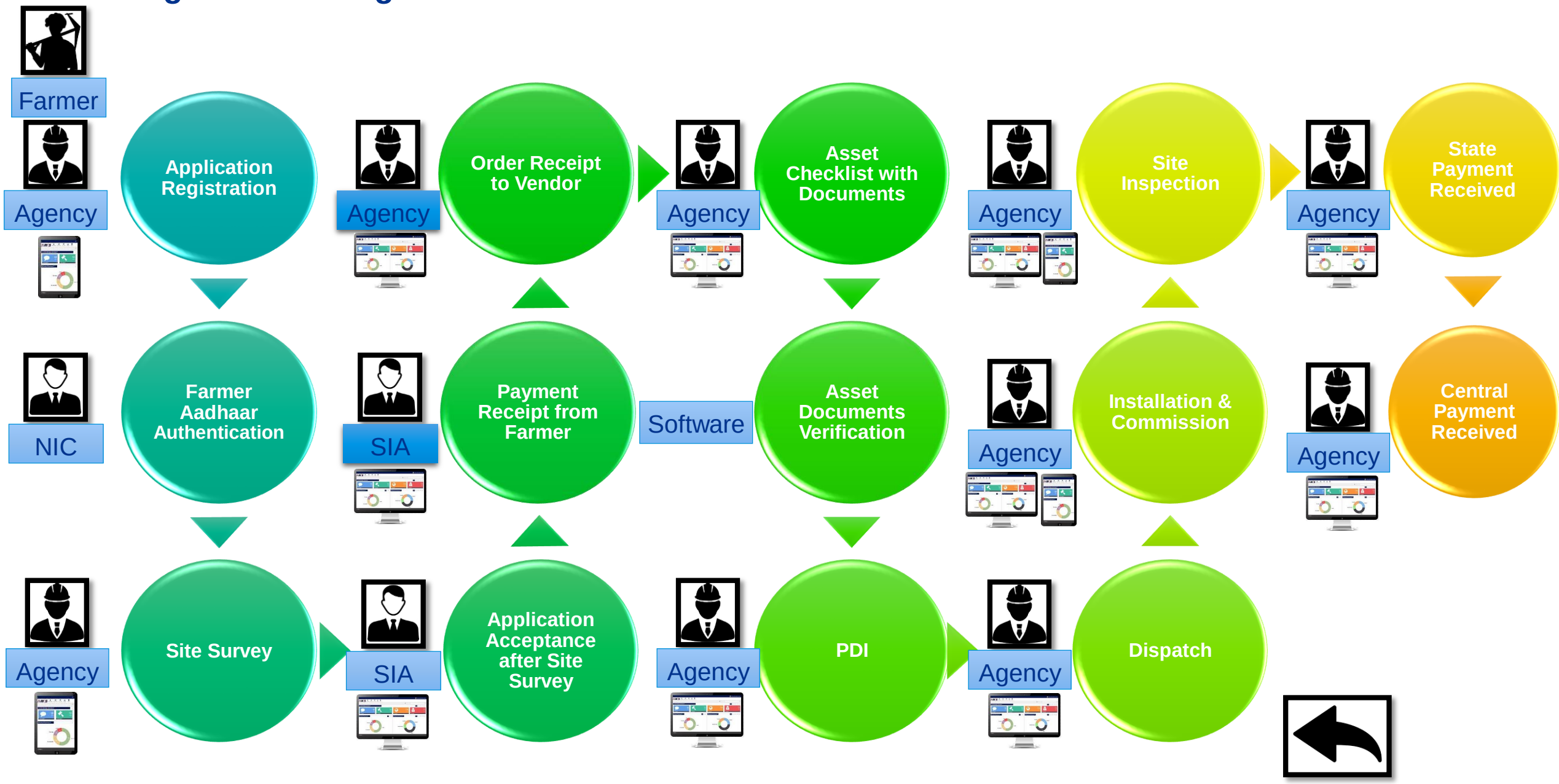
- **Provision to Update and Track Multiple Application Status for Work Flow**
  - 14 Primary Application Status for National Platform requirement
  - Based on State requirement they may add sub status

- **Work Flow with User and Role Management**
  - User from State Implementing Agency or Empaneled Agency may update the status of Application with Date
  - Access to User and Work Flow sequence for sub status may be decided by state implementing agency

- **Provision to Update Application Status in Multiple Modes**
  - Individual Application Status Update
  - Bulk Update
    - To select multiple consumer application number and update the status with date and document ref number
    - District wise .csv upload of multiple applications with status dates
  - Web or Mobile User Interface to update Application Status from Various Modules



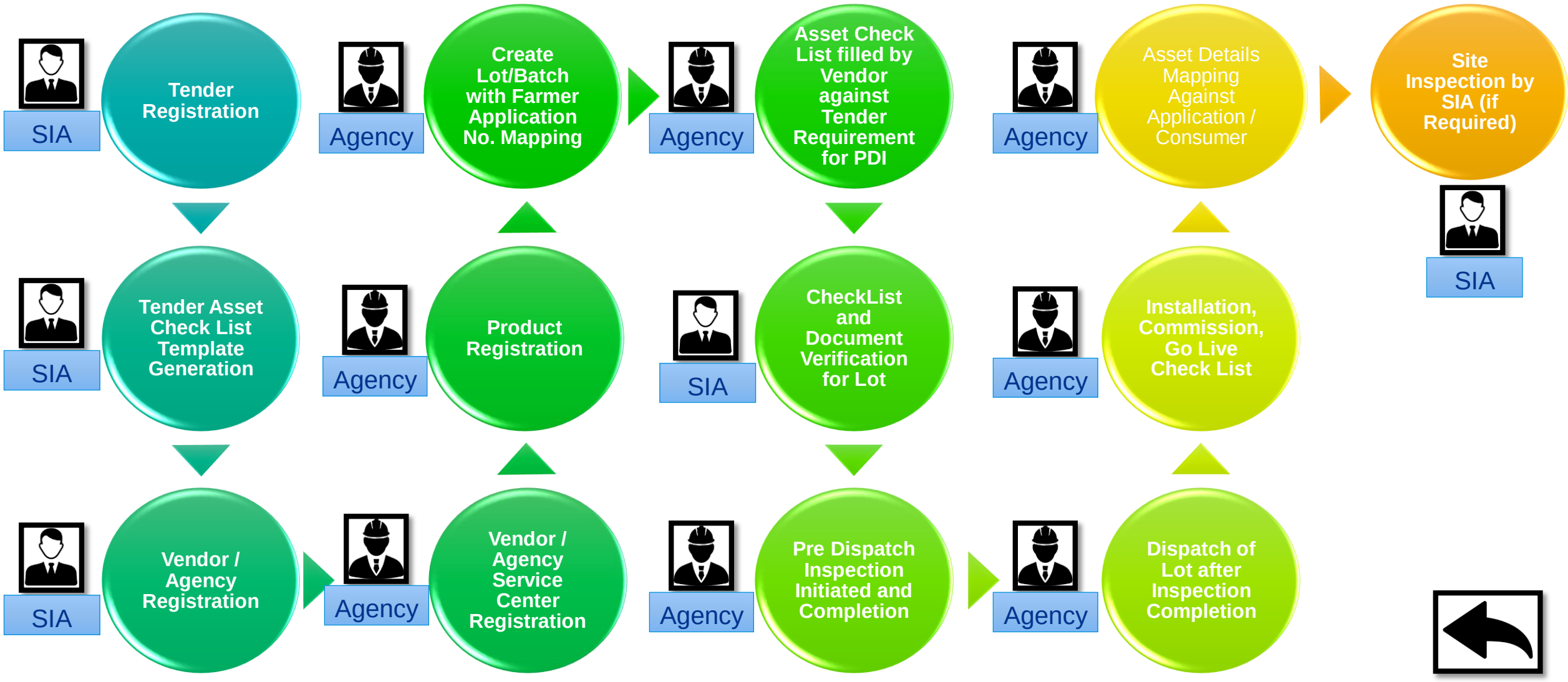
Progress Tracking Work Flow



Asset Management

- **Template Generation :** Register a tender and generate specification Check List Template against individual Item
- **Item Registration :** Panel, Pump Sets, Pump Controllers, Inverters, String Combiner Box, Meters, RMS
- **Vendor Registration :** Registration of Manufacturers, Dealers/Distributors, System Integrators
- **Asset Registration :** Vendor can register bulk assets against a lot prepared for PDI (Pre Dispatch Inspections)
    - **Solar Assets :**
        - Solar Panels with Serial Number of Individual Panel
        - String Combiner Box, AC DB, DC DB
        - Inverter
    - **Pump Assets :**
        - AC/DC Pump
        - Pump Controller / Drive
    - **Metering Assets :**
        - Bi Directional Net Meter
        - Generation Meter and Pump Consumption Meter
    - **Remote Monitoring and Data Acquisition System**
        - Remote Communication : GSM / GPRS / 3 G / 4 G / NB- IoT
        - Geo Location Sensing : GPS / GNSS / Manual Configuration
        - Local Communication : Ethernet / Bluetooth / Wi-Fi
        - Field Interfaces : Analog Inputs, Digital Inputs, Digital Outputs
- **Asset Check List :** Vendor can fill up check list against template requirements with required documents to speed up PDI
    - Ratings, Specifications, Type Tests, Certificates
- **Consumer Asset Registration Mapping**
    - Make, Model No, Serial No, Manufacturing Date, Warranty Details
- **Consumer Asset Replacement**
    - Replacement Details with Date
    - Report generation for Asset Replaced

Asset Tracking Work Flow



Complaint and Ticket Management

Acknowledge . Allocate . Respond . Resolve . Analyse

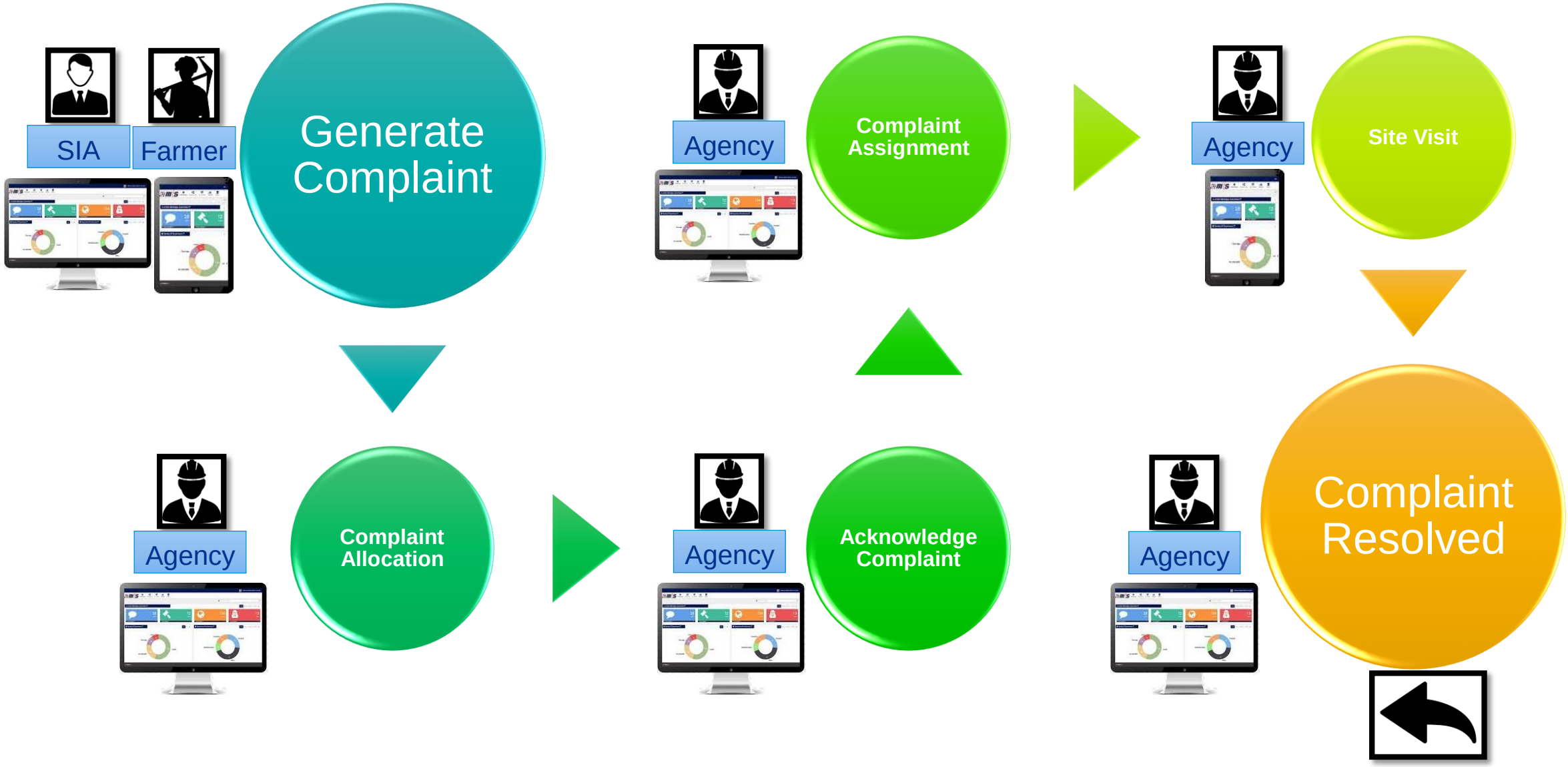
- **Complaint Logging :**
- Farmer Mobile Application
- Implementing Agency Engineer

- **Ticket Generation and Allocation :**
- Ticket generation against complaint
- Ticket Allocation to respective Vendor

- **Ticket Status Tracking :**
- Acknowledgement
- Allocation
- Assignment
- Site Visit – Status update by Vendor
- Resolution – Resolved Status update by Vendor

- **Ticket Analysis :**
- Time Taken to Acknowledge, Respond and Resolve a ticket
- Reason and Component Failure Analysis

Complaint & Ticket Management Work Flow



Asset Live Monitoring

Monitoring . Configuration . Control . System Diagnostics

- **Monitoring of Live Parameters on Dash Board with Map View**
- **Navigation :**
  - It shall be possible to navigate from State to District to Individual Consumer on a single page in Map View
  - At State and District Level Summary of Parameters to be displayed in Pop Window
- **List of Important Parameters to be displayed in pop Window:**
- Electrical Parameters
  - DC/AC - Voltage, Current, Frequency
- Power Parameters
  - Solar kW, Pump kW, Net kW (Import / Export)
- Status and Running Hours Parameters
  - Geo Location Mismatch Status, Pump Status, Inverter Status – On/Off/Alarm, Grid Status – Not Available, Single Phase, Three Phase
- Communication Status
  - Live / Connected / Disconnected Status
  - Last Time Stamp
  - Last RSSI (Signal Strength)
- **Entire Architecture should be based on Pub Sub Model and integrated with National Level Platform**
- **Configuration of Parameters :**
- Configuration of Protection Limits
- **On Demand Operations and control :**
- Remote Pump Operations
- Remote Appliance control
- **System Diagnostics :**
- Error / Fault / Warnings of drives/controllers/inverters
- Communication failures
- Grid Failures and single phase / three phase switching

Live Operational Status - Instantaneous Parameters with Geo Location

IA Level : On Line Data From Remote Monitoring System – IIoT SCADA, Pub Sub Communication Model

Live Geo Location of all Assets deployed under KUSUM A, B, C

Component -A

- String (200-500 kW) : DC - V, I, kW
- Inverter (500 -1500 kW) : DC & AC – V, I, F, kW, kVAR
- ICR (1500 – 2000 kW) : DC&AC – V, I, kW
- MCR (2000 – 10000 kW) : AC – V, I, kW
- Status : String, Inverter, Breaker, Plant, Connectivity

Component -B

- Pump Controller : DC / AC – V, I, kW
- Pump : Frequency, Water Flow Rate
- Status : Pump Controller, Pump, Connectivity

Component-C

- Grid Parameters : Voltage, Single Phase, Three Phase
- Inverter : DC & AC – V, I, F, PF, kW, kVAR
- Net Meter : V, I, PF, F, kW, kVAR
- Pump : I, kW, Water Flow Rate
- Status : Inverter, Pump, Import / Export , Connectivity
- Status : Inverter, Pump, Import / Export , Connectivity

State Level : BOTs for Analysis and Summary of On Line Data

Consumer Summary from Raw Data

Feeder Level Summary – Sum, Count, %

DISCOM Level Summary – Sum, Count, %

Summary Parameters:

Number of Systems Connected : Total and %

Number of Pumps On : Total and %

Number of Generation On : Total and %

Solar Generation : Total kW and % of Installed Capacity

Pump Load : Total kW

Net (Import/Export) Load : Total kW

Water Flow : Total Water Flow Output

National Dash Board : Subscribe and Filter On Line Data

Subscription of Sum / Count / % Data

National Summary

State / DISCOM / District wise Summary

Mapping and Sorting of Data

Chart Representation

- Google Map Indicators for Display of Summary Parameters in Pop Window against each Location

- Top Five States against parameter

- Last Five States against parameter

Key Performance Analysis

System Performance Analysis . Irrigation Analysis . Energy Transaction Analysis

- **Duration Selection Filter**
  - Between Any Dates From Last Two Months
  - Standard Duration Options : Last Week / Current Week / Last Month / Current Month
- **System Performance Analysis**
  - Solar Performance Analysis – Generation, %CUF, %PR
  - Pump Performance Analysis – Pump Consumption vs. Running Hours
  - Grid Performance Analysis – Running Hours in Single Phase/Three Phase/Over Voltage/Under Voltage
  - RMS Performance Analysis - % Data Availability, % Device Connectivity
- **Irrigation Analysis**
  - Pump Running Hours / Usage vs. Season, Area, Crop
  - Water Discharge / Usage vs. Season, Area, Crop
- **Energy Transaction Analysis**
  - Solar Generation, Pump Consumption, Import, Export, Net Energy
- **Navigation :**
  - It shall be possible to navigate from State to District to Individual Consumer on a single page in Map View
  - At State and District Level Summary of Parameters to be displayed in Pop Window
  - On selecting any parameter from pop window, It shall be possible to have display of Day wise Trend for selected duration

Energy transaction - Performance Analysis - Irrigation Analysis

IA Level : Archived Data From Remote Monitoring System – SCADA with IIoT Based Comm., Pub Sub Model

Component -A

- String (200-500 kW) : DC kWh, Running Hours, %CUF
- Inverter (500 -1500 kW) : kWh, kVARh, Running Hours, %CUF
- ICR (1500 – 2000 kW) : kWh, kVARh, %CUF
- MCR (2000 – 10000 kW) : kWh, kVARh, %CUF
- Connectivity : % Connectivity, % Data Availability

Component -B

- Generation : kWh, Running Hours, %CUF
- Pump : Running Hours, Till Date Water Discharge
- Connectivity - % Connectivity, % Data Availability

Component-C

- Grid : % Three Phase Supply, % High Voltage Run Hours
- Generation : kWh, Inverter Running Hours, %CUF
- Net Meter : Import kWh, Export kWh, Net kWh
- Pump : Pump kWh, Pump On-% Low PF Run Hours, Total Water Discharge
- Connectivity - % Connectivity, % Data Availability

State Level : BOTs for Analysis and Summary of Archived Data

Consumer Summary from Raw Data

Feeder Level Summary – Sum and %

DISCOM Level Summary – Sum and %

Summary Parameters:

Total Energy Transaction : Import, Export, Net Energy

% Availability : Connectivity, Data, Grid Three Phase

Solar Performance : % CUF

Running Hours : String, Inverter, Pump, Feeder

Power Quality : % High Voltage Run Hours,

% High kVAR Run Hours, % Low PF Run Hours

Irrigation : Water Discharge, Pump Run Hours in Day Time

National Dash Board : Subscribe and Filter Archived Data

Subscription of Data Archived Data

National Summary

State / DISCOM / District wise Summary

Client Side Processing of Data

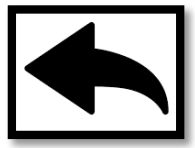
Chart Representation

- Google Map Indicators for Display of Summary Parameters in Pop Window against each Location
- Over All Summary of multiple Performance Indicators
- Top Five States (Against Performance Parameter)
- Last Five States (Against Performance Parameter)

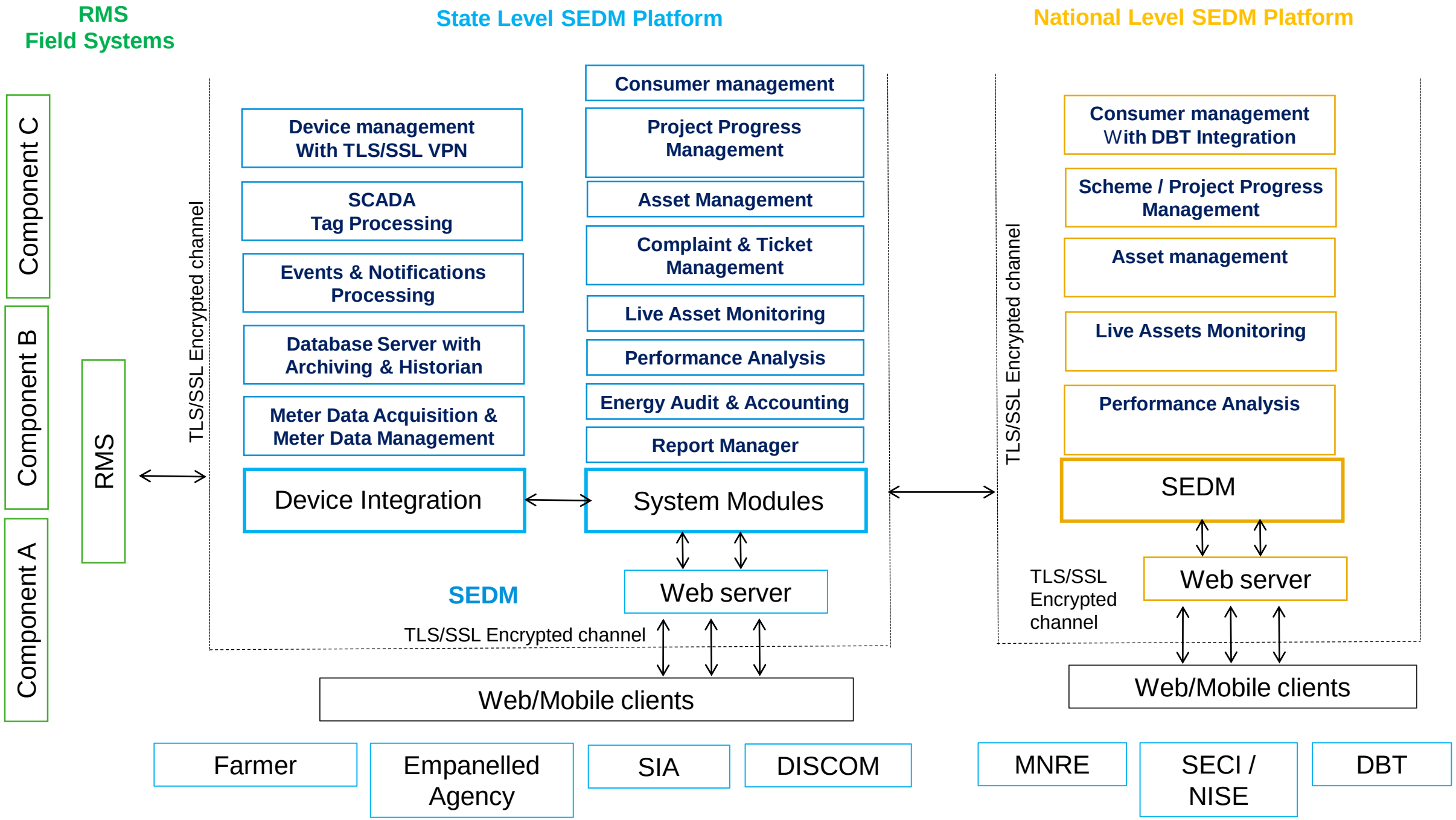
Report Manager

- **Reports generation with multiple duration filters :**
  - Last Week,
  - Last Month,
  - Current Week,
  - Current Month,
  - Current Billing Cycle,
  - Between User Configurable Dates

- **Report Generation for multiple performance indicators :**
  - Running Hours
  - %CUF
  - Pump Consumption
  - Solar Energy Generation
  - Billing : Net, Import, Export of Energy
  - Loss Calculations
  - Abnormal Electrical System Reports : Over Voltage, Voltage Un balance, Over Load, Un Balance Load, High Temp.
  - Instantaneous Parameters : Min., Max., Average values of Voltage, PF, Power etc.
  - % Device Connectivity
  - % Data Availability
  - Comparison & Correlation Reports : Comparison of two duration/season , comparison of two products etc.



Device Integration Software Modules


RMS
Field Systems
State Level SEDM Platform
National Level SEDM Platform
Component C
Component B
Component A
RMS
TLS/SSL Encrypted channel
Device management
With TLS/SSL VPN
SCADA
Tag Processing
Events & Notifications
Processing
Database Server with
Archiving & Historian
Meter Data Acquisition &
Meter Data Management
Device Integration
Consumer management
Project Progress
Management
Asset Management
Complaint & Ticket
Management
Live Asset Monitoring
Performance Analysis
Energy Audit & Accounting
Report Manager
System Modules
SEDM
Web server
TLS/SSL Encrypted channel
Web/Mobile clients
TLS/SSL Encrypted channel
Consumer management
With DBT Integration
Scheme / Project Progress
Management
Asset management
Live Assets Monitoring
Performance Analysis
SEDM
TLS/SSL
Encrypted
channel
Web server
Web/Mobile clients
Farmer
Empanelled
Agency
SIA
DISCOM
MNRE
SECI /
NISE
DBT

Device Management

Configuration . Security. Connectivity. Communication. Availability

- **Device Registration and Configuration :**
  - Universal Unique ID : IMEI number(Cellular Connectivity) or MAC ID (Ethernet or Wi-Fi Connectivity)
  - Manufacturer Unique ID : Serial Number, Batch, Manufacturing Date, Model Number etc.
  - VPN Security : Upload and configure TLS / SSL certificate for AES 256 Bit Encryption
  - Device SIM Card Details : Mobile Number of Device, Service Provider APN, User Name, Password
  - Server Connection Configuration : IP, URL, Port, MQTT and FTP server details
  - Server Authentication Credentials : Token/Username and Password for MQTT and FTP Server
  - OTP Configuration : Auto Generation and exchange of 32 character random topic for OTP subscription
  - Communication Topics : Auto Generation and Exchange with Topic authorization against Unique Identification
  - Gateway Mobile Number Configuration for SMS connectivity
- **Multiple Device Communication Connectivity**
  - MQTT (IIoT) Server to handle bi directional communication of up to 5000 devices with single instance
  - SMS Gateway Integration
  - FTP Server for updating Device Configuration Files
- **IIoT Communication Modes**
  - **1.** Push on Periodic Interval **2.** Push on Event **3.** On Demand Read Parameter **4.** On Demand Command **5.** Configuration Read / Write
- **IIoT Communication Analysis**
  - **1.** % Device Connectivity **2.** % Data Availability of Different Parameters **3.** Number of Messages / Data
- **SMS Communication Modes**
  - **1.** SMS of Periodic Data **2.** SMS to Read and Write a parameter on Demand **3.** SMS for Configuration Update
- **SMS Communication Security**
  - Verification of Device Mobile Number, IMEI Number, OTP
- **IIoT Communication Security**
  - **1.** Identification **2.** Encryption **3.** Authentication **4.** Authorization **5.** OTP

SCADA Tag Processing

Message Processing . Data Processing . History Back Fill Processing . Mapping & Group Processing

- **Message Processing :**
  - MQTT Messages
    - Device Push Messages : Push on Periodic Interval | Push on Event
      - JSON parsing of messages at a speed of **100 messages per second** using multiple threads
      - Virtual Device configuration based message parsing : single device may have **10 virtual devices such as Pump Controller / Drive, Bi Directional Meter, Generation Meter, Pump Meter, Health Parameters etc.**
    - Device On Demand Messages : User / Server Initiated Parameter Read or Write Commands
      - **Send Remote Commands** to Device such as Remote Pump Operation
      - **Update single or multiple configuration parameters** such as alarm limits or schedule of operation
      - **Bulk Update multiple devices on a single command** such as updating pump operation running hours
      - **Auto Update Device Configuration** such as RTC sync with Server Time Stamp
      - **Auto Generated M2M (Device-Device) Commands** such as Pump Off for Demand Side Management
  - SMS Messages : Read and Write an individual parameter using SMS messages
- **Data Processing :**
  - Processing multiple tags or parameters such as V, I, PF, F, kW, kWh for trend and analysis purpose
  - Processing Soft Parameters based on logics and conditions **Voltage Un Balance / Un Balance Load etc.**
- **History Back Fill Processing :**
  - Server side Automatic Processing of mixing data based on missing indexes, periodic interval and time period
  - Priority configuration for virtual device, duration, samples to retrieve important missing data on higher priority
- **Mapping and Group Processing :**
  - Create multiple group of parameters : Instantaneous, Notifications, Mobile Application Groups
  - Map Device against consumer to automatically allow consumers to view groups
  - User and Role Management against group processing to restrict user access

Events & Notification processing

Alarms . Events . Notifications . M2M Event Handling

- **Alarm Configuration & Processing :**
  - Configuration of Limits for Analog Alarms – H, HH, L, LL Limits and Digital Alarms – V, I, kW, PF, F etc.
  - Processing Hard Tags and Soft Tags and generating alarms against it – Pump Status, Inverter Status etc.

- **Soft Alarm Configuration & Processing:**
  - Generating logic and calculation based alarms against Hard Tags and soft tags

- **Alarm against archived parameters:**
  - Configuration and processing of alarms / events / notifications against archived parameters – Daily / Weekly / Monthly %CUF, Average Pump Running Hours etc.

- **Notification:**
  - Configuration and processing of Notifications against Alarm/Event or schedule basis
  - **SMS, Mail and Push Notifications to configured users**
  - **Notifications at different intervals on unavailability of Data to Farmer as well as Vendor**
    - **Component A : 24 Hours (Vendor)**
    - **Component B : 3 Days (Vendor), 10 Days (Farmer)**
    - **Component C : 3 Days (Vendor), 5 Days (Farmer)**

- **Notification Groups & Security:**
  - User and Role Management based subscription of Notifications for User as well as Device

Archiving And Historian

Parameter Trend . Event History . Archiving . Historian . Summary

- **Rule based Archiving :**
  - Archiving with Min., Max., Initial, Last, Count, Sum values of configured parameters and time duration
  - 15 min. slot wise Archiving
  - Daily Archiving
  - Monthly Archiving

- **Archiving configuration :**
  - Configuration of multiple parameters from multiple devices in a single virtual device

- **Summary Parameters:**
  - Deriving Summary of entire district or Feeder or State on Daily and Monthly basis

- **Archiving Notification:**
  - Configuration and processing of Notifications against Alarm/Event of archived parameters

- **Soft Tag :**
  - API based logic and calculation processing of integrated parameters

- **Historian :**
  - Storage and retrieval of history data in multiple tables, formats derived based on archiving

MDAS & MDM

Meter Data Acquisition & Meter Data Management

- **Meter Information :**
- Meter Make, Model Number, Serial Number, Ratings etc.

- **Meter Instantaneous Data :**
- RTC Time Stamp
- Voltage : Line to neutral voltage and Line to Line voltage
- Current : Phase wise current, Total Current
- Power : Active Power, Reactive Power, Apparent Power
- Power off Duration

- **Meter Billing History Data :**
- Active Energy
- Reactive Energy
- MD (kW)
- MD (kVA)

- **Load Survey Data :** 15 minute load survey data

- **Tamper Data :** Tamper events with snap shot of multiple parameters

- **Rule based Meter Data Verifications and Validation**

- **Meter Replacement Process**

- **Integration with Billing System**

Other Software Modules

User & Role Management

Meter Data Acquisition & Meter Data Management

- **Create Multiple Types of Organizations :**
  - National Implementing Agency
  - State Implementing Agency
  - State PSUs : DISCOMs, Transmission Companies etc.
  - Solar EPC / Project Execution Agency
  - RMS and Software System Integrator
- **Add Multiple Users**
- **Assign District Level or Feeder Level or Plant Level Access to Organization**
  - Component A : Plant Level
  - Component B : District Level
  - Component C : Feeder Level
- **Create Multiple User Roles for Configuration**
  - Admin
  - Users with Add / Edit / Delete Rights
  - View Only Users
- **User Level Access Control :**
  - Assign systems and group of parameters against user
  - View Only Access of Data
  - Write Command and Configuration to System
- **Consumer / Farmer / Owner Mapping :**
  - Add Thousands of consumers in a system
  - Access control to his particular system only

Farmer Mobile Application with Multiple Language Selection

Monitor . Analyze. Complain . Help . Improve Utilization

- **Multiple Language Selection at Log In**
- **User Profile & Details**
- **OTP based Password Reset Mechanism**
- **System Details**
  - Pump Ratings , Plant Ratings , Connection Details
- **Live Status**
  - RMS Connectivity Status Parameter
  - Pump Status : ON / OFF
  - Generation Status : Inverter ON /OFF
  - Grid Status : Not Available Single Phase / Three Phase
  - Power Status : Import / Export (in kW)
  - Today's Running Hours : Pump Running Hours
- **Performance Analysis – Summary**
  - Yesterday and Current Month
  - Summary of Generation, Consumption, %CUF
- **Performance Analysis – Trend**
  - Current Week / Last Week / Current Month / Last Month
  - Day wise Trend of Solar Generation / Pump Consumption / Net Energy
  - Day wise Trend of Water Discharge and Pump Running Hours
- **Complaint Registration**
- **Service Center Contact Details**
  - Address
  - Contact Person
  - Mobile Number
- **Help Documents**
  - Safety Guidelines
  - Guidelines for System Performance Improvement

Site Survey Mobile Application

- Provision to Search farmer/beneficiary by Application No/Mobile No

- Site Survey Mobile app shall capture latitude, longitude of the location where system shall be installed

- Provision to upload images such as site photographs etc.

- Provision to upload site survey consent/approval document from farmer/beneficiary

- Site Survey shall cover Following Fields as per Actual Site Details

- Crop Details
- Source of Water
- Micro Irrigation System
- Existing Pump details
- Source of Power for existing pump
- Required Pump details
- Grid Connection application status

Annexure-1

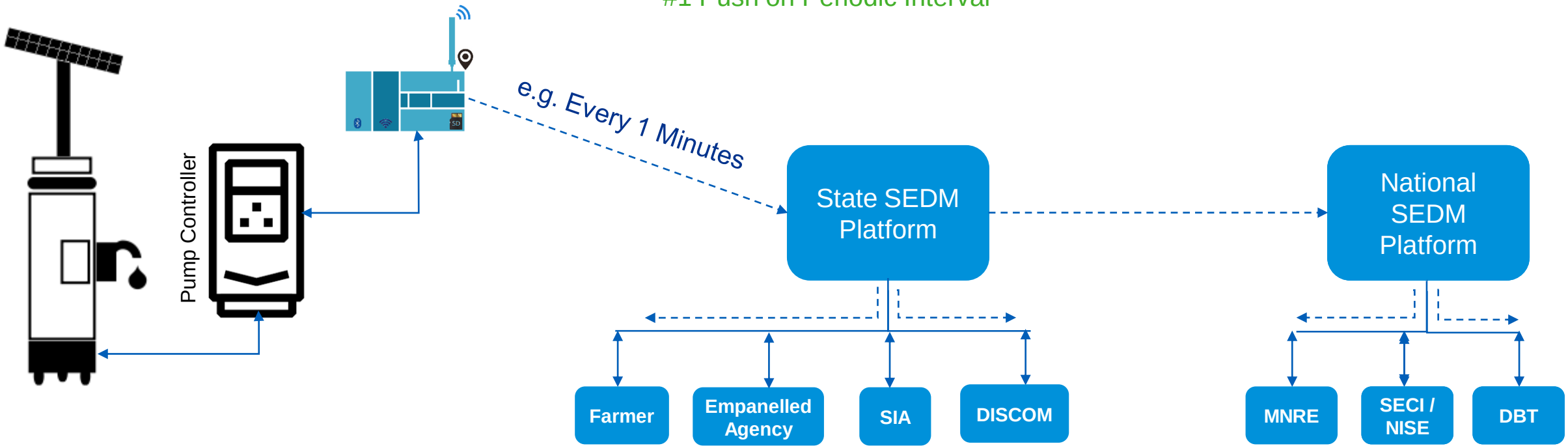
RMS Integration with State Level SEDM Platform

Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

COMMUNICATION MODES (with reference to EESL Tender Annexure 8 – clause 4.b)

Five Different Communication Modes between RMS & SEDM Platform

#1 Push on Periodic Interval

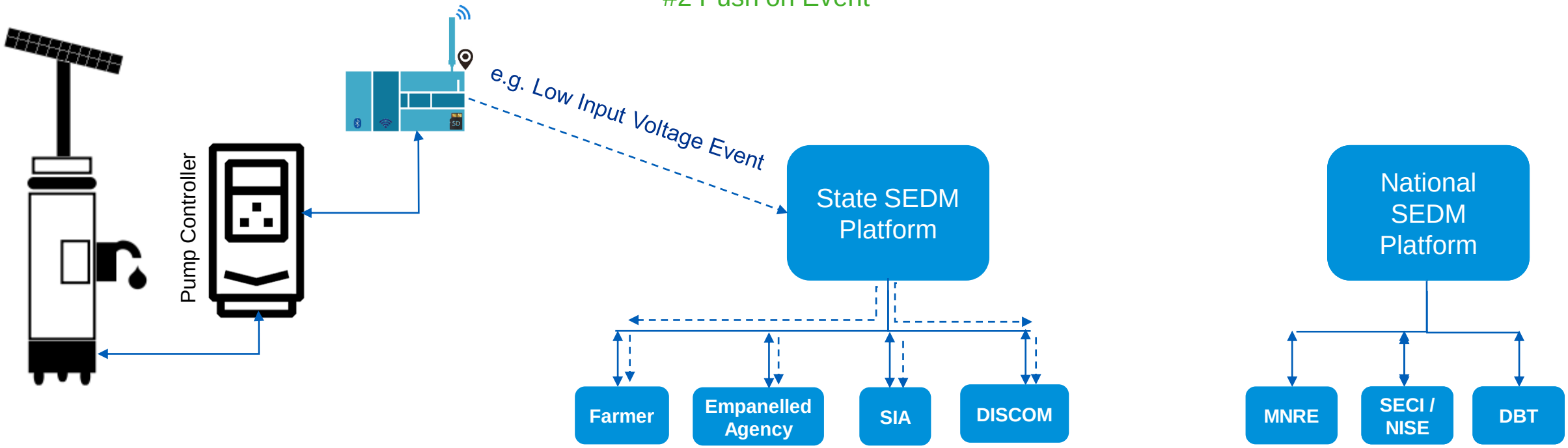


Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

COMMUNICATION MODES

Five Different Communication Modes between RMS & SEDM Platform

#2 Push on Event

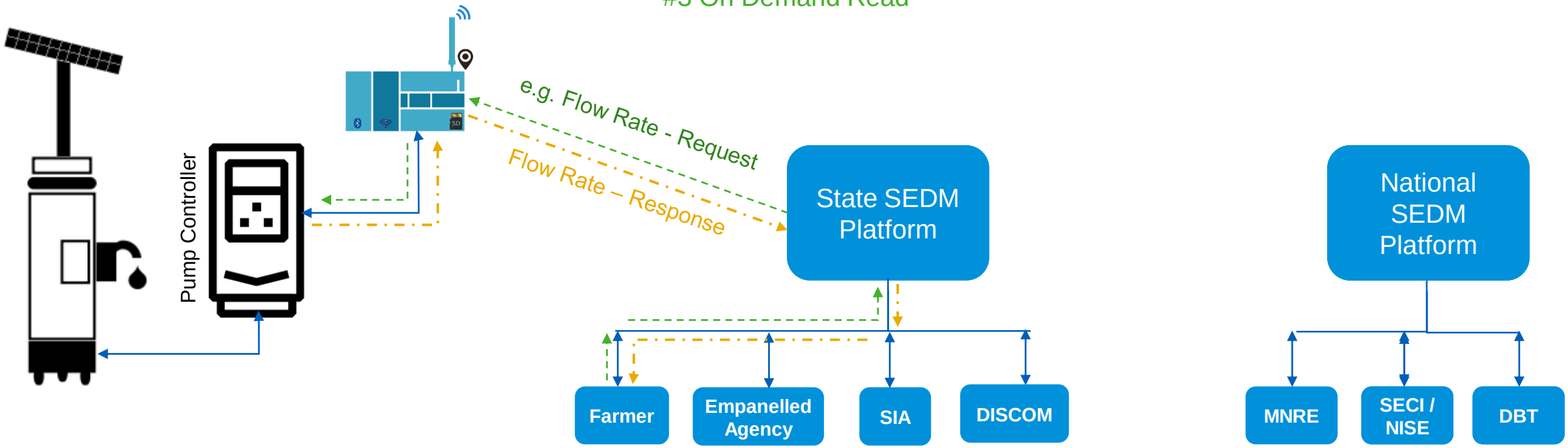


Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

COMMUNICATION MODES

Five Different Communication Modes between RMS & SEDM Platform

#3 On Demand Read

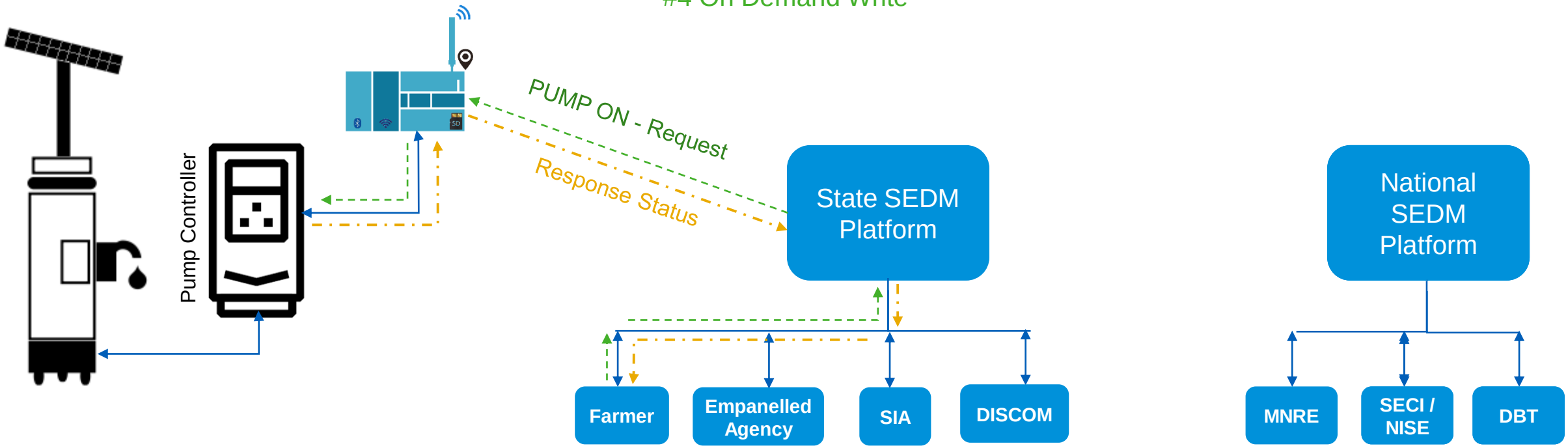


Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

COMMUNICATION MODES

Five Different Communication Modes between RMS & SEDM Platform

#4 On Demand Write

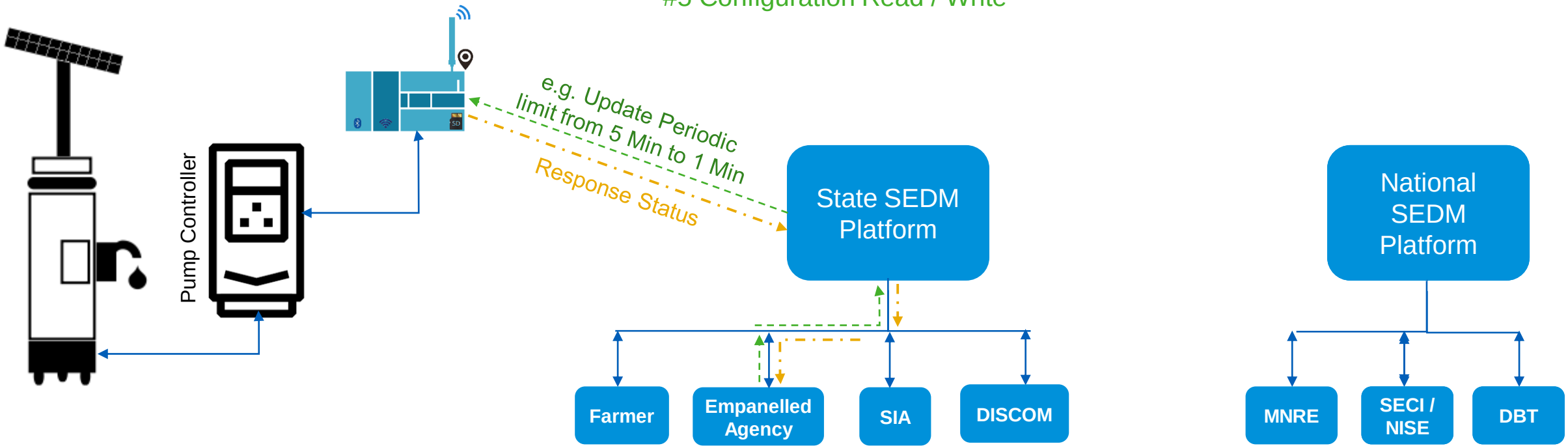


Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

COMMUNICATION MODES

Five Different Communication Modes between RMS & SEDM Platform

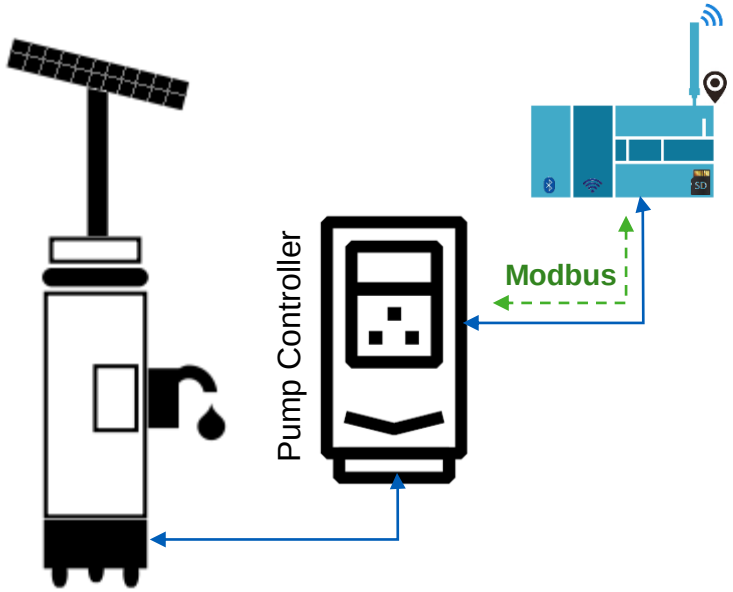
#5 Configuration Read / Write



Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

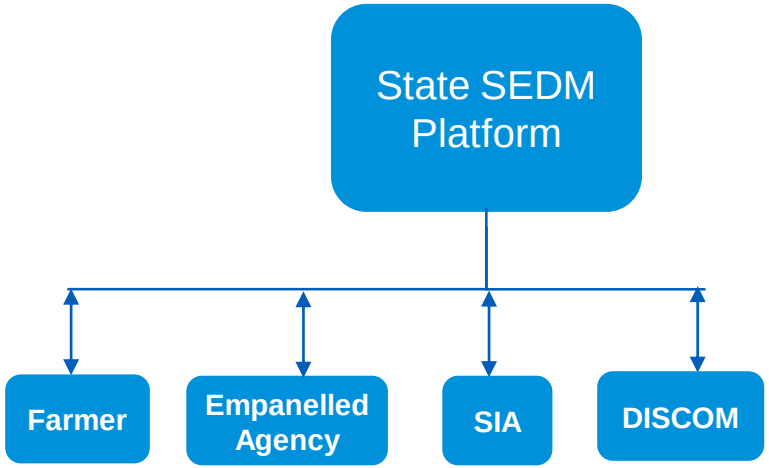
COMMUNICATION PROTOCOLS (with reference to EESL Tender Annexure 8 – clause 4.a & 4.c)

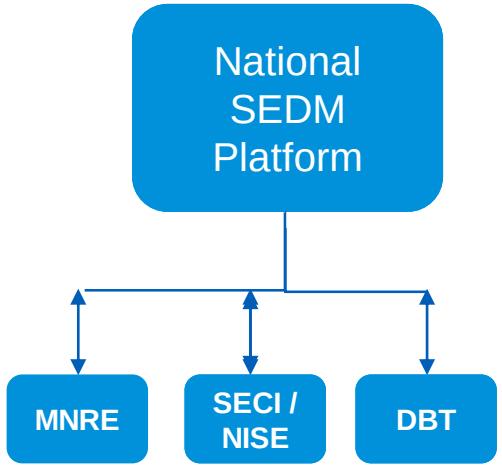
Open Protocol Architecture Accepted Worldwide by all Manufacturers



#1 Field Device Communication

An Open Device communication Protocol supported by Manufacturers of Pump Controller/ Drive/Inverter/ Energy Meters / String Combiner Box





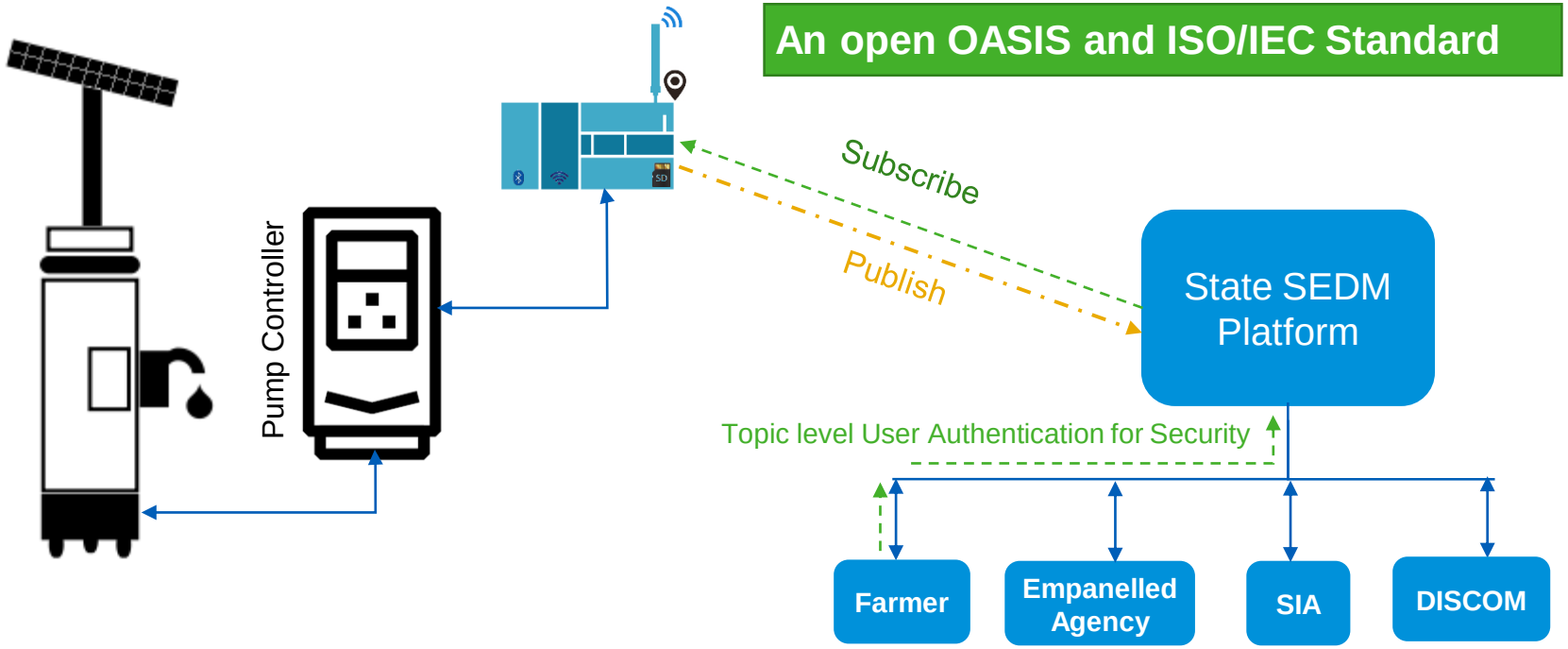
Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

COMMUNICATION PROTOCOLS

#2 RMS to Server Communication – **Industrial IoT** MQTT Protocol

Lightweight – Low bandwidth remote applications | Pub-Sub Architecture – Scalable for Millions of Devices | Message Queuing

An open OASIS and ISO/IEC Standard



MQTT - Supported by Global OT Players across Smart Grid, Smart RE & Smart City Applications

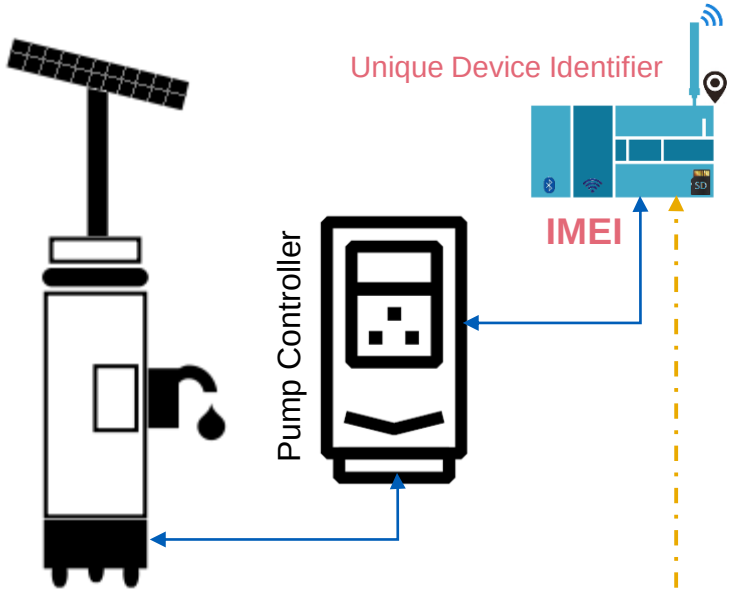
MQTT - Accepted by Global IT Players for Integration with Cloud Infrastructure

Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

SECURITY ARCHITECTURE (with reference to EESL Tender Annexure 8 – clause 4.d)

Identification & Registration | Certification | Authentication | Encryption | Authorization | OTP

#1 Identification & Registration, #2 Certification



State SEDM Platform

List of IMEI numbers with Solution Type

Farmer | Empanelled Agency | SIA | DISCOM

National SEDM Platform

MNRE | SECI / NISE | DBT

Registration Details Downloaded to RMS

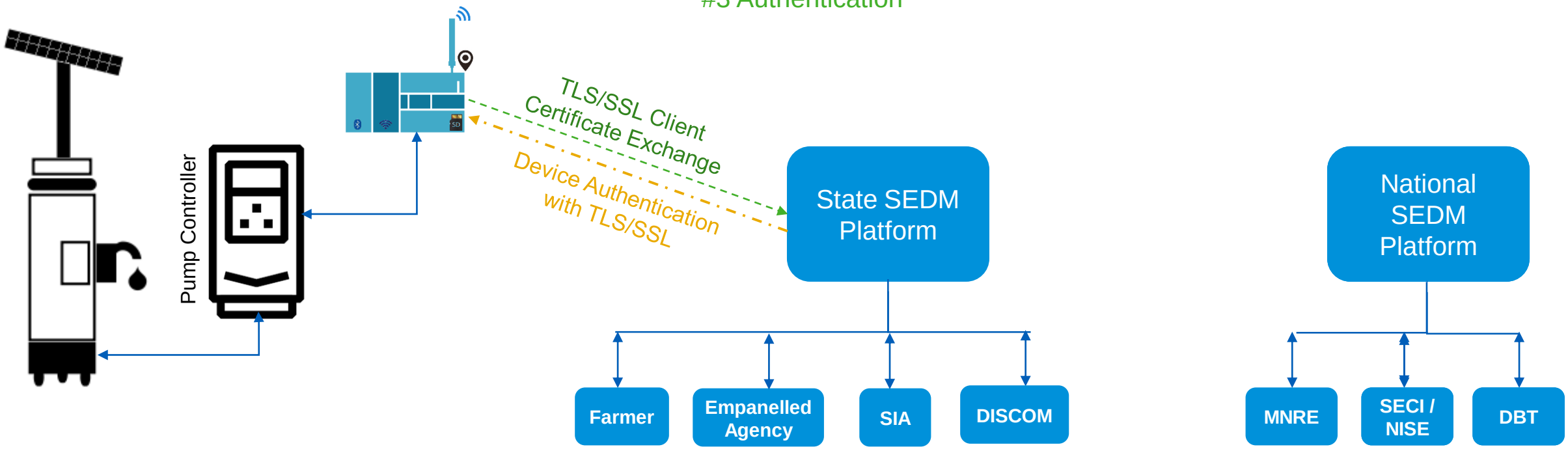
TLS SSL Client Certificate
MQTT Broker Url
"Info" Topic

Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

SECURITY ARCHITECTURE

Identification & Registration | Certification | Authentication | Encryption | Authorization | OTP

#3 Authentication

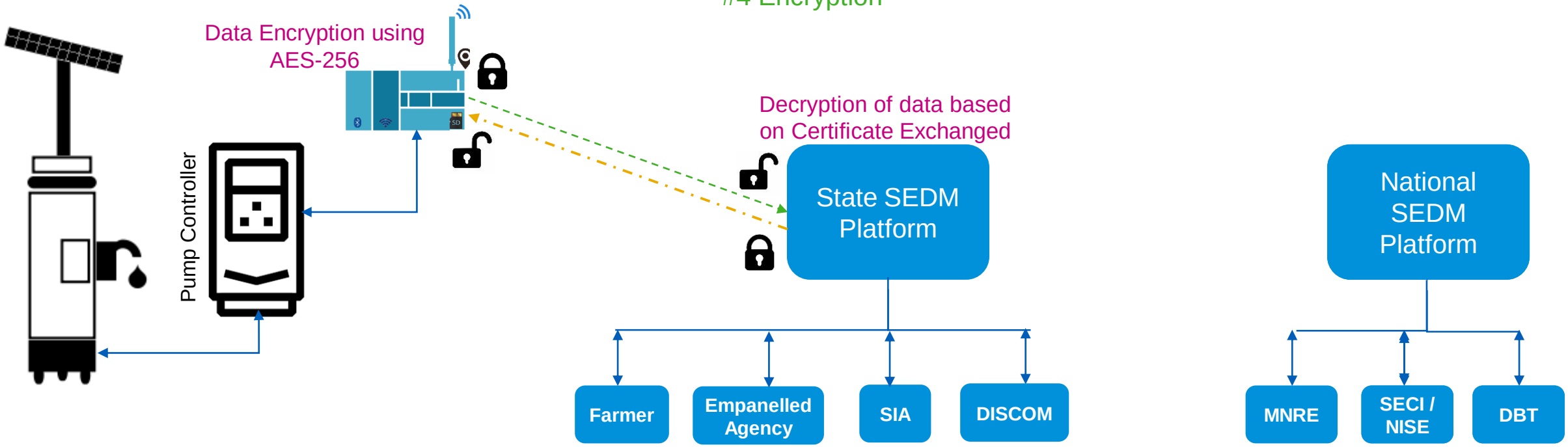


Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

SECURITY ARCHITECTURE (with reference to EESL Tender Annexure 8 – clause 4.d)

Identification & Registration | Certification | Authentication | Encryption | Authorization | OTP

#4 Encryption

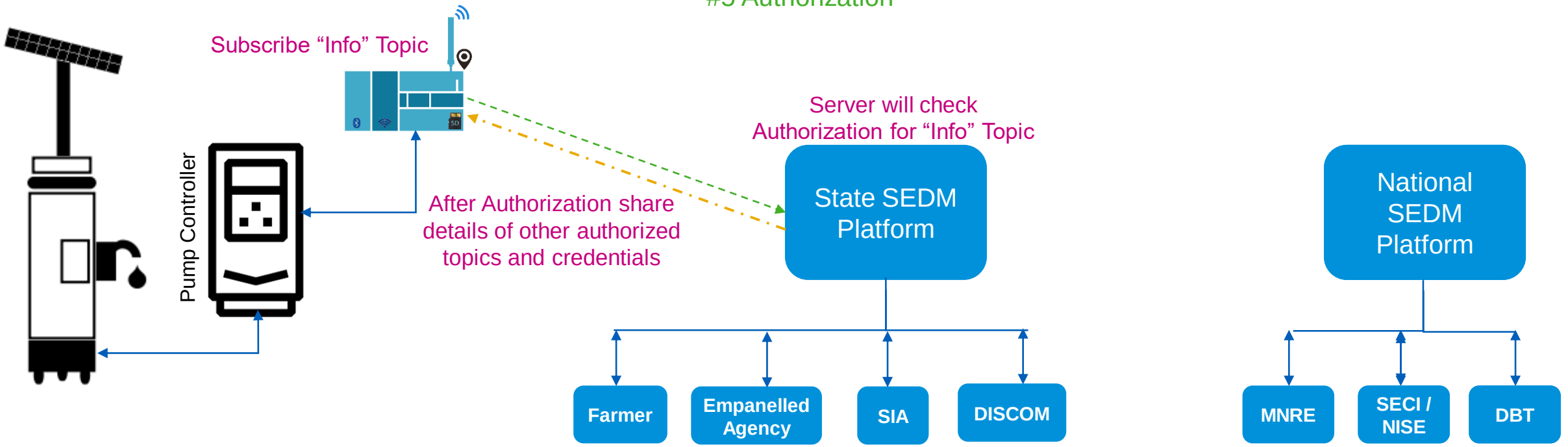


Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

SECURITY ARCHITECTURE

Identification & Registration | Certification | Authentication | Encryption | Authorization | OTP

#5 Authorization

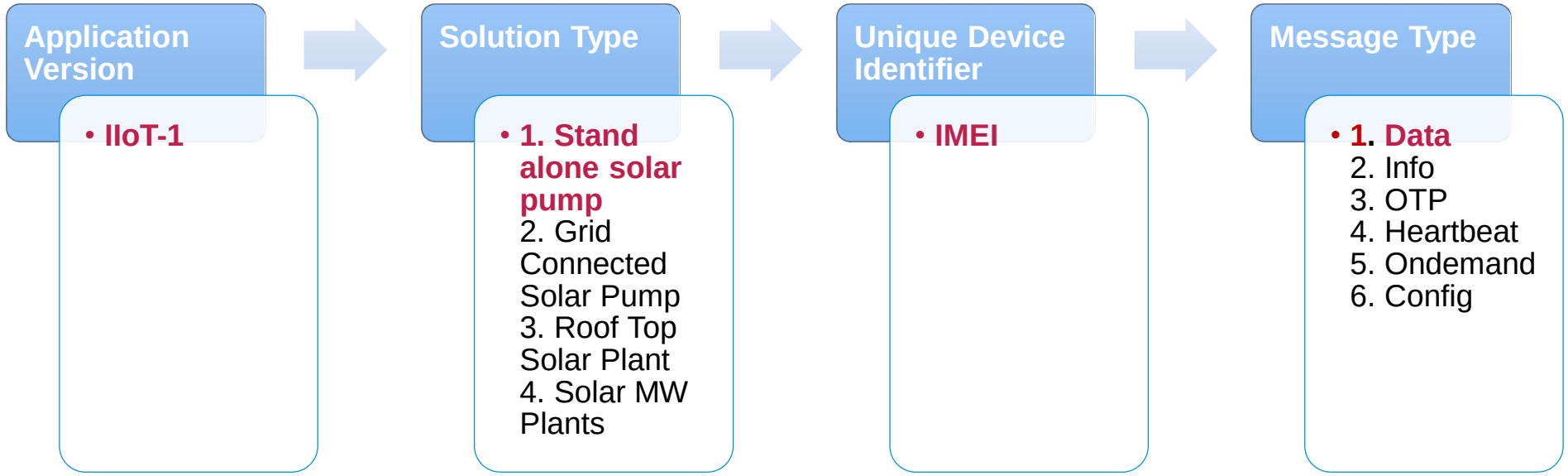


Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

MQTT Topic Structure for Authorization

Sample topic Structure for Standalone Solar Pump

IIOT-1 / Standalone Solar pump / IMEI / data

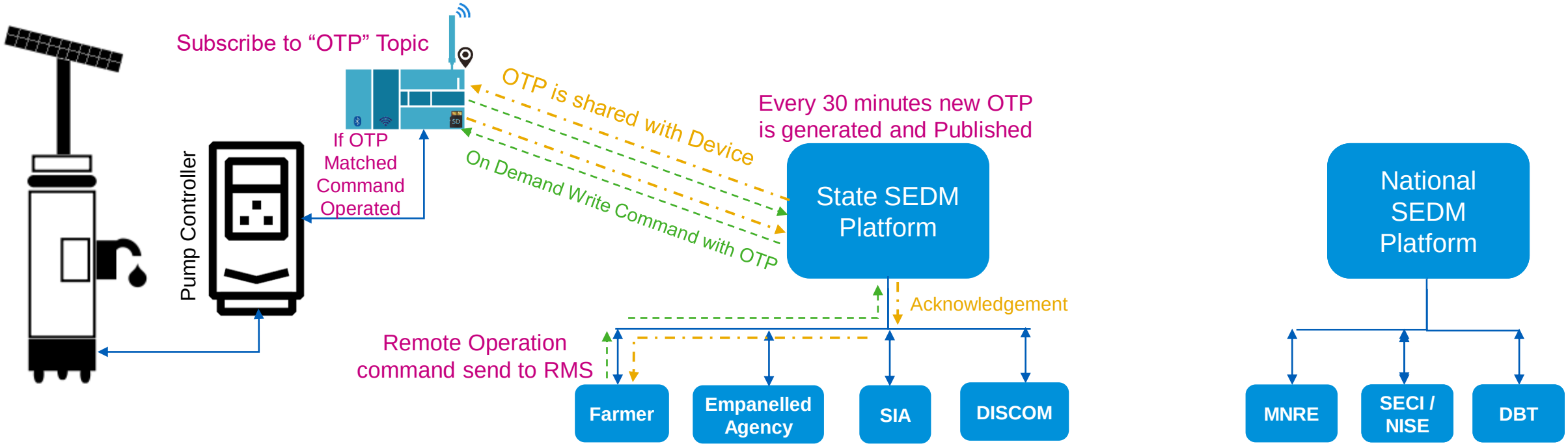


Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

SECURITY ARCHITECTURE

Identification & Registration | Certification | Authentication | Encryption | Authorization | OTP

#6 One Time Password (OTP) Mechanism for command and Configuration Updates



Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

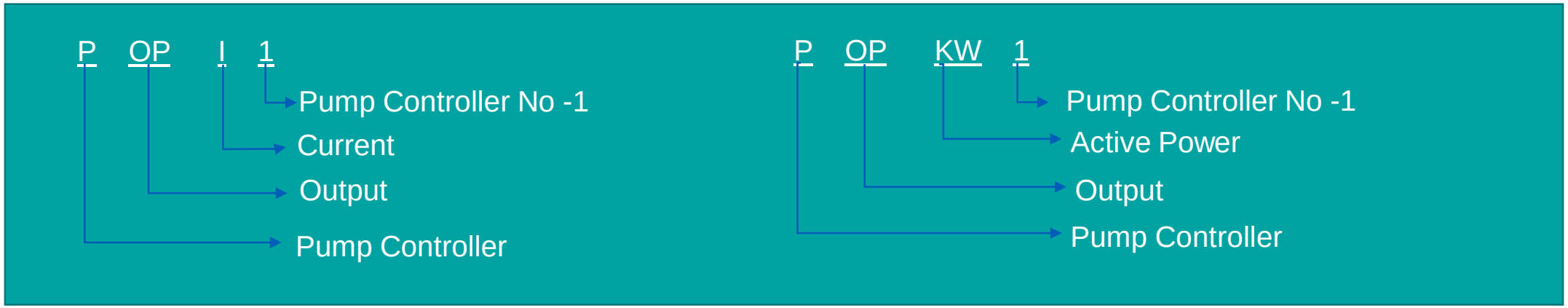
JSON MESSAGE STRUCTURE (with reference to EESL Tender Annexure 8 – clause 4.e)

An open Human readable message format, easy to parse in web /mobile/embedded applications

Message Format

```
{
  “POPI1”: 30,
  “POPKW1”: 3.6
}
```

Keyword Abbreviation



Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

JSON MESSAGE STRUCTURE (with reference to EESL Tender Annexure 8 – clause 4.e)

keyword	Description	Format	Sample Value
IMEI	Unique Identification of RMS/DCU – required to ensure registered source of data	Numberic – 15 Digit	863287049443888
VD	Virtual device/group – required for grouping parameters based on update interval/subsystems such as inverter/pump controller/meter/string combiner box etc.	Numeric	2
MSGID	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback	Numeric	123456789
COMMAND	Read/Write - Applicable only in case of “Ondemand”/”Config” message Type	String (Read/Write)	Read
TIMESTAMP	RTC timestamp of RMS/DCU against all parameters of vd/group	(YYYY-MM-DD HH:mm:SS)	2019-08-20 20:15:08
STINTERVAL	Periodic interval at which RMS shall store and transmit data to server. (in minutes)	Numeric	15
DATE	local storage date – required as a reference to fetch data from local storage	(YYYY-MM-DD)	2020-06-15
INDEX	Local storage Index – required as a reference to fetch data from local storage	Numeric	5
MAXINDEX	Local storage maximum index of local storage date – required to calculate missing index	Numeric	96
LOAD	Local storage retrieval command & status	Numeric	0
POTP	Previous One Time Password	Numeric – 6/8 Digit	12345678
COTP	Current One Time Password, State SWPS Broker will update OTP at interval of 30/60 minutes	Numeric – 6/8 Digit	12345678

Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

MQTT JSON MESSAGE STRUCTURE

Message Format : Periodic Push - Pump Controller – Part I

Response Message		
Message	**Description**	**Requirement in JSON Format**
{		
"vd":1	Virtual Device Index/Group	Must Have
"timestamp":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group	Must Have
“maxindex”:96	maximum index of local storage date	Must Have
"index":7,	reference of local storage	Must Have
"load":0,	Local storage retrieval command & status	Must Have
"stinterval":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)	Must Have
"msgid":"",	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback	Must Have
"date":200518,	local storage date	Must Have
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU	Must Have
"ASN_11":"34123450",	Pump Controller Serial No.	Must Have
"POTP":"341234",	Previous One Time Password	Must Have
"COTP":"341234",	Current One Time Password	Must Have

Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

MQTT JSON MESSAGE STRUCTURE

Message Format : Periodic Push - Pump Controller – Part II

"PMAXFREQ1":"50.00",	Maximum Frequency	Good to Have
"PFREQLSP1":"50.00",	Lower Limit Frequency	Optional
"PFREQHSP1":"50.00",	Upper Limit Frequency	Optional
"PCNTRMODE1":"1",	Solar Pump Controller Control Mode Status	Optional
"PRUNST1":"2",	Solar Pump Controller Run Status	Must Have
"PREFFREQ1":"50.00",	Solar Pump Controller Reference Frequency	Optional
"POPFREQ1":"50.00",	Solar Pump Controller Output Frequency	Good to Have
"POPI1":"20.00",	Output Current	Must Have
"POPV1":"230.00",	Output Voltage	Must Have
"POPKW1":"45.00",	Output Active Power	Must Have
"PDC1V1":"550.00",	DC Input Voltage	Must Have
"PDC1I1":"50.00",	DC Current	Must Have
"PDCVOC1":"650.00",	DC Open Circuit Voltage	Optional
"PDKWH1":"35.00",	Today Generated Energy	Must Have
"PTOTKWH1":"120.00",	Cumulative Generated Energy	Must Have
"POPFLW1":"2.00",	Flow Speed	Good to Have
"POPDWD1":"120.00",	Daily Water Discharge	Must Have
"POPTOTWD1":"220.00",	Total Water Discharge	Must Have
"PMAXDCV1":"750.00",	Max DC Voltage	Good to Have
"PMAXDCI1":"40.00",	Max DC Current	Good to Have
"PMAXKW1":"650.00",	Max Output Active Power	Good to Have
"PMAXFLW1":"650.00",	Max Flow Speed	Good to Have
"PDHR1":"8.00",	Pump Day Run Hours	Must Have
"PTOTHR1":"8.00",	Pump Cumulative Run Hours	Must Have
}		

Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

MQTT JSON MESSAGE STRUCTURE

Message Format : Periodic Push - RMS Device Heartbeat - Part I

Response Message		
Message	**Description**	**Requirement in JSON Format**
{		
"vd":0	Virtual Device Index/Group	Must Have
"timestamp":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group	Must Have
“maxindex”:96	maximum index of local storage date	Must Have
"index":7,	reference of local storage	Must Have
"load":0,	Local storage retrieval command & status	Must Have
"stinterval":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)	Must Have
"msgid":"",	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback	Must Have
"date":200518,	local storage date	Must Have
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU	Must Have
"ASN_11":"34123450",	Pump Controller Serial No.	Must Have
"POTP":"341234",	Previous One Time Password	Must Have
"COTP":"341234",	Current One Time Password	Must Have

Unified Data Integration Architecture for Solar Energy Data Management (SEDM) Platform

MQTT JSON MESSAGE STRUCTURE

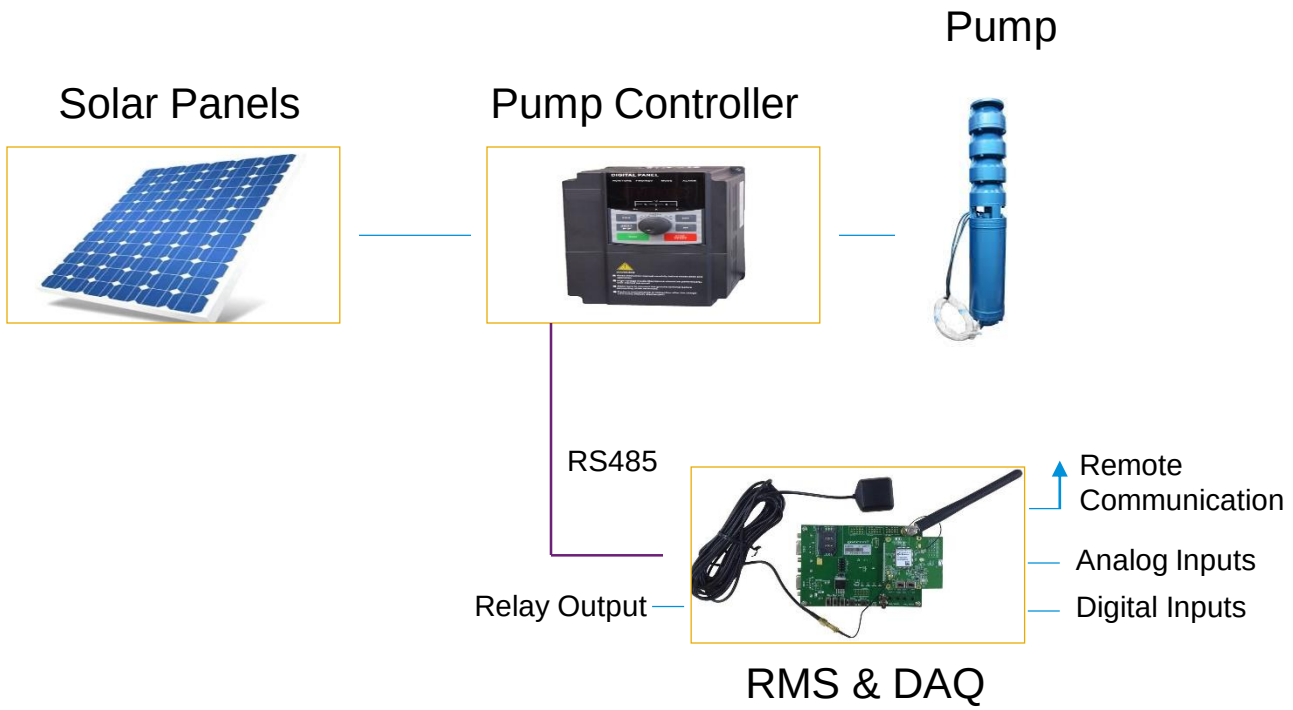
Message Format : Periodic Push - RMS Device Heartbeat – Part II

"gsm":1,	Device connected to GSM network	Optional
"sim":1,	SIM detected (1 - detected)	Optional
"net":1,	Device in Network (1 - in network)	Optional
"gprs":"1",	GPRS connected (1 - connected)	Optional
"rssi":22,	Signal Strength	Must Have
"sd":"1",	SD card detected (1 - detected)	Must Have
"online":1,	Device Online (1- Online)	Optional
“gps”:1,	GPS Module Status (1-ON,0-OFF)	Must Have
“gpsloc”:1,	GPS Location Locked	Must Have
“rf”:1,	WiFi/Bluetooth Module Status (1-ON,0-OFF)	Must Have
"rtcdate":180918,	RTC Date	Must Have
"rtctime":175800,	RTC Time	Must Have
“temp”:45.5,	Device Temperature	Optional
“lat”:19.06,	Latitude from gps	Must Have
“long”:72.8777,	Longitude from gps	Must Have
“simslot”:1,	Sim Slot (Current Sim Slot: 1 or 2)	Optional
“simchngcnt”:10,	Total Sim Slot Change Count	Optional
“flash”:1,	Device Flash Status 1: Detected 0: Error	Good to Have
“Battst”:0,	Battery Input Status: 1 if on battery power else 0	Good to Have
“vbatt”:5.0,	Battery Voltage	Good to Have
“Pst”:1	Power Supply (1-Mains, 2-Battery)	Good to Have
}		

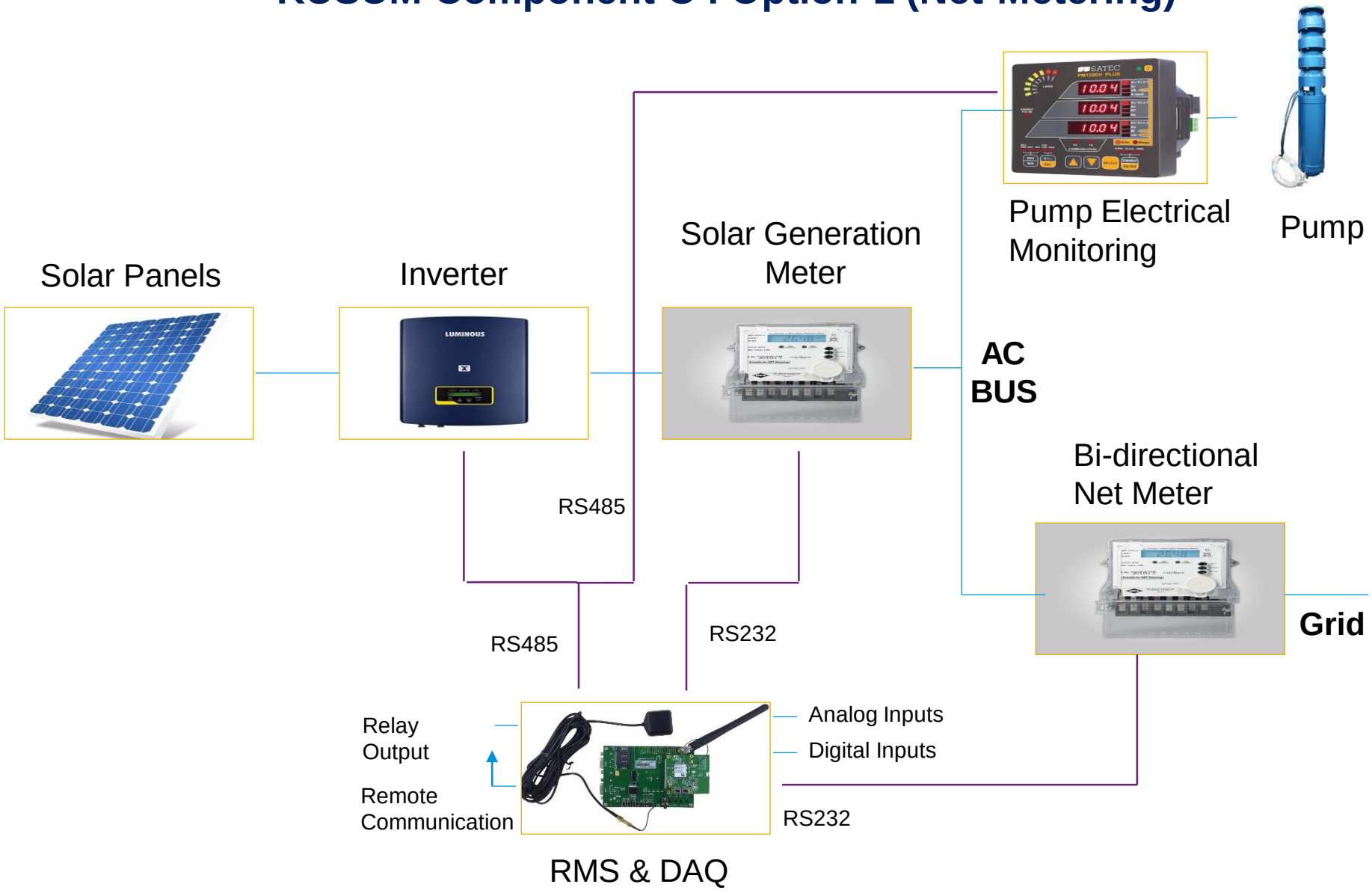
Annexure-2

System Components & Architecture

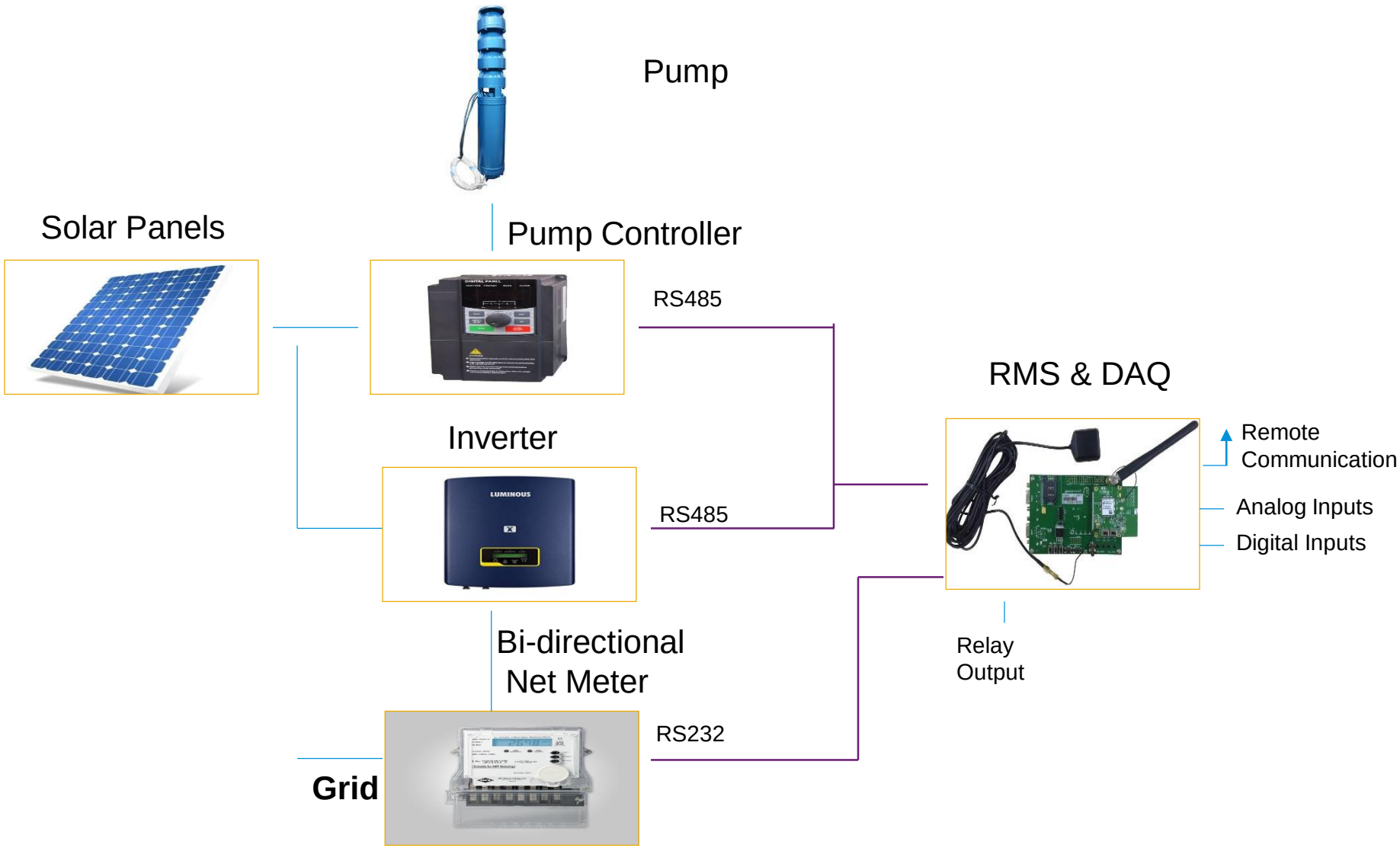
System Components & Architecture
KUSUM Component B



System Components & Architecture
KUSUM Component C : Option-1 (Net-Metering)



System Components & Architecture
KUSUM Component C : Option-2 (Pump to run on Solar Power Only)



System Components & Architecture
KUSUM Component C or A : Option-3 (Solarisation of Ag Feeder at SS Level)

Sub Station End
Solar Plant Performance & Feeder Availability Monitoring

String Combiner – n
DC – V, I, kW, kWh etc.

Inverter – n
DC – V, I, kW, kWh
AC – V, I, kW, kWh, kVARh, kVAh etc.

Solar Panels

String Combiner - 1

Inverter - 1

Generation Meter

415 V

11 kV

11 kV Feeder

RS485

RS485

Digital Inputs
Feeder Status
ON/OFF/TRIP

Remote Communication

Relay Output

Analog Inputs
Weather for %PR Irradiation, Temp, Wind Speed

RMS & DAQ

RS232 / RS485

Bi-directional Meter

11 kV BUS (SS)

Farmer End
Pump Performance & Energy Monitoring

Remote Communication

Relay Output

Farmer-1
New Smart Meter

RS232/
RS485

Remote Communication

Analog Inputs

Digital Inputs

Relay Outputs

Farmer-2
Existing Energy Meter with RMS & DAQ
(Similar to Stand Alone Solar Pumps)

Multiple Operational Modes to Save Energy

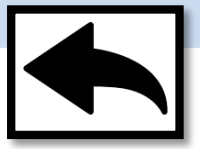
- Remote Operations
- Schedule Based Operations
- Sensor (Moisture) Based Operations

Annexure-3

List of Consumer Information for Beneficiary Tracking

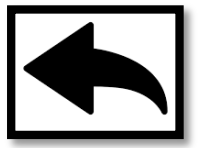
Application & Consumer Details

Field Name	Description	Sample Data
Application No	State Application No. Input value should be unique Application No.	123456789
Application Category	Farmer/Gaushala/Water User Association	Farmer
Aadhaar No	Should be Unique Aadhaar No	12345678902
Farmer Name	Farmer Name should be as per land registration Document.	CHAMPABEN PATEL
Father/Husband Name	Name of Applicants father/Husband	HARIBHAI PATEL
Gender	Male/Female/Transgender	Female
Email	Email Address for Communication	abc@gmail.com
Mobile No.	Should be Unique Mobile No for Aadhaar Authentication.	9876543210
FarmerType	GEN/SC/ST/OBC	SC
Implementation Agency	Name of the Implementing Agency DISCOM/PHED/Agriculture Department	GUVNL
Application Priority	Priority of Application	1,2,3



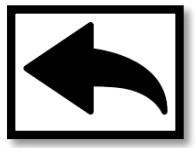
Agriculture Details

Field Name	Description	Sample Data
CropType_Y1	Previous Year Crop Type Rabi/Kharif/Zaid	Rabi
CropType_Y2	Last to Last Year Crop Type	Rabi
CropCount_Y1	No. of Crops in previous Year.	1
CropCount_Y2	No of Crops in last to last year.	1
Land Coverage	Value should be in Sq. Meter.	1250



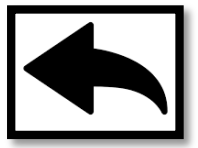
Irrigation Details

Field Name	Description	Sample Data
Water Depth Level	Value should be in Feet for surface - 0.	50
Irrigation Mode	Micro Irrigation/Open Irrigation/Irrigation with Pipe	Micro Irrigation
Micro Irrigation Mode	Drip / Sprinkler	
Existing Farm Pond	Existing Farm Pond Field : Yes/No/Under Construction	Yes
Source of Water	Source of Water : Bore, Well, Pond, River/Canal	Borewell
Quality Of Water	Fit for Irrigation / Not Fit for Irrigation	Fit for Irrigation
Size of Borewell	Size of Borewell in inches	10



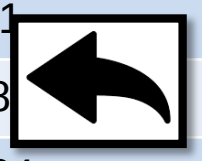
Bank Details

Field Name	Description	Sample Data
Bank Branch	Branch Name of the Bank where Bank Account of the Farmer is held	Sola Road
Bank Name	Name of Bank where Bank Account of the farmer is Held	State Bank of India
Bank Account No	Bank Account No of the Farmer	30222806989
Account Type	Savings / Current	Savings
IFSC Code	Unique Brach Code of the Bank	SBIN0000838
Account Holder Name	Farmer Name as per the records of the Bank	CHAMPABEN HARIBHAI PATEL



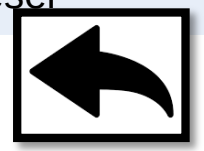
Contact & Location Details

Field Name	Description	Sample Data
Address	Should be Landmark/ house no. where farmer resides for communication	L.S NO.266/1
Town	Name of the Town/Village where farmer is residing.	SAMLOD
Taluka	Name of the Taluka of corresponding Town.	BHARUCH
District	Name of the District of corresponding Taluka.	BHARUCH
Assembly Constituency	Name of Assembly Constituency as per Voter Registration	BHARUCH
State	State Code for corresponding District.	GJ
Pincode	Pincode of farmer communication address	38061
Location_SurveyNo	Farm's Survey No. where Solar Pump is to be installed.	455/1
Location_Town	Name of the Town/Village of corresponding Survey No. Where Solar Pump is to be installed	SAMLOD
Location_Taluka	Name of the Taluka of corresponding Town.	BHARUCH
Location_District	Name of the District of corresponding Taluka.	BHARUCH
Location_State	State Code for corresponding District.	GJ
Location_PinCode	Pincode of Farm location	380061
Latitude	Latitude of the location where system is to be installed.	22.258
Longitude	Longitude of the location where system is to be installed.	71.1924



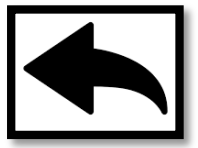
Pump Details

Field Name	Description	Sample Data
Is Existing Pump User	Is Farmer already using water Pump? Yes/No	Yes
Existing Pump Type	If Existing Pump User, then Pump Type : AC/DC	AC
Existing Pump SubType	Submersible/Surface	Surface
Existing Pump Capacity	Value of Existing pump capacity should be in HP.	3
Energy Efficient Pump	For Existing Pump, Yes/No	Yes
Required Pump Type	If Existing Pump User, then Pump Type : AC/DC	AC
Required Pump SubType	Submersible/Surface/BLDC	
Pump Category	Required Pump Category : Oil filled/ Water Filled	Oil Filled
Required Pump Capacity	Value should be in HP.	5
Annual Diesel Requirement	Value Input should be in liters, If existing diesel pump user, Only for Component B	985
Water Throughput required	Value should be in litres/Minute	50
Source of Power Existing Pump	Diesel/Electric	Diesel



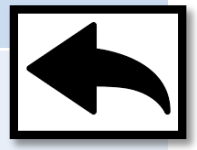
Solar Details

Field Name	Description	Sample Data
SPV Cap as per Norms	SPV Capacity as per Norms in KW-DC	10
SPV Cap Applied	Applied SPV Capacity Installed in KW-DC	10



Financial & Commercial Details

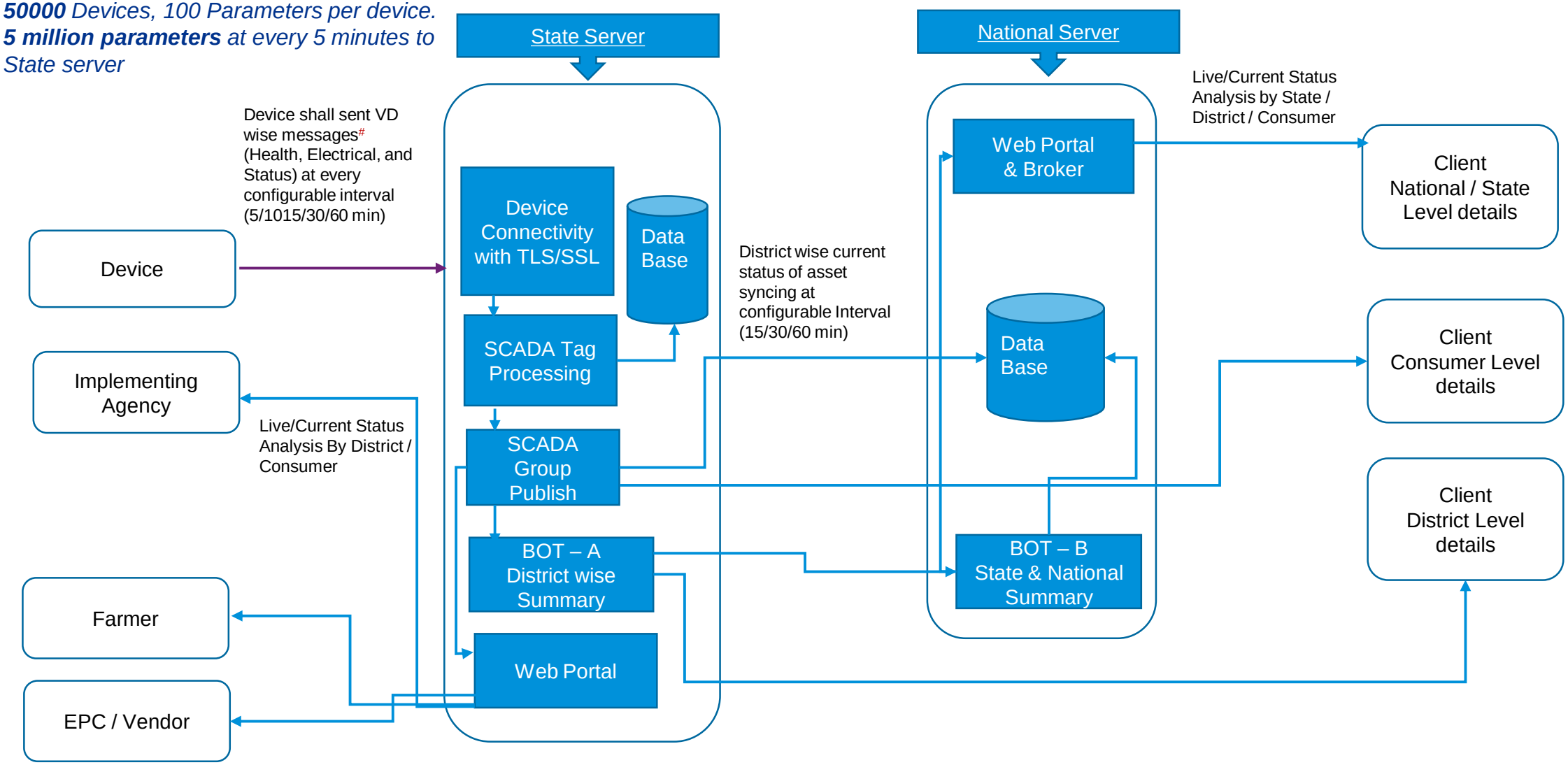
	Description	Sample Data
Installer	Installation Agency Name	XYZ PVT LTD
Solar Pump Cost	Cost of the Total System to be deployed	200000
Is USPC	USPC Purchased by Farmer ? Yes/No	No
USPC Cost	Cost of the USPC System in INR	0
Central Contribution	Value input should be in percentage (%).	20%
State Contribution	Value input should be in percentage (%).	20%
Farmer Contribution	Value input should be in percentage (%).	60%
FarmerLoan_institution	Name of the Institution from where Farmer has availed loan facility	NABARD
FarmerLoan_Amount	Loan amount of the farmer if availed. Number input should be in INR.	100000
LOA Date	LOA. Input date should be DD/MM/YYY	13/03/2020
PBG_Amount	Performance Bank Guarantee from Installer. Number input should be in INR.	50000
Scheduled Implementation Date	Scheduled Implementation Date. Input date should be DD/MM/YYY	13/03/2020



Annexure-4

Data Integration Between National and State Level Portal

***50000** Devices, 100 Parameters per device.*
***5 million parameters** at every 5 minutes to State server*



Live Monitoring Parameters	Solar Generation kW, Pump Load kW, Net Power kW, String Level DC Current, DC Voltage, Inverter DC /AC Voltage and Current, PF, Frequency etc.
	Grid Status, Pump Status, Inverter Status, Drive Status, Protection Status, Alarm Status, ICR/MCR Breaker Status, ICR/MCR Transformer Status
BOT-A Process **(Live Monitoring Parameters)**	Consumer wise summary, District wise summary, State summary Dash Board -1 with Google Map View : District / Division / Sub Division / Sub Station / Feeder / Inverter Control Room
BOT-B Process **(Live Monitoring Parameters)**	State wise summary, Nation summary Dash Board -1 with Google Map View : State/District / Division / Sub Division / Sub Station / Feeder / Inverter Control Room

BOT-A Process **(Performance Indicators)**	Consumer wise monthly summary, District wise daily summary, District wise monthly summary, state monthly summary. Dash Board : State / DISCOM / District / Division / Sub Division / Sub Station / Feeder / Inverter Control Room / Main Control Room Duration Filters : Current Week / Current Month / Last Week / Last Month / Individual Month / Between Dates Connectivity : % Device Connectivity / % Data Availability Energy : Energy Generated / Energy Import / Energy Export / Net Energy / Energy Consumed Solar Performance : % CUF / Per Day Per kW Generation / Individual Inverter Level Generation / Individual String Level Generation Running Hours : Grid Available / Three Phase Supply Available/Inverter Running Hours / Pump Running Hours / High Voltage Running Hours / Low PF Running Hours / String Level Generation Hours Irrigation Indicators : Total Water Output / % Day Time Pump Operation / Income Earned by Farmers in case of no Irrigation
BOT-B Process **(Performance Indicators)**	State Level monthly summary, Nation monthly summary Dash Board : National / State / DISCOM / District / Division / Sub Division / Sub Station / Feeder / Inverter Control Room / Main Control Room Duration Filters : Current Week / Current Month / Last Week / Last Month / Individual Month / Between Dates Connectivity : % Device Connectivity / % Data Availability Energy : Energy Generated / Energy Import / Energy Export / Net Energy / Energy Consumed Solar Performance : % CUF / Per Day Per kW Generation / Individual Inverter Level Generation / Individual String Level Generation Running Hours : Grid Available / Three Phase Supply Available/Inverter Running Hours / Pump Running Hours / High Voltage Running Hours / Low PF Running Hours / String Level Generation Hours Irrigation Indicators : Total Water Output / % Day Time Pump Operation / Income Earned by Farmers in case of no Irrigation

RMS Communication and Security Architecture- PM KUSUM SEDM Platform

Date: 14/07/2020

Contents

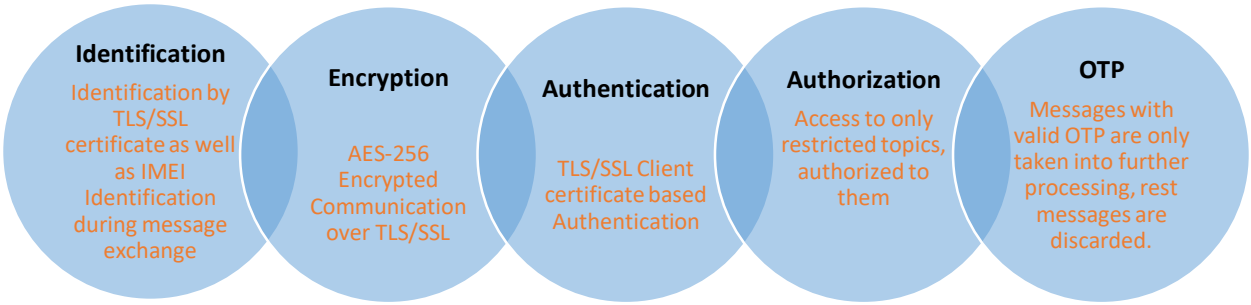
RMS Communication & Security Architecture

1. Security Architecture (with reference to EESL Tender Annexure 8 – clause 4.d)
2. RMS Registration (with reference to EESL Tender Annexure 8 – clause 4.d)
3. MQTT Topic Structure (with reference to EESL Tender Annexure 8 – clause 4.b,4.c)
4. MQTT Message Structure (with reference to EESL Tender Annexure 8 – clause 4.e,4.f)
5. Annexure: JSON Formats with parameter keywords, sample values and description
    a. Annexure: Pump Controller
    b. Annexure: Energy Meter
    c. Annexure: Inverter
    d. Annexure: String Combiner Box (SJB)
    e. Annexure: Heartbeat
    f. Annexure: DAQ

1. Security Architecture

This section highlights the communication security architecture between RMS/DCU and State SWPS IoT Platform. With this security, architecture, third parties are unable to intercept or "sniff" the encrypted data. This stops ISPs, employers, local network administrators and cybercriminals from being able to perform "packet sniffing" to access what the traffic contains. It also protects against man in the middle (MitM) attacks. This implements Private TLS/SSL VPN to ensure highest level of security.

In additional to this, use of OTP in every message exchange shall help restrict spammers and Bots. Such OTP based mechanism will provide transaction level security which is required for remote operations.



2. RMS Registration

This section details how individual RMS/DCU shall be registered and communicate securely with State SWPS IoT Platform.

- Every supplier/vendor must Register all unique IMEI (International Mobile Equipment Identity) of RMS/DCU with State SWPS
- State SWPS will generate individual client certificate for RMS/DCU against unique IMEI registered and share with supplier/vendor through secured web API interface.
- Every supplier/vendor shall be able to access web API with unique credentials shared with them.
- Web API shall return individual client certificate, Device Broker url and "info" topic.
- After installation of client certificate relevant to IMEI of RMS/DCU, RMS/DCU will connect to Device Broker and get authenticated using client certificate and further shall be able to receive additional configuration details such as FTP credential, Message Topic structure etc. after subscribing to default topic.
- After client certificate expiry, RMS will connect to FTP using available credentials and download the renewed certificate

3. MQTT Topic Structure

This section defines the different topic structure for communication between RMS/DCU and State SWPS through Device Broker.

RMS/DCU will publish and subscribe to their respective topics only, authorization of topic shall be done against unique credentials.

Application Version	Solution	IMEI	Message Type	Publish/Subscribe
IIOT-1	Standalonesolarpump	{IMEI}	Info	Subscribe
	Gridconnectedsolarpump		OTP	Subscribe
	SolarMW		Heartbeat	Publish
	Ongridrooftop		Data	Publish
	Offgridrooftop		Ondemand	Subscribe
			Config	Subscribe

Sample Topic structure for Stand-alone Solar Pump shall be: **IIOT-1/Standalonesolarpump/{IMEI}/info**

Multiple sub-topics will be formed for communication between RMS/DCU and sate SWPS IoT Platform

- **Info:** Default Topic To exchange RMS/DCU configuration details
- **OTP:** To exchange OTP at every interval of 15/30/60 minutes
- **Heartbeat:** To update RMS/DCU health indicators at frequent configurable intervals.
- **Data:** To exchange data related to RMS/DCU Monitoring parameters in "**push mode**"
    - Push data Periodically
    - Push data on Event/Notification
    - History Missing Data Push Mode: History data will be identified against **"index"**

- **Ondemand:** To exchange data between RMS/DCU and Server in "**Command on Demand**" Mode
    - Each "On Demand" message will have two transactions: Commands, Response.
    - On demand command and response will be tracked against a common **"MSGID".**
    - On demand message can be used to read and write with two command types
        - Command: **"Read"** - In json received from server replace each key with value from RMS/DCU and send the updated json back to server.
        - Command: **"Write"** - After executing the command based on key-value pair received in json, send the updated json back to server on successful execution.
        - Note: handshaking parameters such as msgid, etc has to send back to server as is, without modification
- **Config:** To update configurable parameters of Device, which is similar to Ondemand but will be used only for configurable parameters of Device, this implements "**Configuration over the air**"
        - Command: **"Read"** - In json received from server replace each key with value from RMS/DCU and send the updated json back to server.
        - Command: **"Write"** - After executing the command based on key-value pair received in json, send the updated json back to server on successful execution.
        - Note: handshaking parameters such as msgid, etc has to send back to server as is, without modification

4. Communication Modes

- **Push on Periodic Interval:** In this mode deployed RMS shall transmit data of Multiple devices and sensors on different configurable time intervals such as Inverter or pump controller data at every 5 minutes, Energy Meter data at every 15 minutes, String Combiner Box data at every 10 minutes
- **Push on Event:** RMS shall detect various configurable alarm or event conditions such as Pump On / Off Status, Inverter On/Off Status, Low Water Flow Rate, Fault or Trip status etc. and It shall transmit data immediately to the server
- **On Demand Read:** In this mode, User will send command to RMS to get data as and when required and RMS will send the required data to server immediately
- **On Demand Write:** In case of Remote Operations, Farmer / Consumer shall send On Demand Write Command to the RMS and RMS will send back the acknowledgement with change in parameters after operation is completed
- **Configuration read/write:** Using this mode, user will be able to read and change configurable parameters remotely such as updating periodic interval, alarm limits, server parameters etc.

5. Communication Protocols

- **Field Device Communication:** RMS to Field Devices communication such as Inverter, Pump Controller, Drive, String Combiner box, MFT/MFM, Data Acquisition System shall be established using **MODBUS RTU protocol** supported by all leading manufacturers globally

- **Energy Meter Communication:** RMS to Energy Meter communication such as Bi Directional (Revenue) Meter, Solar Generation (Audit) Meter shall be established using **DLMS/Modbus protocol** supported by all leading Meter Manufacturers in India
- **RMS to Server Communication - Industrial IoT MQTT Protocol:** RMS to Server Communication shall be established using MQTT protocol which is well accepted IoT protocol across the globe and supported by all leading IT as well as OT companies for Smart Grid, Smart RE and Smart City Applications

6. MQTT Message Structure

This section details message structure exchanged between RMS/DCU and state SWPS IoT Platform through Device Broker

keyword	Description	Sample Value
IMEI	Unique Identification of RMS/DCU – required to ensure registered source of data	863287049443888
VD	Virtual device/group – required for grouping parameters based on update interval/subsystems such as inverter/pump controller/meter/string combiner box etc.	2
MSGID	Message Transaction Id - required for "Ondemand"/"Config" message type, request/response/acknowledgement/feedback	123456789
COMMAND	Read/Write - Applicable only in case of "Ondemand"/"Config" message Type	Read
TIMESTAMP	RTC timestamp of RMS/DCU against all parameters of vd/group (YYYY-MM-DD HH:mm:SS)	2019-08-20 20:15:08
STINTERVAL	Periodic interval at which RMS shall store and transmit data to server. (in minutes)	15
DATE	local storage date – required as a reference to fetch data from local storage (YYYY-MM-DD)	2020-06-15
INDEX	Local storage Index – required as a reference to fetch data from local storage	5
MAXINDEX	Local storage maximum index of local storage date – required to calculate missing index	96
LOAD	Local storage retrieval command & status	0
POTP	Previous One Time Password	12345678
COTP	Current One Time Password, State SWPS Broker will update OTP at interval of 30/60 minutes	12345678
Parameter-1 **Parameter-2** **Parameter-3** **Parameter-1** **……..** **Parameter-n**	Equipment wise Keywords for multiple Parameters.	

Communication Format Annexure

Annexure – 1 (Revision-B) Pump Controller

Message Name	: Periodic Push Pump Controller (1)
Message Format	: JSON
Message Type	: Data
Message Command Flow	: Not Applicable for Data periodic Push
Message response Flow	: RMS -> State SWPS IoT Platform
Message Medium	: GPRS

Command Message	
Not Applicable	

Response Message		
Message	**Description**	**Unit**
{		
"VD":1	Virtual Device Index/Group	-
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group	-
“MAXINDEX”:96	maximum index of local storage date	-
"INDEX":7,	reference of local storage	-
"LOAD":0,	Local storage retrieval command & status	-
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)	-
"MSGID":"",	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback	-
"DATE":200518,	local storage date	YYMMDD
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU	-
"ASN_11":"34123450",	**Pump Controller Serial No.** RMS: 0 DAQ: 1-9 Pump Controller: 11-19 Meter: 21-29 Inverter: 31-39 String Combiner Box: 41-49	**-**
"POTP":"341234",	**Previous One Time Password**	**-**
"COTP":"341234",	**Current One Time Password**	**-**
"PMAXFREQ1":"50.00",	**Maximum Frequency**	**Hz**

"PFREQLSP1":"50.00",	**Lower Limit Frequency**	**Hz**
"PFREQHSP1":"50.00",	**Upper Limit Frequency**	**Hz**
"PCNTRMODE1":"1", 0 – Variable Frequency Control Mode 1 – CVT Mode for Solar 2 – MPPT mode for Solar	**Solar Pump Controller Control Mode Status**	**-**
"PRUNST1":"2", 0 – Stop 1 – Running 2 – Sleep 3 – Low Speed Protection 4 – Dry Run Protection 5 – Over Current Protection 6 – Minimum Power Protection	**Solar Pump Controller Run Status**	**-**
"PREFFREQ1":"50.00",	**Solar Pump Controller Reference Frequency**	**Hz**
"POPFREQ1":"50.00",	**Solar Pump Controller Output Frequency**	**Hz**
"POPI1":"20.00",	**Output Current**	**A**
"POPV1":"230.00",	**Output Voltage**	**V**
"POPKW1":"45.00",	**Output Active Power**	**KW**
"PDC1V1":"550.00",	**DC Input Voltage**	**DC V**
"PDC1I1":"50.00",	**DC Current**	**DC I**
"PDCVOC1":"650.00",	**DC Open Circuit Voltage**	**DC V**
"PDKWH1":"35.00",	**Today Generated Energy**	**KWH**
"PTOTKWH1":"120.00",	**Cumulative Generated Energy**	**KWH**
"POPFLW1":"2.00",	**Flow Speed**	**LPM**
"POPDWD1":"120.00",	**Daily Water Discharge**	**Litres**
"POPTOTWD1":"220.00",	**Total Water Discharge**	**Litres**
"PMAXDCV1":"750.00",	**Max DC Voltage**	**DC V**
"PMAXDCI1":"40.00",	**Max DC Current**	**DC I**
"PMAXKW1":"650.00",	**Max Output Active Power**	**DC KW**
"PMAXFLW1":"650.00",	**Max Flow Speed**	**LPM**
"PDHR1":"8.00",	**Pump Day Run Hours**	**Hrs**
"PTOTHR1":"8.00",	**Pump Cumulative Run Hours**	**Hrs**
}		

Reaction	
Not Applicable	

Communication Format Annexure

Annexure - 2 Energy Meter

Message Name : Periodic Push Meter (1)
Message Format : JSON
Message Type : Data
Message Command Flow : Not Applicable for Data periodic Push
Message response Flow : RMS -> State SWPS IoT Platform
Message Medium : GPRS

Command Message	
Not Applicable	

Response Message	
Message	**Description**
{	
"VD":2	Virtual Device Index/Group
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group
“MAXINDEX”:96	maximum index of local storage date
"INDEX":7,	reference of local storage
"LOAD":0,	Local storage retrieval command & status
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)
"MSGID":"",	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback
"DATE":200518,	local storage date

"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU
"ASN_21":12345678,	Asset Serial Number RMS: 0 DAQ: 1-9 Pump Controller: 11-19 Meter: 21-29 Inverter: 31-39 String Combiner Box: 41-49
"MTDET1":30012302,	Meter Detail
"POTP":"34123450",	**Previous One Time Password**
"COTP":"34123450",	**Current One Time Password**
"MTBLDATE1":18,	Billing Date for meter 1
"DATE1":180606,	Present date for meter1
"TIME1":105400,	Present time for meter1
"IR1":20.58,	R Phase Current in Amps
"IY1":20.65,	Y Phase Current in Amps
"IB1":20.12,	B Phase Current in Amps
"VRN1":240.12,	R Phase to Neutral Voltage in Volts
"VYN1":242.13,	Y Phase to Neutral Voltage in Volts
"VBN1":243.55,	B Phase to Neutral Voltage in Volts
"VRY1":420.18,	Phase to Phase Voltage(R-Y) in Volts
"VYB1":419.38,	Phase to Phase Voltage(Y-B) in Volts
"VBR1": 421.5,	Phase to Phase Voltage(B-R) in Volts
"PFR1":0.98,	R Phase Power Factor
"PFY1":0.97,	Y Phase Power Factor
"PFB1":0.96,	B Phase Power Factor
"FRQ1":50.05,	Grid Frequency
"POWR1":42.578,	R Phase Active Power in KW
"POWY1":42.156,	Y Phase Active Power in KW
"POWB1":42.354,	B Phase Active Power in KW
"POW1":42.185,	Total Active Power in KW
"RPOWR1":22.123,	R Phase Reactive Power in KVAR
"RPOWY1":20.110,	Y Phase Reactive Power in KVAR
"RPOWB1":22.310,	B Phase Reactive Power in KVAR
"RPOW1":65.610,	Total Reactive Power in KVAR
"APOWR1":55.610,	R Phase Apparent Power in KVA
"APOWY1":52.910,	Y Phase Apparent Power in KVA
"APOWB1":53.911,	B Phase Apparent Power in KVA
"APOW1":14.198,	Total Apparent Power in KVA
"KWHNET1":98561.4,	Cumulative Net Energy in KWH
"KWHIMP1":98561.4,	Cumulative Import Energy in KWH
"KWHEXP1":98561.2,	Cumulative Export Energy in KWH
"KVAHNET1":99100.3,	Cumulative Net Energy in KVAH
"KVAHIMP1":99105.1,	Cumulative Import Energy in KWH
"KVAHEXP1":98999.1,	Cumulative Export Energy in KWH
"MDKWIMP1":100.3,	Rising Demand (Import) in KW
"MDKWEXP1":98.6,	Rising Demand (Export) in KW

"POFF1":1020,	Grid Power Failure in Minutes
"TC1":100,	Total Tamper Counts
"PF1":0.99,	Average PF
"LBKWHNET1":98561,	Last Billing Cycle Net Energy in KWH
"LBKWHIMP1":98561,	Last Billing Cycle Import Energy in KWH
"LBKWHEXP1":98561,	Last Billing Cycle Export Energy in KWH
"PMDKVAIMP1":22.50,	Present MD KVA Import
"PMDKVAEXP1":0.00,	Present MD KVA Import
"LBMDKWIMP1":7.07,	Last Billing MD KW Import
"LBMDKWEXP1":0.00,	Last Billing MD KW Export
"LBMDKVAIMP1":7.07,	Last Billing MD KVA Import
"LBMDKVAEXP1":0.00,	Last Billing MD KVA Export
"MDRSTC1":4	MD Reset Count
}	

Reaction	
Not Applicable	

Communication Format Annexure

Annexure – 3 Inverter

Message Name : Inverter Periodic Push (INVERTER-1)
Message Format : JSON
Message Type : Data
Message Command Flow : Not Applicable for Data periodic Push
Message response Flow : RMS -> State SWPS IoT Platform
Message Medium : GPRS

Command Message	
Not Applicable	

Response Message	
Message	**Description**
{	
"VD":5	Virtual Device Index/Group
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group
“MAXINDEX”:96	maximum index of local storage date
"INDEX":7,	reference of local storage
"LOAD":0,	Local storage retrieval command & status
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)
"MSGID":"",	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback
"DATE":200518,	local storage date
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU
"ASN_31":"34123450",	**Inverter Serial No.**

	<table><tr><td>RMS</td><td>0</td></tr><tr><td>DAQ</td><td>1-9</td></tr><tr><td>Pump Controller</td><td>11-19</td></tr><tr><td>Meter</td><td>21-29</td></tr><tr><td>Inverter</td><td>31-39</td></tr><tr><td>String Combiner Box</td><td>41-49</td></tr></table>
"POTP":"34123450",	**Previous One Time Password**
"COTP":"34123450",	**Current One Time Password**
"IST1":1,	**Inverter Status**
"IFREQ1":40,	**Frequency**
"IPF1":0.8,	**Power Factor**
"IDC1V1":500,	**DC-1 Voltage**
"IDC1I1":200,	**DC-1 Current**
"IDC1KW1":200,	**DC-1 Power**
"IDC2V1":243.55,	**DC-2 Voltage**
"IDC2I1":420.18,	**DC-2 Current**
"IDC2KW1":200,	**DC-2 Power**
"IDC3V1":419.38,	**DC-3 Voltage**
"IDC3I1":421.8,	**DC-3 Current**
"IDC3KW1":200,	**DC-3 Power**
"IDC4V1":0.98,	**DC-4 Voltage**
"IDC4I1":0.97,	**DC-4 Current**
"IDC4KW1":200,	**DC-4 Power**
"IRPHV1":0.96,	**R phase voltage**
"IRPHI1":50.05,	**R phase current**
"IRPHKW1":50.05,	**R phase Active Power**
"IYPHV1":42.578,	**Y phase voltage**
"IYPHI1":42.156,	**Y phase current**
"IYPHKW1":50.05,	**Y phase Active Power**
"IBPHV1":42.354,	**B phase voltage**
"IBPHI1":42.185,	**B phase current**
"IBPHKW1":50.05,	**B phase Active Power**
"IKW1":22.123,	**Active Power**
"ITKWH1":20.110,	**Today Generated Energy**
"ITON1":22.310,	**Today On Time of Inverter**
"ILKWH1":65.610,	**Life time Generated Energy**
"ILON1":55.610,	**Life time running hours**
"ITEMP1":52.910,	**Inverter Temperature**
"IFT11":53.911,	**Fault-1**
"IFT21":14.198,	**Fault-2**
"IFT31":98561.4,	**Fault-3**
"IFT41":98561.4,	**Fault-4**
"IFT51":98561.2,	**Fault-5**
"IKVA1":99100.3,	**Apparent power**
"IKVAR1":99105.1	**Reactive power**
}	

Reaction	
Not Applicable	

Communication Format Annexure

Annexure - 4 String Combiner Box

Message Name : Periodic Push String Combiner Box
Message Format : JSON
Message Type : Data
Message Command Flow : Not Applicable for Data periodic Push
Message response Flow : RMS -> State SWPS IoT Platform
Message Medium : GPRS

Command Message	
Not Applicable	

Response Message	
Message	**Description**
{	
"VD":9	Virtual Device Index/Group
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group
“MAXINDEX”:96	maximum index of local storage date
"INDEX":7,	reference of local storage
"LOAD":0,	Local storage retrieval command & status
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)
"MSGID":"",	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback
"DATE":200518,	local storage date
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU
"ASN_41":"34123450",	**SJB Serial no** RMS: 0 DAQ: 1-9

	Pump Controller 11-19 Meter 21-29 Inverter 31-39 String Combiner Box 41-49
"POTP":"34123450",	**Previous One Time Password**
"COTP":"34123450",	**Current One Time Password**
"SI11":"3.00",	**SJB1, Channel1 Current**
"SI21":"5.00",	**SJB1, Channel2 Current**
"SI31":"5.00",	**SJB1, Channel3 Current**
"SI41":"5.00",	**SJB1, Channel4 Current**
"SI51":"5.00",	**SJB1, Channel5 Current**
"SI61":"5.00",	**SJB1, Channel6 Current**
"SI71":"5.00",	**SJB1, Channel7 Current**
"SI81":"5.00",	**SJB1, Channel8 Current**
"SI91":"5.00",	**SJB1, Channel9 Current**
"SI101":"5.00",	**SJB1, Channel10 Current**
"SI111":"5.00",	**SJB1, Channel11 Current**
"SI121":"5.00",	**SJB1, Channel12 Current**
"SI131":"5.00",	**SJB1, Channel13 Current**
"SI141":"5.00",	**SJB1, Channel14 Current**
"SI151":"5.00",	**SJB1, Channel15 Current**
"SI161":"5.00",	**SJB1, Channel16 Current**
"SI171":"5.00",	**SJB1, Channel17 Current**
"SI181":"5.00",	**SJB1, Channel18 Current**
"SI191":"5.00",	**SJB1, Channel19 Current**
"SI201":"5.00",	**SJB1, Channel20 Current**
"SI211":"5.00",	**SJB1, Channel21 Current**
"SI221":"5.00",	**SJB1, Channel22 Current**
"SI231":"5.00",	**SJB1, Channel23 Current**
"SI241":"5.00",	**SJB1, Channel24 Current**
"SDCV1":"635.00",	**SJB1, DC Voltage**
"SDCTOTI1":"40.00",	**SJB1, Total DC Current**
"SDCTOTKW1":"28.00",	**SJB1, Total DC Power**
"SDI11":"1.00",	**SJB1, Digital Input1**
"SDI21":"1.00",	**SJB1, Digital Input2**
"ST11":"1.00",	**SJB1, Temperature1**
"ST21":"1.00",	**SJB1, Temperature2**
"ST31":"1.00"	**SJB1, Temperature3**
}	

Reaction	
Not Applicable	

Communication Format Annexure

Annexure – 5 RMS

Message Name : RMS
Message Format : JSON
Message Type : Heartbeat
Message Command Flow : Not Applicable
Message response Flow : RMS -> State SWPS IoT Platform
Message Medium : GPRS

Command Message	
Not Applicable	

Response Message	
Message	**Description**
{	
"VD":0	Virtual Device Index/Group
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group
“MAXINDEX”:96	maximum index of local storage date
"INDEX":7,	reference of local storage
"LOAD":0,	Local storage retrieval command & status
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)
"MSGID":"",	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback
"DATE":200518,	local storage date
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU
"POTP":"341234",	**Previous One Time Password**
"COTP":"341234",	**Current One Time Password**
"GSM":1,	Device connected to GSM network
"SIM":1,	SIM detected (1 - detected)
"NET":1,	Device in Network (1 - in network)
"GPRS":"1",	GPRS connected (1 - connected)

"RSSI":22,	Signal Strength
"SD":"1",	SD card detected (1 - detected)
"ONLINE":1,	Device Online (1- Online)
“GPS”:1,	GPS Module Status (1-ON,0-OFF)
“GPSLOC”:1,	GPS Location Locked
“RF”:1,	RF Module Status (1-ON,0-OFF)
"RTCDATE":180918,	RTC Date
"RTCTIME":175800,	RTC Time
“TEMP”:45.5,	Device Temperature
“LAT”:19.06,	Latitude from gps
“LONG”:72.8777,	Longitude from gps
“SIMSLOT”:1,	Sim Slot (Current Sim Slot: 1 or 2)
“SIMCHNGCNT”:10,	Total Sim Slot Change Count
“FLASH”:1,	Device Flash Status 1: Detected 0: Error
“BATTST”:0,	Battery Input Status: 1 if on battery power else 0
“VBATT”:5.0,	Battery Voltage
“PST”:1	Power Supply (1-Mains, 2-Battery)
}	

Reaction	
Not Applicable	

Communication Format Annexure

Annexure – 6 DAQ System

Message Name : Periodic Push DAQ System
Message Format : JSON
Message Type : Data
Message Command Flow : Not Applicable for Data periodic Push
Message response Flow : RMS -> State SWPS IoT Platform
Message Medium : GPRS

Command Message	
Not Applicable	

Response Message	
Message	**Description**
{	
"VD":12	Virtual Device Index/Group
"TIMESTAMP":"2020-05-18 17:58:00",	RTC timestamp of RMS/DCU against all parameters of vd/group
“MAXINDEX”:96	maximum index of local storage date
"INDEX":7,	reference of local storage
"LOAD":0,	Local storage retrieval command & status
"STINTERVAL":15,	Periodic interval at which RMS shall store and transmit data to server. (in minutes)
"MSGID":"",	Message Transaction Id - required for “Ondemand”/”Config” message type, request/response/acknowledgement/feedback
"DATE":200518,	local storage date
"IMEI":"1234561234561234",	IMEI No. of First Sim to be considered always for unique identity of DCU
"POTP":"34123450",	**Previous One Time Password**
"COTP":"34123450",	**Current One Time Password**
“AI11”:45.5,	Analog Input – 1
“AI21”:45.5,	Analog Input – 2
“AI31”:45.5,	Analog Input – 3
“AI41”:45.5,	Analog Input – 4

“DI11”:1,	Digital Input – 1
“DI21”:0,	Digital Input – 2
“DI31”:1,	Digital Input – 3
“DI41”:0,	Digital Input – 4
“DO11”:1,	Digital Output – 1
“DO21”:1,	Digital Output – 2
“DO31”:1,	Digital Output – 3
“DO41”:1	Digital Output – 4
}	

Reaction	
Not Applicable	

Annexure - 7

Message Name : On Demand Read/Write Parameter/Keyword
Message Format : JSON
Message Type : Config
Message Command Flow : Cloud Server-> RMS
Message Response Flow : RMS -> Cloud Server
Message Medium : GPRS

Command Message	
Message	**Description**
{	
"timestamp":"2018-09-18 17:58:00",	
"type": "config",	
"cmd":"write",	To write config
"msgid":"130",	Server Auto Generated
"APN1": "www"	APN Value for sim1
"USR1": "string"	sim1 user name
"PASS1": "string"	sim1 password
"APN2": "Internet"	APN Value for sim2
"USR2": "string"	Sim2 user name
"PASS2": "string"	Sim2 password
"RESTART":1	To restart DCU, 1 : Execute command
"UPDATEINTERVAL":15	Enter update interval in mins.
"HEARTINTERVAL":5	Heartbeat Update Interval in mins
"URTCDATE":200622	DCU RTC Date (YYMMDD) Update
"URTCTIME":220312	DCU RTC Time (HH:MM:SS) Update - 24 hour format
"UPDATERTC":1	Update RTC, 1: Execute command, 0 : Successful execution
"GSMSYNC":1	RTC auto GSM synchronization, 1: to execute command
"DO1":1	Pump Remote ON/OFF Operation (1-ON, 0-OFF)
"AI1ZERO":1	Engineering Zero Value (4 mA dc) for AI1 E.G. 0(LPM)
"AI1SPAN":100	Engineering Span Value (20 mA dc) for AI1 E.G. 5000(LPM)
"AI2ZERO":1	Engineering Zero Value (4 mA dc) for AI2

"AI2SPAN":100	Engineering Span Value (20 mA dc) for AI2
"AI3ZERO":1	Engineering Zero Value (4 mA dc) for AI3
"AI3SPAN":100	Engineering Span Value (20 mA dc) for AI3
"AI4ZERO":1	Engineering Zero Value (4 mA dc) for AI4
"AI4SPAN":100	Engineering Span Value (20 mA dc) for AI4
"URL":"rms1.kusumiiot.co"	URL of Broker Server
"PORT":8883	Port of Broker Server
"CID":"d:860906045525646$standalonesolarpump$27"	Unique Client id of device
"USERNAME":"860906045525646$standalonesolarpump$27"	Username for device authentication
"PASSWORD":"9e0baa73"	Password for device authentication
"FTPURL": "rms1.kusumiiot.co"	URL for FTP
"FTPUSER":"866191037709301"	Username for FTP
"FTPPASS":"908552f"	Password for FTP
"FTPPORT":22	Port for FTP
"FTPDOWN":1	Download Certificates from ftp 1: To execute command, 0: Command is successfully executed
}	

Response Message	
Message	**Description**
{	
"timestamp":"2018-09-18 17:58:00",	
"type": "config",	
"cmd":"write",	To write config
"msgid":"130",	Server Auto Generated
"APN1": "www"	APN Value for sim1
"USR1": "string"	sim1 user name
"PASS1": "string"	sim1 password
"APN2": "Internet"	APN Value for sim2
"USR2": "string"	Sim2 user name
"PASS2": "string"	Sim2 password
"RESTART":1	To restart DCU, 1 : Execute command
"UPDATEINTERVAL":15	Enter update interval in mins.
"HEARTINTERVAL":5	Heartbeat Update Interval in mins

"URTCDATE":200622	DCU RTC Date (YYMMDD) Update
"URTCTIME":220312	DCU RTC Time (HH:MM:SS) Update - 24 hour format
"UPDATERTC":1	Update RTC, 1: Execute command, 0 : Successful execution
"GSMSYNC":1	RTC auto GSM synchronization, 1: to execute command
"DO1":1	Pump Remote ON/OFF Operation (1-ON, 0-OFF)
"AI1ZERO":1	Engineering Zero Value (4 mA dc) for AI1 E.G. 0(LPM)
"AI1SPAN":100	Engineering Span Value (20 mA dc) for AI1 E.G. 5000(LPM)
"AI2ZERO":1	Engineering Zero Value (4 mA dc) for AI2
"AI2SPAN":100	Engineering Span Value (20 mA dc) for AI2
"AI3ZERO":1	Engineering Zero Value (4 mA dc) for AI3
"AI3SPAN":100	Engineering Span Value (20 mA dc) for AI3
"AI4ZERO":1	Engineering Zero Value (4 mA dc) for AI4
"AI4SPAN":100	Engineering Span Value (20 mA dc) for AI4
"URL":"rms1.kusumiiot.co"	URL of Broker Server
"PORT":8883	Port of Broker Server
"CID":"d:860906045525646$standalonesolarpump$27"	Unique Client id of device
"USERNAME":"860906045525646$standalonesolarpump$27"	Username for device authentication
"PASSWORD":"9e0baa73"	Password for device authentication
"FTPURL": "rms1.kusumiiot.co"	Url for FTP
"FTPUSER":"866191037709301"	Username for FTP
"FTPPASS":"908552f"	Password for FTP
"FTPPORT":22	Port for FTP
"FTPDOWN":1	Download Certificates from ftp 1: To execute command, 0: Command is successfully executed
}	

Command Message	
Command – B. In case, if some key in command are invalid	
Message	**Description**
{	
"timestamp":"2018-09-18 17:58:00",	
"type":"config",	
"cmd":"write",	to write config
"msgid":"130,	server auto generated
"APNN1": 2	send value "2"
"USR1": "xyz"	send value "xyz"
}	

Response Message	
Message	**Description**
{	
"timestamp":"2018-09-18 17:58:00",	
"type": "config",	
"cmd":"write",	to write config
"msgid":"130",	server auto generated
"APNN1": 0	invalid Key, value will be returned '0'
"USR1": "xyz"	actual value received
}	

Reaction	
Not Applicable	

PSR PROGRAMME | Supporting Structural Reforms in the Indian Power Sector

Specifications for Remote Monitoring System- PM KUSUM Component A, C

Supporting Structural Reforms in the Indian Power Sector

Date: 15/07/2020

Disclaimer

- This report has been prepared on the basis set out in KPMG's contract for 'Service Provider for Supporting Structural Reforms in the Indian Power Sector' with the Secretary of State for International Development at the Department for International Development ("the Client").
- Nothing in this report constitutes a valuation or legal advice.
- KPMG has not verified the reliability or accuracy of any information obtained in the course of its work, other than in the limited circumstances set out in the Services Contract.
- In connection with the report or any part thereof, KPMG does not owe duty of care (whether in contract or in tort or under statute or otherwise) to any person or party to whom the report is circulated to and KPMG shall not be liable to any party who uses or relies on this report. KPMG thus disclaims all responsibility or liability for any costs, damages, losses, liabilities, expenses incurred by such third party arising out of or in connection with the report or any part thereof.

Contents

Specifications for Remote Monitoring System – Grid Connected Solar Pumps

1. State Implementing Agency (SIA) will have a common SWPS (Solar Water Pumping System) Management platform for monitoring of operation and performance of SWPS installed under PM KUSUM Scheme.
2. Remote Monitoring System (RMS) of SWPS should have following minimum features or modules
    a. Solar System Performance: DC Voltage, DC current, AC output Current, Power, Energy, Inverter Status, Drive Frequency etc.
    b. Pump Performance and Protections: Parameters such as Running Hours, Water Discharge (Output), Voltage, Current, Power, Energy of pump as well as protections required for “On Grid Systems” such as Over Voltage, Under Voltage, Voltage Un Balance, Overload, Short Circuit, Earth Leakage protection etc.
    c. Net Metering:
        i. As per CEA guidelines, on grid solar plant will require minimum Two energy meters mainly:
            - Bi-Directional Grid Interface Meter
            - Solar Generation Audit Meter.
        ii. Remote Monitoring System should have provision to integrate both energy meters on DLMS communication protocol on RS232 ports
        iii. Important electrical parameters of Bi-Directional Grid Interface Meter such as Imported Energy, Exported Energy, Net Energy, Solar Generation Energy, Voltage, Power (Import or Export)
        iv. Important electrical parameters of Solar Generation such as Voltage, Current, PF, Power, Energy etc.
    d. Billing Data Management: Remote Monitoring System should provide Billing parameters from Bi-Directional Grid Interface meter required by DISCOMS
    e. RMS Performance: %Device Connectivity, %Data Availability etc.
    f. Events and Notifications: Faults related to Pump Operation, Solar generation, inverter fault, Controller/Drive faults like overload, dry run, short circuit etc.
    g. Consumer Management: Name, Agriculture details, Service No, Contact Details etc.
    h. Asset Management: Ratings, Serial Number, Make, Model Number of Pump, Panel and Controller, IMEI number (of communication module) and ICCID (of SIM) etc.
    i. Complaint and Ticket Management
    j. Consumer Mobile Application: Generation, Running Hours, Water Discharge, Complaint logging, etc.
3. Remote Monitoring System (RMS) provided by all bidders should connect to State Level Solar Energy Data Management platform, which will have interface with National level Solar Energy Data Management platform.
4. Communication Architecture between SWPS and RMS should be as per following:
    a. **Communication Connectivity:**
        i. **Field Device Connectivity:** Communication between RMS and Pump Controller / Inverter should be on RS485 MODBUS RTU protocol to ensure interoperability irrespective of make and manufacturer
        ii. **Remote Connectivity:** RMS of SWPS should be using GSM/GPRS/2G/3G/4G cellular connectivity

iii. **Local Connectivity:** Ethernet/Bluetooth/Wi-Fi connectivity to configure parameters, notifications, communication interval, set points etc. or to retrieve locally stored data
iv. **Sensor Connectivity:** RMS should have provision for at least four Analog inputs with 0.1% accuracy to address the requirement of local sensors connectivity if required by SIA/Consumer for applications such as irradiation, flow meter for water discharge, moisture sensor for micro irrigation etc. and four digital inputs.
v. RMS should have provision of relay or contactors of suitable ratings for remote pump operations with multiple modes such as farmer mobile app based operations / configurable schedule based operations / sensor based operations

b. **Communication Modes:**
   i. Push Data on Event/Notification: such as pump on, pump off, protection operated etc.
   ii. Push Data Periodically: important parameters of solar pump (as mentioned in tender) should be pushed to central server on configurable interval. Interval should be configurable in multiple of 1 minute.
   iii. Command On Demand: It should be possible to send commands via GSM or GPRS to RMS either to control pump operations or to update configuration
c. **Communication Protocol:**
   i. RMS should provide data on MQTT Protocol to establish communication with thousands of systems.
d. **Security:**
   i. Communication between RMS and Server should be secured and encrypted using TLS/SSL/X.509 certificate etc.
   ii. As a part of IoT protocol, Authentication and Authorization should be implemented using token/password mechanism
e. **Message Format:**
   i. RMS should provide data in a JSON message format as required by respective SNA
f. **Data Storage:**
   i. In case of unavailability of cellular network, RMS should store data locally and on availability of network it should push data to central server. Local data storage should be possible for at least one year in case of unavailability of cellular network.
g. **Configuration Update Over-The-Air:** Configuration update over the air of multiple parameters such as IP, APN, Data Logging Interval, Set Points etc. is essential.

5. EMI/EMC Certifications:

1	Surge Immunity Test (IEC 61000-4-5)	A
2	Electrical Fast Transient (IEC 61000-4-4)	A
3	Electrostatic Discharge (IEC 61000-4-2)	A
4	Radiated Electromagnetic Field Test (IEC 61000-4-3)	A

5	Power Frequency Magnetic Field (IEC 61000-4-8)	A
6	Conducted Disturbances induced by radio frequency (IEC 61000-4-6)	A
7	Voltage Dips, short interruptions (IEC 61000-4-11)	A
8	Dry Heat test (IEC 60068-2-2), continuous operations @ 55 deg. C	O
9	Damped Heat Test (IEC 60068-2-78), @ 95% RH and 40 deg. C	O

Note: Passing Criteria

A: Temporary degradation or loss of function or performance which is self-recoverable

O: Normal performance within the specified limits

Specifications for Remote Monitoring System – Decentralised Gird Connected Solar Plants

1. State Implementing Agency (SIA) will have a common SWPS (Solar Water Pumping System) Management platform for monitoring of operation and performance of SWPS and decentralised solar plants installed under PM KUSUM Scheme.
2. Remote Monitoring System (RMS) of SWPS should have following minimum features or modules
    a. Solar System Performance: DC Voltage, DC current, AC output Current, Power, Energy, Status of Inverter & String Combiner Box etc.
    b. Net Metering:
        i. As per CEA guidelines, grid connected solar plant will require minimum Two energy meters mainly:
            - Bi-Directional Grid Interface Meter
            - Solar Generation Audit Meter.
        ii. Remote Monitoring System should have provision to integrate both energy meters on DLMS communication protocol on RS232 ports
        iii. Important electrical parameters of Bi-Directional Grid Interface Meter such as Imported Energy, Exported Energy, Net Energy, Solar Generation Energy, Voltage, Power (Import or Export)
        iv. Important electrical parameters of Solar Generation such as Voltage, Current, PF, Power, Energy etc.
    c. Billing Data Management: Remote Monitoring System should provide Billing parameters from Bi-Directional Grid Interface meter required by DISCOMS
    d. RMS Performance: %Device Connectivity, %Data Availability etc.
    e. Events and Notifications: Faults related to solar generation, inverter fault/alarms, Breaker status change such as on/off/trip etc.
    f. Asset Management: Ratings, Serial Number, Make, Model Number of Inverter, String combiner Box, IMEI number (of communication module) and ICCID (of SIM) etc.
    g. Complaint and Ticket Management
3. Remote Monitoring System (RMS) provided by all bidders should connect to State Level Solar Energy Data Management platform, which will have interface with National level Solar Energy Data Management platform.
4. Communication Architecture between SWPS and RMS should be as per following:
    a. Communication Connectivity:
        i. **Field Device Connectivity:** Communication between RMS and Inverter / String Combiner Box should be on RS485 MODBUS RTU protocol to ensure interoperability irrespective of make and manufacturer
        ii. **Remote Connectivity:** RMS of SWPS should be using GSM/GPRS/2G/3G/4G cellular connectivity
        iii. **Local Connectivity:** Ethernet/Bluetooth/Wi-Fi connectivity to configure parameters, notifications, communication interval, set points etc. or to retrieve locally stored data
        iv. **Sensor Connectivity:** RMS should have provision for at least four Analog inputs with 0.1% accuracy for applications such as breaker & transformer health etc. and four digital inputs for breaker status
    b. Communication Modes:
        i. Push Data on Event/Notification: Faults related to solar generation, inverter fault/alarms, Breaker status change

ii. Push Data Periodically: important parameters of inverter, string combiner box and energy meter should be pushed to central server on configurable interval. Interval should be configurable in multiple of 1 minute.
iii. Command On Demand: It should be possible to send commands via GSM or GPRS to RMS either to update configuration

c. Communication Protocol:

i. RMS should provide data on MQTT Protocol to establish communication with thousands of systems.

d. Security:

i. Communication between RMS and Server should be secured and encrypted using TLS/SSL/X.509 certificate etc.
ii. As a part of IoT protocol, Authentication and Authorization should be implemented using token/password mechanism

e. Message Format:

i. RMS should provide data in a JSON message format as required by respective SNA

f. Data Storage:

i. In case of unavailability of cellular network, RMS should store data locally and on availability of network it should push data to central server. Local data storage should be possible for at least one year in case of unavailability of cellular network.

g. **Configuration Update Over-The-Air:** Configuration update over the air of multiple parameters such as IP, APN, Data Logging Interval, Set Points etc. is essential.

5. EMI/EMC Certifications:

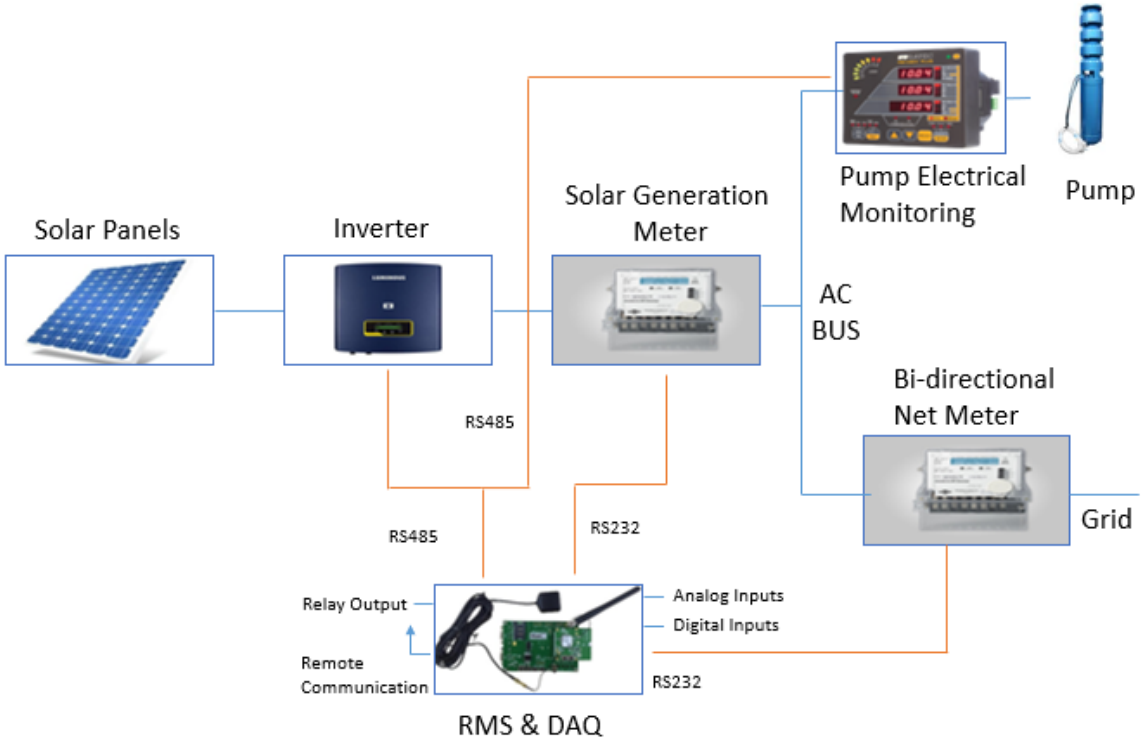
1	Surge Immunity Test (IEC 61000-4-5)	A
2	Electrical Fast Transient (IEC 61000-4-4)	A
3	Electrostatic Discharge (IEC 61000-4-2)	A
4	Radiated Electromagnetic Field Test (IEC 61000-4-3)	A
5	Power Frequency Magnetic Field (IEC 61000-4-8)	A
6	Conducted Disturbances induced by radio frequency (IEC 61000-4-6)	A
7	Voltage Dips, short interruptions (IEC 61000-4-11)	A
8	Dry Heat test (IEC 60068-2-2), continuous operations @ 55 deg. C	O
9	Damped Heat Test (IEC 60068-2-78), @ 95% RH and 40 deg. C	O

Note: Passing Criteria

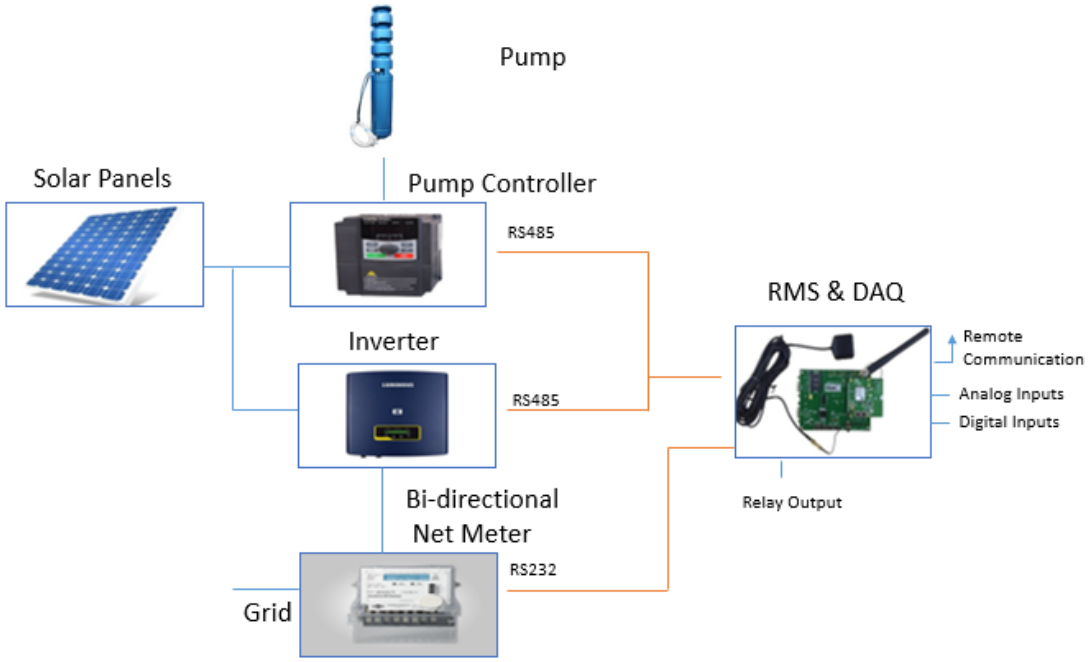
A: Temporary degradation or loss of function or performance which is self-recoverable

O: Normal performance within the specified limits

System Components and Architecture: PM KUSUM Component C: Option 1 (Net Metering)



System Components and Architecture: PM KUSUM Component C: Option 2 (Pump to run on solar power only)



System Components and Architecture: PM KUSUM Component C or A: Option 3 (Solarisation of agricultural feeder at sub-station level)