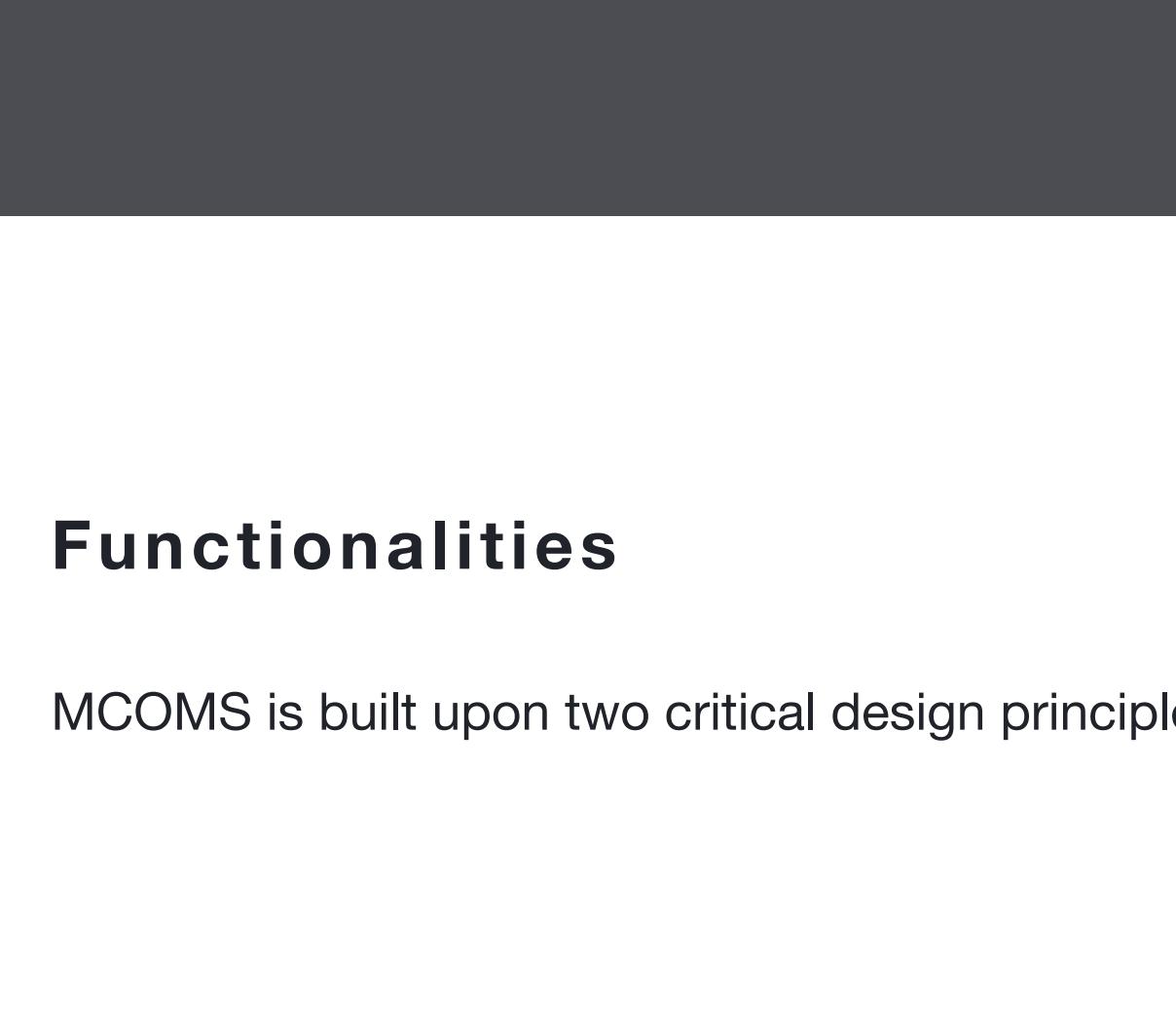


The Mini-grid Communications, Operations, and Management Suite (MCOMS)

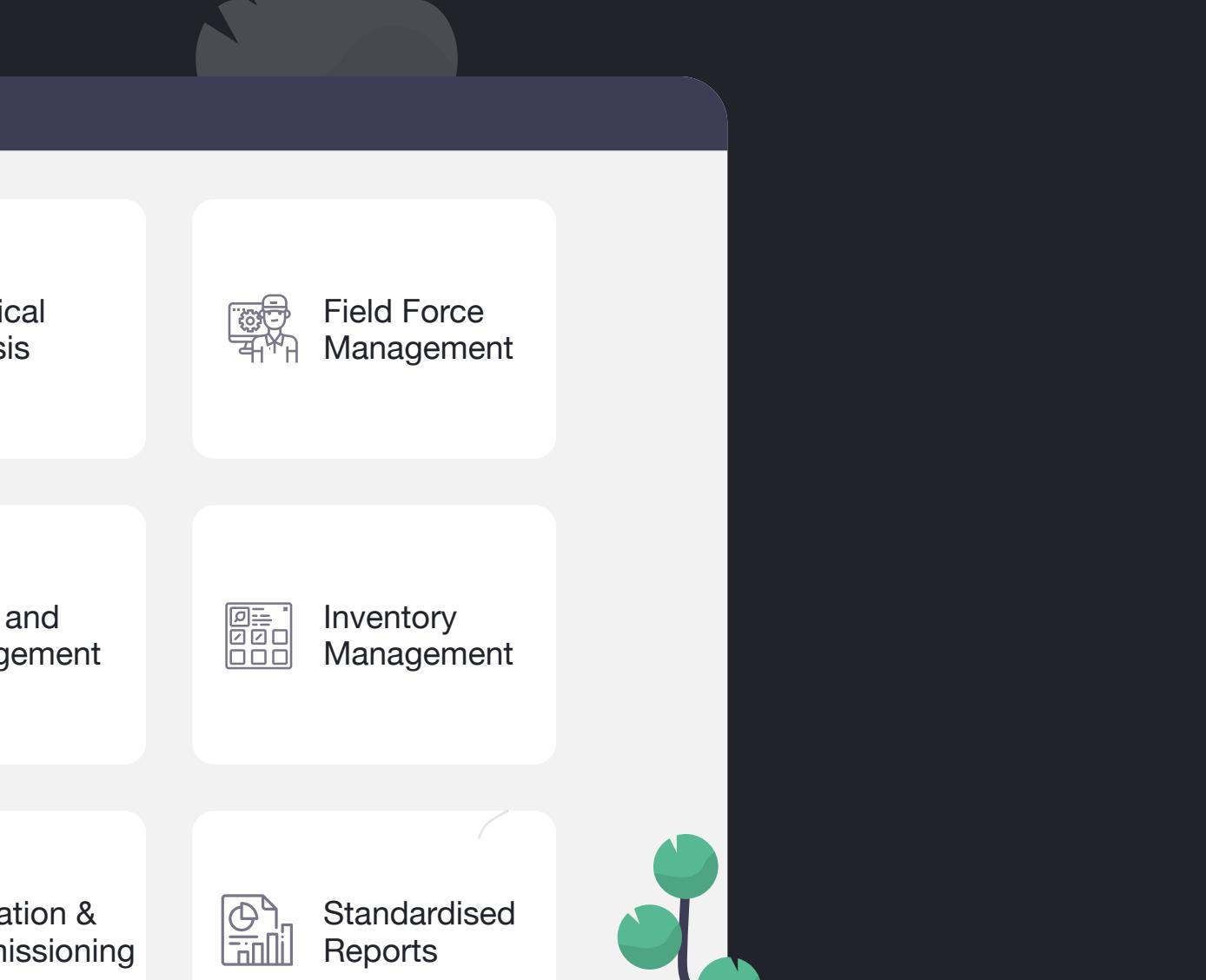


Purpose

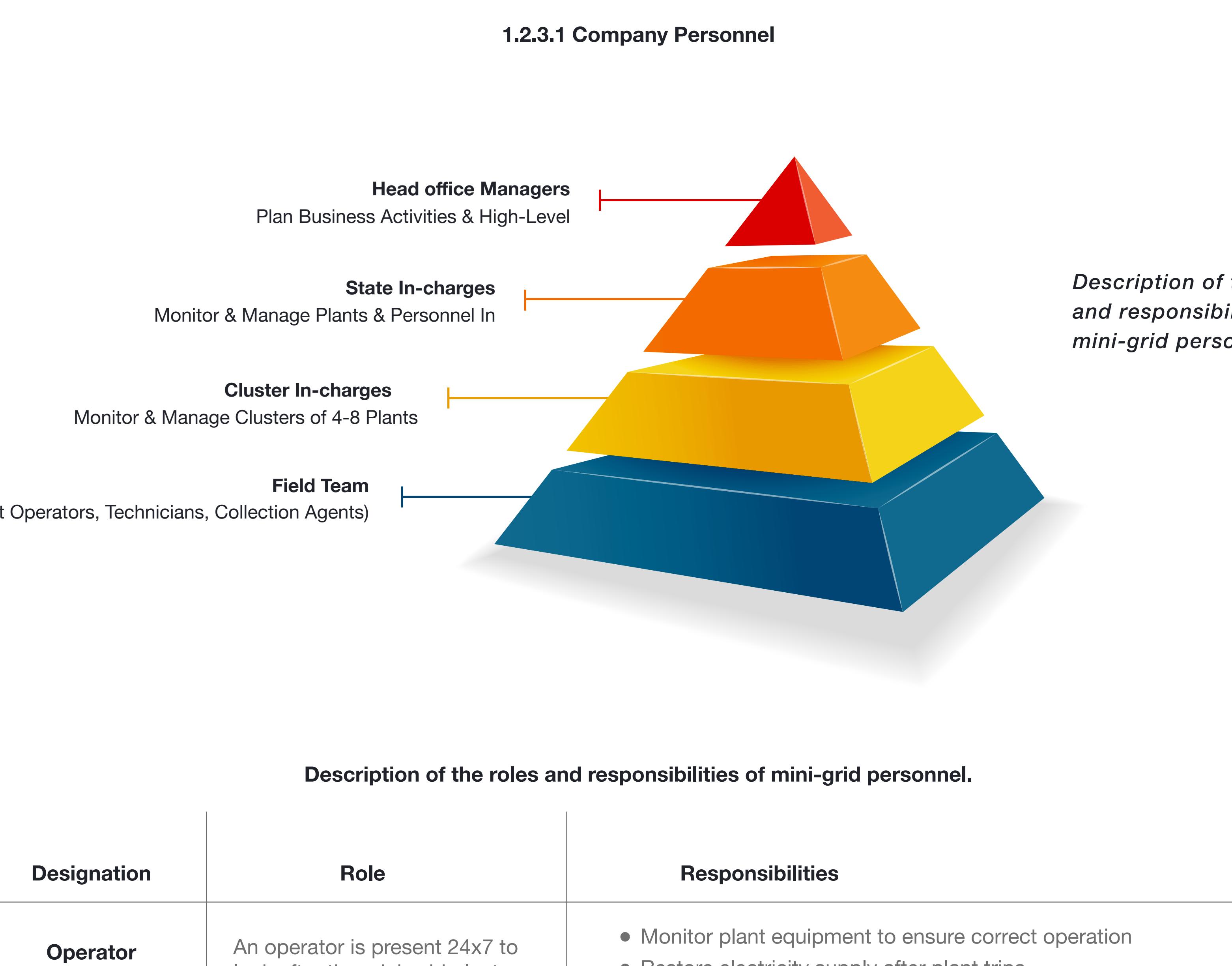
The goal of MCOMS is to provide a platform for different mini-grid stakeholders to effectively communicate, through standardised workflows, easy-to-use interfaces, third-party hardware interoperability, rapid and automated data aggregation, and transparent and reliable record-keeping.

Functionalities

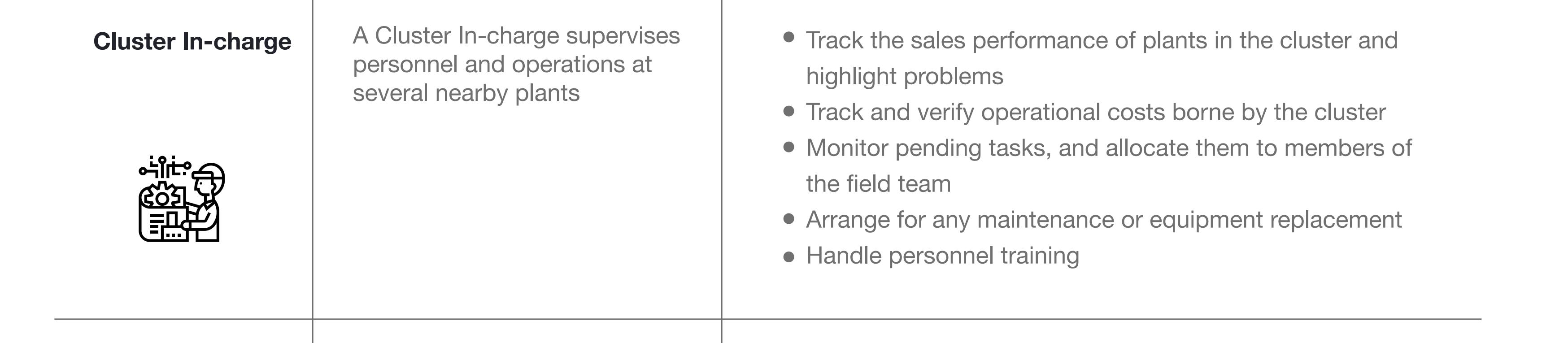
MCOMS is built upon two critical design principles, shown in Figure 1.



1.2.2 Functionalities



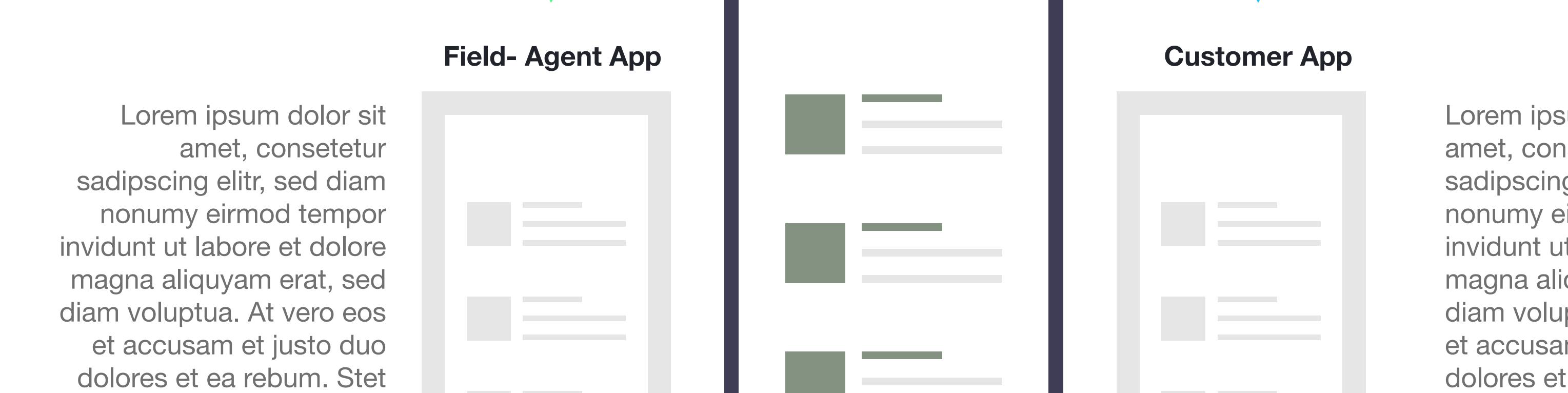
1.2.3.1 Company Personnel



Description of the roles and responsibilities of mini-grid personnel

Designation	Role	Responsibilities
Operator	An operator is present 24x7 to look after the mini-grid plant	<ul style="list-style-type: none"> Monitor plant equipment to ensure correct operation Restore electricity supply after plant trips Record routine operations data, such as plant meter readings Handle complaints of customers who come to the plant
Technician	A technician addresses technical issues encountered by customers or at the plant	<ul style="list-style-type: none"> Respond to customer connection problems Diagnose and fix equipment faults throughout the mini-grid Connect new consumers to the network Record customer energy consumption
Customer Service Agent (CSA)	A CSA manages customer relationships and conducts sales activities	<ul style="list-style-type: none"> Market mini-grid services and schemes to potential customers in the catchment area Issue bills and collect payment from customers, and make deposits Intervene in the case of non-payment Respond to customer complaints or difficulties faced Administer requested package upgrades / downgrades
Cluster In-charge	A Cluster In-charge supervises personnel and operations at several nearby plants	<ul style="list-style-type: none"> Track the sales performance of plants in the cluster and highlight problems Track and verify operational costs borne by the cluster Monitor pending tasks, and allocate them to members of the field team Arrange for any maintenance or equipment replacement Handle personnel training
State In-charge	A State In-charge supervises operations at all plants within a state	<ul style="list-style-type: none"> Create monthly business performance targets, including revenue and customer numbers, and track progress towards them Coordinate schemes and initiatives between all plants within the state Create sales and operations reports for the head office Create recruitment plans Coordinate and plan portfolio expansion, construction, and recruitment
Head Office Manager	Head Office Managers are key decision-makers who manage portfolio and business development	<ul style="list-style-type: none"> Develop strategies and initiatives to enhance business performance Reconcile expenses and earnings reports Perform cross-plant analyses of technical health, and arrange interventions to optimise the asset portfolio. Create new packages and services Plan the strategic, technical, and financial elements of business expansion

Mini-Grid Customers



1.3 MComs Interfaces and System Integration

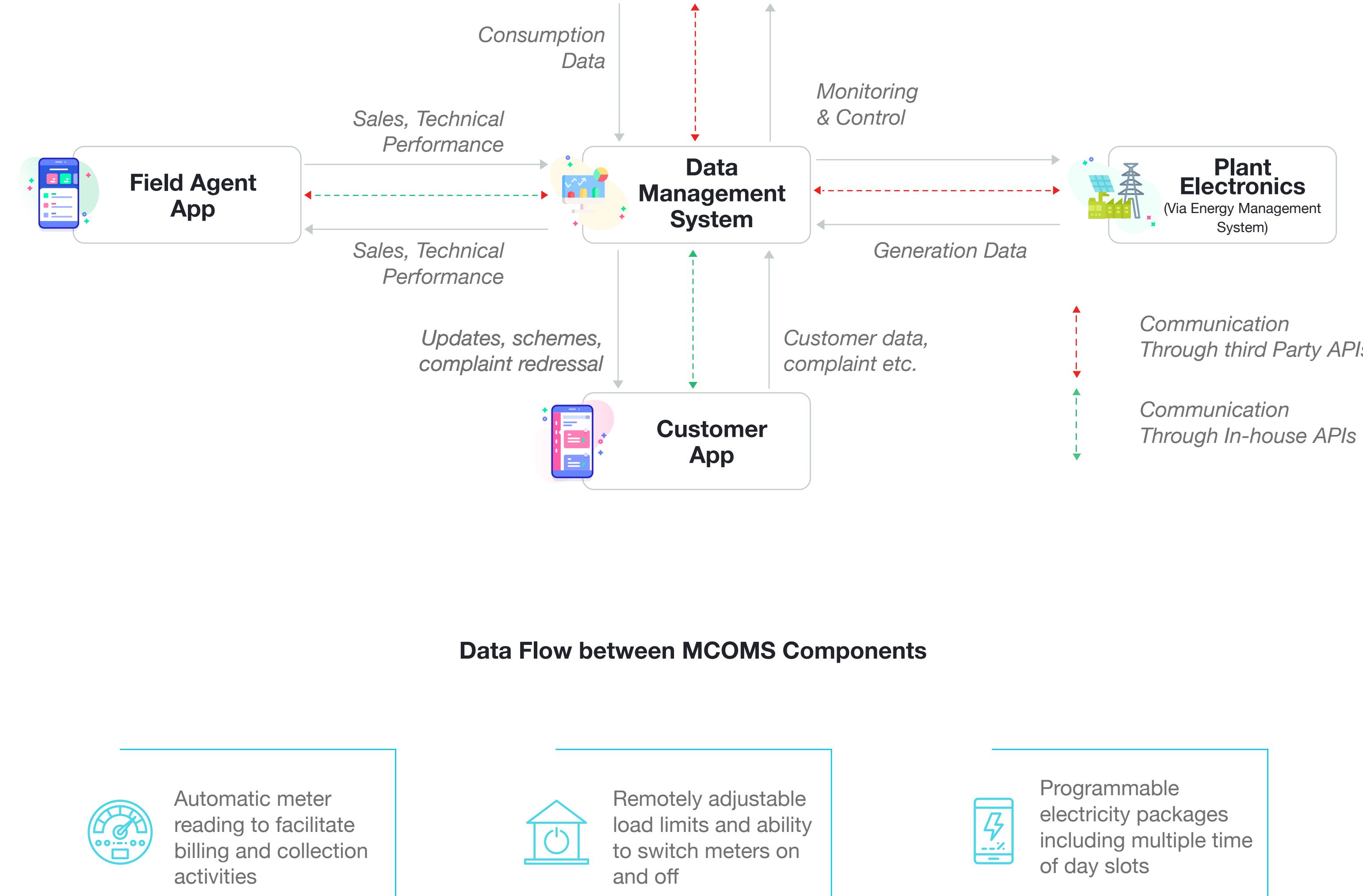


Placeholder text for the Field-Agent App section.

Placeholder text for the Customer App section.

Placeholder text for the Web-based Centralised Dashboard* section.

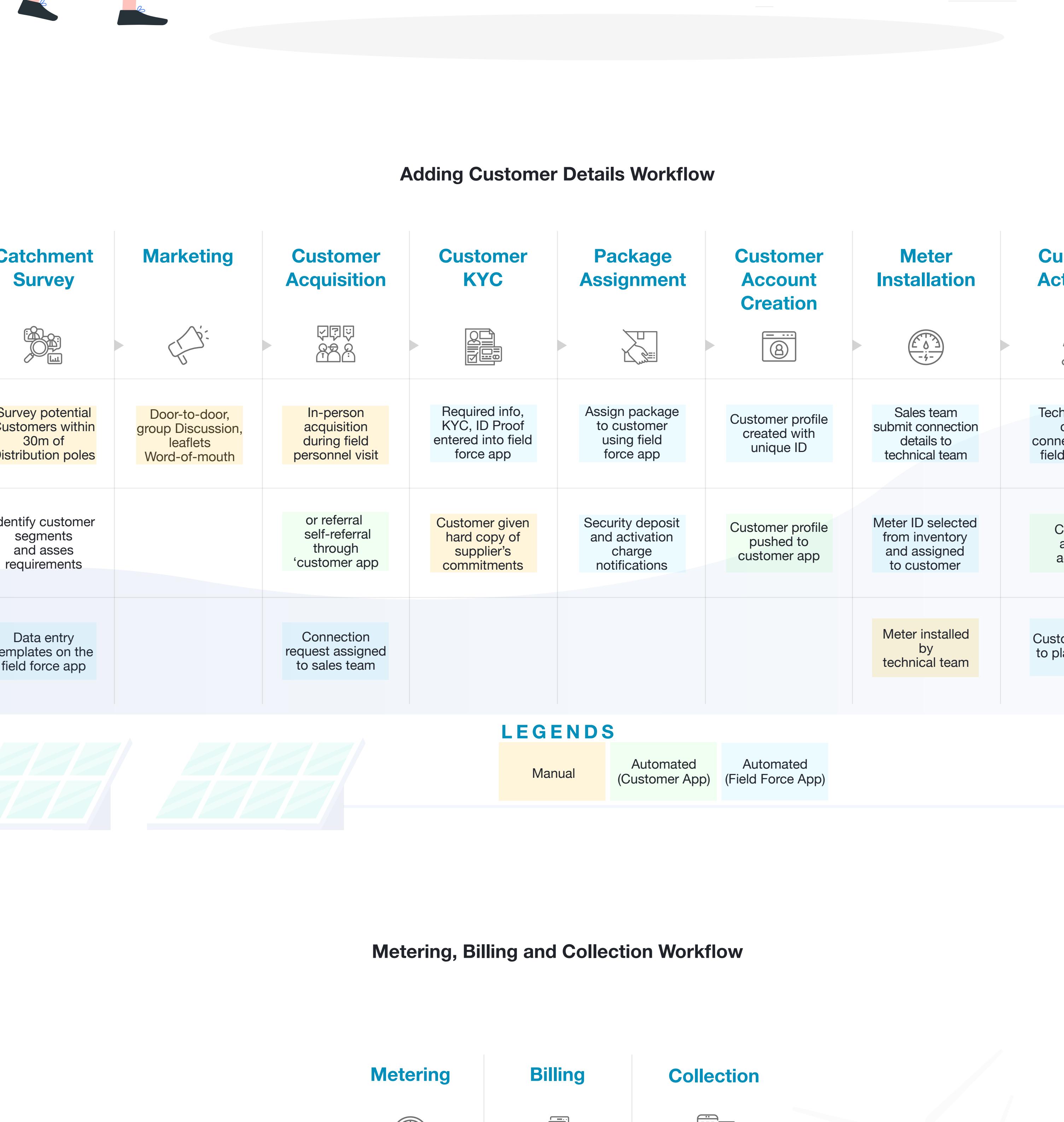
Data Flow between MCOMS Components



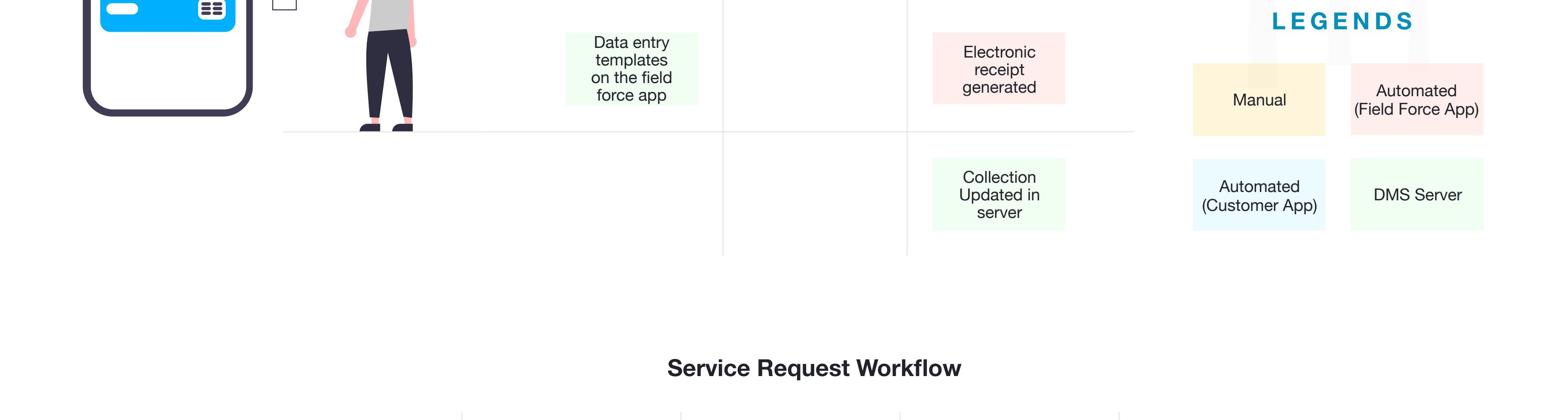
Data Flow between MCOMS Components



Technical Monitoring of Mini-Grid Supply Side Equipment

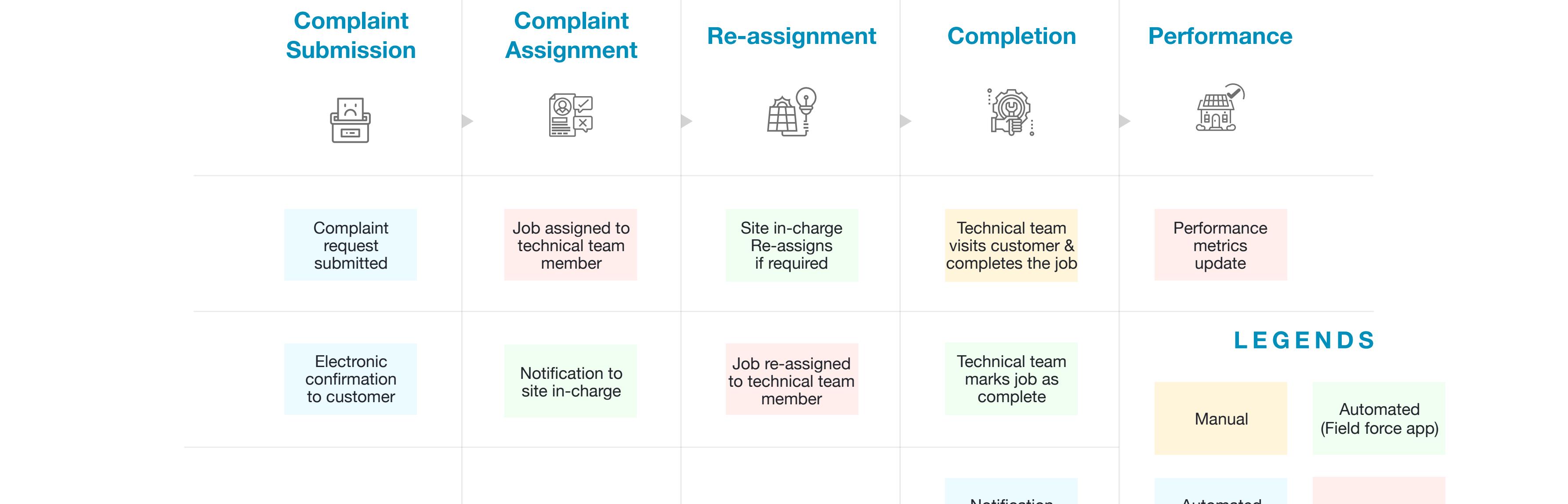


Adding Customer Details Workflow



LEGENDS

Manual Automated (Customer App) Automated (Field Force App)



LEGENDS

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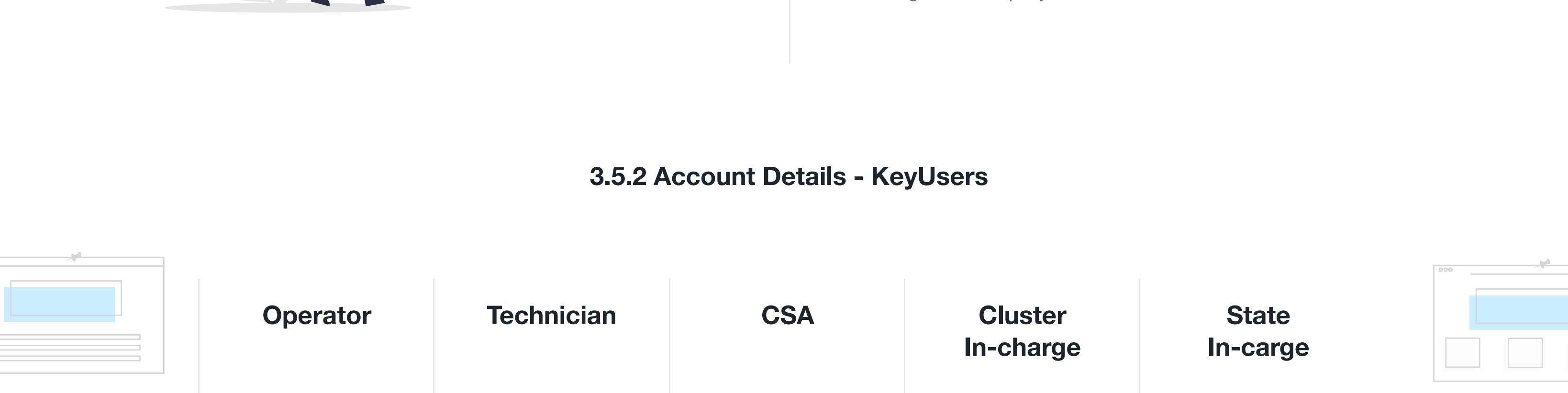
3.4.5 Sparkserver - KeyUsers

Main Purpose	Technician	CSA	Cluster In-charge	State In-charge
Example Use Case	Review the status of the meter associated with a particular customer at the plant	Same as Technician	Control the state of the meter for a particular customer or group of customers	Same as cluster In-Charge
Example Use Case	Checking whether the meter has automatically tripped into the off state	Checking the status of a particular meter	Shutting off the meter of a customer whose faulty appliance is impacting the whole distribution network	Shutting down multiple meters at one time in the state of a technical emergency

3.4.5 Receivable - KeyUsers

Main Purpose	Technician	CSA	Cluster In-charge	State In-charge
Example Use Case	Validate whether a customer is active	View the expected revenue and outstanding amount each customer at the plant	Summary of collections in a given time interval	View customers with high outstanding accounts
Example Use Case	Checking the cause when a customer comes to the plant to complain of a connection issue	Prioritising which customers (or ex-customers) the sales team should approach for settling arrears	Comparing different plants' collection performance for the current month	Reviewing customer payment history when deciding whether to deactivate or reactivate an account

3.4.6.1 Aging Receivables - Functionality



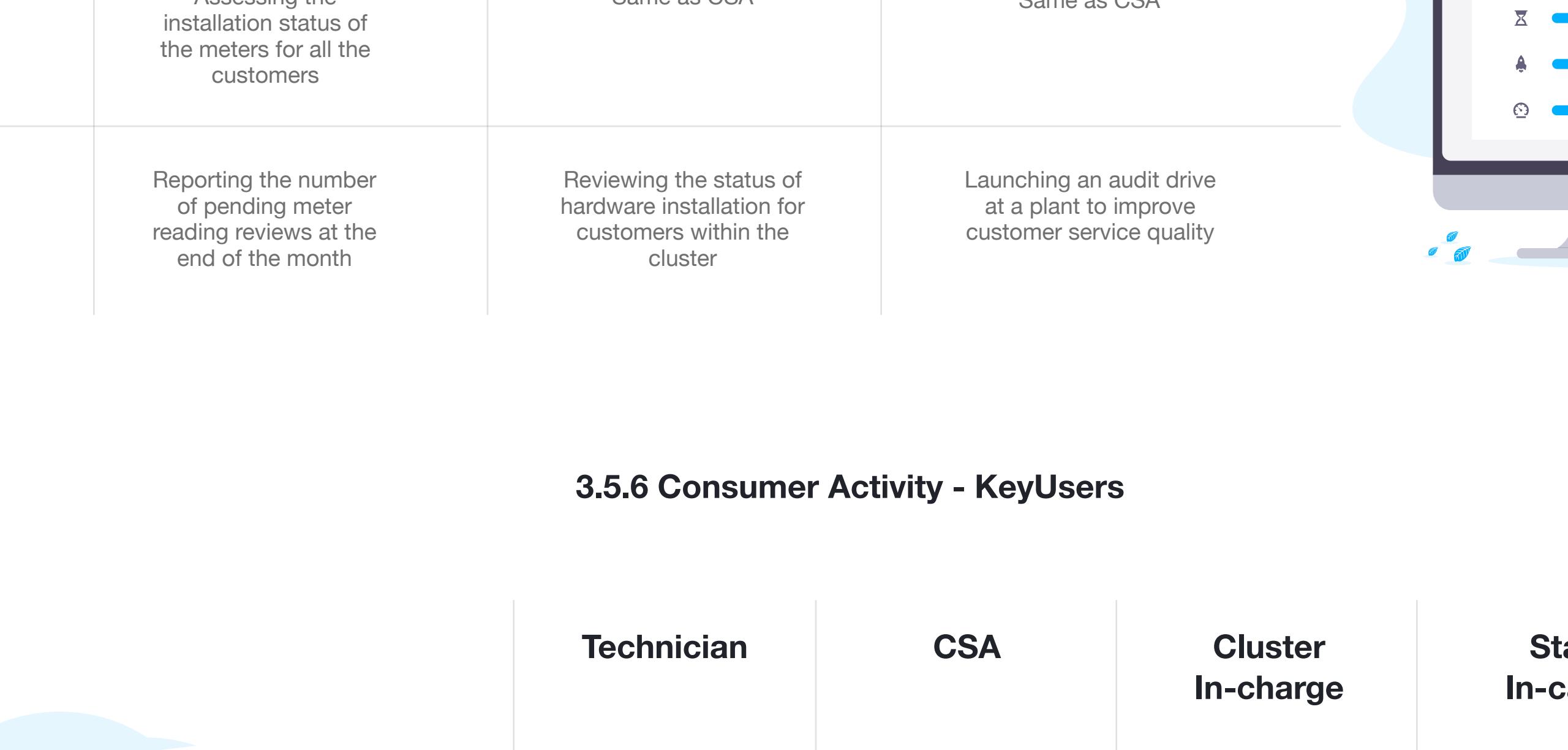
3.4.7 Contacts - KeyUsers

Main Purpose	Designation	All Employees
Example Use Case	Access to individual employees contact	
Example Use Case	To verify a decision made by another agent working at the company	

3.5.2 Account Details - KeyUsers

Main Purpose	Operator	Technician	CSA	Cluster In-charge	State In-charge
Example Use Case	Validating the activeness of a customer	Reviewing meter reading data for a specific consumer	Reviewing the meter reading data to check for overload on electrical apparatus	Summary of collections in a specified time interval	View customers with high outstanding accounts
Example Use Case	Prioritising which customers (or ex-customers) the sales team should approach for settling arrears	Reviewing the meter reading data to check for overload on electrical apparatus	Prioritising which customers (or ex-customers) the sales team should approach for settling arrears	Comparing different plants' collection performance for the current month	Confirming a customer's balance when collecting payment, and resolving confusion about when past bills were paid

3.5.2.1 Page Details



3.5.2 Account Details - KeyUsers

Main Purpose	Technician	CSA	Cluster In-charge	State In-charge
Example Use Case	Access to the list of active members on the plant	Same as Technician	Summary of total number of customers in the cluster	Summary of the total number of customers in the state
Example Use Case	To check the consumer ID of a particular consumer	To check the number of active customers	To create a report on the customers served at a cluster in a given time frame	To create a report on the customers served in a state in a given time frame

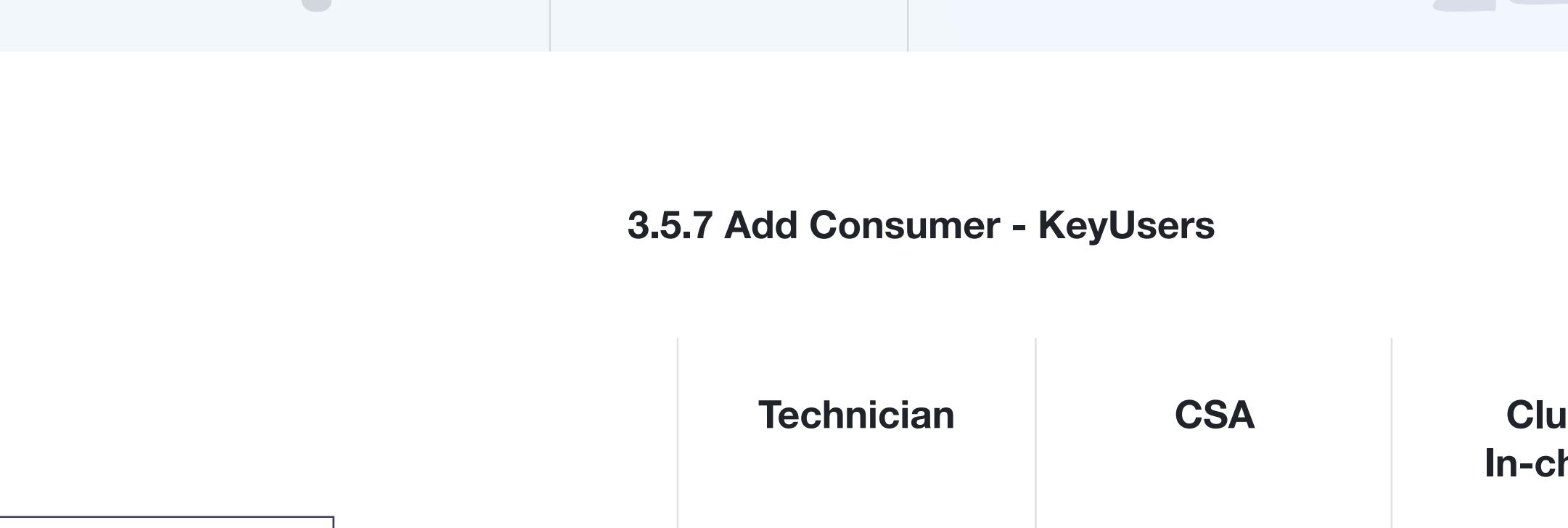
3.5.5 Consumer Status - KeyUsers

Main Purpose	CSA	Cluster In-charge	State In-charge
Example Use Case	Assessing the installation status of the meters for all the customers	Same as CSA	Same as CSA
Example Use Case	Reporting the number of pending meter reading reviews at the end of the month	Reviewing the status of hardware installation for customers within the cluster	Launching an audit drive at a plant to improve customer service quality

3.5.6 Consumer Activity - KeyUsers

Main Purpose	Technician	CSA	Cluster In-charge	State In-charge
Example Use Case	To execute requested changes to customer status	Same as Technician	To register a change to customer status and assign to field personnel	Approve customer status requests at plants in the state
Example Use Case	Reviewing which customers need to be de-/re-activated, and making the necessary changes to their connection	Same as Technician	Using the app to check with a field agent whether they are available for executing the change	Checking how many status change requests are pending and at which plants

3.5.6 Consumer Activity - Tabs



3.5.7 Consumer Service - KeyUsers

Main Purpose	Technician	CSA	Cluster In-charge	State In-charge
Example Use Case	To review service requests assigned to them	Same as Technician	To view all requests from customers in the cluster	To gain an overview of service request statistics in the state
Example Use Case	Prioritising pending requests, depending on when they were registered and the nature of the work	Phoning customers to understand what issue is being faced, and assign the request as complete when it has been resolved	Reviewing pending requests and assigning them to personnel for follow-up	Tracking targets on personnel response time and customer satisfaction

3.5.7 Page Details

3.5.8 Temporary Disconnect

Main Purpose	Technician	Cluster In-charge
Example Use Case	Disconnecting specific customers at a plant	Disconnecting all customers at a plant
Example Use Case	Disconnecting high-load customers when a demand surge causes the plant to trip, until system stability is restored	Disconnecting all customers for safety during network maintenance

3.5.7 Add Consumer - KeyUsers

Main Purpose	Technician	CSA	Cluster In-charge	State In-charge
Example Use Case	To add a consumer into the company database	Same as Technician	Same as Technician	Same as Technician
Example Use Case	Manual addition of a customer who cannot request an account through the customer smartphone app	Same as Technician	Same as Technician	Same as Technician

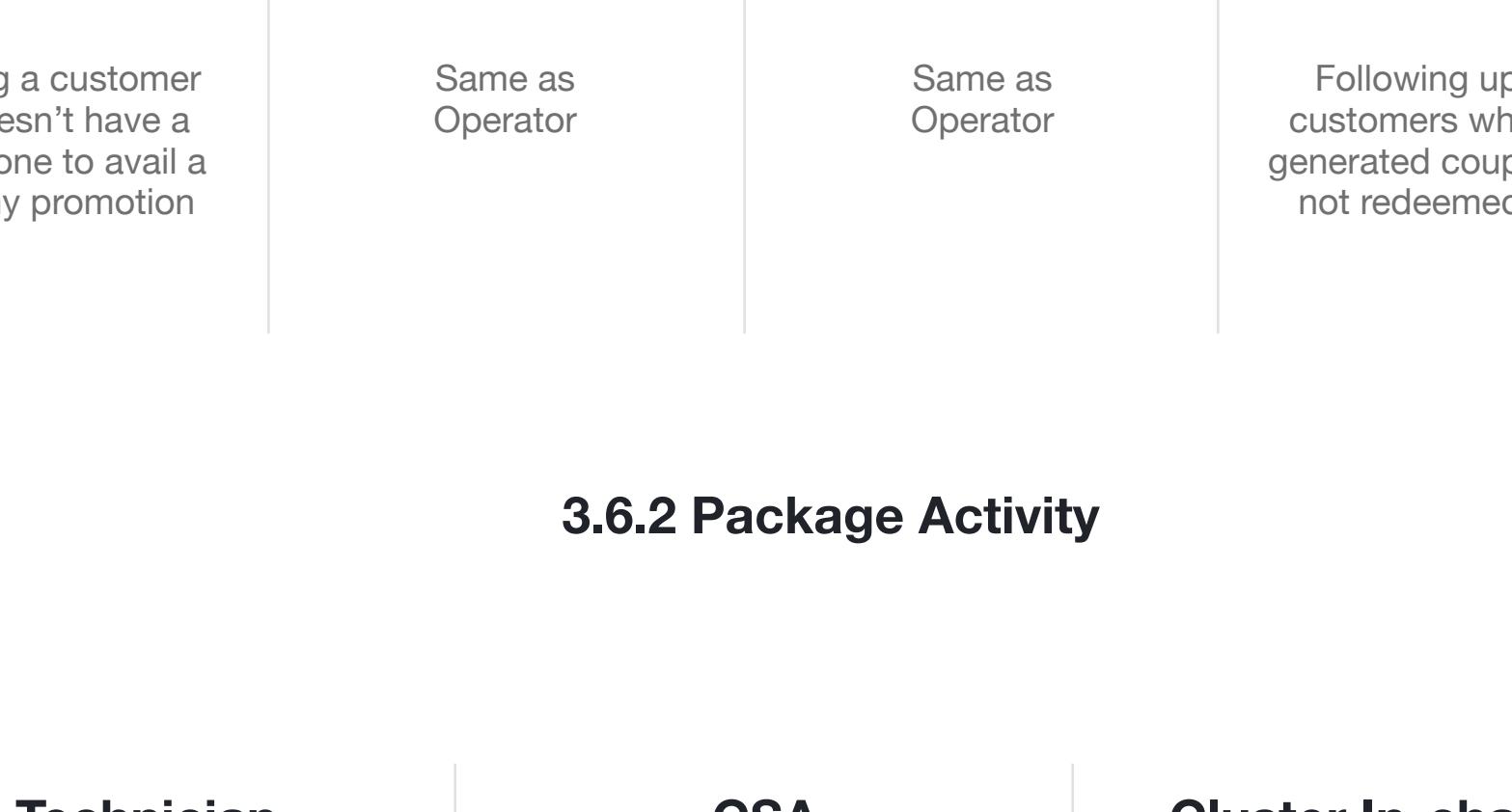
3.5.11 Catchment Survey

	Operator	Technician	CSA	Cluster In-charge
Main Purpose	To record survey responses of energy consumers	Same as Operator	Same as Operator	Same as Operator
Example Use Case	Interviewing a local who comes to the plant to enquire about getting a connection	Updating an existing customer's profile and contact information	Interviewing locals in the catchment area to understand energy needs and use patterns	Reviewing the number of active, inactive, and prospective customers in the cluster

3.5.11 Theft Complaint

	Operator	Technician	CSA	Cluster In-charge
Main Purpose	To register a possible theft for follow-up	To view pending theft complaints	Same as Operator	To review logged theft complaints and assign them to field agents for investigation
Example Use Case	Registering a complaint from a customer who visits the plant	Checking the distribution network cables as directed by the Cluster In-charge	Registering a complaint after noticing new unsanctioned cables	Reviewing the total number of theft complaints within a given time frame

3.5.11 Page Details



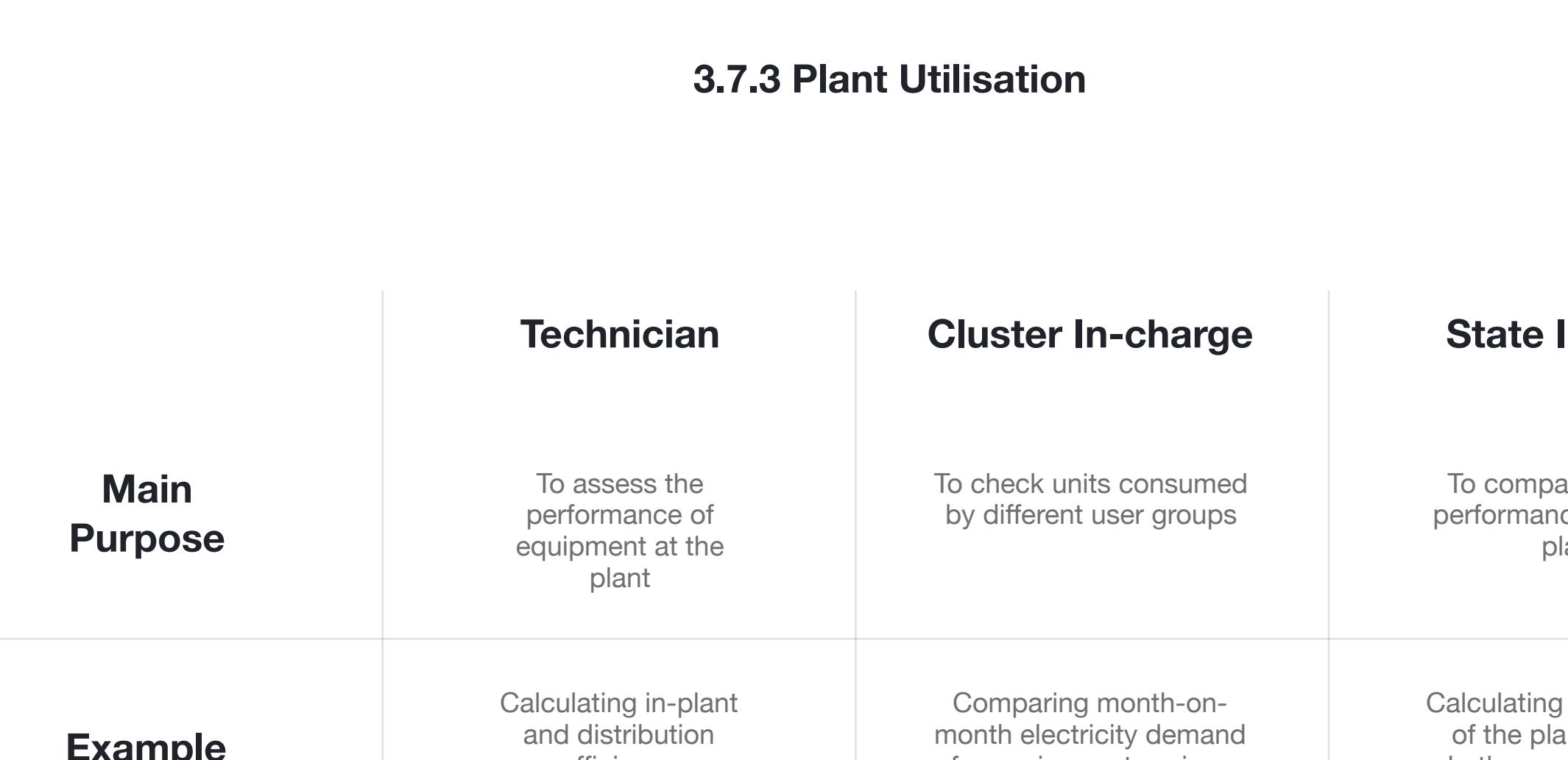
3.5.13 Coupon Discount

	Operator	Technician	CSA	Cluster In-charge	State In-charge
Main Purpose	To generate coupon codes on behalf of customers	Same as Operator	Same as Operator	To track the customers whose coupons are going to expire	To monitor the results of coupon schemes at different plants
Example Use Case	Assisting a customer who doesn't have a smartphone to avail a company promotion	Same as Operator	Same as Operator	Following up with customers who have generated coupons but not redeemed them	Calculating the proportion of eligible customers who participated in the initiative

3.6.2 Package Activity

	Technician	CSA	Cluster In-charge	State In-charge
Main Purpose	To implement package changes requested by customers	To register and view package change requests	To check the number of requests and assign to field personnel	To check the number of requests at plants in the state
Example Use Case	Reviewing the list of customers who require up/downgrades to their connection	Registering a change on behalf of a customer who isn't using the customer smartphone app	Notifying a field agent that they are responsible for following up with the customer	Checking how many package change requests are pending and at which plants

3.6.2 Page Details



3.6.4 Product Inventory

	Operator	Technician	CSA	Cluster In-charge	State In-charge
Main Purpose	To view available appliances in the company warehouse	Same as Operator	Same as Operator	Same as Operator	Same as Operator
Example Use Case	Checking on behalf of a customer whether a particular appliance is available as part of a scheme	Same as Operator	Same as Operator	Requesting purchase of an appliance which is in demand	Checking inventory levels and whether new purchase orders are required

3.7.2 Plant Performance

	Operator	Technician	CSA	Cluster In-charge	State In-charge
Main Purpose	To check data logs for a particular plant	To assess the performance of the equipment at the plant	To check units sold in a particular timeframe	To compare technical performance of multiple plants	Same as Operator
Example Use Case	Ensuring that the database agrees with ground measurements	Calculating in-plant and distribution efficiency	Comparing units sold in one month with the previous month	Same as Technician	Calculating the utilisation of the plant to inform whether more customers should be connected

3.7.3 Plant Utilisation

	Technician	Cluster In-charge	State In-charge
Main Purpose	To access the performance of equipment at the plant	To check units consumed by different user groups	To compare technical performance of multiple plants
Example Use Case	Calculating in-plant and distribution efficiency	Comparing month-on-month electricity demand from micro-enterprises	Calculating the utilisation of the plant to inform whether more customers

3.7.4 Add Generation Data

	Operator	Technician	Cluster In-charge	State In-charge
Main Purpose	To add generation data for a particular date	Same as Operator	Same as Operator	Same as Operator
Example Use Case	Reading units generated at each solar MPPT daily, and recording in the app	Same as Operator	Same as Operator	Same as Operator

3.7.5 Add Consumption Data

	Operator	Technician	Cluster In-charge	State In-charge
Main Purpose	To add dispatch data for a particular date	Same as Operator	Same as Operator	Same as Operator
Example Use Case	Reading units through each feeder daily, and recording in the app	Same as Operator	Same as Operator	Same as Operator

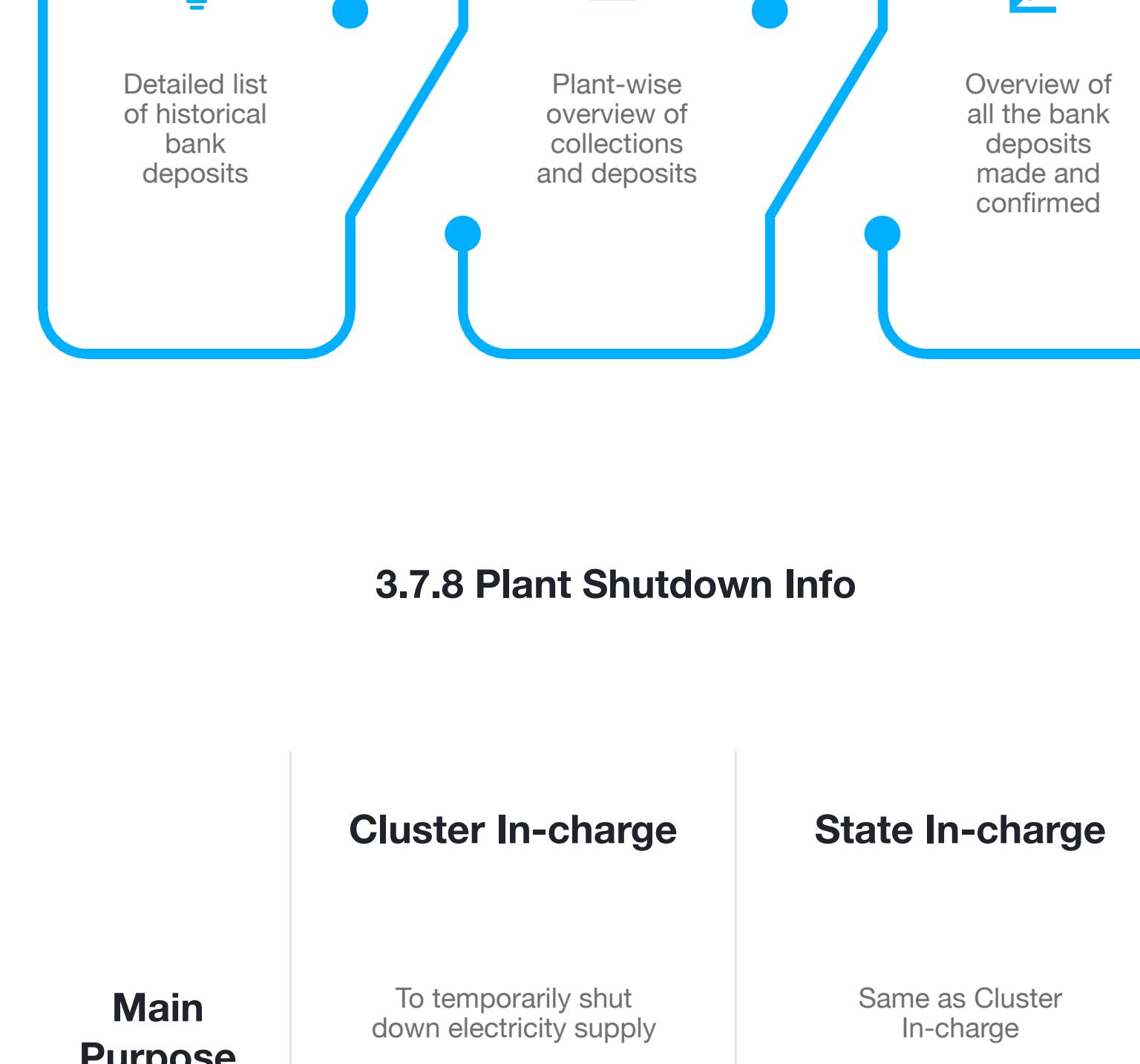
3.7.6 Diesel Consumption

	Cluster In-charge	State In-charge
Main Purpose	To maintain a record of diesel expenses and fuel use	To review diesel expenses and DG usage at different plants
Example Use Case	Adding a diesel purchase made at a particular plant within the cluster	Checking for fuel pilferage by comparing fuel efficiencies at different plants / times

3.7.7 Bank Deposit

	CSA	Cluster In-charge	State In-charge
Main Purpose	To register new deposits	To view the cash flow for plants in the cluster	To view the cash flow for plants in the state
Example Use Case	Depositing cash collected from customers into the company bank account	Checking the amount of collected cash is still with filed agents and is yet to be deposited	Ensuring bank deposits are going through correctly, and are happening on schedule

3.7.7 Page Details



3.7.8 Plant Shutdown Info

	Cluster In-charge	State In-charge
Main Purpose	To temporarily shut down electricity supply	Same as Cluster In-charge
Example Use Case	Shutting a feeder down for maintenance, for a specified time duration	Same as Cluster In-charge

3.7.9 Plant Maintenance

	Cluster In-charge	State In-charge
Main Purpose	To register a plant maintenance activity	Same as Cluster In-charge
Example Use Case	Creating a log of DG servicing or PV panel repair	Same as Cluster In-charge

3.7.10 DG Log

	Operator	Technician	CSA	Cluster In-charge	State In-charge
Main Purpose	To log diesel generator runtime and units output	Same as Operator	Same as Operator	To view generator usage at different plants	Same as Cluster In-charge
Example Use Case	Recording each time the DG is switched on and off	Same as Operator	Same as Operator	Checking how reliance of different plants on backup generators changes over time	Same as Cluster In-charge

3.8.2 Change Meter

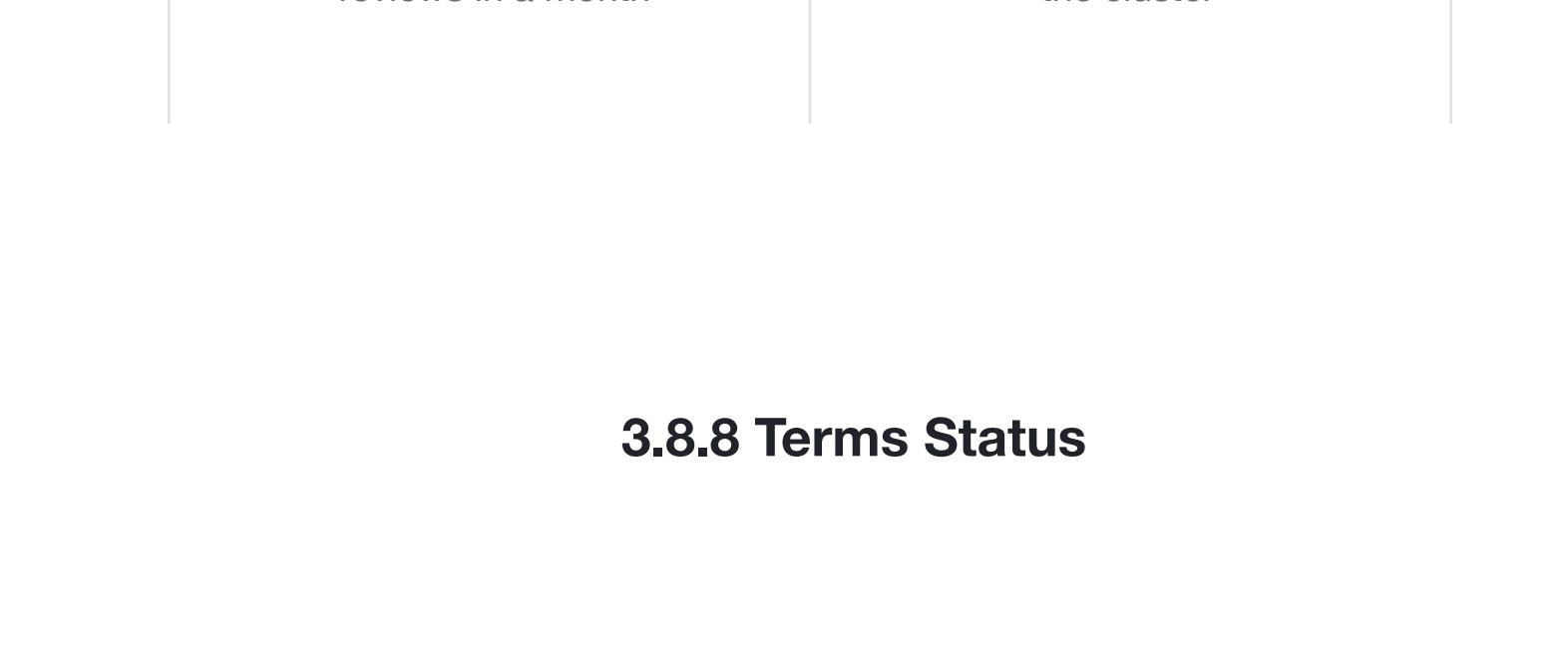
	Cluster In-charge	State In-charge
Main Purpose	To request a change of meter for a customer	Same as Cluster In-charge
Example Use Case	Registering and switching out a malfunctioning meter	Same as Cluster In-charge

3.8.2 Unreleased Meter

	Cluster In-charge	State In-charge
Main Purpose	To view pending meter change requests and assign to field agents	To view and acknowledge meter changes
Example Use Case	Contacting the agent who worked on a particular meter assignment	Checking the number of pending meter assignments

3.8.2 Page Details

Pending Review Completed



3.8.5 Spark Feeder Status

	Cluster In-charge	State In-charge
Main Purpose	Control the state of the meter for all customers on a particular feeder	Same as Cluster In-charge
Example Use Case	Shutting off a large number of meters in case of a technical emergency	Shutting off the meter of a customer whose faulty appliance is impacting the whole

3.8.6 Meter Reading

Technician CSA Cluster In-charge State In-charge

Main Purpose	To view which customer meters need to be read	Same as Technician	To check the number of pending meter readings	Same as Cluster In-charge
Example Use Case	Planning which customers to visit for metering before the end of the month	Same as Technician	Contacting field agents to remind them about incomplete meter readings	Same as Cluster In-charge

3.8.7 Meter Reading Review

CSA Cluster In-charge State In-charge

Main Purpose	To assess the number of consumers who are yet to undergo the meter reading	To conduct a review on the consumers whose meter readings are still pending	Same as Cluster In-charge
Example Use Case	Assessing the number of completed reading reviews in a month	Assessing the number of pending reviews within the cluster	Assessing the number of pending reviews at a plant

3.8.8 Terms Status

Operator Technician CSA Cluster In-charge State In-charge

Main Purpose	To access information about and control of a customer's meter	Same as Operator	Same as Operator	Same as Technician
Example Use Case	Investigating why a customer meter may have tripped off - e.g. they are deactivated	Switching a meter on or off	Same as Technician	Same as Technician

3.8.9 Battery Maintenance

Technician Cluster In-charge State In-charge

Main Purpose	To change the state of a battery bank	Same as Technician	To check which batteries are online
Example Use Case	Switching the battery status of a plant between on and off	Same as Technician	Creating a report on the number of battery packs available at each plant