LV Insights® X
Product Sheet

LV Insights X is a modern low voltage management software that enables users to monitor their low voltage grids and augment workflows around outage management and provides access to grid insights to multiple departments.

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LV Insights X Product Sheet
(Documentation)

General

Value Proposition	LV Insights supports distribution system operators in three main areas: 1. **Transparency**: Live visibility in the lower end of the grid with (near) real time observability of topology and grid state utilizing existing metering devices and artificial intelligence to make the most of the existing equipment. Sharing this information across multiple departments without granting access to mission critical SCADA system. 2. **LV Outage Augmentation:** Improve workflows of LV outage management (automatic detection of LV outages, optimization of case management and reporting), efficient handling of grid data, grid model management and updates. 3. **Grid Impact Assessment:** Advanced data exchange and analytics to detect limit violations, enable potential grid segments being operated closer to their operational limits and optimize investment and asset management strategy.

Prerequisites & Specific Terms

Operating systems and web browsers for users	LV Insights X is a SaaS with a web-based browser frontend for use on desktop computers or notebooks. LV Insights X requires a recent version of an HTML5 capable Internet Browser, e.g. Google Chrome
Use Restriction	You acknowledge that insights provided by LV Insights X are limited to the grid model based on the Asset Data, connectivity information, mapping of entities and telemetry provided by the Customer and results may not fully correspond to the real-world situation. The interpretation, implementation and utilization of reports, concepts and

results is the sole responsibility of the Customer. Siemens does not assume any liability, warranty, or guarantee for the feasibility or usability of reports, concepts, and results, nor for actions or omissions based on the reports, concepts, proposals or recommendations.

Description & Functionalities

Grid model building	Grid model building module of LV Insights X provides the ability to visually build grid models for LV Insights X by leveraging relevant data sources (e.g. GIS, ERP), processing the data and directly verifying results using geographical user interface. The required data from relevant sources is combined and integrated in a Grid Model that is flexible and extendable to meet changing needs of LV Insights X over time.

The electrical domain of data is leveraged to logically split the grid model in circuits, facilitating the user navigation and data analysis step. A robust and flexible grid model validation engine ensures data is validated before it reaches operations. Users can directly relate to erroneous grid segments on the same geographic interface highlighted according to severity.
Selected examples of validation rules include
- Connectivity
- Completeness
- Electrical properties
- Consistency of voltage
- Relationship (parent – child)

Once all data model prerequisites for LV Insights X are fulfilled and validated the datasets are serialized according to the requirements and structure of operational needs of LV Insights X. But still ensuring consistency regarding unique IDs and therefore guaranteeing interoperability.

Since grid models are subject to constant change, the grid model building module subscribes to and receives model changes from master systems, updates and re-validates the grid model and sends updates to LV Insights X. |
| Low Voltage Transparency | The low voltage transparency provides a visual grid model representation comprising medium and low voltage equipment. A live visualization of current topology and grid |

state is based on available measurements and (optional) manual updates of (non-remote-controlled) breaking equipment.

The combination of a geographical, schematic view and software-inherent understanding of the electrical circuit enables users to navigate within the grid and drill down into details, when necessary, based on smart topology highlighting.

Substations, cable cabinets and connection points are high-level elements in LV Insights X automatically aggregating underlying equipment to reduce cognitive load of users. The following aggregations are supported
- Connection points aggregate multiple service delivery points, that is defined as the point of delivery at which a utility service, in this case electricity, is supplied.
- Primary substations aggregate transformers and breaking equipment relevant to denote medium voltage feeders
- Secondary substations aggregate transformers and breaking equipment relevant to denote low voltage feeders.
- Cable cabinets aggregate breaking equipment relevant to denote low voltage feeder (sub-)segments

Visual representation and details depend on the available grid model for certain grid areas including equipment and connectivity information from medium voltage down to low voltage service delivery points.

Telemetry Data	Any telemetry data from the field through a SCADA system or other systems (e.g. MDM or IoT headend) can be ingested in LV Insights X and is automatically mapped to the available equipment. Relevant attributes and IDs are mapped in the grid model builder module ensuring consistency and compatibility. Telemetry data preview is provided on equipment level and automatically aggregated on connection point level including upper and lower limits to avoid misinterpretation. Detailed analysis can be conducted over historic data using the data analysis component providing time range selection to observe patterns.

Case Management	The case management enables you to save a context-specific view of the grid area with all selected objects. The software supports different types of cases with individual workflows. Each case has a start time and type specific information, e.g., concerning the equipment, the fault, and the operations performed for LV outages. LV Insights X supports the following case types: • LV Outage for unplanned outages • LV Outage for planned outages All cases are accessible via the case library and can be searched, filtered, and managed in there. The list of cases is automatically sorted by priority. In addition, active cases are shown in the map and aggregated automatically depending on the zoom level showing the highest severity.
LV Outage Augmentation	LV outage augmentation supports operators and relevant LV staff with workflows to better handle unplanned outages. Unplanned LV outages are either automatically detected based on smart meter events received as telemetry data or manually tracked, e.g., based on trouble calls. The workflows for manually and automatically detected unplanned outage cases comprise the following functionalities: • Search for smart meter IDs and addresses to find customer's matching SDP including highlighting of relevant LV feeder • Manual creation of LV outages by selecting affected equipment in the map incl. automatic update of the LV feeder by setting it to tripped to indicate to all users that this area is unsupplied • Ranking of LV outages based on affected SDPs derived by current topology • Visualization of LV Outages in the map on corresponding secondary substation including aggregation based on zoom-level • Visualization of smart meter status based on meter events (last gasp and first breath) within the geological view and equipment details • Automatic detection of LV outages based on smart meter events, planned LV outages and current topology / energizing state

- Support for "Temporarily Fixed" cases once the field crew has been temporarily resupplied the area incl. automatic update of relevant upstream breaker
- Journal for tracking all relevant outage activities, changes within the topology including the effect on affected SDPs (customers), relevant smart meter events and adding comments
- Ability to ping individual SDPs, Connection Points and low voltage feeders for outage assessment and power restoration verification

Automatic detection of low voltage outages requires availability of smart meter events (last gasp and first breath), energization information on medium voltage level, low voltage topology and optionally planned outage information including the affected equipment.

Grid Insights	The software is capable to identify potential equipment and elements in the grid close to their operational / predefined limits by analyzing historical telemetry data. Once, a violation has been identified, they are visualized on the geographical view and within the case management. The software supports the following rules on service delivery point level based on EN 50160: • Voltage threshold violations (+10%/-10%) for SDPs / Connection Points • Short-term voltage violation • Long-term voltage violations in 7-day sliding window Identification of voltage violations requires 15-minute or 10-minute interval measurements of three phase voltages on the monitored service delivery points. Data may be ingested later, e.g. every 24h or older, but order must be ensured.

Administration, and data access

Authentication and Access	Authentication and authorization are on User level based on the authentication method supported by the customer's identity and access provider (IDP) supporting openIDConnect.
Administrator	Permissions to administrate users of LV Insights X and access the Administrative Interface.

LV Insights X Standard User / LV/MV Service Manager	Permissions to access the geospatial data visualization. Typical user of LV Insights X with full access to all functionality besides administrative tasks.
Grid Model Building User / Grid Model Engineer	Permission to import, configure and adapt grid models using the grid model management feature of LV Insights X.
Administrative Interface	The administrative interface allows managing users, roles, groups, and the integration with identity providers. For every user, an individual login is required. Users are also permitted to access and utilize the user management. The administrative interface provides the ability to issue and manage client credentials that can be used to access data programmatically.
Outage Events Interface	The Outage Events interfaces can be used to query and write unplanned outage and work task information. The interface may be used for any synchronization with outage management systems (OMS) or other reporting systems. The interface has the following characteristics: • Data model based on IEC 61968-3 (CIM) • Event-based interface
Telemetry Interface	All measurements (analogs, smart meters readings) and information (e.g. switch states) coming from the field, or another system are treated as telemetry data. The telemetry interface is responsible for ingesting any type of telemetry data from various headend systems. The interface has the following characteristics: • Data format is based on IEC 61968 (CIM) • Event-based interface It is Customers responsibility to comply with the Telemetry Interface characteristics stated above.
Client Credentials	The client credentials are used by clients to obtain an access token outside of the context of a user to utilize the provided interfaces.

SaaS Operational Environment and Services

Security	Siemens implements and maintains a cyber security framework based on ISO/IEC 27001. Siemens will

	- handle security related incident identification, monitoring and remediation according to ISO/IEC 27001 ISMS policy framework of 'Detect; Respond; Remediate; Recover' by the operational team with highest priority - perform regular penetration testing of LV Insights X. - assure that data in transit and in rest are encrypted - optionally enable multifactor authentication for User Interface (UI) access via customer's IDP
Updates	Siemens is makes reasonable efforts to keep all customers on the latest available product release. Siemens will - apply operating system and other third-party security patches and updates as appropriate. - apply application software patches as necessary and perform periodic upgrades with latest application software releases (usually two upgrade releases a year). - maintain and troubleshoot third party software issues required for ongoing operations, work with third party provides to troubleshoot as required. - notify its customers of release schedule and availability of new upgrades, patches and service releases in a regular fashion. The schedule for installation will be mutually agreed upon. Customer has the obligation to approve and enable updates for the latest supported version within 6 months after release of the new version or until a mutually agreed date. Otherwise, Siemens may suspend product support and operations.
Monitoring and Maintenance	Siemens will - administer and monitor environments including utilization of Central Processing Unit (CPU), memory, Input/Output Operations (IOPs) and disk space - administer and maintain associated operating systems - manage and troubleshoot the infrastructure components and processes, software licenses and maintenance

	• develop, maintain and utilize standard operations procedures and daily checklists for Siemens operators and administrators
Testing Environment	Siemens uses a system for testing purposes that may be integrated with Customer's systems for delivery and testing of updates before deployment in production environment. The testing environment does not adhere to the SLAs.
Data Retention	Siemens will provide • One (1) month of hot storage • Up to one (1) year of cold storage • Upon termination data archival of data for up to three (3) months to permit transfer to customer
Training	Siemens will provide • LV Insights X SaaS User Guides and onboarding material • Instructor-led training (additional costs)
Onboarding	Siemens offers to the Customer to onboard LV Insights X into the customer IT/OT landscape for additional fees on time and material basis and under separately agreed terms and conditions.

Packages

Overview	The packages in the table below have limits that apply for the entire Subscription Term, unless expressly indicated as "monthly" limit.

Package	Tier 1	Tier 2	Tier 3
Included SDPs	300.000	600.000	1.200.000
LV Insights Standard Users	15	25	30
Grid Model Building Users	3	3	8
	Upgrade Packages		
Additional SDPs	50.000	50.000	50.000
Additional Standard and Administrator Users	10	10	10
Additional Users for grid	5	5	5

model building			

Specific User Types	• LV Insights Standard Users are entitled to use the capabilities (e.g. accessing the geospatial visualization, monitoring equipment and handling different workflows) provided by LV Insights X excluding grid model building capabilities and administrative tasks through the web-based interfaces. • LV Insights Administrator Users are entitled to use the administrative capabilities (e.g. managing user access) in addition to the LV Insights Standard User entitlements. • Grid Model Engineer Users are entitled to use the grid model building capabilities through the web-based interfaces. A non-human operated device will not be counted as a named user in addition to all individuals authorized to use the services, if such devices can access the services
Service Delivery Points	Service delivery point is defined as the point of delivery at which a utility service, in this case electricity, is supplied.
API Limits	Overview of services and limits levels included in the LV Insights X Packages listed below:

Package	Tier 1	Tier 2	Tier 3
Telemetry Average Rate	25 MB/s	50 MB/s	210 MB/s
Telemetry Batch Rate (10% of the time in 12 h)	37,5 MB/s	75 MB/s	315 MB/s
Outage Event Interface	100 messages per minute	200 messages per minute	800 messages per minute
Token Management	20 requests per minute	40 requests per minute	60 requests per minute

All services are protected against Denial of Services attacks that may result in temporary limiting overall requests per client.

Siemens Grid Software

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