

GIS Based Consumer Indexing For Dishergarh Power Supply Co Ltd

Business Case

CMC is implementing a GIS Based Consumer Indexing System for Dishergarh Power Supply Co Ltd. It covers more than 350 11 KV consumer and a few 3.3 KV and 550 Volt consumer. It also covers 5 no of 33/11KV grid, 25 no of 11 KV substations and 25 no of 11 KV switching substations.

DPSC Limited (DPSCL) incorporated in 1919, generates power to provide survival power requirement of Eastern Coalfields Limited (ECL), Bharat Coking Coal Company Ltd., and other industries and townships in the Asansol - Raniganj areas. The licensed area of the company is 618 sq. km. The company serves the consumers with high-tension distribution mains mostly comprising of 11 KV overhead lines and having approximate circuit lengths of 775 km. Recently DPSC Limited has installed 29-kV Chinakuri-Satgram transmission line. New lines were being added every year for rendering increased stability of supply.

The project envisages indexing the consumers, develop maps/sketches of Sub Transmission and Distribution Network covering Power Station Bus, 33/11 KV Grid, 11KV Switching Station, 33KV/11KV/3.3KV/550V feeders, consumer data collection through pole-to-pole survey using GPS and a customised software application for integration of single line diagrams of the distribution network with updated consumer related data, network attribute data for distribution planning, data analysis and reporting facilities for both Dishergarh and Seebpur zones. It also provides a Unique Consumer Index for each of the consumers in DPSC Limited.

Scope of the system includes:

- Consumer indexing of electricity distribution network for DPSC Limited
- Creation of base map of the electrical distribution area with the following layers.
 - State boundary
 - District boundary
 - Water bodies
 - Roads
- Assets of power distribution network – feeders, transformers, towers, poles etc as separate layers.
- GPS mapping of electrical assets and collection, compiling of their attributes
- Consumer indexing and preparation of database of consumers and assets with attributes and geo-referencing of survey data with GIS map of the area.

- Integration of the database and software with existing Billing Module
- Relevant queries and MIS on electrical entities and consumers

The solution is developed on Map Server , Oracle 10g ,PHP and Windows 2008

Background

DPSCL wants to enhance the efficiency of distribution system in terms of quality of power and increased revenue earning by reducing T & D losses (both technical and commercial), outages and to merge the functions of independent offices into the main stream operational hierarchy with the help of organization wide networking . With this objective in mind they planned to survey and index their existing consumers using GIS technology. CMCs strong presence in the power sector and GIS domain ENABLED DPSCL to grant this order to CMC

CMC's Solution

The proposed GIS solution consists of the following modules :

- **User Access Control Module**
This module will Add, Modify and Delete user role, user and role access. The options available in this module are:
 - User Role Master
 - User Master
 - Role Access Master
- **Attribute Data Maintenance Module**
This module will Add, Modify and Delete attribute for each Electrical Distribution Network Assets. It will have the option for the following Assets:
 - Transformer Attribute Maintenance
 - Energy Meter Attribute Maintenance
 - CT Attribute Maintenance
 - PT Attribute Maintenance
 - Capacitor Attribute Maintenance
 - Breaker Attribute Maintenance
 - FCRP Attribute Maintenance
 - Feeder Attribute Maintenance
 - Pole Attribute Maintenance
 - Receiving Station / Switching Sub-Station Attribute Maintenance
 - Consumer Attribute Maintenance
- **GIS Mapping Module**
This module will display GIS map of Electrical Distribution Network with Land base data. There will be option for GIS Map navigation, and query. The options available are:
 - GIS Map Display
 - GIS Map Navigation
 - GIS Map Query
 - Upstream Tracing of a Consumer
 - Special Query of GIS Map
 - Display all Consumers getting Power from a Substation
 - Display all Consumers fed from a Feeder
 - Display all Consumers Connected to a Power Transformer

- **GIS Data Editing Module**
This module will help to Edit GIS data centrally through a GIS Editor tool.
- **Billing Interface Module**
This module will interact with the existing Billing module to get some data for each consumer.
- **Reporting Module**
This module will produce some MIS reports which will help user to analyse asset information of Electrical distribution Network. The reports available are:
 - Feeder wise, category wise consumer details
 - Substation/Feeder wise consumers based on connected
 - List of substation based on transformer capacity
 - List of substation commissioned during specified period
 - List of Consumers provided connection during specified period
 - Category wise monthly revenue demand for consumers
 - List of Consumers with zero consumption
 - Monthly low consumption report (current year, previous month)
 - Monthly low consumption report (previous year, same month)
 - Seasonal low consumption report
 - Monthly high consumption report (current year, previous month)
 - Monthly high consumption report (previous year, same month)
 - Seasonal high consumption report
 - List of defaulting consumers
 - Circle, Sub-station, Feeder and Category wise load growth or loss
 - Consumer wise last six month consumption

The GIS module which is the main module ,displays configurable maps of land base data (state boundary, district boundary, road, etc.) superimposed with assets of Electrical Distribution Network (receiving station,feeder,transformer, electrical pole and consumer, etc.) of an electrical distribution area. This module is the graphical interface between user and system using GIS map. It is used for monitoring Electrical Distribution Network assets. The various functionalities covered under GIS Mapping Module are:

Topic No	Functionality Name
3.1.2.1	Display Land Base Map of the licensed area.
3.1.2.2	Display Electrical Distribution Network diagram.
3.1.2.3	GIS Map Navigation
3.1.2.3.1	Zoom-In by Rectangle
3.1.2.3.2	Zoom-In by Mouse click
3.1.2.3.3	Zoom-Out by Mouse click
3.1.2.3.4	Pan
3.1.2.3.5	Full Extent
3.1.2.3.6	Selection of Layer
3.1.2.3.7	Display Legend of Layers
3.1.2.3.8	Display Co-ordinate
3.1.2.4	GIS Map Query
3.1.2.4.1	Query Setting
3.1.2.4.2	Query Attributes of Layer
3.1.2.4.2.1	Receiving Station
3.1.2.4.2.2	Switching Sub-Station
3.1.2.4.2.3	Power Transformer
3.1.2.4.2.4	Feeder
3.1.2.4.2.5	Pole

3.1.2.4.2.6	Consumer
3.1.2.4.3	Upstream tracing of a Consumer
3.1.2.4.4	Special Query of GIS Map
3.1.2.4.4.1	Display all Consumers getting Power from a Substation
3.1.2.4.4.2	Display all Consumers fed from a Feeder
3.1.2.4.4.3	Display all Consumers Connected to a Power Transformer

The details of these functionalities are:

Display Land Base Map of the licensed area

User can display the full licensed area map of land base data with this module. User can display any combination of land base data layers depending on their requirement. The land base data layers are:

- State Boundaries
- District Boundaries
- Water Bodies
- Roads

These layers will be displayed with different symbols and colours to distinguish them perfectly on the full map.

Display Electrical Distribution Network diagram

User can superimpose the full licensed area map of Electrical Distribution Network Assets over the map of land base data in this module. User can display any combination of Distribution Network Asset layers depending on their requirement. The Distribution Network asset layers are:

- Receiving Station
- Power Transformer
- Feeder
- Pole/Tower
- Consumer

These layers will be displayed with different symbol and colour to distinguish them perfectly on the full map.

GIS Map Navigation

User can navigate the full map using the following functionalities

a) Zoom-In by Rectangle

The full map of the Electrical Distribution Area Network can be zoomed in by drawing a rectangle on the map by mouse. The centre of the zoomed map will be the centre of the rectangle drawn.

Selection of the layers will remain same after zoom-in. Depending on the scale setting, some of the layers will disappear and some of the layers will appear on the zoomed map. Depending on the size settings of the symbols of the different layer of assets, the size of the symbol will also change as per the change in scale with zoom-in.

b) Zoom-In by Mouse Click

The full map of the Electrical Distribution Area Network can be zoomed in by clicking on the map by mouse. The centre of the zoomed map will be the position where user clicks with mouse.

Selection of the layers will remain same after zoom-in. Depending on the scale setting, some of the layers will disappear and some of the layers will appear on the zoomed map.

Depending on the size settings of the symbols of the different layer of assets, the size of the symbol will also change as per the change in scale with zoom-in.

c) **Zoom-Out by Mouse Click**

The full map of the Electrical Distribution Area Network can be zoomed out by clicking on the map by mouse. The centre of the zoomed-out map will be the position where user clicks with mouse.

Selection of the layers will remain same after zoom-out. Depending on the scale setting, some of the layers will disappear and some of the layers will appear on the zoomed-out map. Depending on the size settings of the symbols of the different layer of assets, the size of the symbol will also change as per the change in scale with zoom-out.

d) **Pan**

The map of the Electrical Distribution Area Network can be panned by clicking and dragging the mouse over the map. User can display the map of the area lying outside the view area on screen with pan option. After zoom in some part of the map will go outside of the display area, but the pan option will help user view that area.

Selection of the layers will remain same after panning. Depending on the pan, some part of the map will be hidden and some part of the map will appear on the panned map.

e) **Full Extent**

After zoom in a small part of the full map will be displayed on the display area. If the user wants to display the full map then the option 'Full Extent' will be useful. User can display full map from the zoom-in map by selecting this option.

Selection of Layer

User can select or deselect different layers with this option as per his requirement and redraw the map with different set of layers. User can hide one or more layers from the existing map by deselecting those layers from the layer list which will appear after clicking on the option.

Selection of layer and then redrawing the map is by Redraw option. User can also display some additional layers by selecting those from the layer list and redrawing the map.

Layer List:	
<input type="checkbox"/>	Layer1
<input type="checkbox"/>	Layer2
<input type="checkbox"/>	Layer3
<input type="checkbox"/>	Layer4
<input type="checkbox"/>	Layer5
<input type="checkbox"/>	Layer6

Display Legend of Layers

User can display legend of all layers displayed on the map. This legend will be represented by the symbol of each layer with colour and the name of the layers in a list.

Display Coordinate

System will display coordinate of the current mouse position and the coordinate value will change with the movement of mouse pointer over the map area. User can see co-ordinate only when the mouse pointer is inside the map area. If the mouse pointer goes outside the map area then the system will not display the coordinate.

GIS Map Query

User can query any layer of the GIS map to get the attribute data for a particular feature of that layer. User has to click on any feature of a particular layer to get the attribute of that feature.

Query Setting

User can configure settings for GIS map Query by this option. User has to select the layer for which query to be fired.

Query Attributes of Layer

User can display attributes of a particular feature of a layer by this option. The user has to first configure the settings for query i.e. select a layer to query. After this when the user clicks on the map, the system will display the attributes of the nearest feature from the mouse click.