



Network Planning Tools

GIS Network Editor

- IEEE / IEC standard symbols
- Real-time Zooming / panning
- Single click Database Link
- Display of study results with SLD
- Dynamic load flow
- Creation of Contingencies
- Nested Networks
- Multi-Layers
- Save / Load snapshot
- Find a Bus / Node
- Element in-service / out-of-service
- User configurable base voltages
- Dynamic IEEE / IEC switch
- Object Z-Order control
- Integrated database
- Invoke any study - LFA, SCS...
- And more...

Database Manager

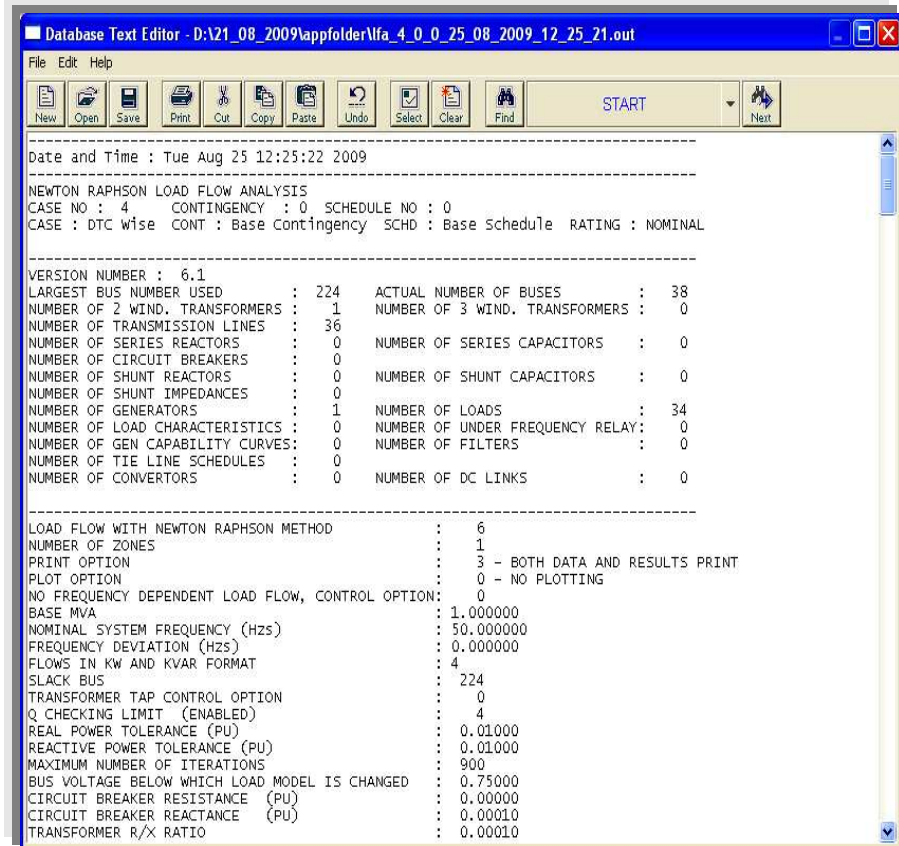
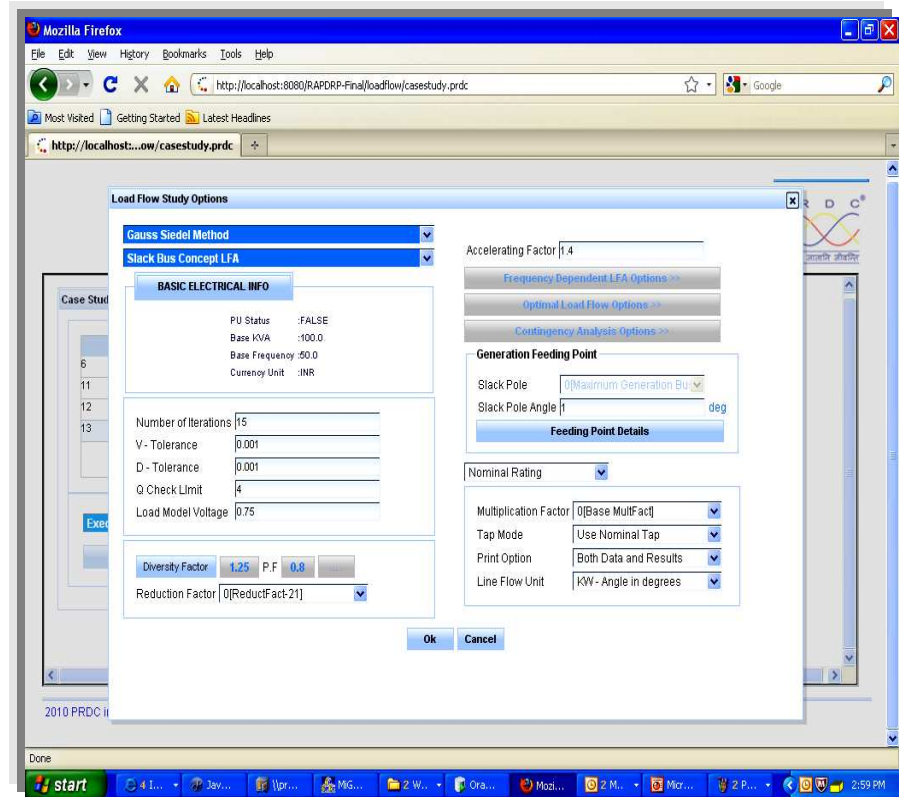
- Centralized for Elements & Library
- User friendly, Interactive forms
- Solid validated library of Relays, Breakers, Generators, AVR, SVC, Fuse, Line & Cable etc.
- Distinct element & connectivity data
- Entry in Per Unit [PU] or own rating
- Unlimited number of contingencies
- Invoke any study - LFA, SCS...
- Apply global multiplication factor
- Apply global reduction factor
- Integrated AVR, PSS, TG, SVC
- Custom HVDC, AVR, PSS, TG SVC
- User defined unlimited branch filters
- User defined load characteristics
- Present worth calculation
- Generator capability curves
- Standard & Custom reports
- Additional MIS reports
- Creation of sub-DB from master DB and more....



Load Flow Analysis

Feature Highlights

- ✓ Efficient memory management using sparsity technique.
- ✓ Slack bus, Frequency dependent, Optimal and contingency ranking
- ✓ Fast-DeCoupled, Newton - Raphson and Gauss - Seidel methods
- ✓ Frequency dependent with Flat Tie-Line, Flat Frequency and Flat Tie-Line Frequency Bias Control
- ✓ Active / Real Optimal load flow
- ✓ Reactive Optimal load flow
- ✓ Active/Real and Reactive load flow
- ✓ AC-DC load flow
- ✓ Looped, radial and Multiple Isolated systems
- ✓ User-defined number of contingencies, cases
- ✓ User-defined filters, load characteristics, Generator capability curves
- ✓ User-defined frequency and base MVA
- ✓ Distribution line can be opened at one or both sides
- ✓ Representation of shunt elements in admittance /impedance
- ✓ Two / Multi - terminal HVDC systems
- ✓ Modeling six/twelve pulse monopolar / bipolar HVDC converters with constant voltage/current/power controls.
- ✓ Modeling two and three winding transformers with auto tap, off nominal fixed tap and phase shift
- ✓ Grouping buses zone/area wise
- ✓ Load values, scheduled generation, reactor and capacitor values can be changed globally or zone wise using reduction factors.
- ✓ Generator Q - check limit violations after a specified number of iterations.
- ✓ Changing the load model from the given type to impedance type automatically, when the voltage magnitude at load bus goes below specified value to have better and realistic convergence.
- ✓ MVAR compensation
- ✓ Load shedding during under frequency to maintain the frequency at desired value.
- ✓ Standard and Custom reports

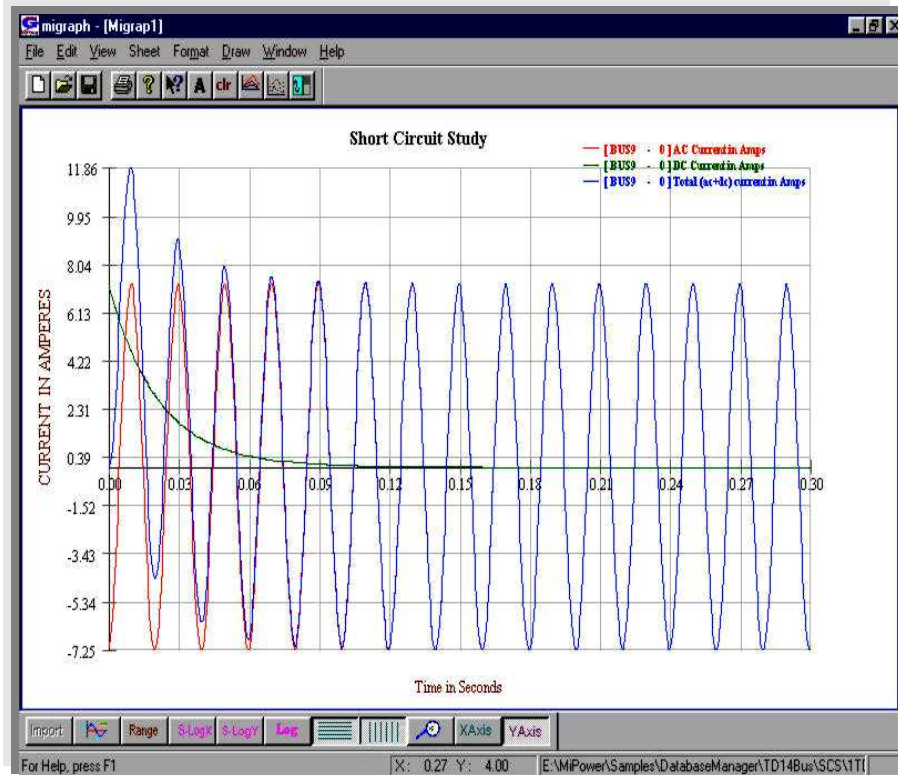
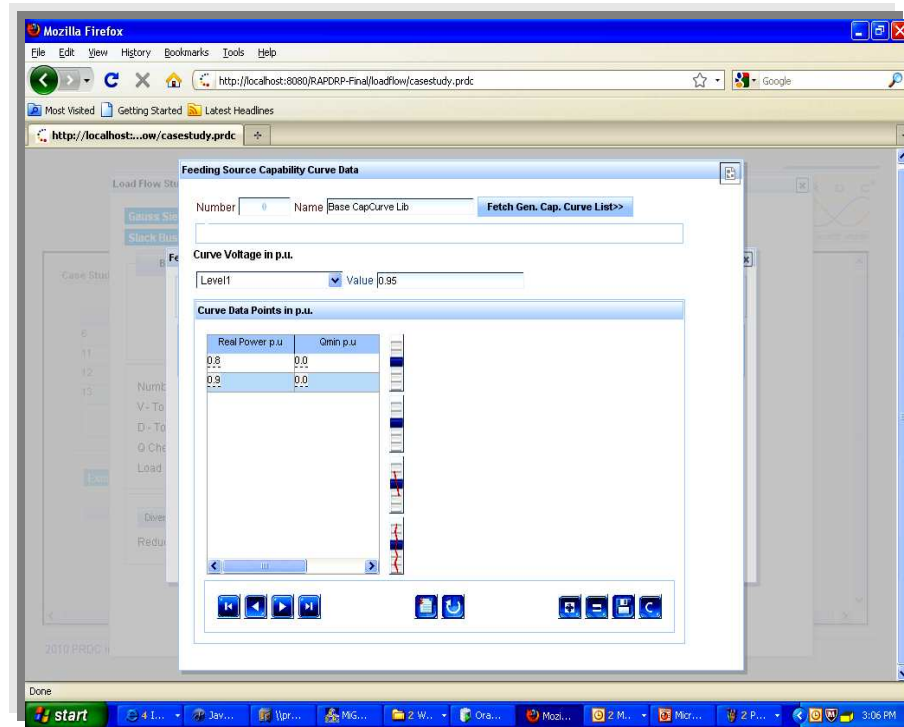




Short Circuit Studies

Feature Highlights

- ANSI / IEEE standards
- IEEE Std 141-1986[4]
- IEEE C37,010-1979[1]
- IEEE C37-5-1979 [3]
- IEEE C7010-1979
- IEC 363
- IEC 909
- Symmetrical and Asymmetrical faults
- Faults with and without impedance
- Loop, radial systems
- Multi islanding
- Multi generation
- Multi cases and contingencies
- Open conductor faults
- Travelling shunt faults
- Fault at all / selected buses sequentially
- Fault at selected voltage level/s
- Earthing & Zigzag transformers
- First cycle and interrupting fault rating
- Reactor Sizing
- Alerts breaker capacity violation
- Motor contribution to faults
- HVDC system contribution to faults
- Pre-fault voltage condition from the load flow/flat start
- Multiplication factors for unknown zero and negative -sequence parameters
- Positive, negative, zero sequence current & fault-MVA
- Phase A, B, C current and fault MVA
- Peak Asymmetrical current, Fault impedance R/x ratio
- Post-fault bus voltages, currents and impedance as seen at the relay positions
- Breaker fault interrupting capacity selection
- User defined Output units
- Custom reports



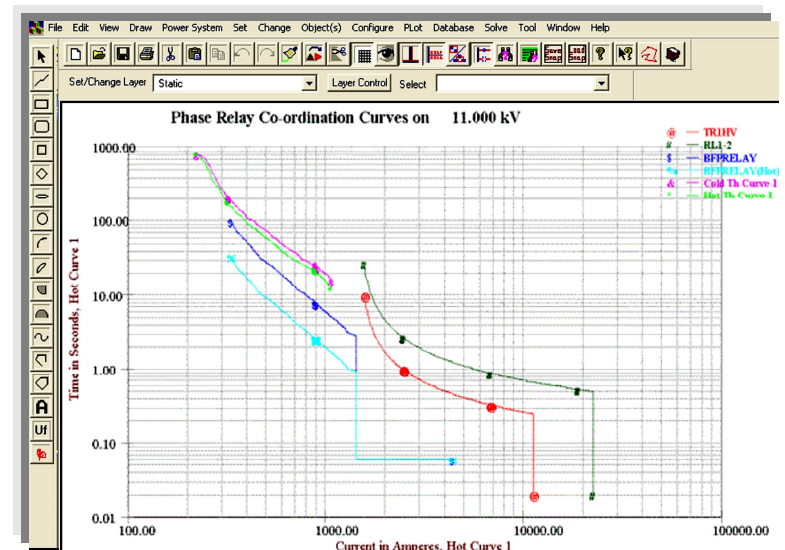
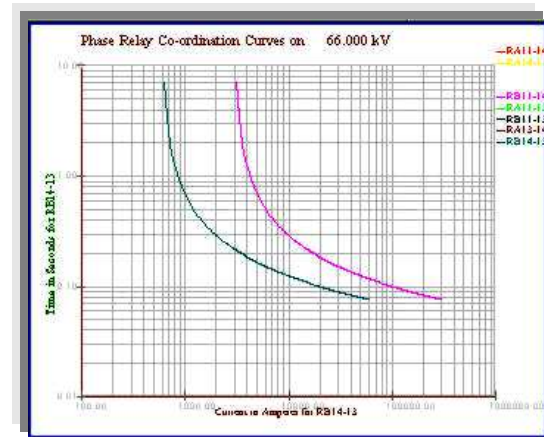


Relay Co-ordination

Feature Highlights

- Inbuilt discrimination time calculator
- Optional inclusion of motor contribution during fault simulation
- Zone 1, zone 2 and zone 3 setting for distance relays
- Hot and cold curves considered
- Phase and Earth relay co-ordination
- Automatic / Interactive / Manual Primary-back-up relay pairs generation

- Text and Graphical Output
- Export to AutoCAD
- Thermal curves for each equipment
- Optional Voltage input from load flow or flat start
- Overload factor, unbalance factor and discrimination time for each relay
- Extensive database of relays
- Radial and mesh networks
- Automatic / Interactive / Manual Primary-back-up relay pairs generation
- Save and retrieval of selected relay pairs
- Embedded fault calculation
- Phase and Earth relay co-ordination
- Optimum setting for Motor relays
- Hot and cold curves considered
- Extensive database of relays
- Extensive fuse data
- Easy adding of new relay to library
- Graphical co-ordination
- Pick, drag and drop relay curves
- Verification of existing relay settings
- Fault simulation and relay trip sequence
- Text and Graphical Output
- Export to AutoCAD
- Thermal curves for each equipment
- Optional Voltage input from load flow or flat start
- Overload factor, unbalance factor and discrimination time for each relay
- Choice of transient / Sub-transient for Fault calculation
- Fault through impedance
- Fault on bus / node/ Transmission line
- Optional inclusion of motor contribution during fault simulation
- Inbuilt discrimination time calculator
- L-G, L-L-L, L-L, L-L-G fault simulation
- Zone 1, zone 2 and zone 3 setting for distance relays
- Impedance seen by the relay for faults



RELAY SETTINGS FOR PHASE FAULTS									
RELAY NAME	CLOSE IN FAULT CURRENT (Amps)	PLUG SETTING RATIO (Amps)	RELAY CAPACITY	REMARKS					
TR1HU	14623.2793	1500.0000	9.749	100.00	Within Limit				
TR1LU	12217.6045	2500.0000	4.887	100.00	Within Limit				
TR2HU	16686.2207	50.0000	333.724	100.00	Exceeds Limit				
TR2LU	10585.0703	1500.0000	78.567	100.00	Within Limit				
RL1-2	15798.9023	1500.0000	10.533	100.00	Within Limit				
BFPRELAY	13909.2266	396.0002	35.124	100.00	Within Limit				
SCMPRELAY	107272.7422	232.5001	461.388	100.00	Exceeds Limit				
GENRELAY	15746.0762	1500.0000	10.497	100.00	Within Limit				
LOADRL	13909.2266	640.0005	21.733	100.00	Within Limit				

RELAY NAME	CT CHOSEN (Amps)	PRIM (%)	PLUG SETTING (%)	T.D.S	CLOSE IN FAULT CURRENT (Amps)	OP. TIME FOR CLOSE IN FAULT (Secs)	REMOTE BUS FALT CURRENT (Amps)	OP.TIME REMOTE BUS FALT (Secs)	INSTANT SETTING (%)	
TR1HU	1500	100.00	0.070		14623.28	0.020000	7330.56	0.3048	750.00	CDG-21
TR1LU	2500	100.00	0.050		12217.60	0.217692	12217.60	0.2177	750.00	CDG-21
TR2HU	50	100.00	0.310		16686.22	0.368552	3993.43	0.4889	*****	CDG-21
TR2LU	1500	100.00	0.050		10585.07	0.081142	10585.07	0.0811	*****	CDG-21
RL1-2	1500	100.00	0.190		15798.90	0.557438	14623.27	0.5764	1500.00	CDG-21
BFPRELAY	400	99.00	4.000		13909.23	0.060000			600.00	CTHM-501
GENRELAY	250	93.00	4.000		107272.74	0.060000			600.00	CTHM-501
LOADRL	640	100.00	1.000		13909.23	0.025000	15746.08	0.9600(F)	*****	CDU22-L&T



Ground Grid Studies

Feature Highlights

- ✓ Dialog based interactive program.
- ✓ Program based on ANSI / IEEE Std 80-1986 IEEE Guide for Safety in AC Substation Grounding
- ✓ Program gives Mesh voltage, Touch voltage and Step voltage
- ✓ library for material constants.
- ✓ Provides the ground grid layout diagram

Compute ✕

3 phase to ground fault MVA

Single phase to ground fault MVA

X1/R1

X0/R0

Ground Grid Design-Configure Data ✕

Study Case No **Case Data** Number Name Fetch Grid Design List>>

System Parameters

Fault Duration Secs Voltage Level kV Frequency Hz

Impedance

R1 ohms R2 ohms R0 ohms Compute

X1 ohms X2 ohms X0 ohms

Burial Depth m Crushed Rock Thickness m

Cond. m Current Division Factor

Available Area Length m Breadth m

Conductor Type Reference Fetch Conductor Library>>

Soil Resistivity ohm-m

Crushed Rock Resistivity ohm-m

Temperature in degrees

Ambient Temperature °C

Maximum Temperature °C

Ground Grid Design-Conductor Library ✕

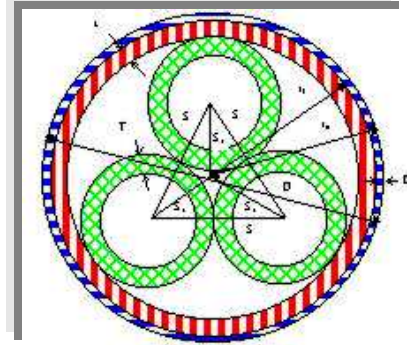
Conductor No	Conductor Name	% Conductivity	Thermal Coef. at 2...	Thermal Coef. at 0 ...	Resistivity of Gnd ...	TCAP factor effect
2	Standard Annealed	100	.00393	234	1.7241	3.422
3	Commercial Hard Dra	97	.00381	242	1.7774	3.422
4	Copper-Clad Steel C	40	.00378	245	4.397	3.846
5	Copper-Clad Steel C	30	.00378	245	5.862	3.846
6	Commercial EC Alum	61	.00403	228	2.862	2.556
7	Aluminum Alloy wire	53.5	.00353	263	3.2226	2.598
8	Aluminum Alloy wire	52.5	.00347	268	3.284	2.598
9	Aluminum Clad Steel	20.3	.0036	258	8.4805	2.67
10	Zinc Coated Steel Cd	8.5	.0032	293	20.1	3.931
11	Stainless Steel No 3	2.4	.0013	749	72	4.032



Line & Cable Parameter Calculation

Feature Highlights

- ✓ Calculates the positive, negative and zero sequence parameters of overhead lines
- ✓ Calculates the positive, negative and zero sequence parameters of Under Ground Cables
- ✓ Single and multi phase configurations
- ✓ Wide range of user defined frequencies and temperatures
- ✓ Calculates the mutual impedance between power and communication lines
- ✓ Supports 6 circuits for 3 phase line and 3 circuits for 6 phase line
- ✓ DC line parameter computation
- ✓ Transposed and untransposed Line parameters
- ✓ MKS and FPS units
- ✓ Impedance in Ohms per km or Ohms
- ✓ Impedance for entire line length or pu per km or pu for the entire line length
- ✓ Frequency varied from minimum to maximum value at user defined step
- ✓ Cable parameter calculation for both single core and 3 core cables
- ✓ Earth return path through ground or through ground and sheath or through sheath



MiCable1

Case Number: 1 Fetch Record >> Cable Name: CABLE-1

Core Type: Single Core Cable Three Core Cable

Conductor Type: 100% Conductivity Copper 97.3 % Copper (Hard Drawn) Aluminium

Earth Return Path: Ground Ground and Sheath Sheath

Shield Type: Unshielded Shielded

Base MVA: 100 Frequency: 60 Hz

Units Type: MKS FPS

Nominal Voltage Level of the Cable: 1000 volts Length of Cable: 10 mile Layers of Strands: 1

Diameter of a Single Strand: 0.0973 inch Overall Diameter of the Cable: 1.732 inch Axial Spacing b/n the Conductors: 0.604 inch

Distance b/n Conductors 'a' and 'b': 0.604 inch Distance b/n Conductors 'b' and 'c': 0.604 inch Distance b/n Conductors 'c' and 'a': 0.604 inch

Lead Sheath Thickness: 0.156 inch Lead Sheath Insulation Thickness: 0.109 inch Belt Insulation Thickness: 0.078 inch

Temperature: 20 Celsius

Resistivity of the Cable Material: 1.53145e-011 ohm-mile Resistivity of the Earth: 100 ohm-mile

Resistivity of the Insulator: 100000 ohm-mile Dielectric Constant: 3.7

Output Options: Actual Value per Unit Length P.u. Value per Unit Length
 Actual Value for Entire Length P.u. Value for Entire Length

```

1MilInsc.out - Notepad
File Edit Format View Help
-----
Date and Time : Wed May 19 12:01:28 2010
-----
CABLE PARAMETER CALCULATION
CASE NO : 1                      SCHEDULE NO : 0
-----
Temperature at which the R is calculated : 20.0 degree celsius
Units : 1 (FPS system)
Diameter of the strand : 0.0973 inch
Number of layers of stranded conductors : 1
Length of the conductor : 10.000 mile
Resistivity at zero degree celsius : 1.53145e-011 ohm-mile
Lead sheath insulation : 0.1090 inch
Axial spacing between conductors : 0.6040 inch
Frequency : 60.0 hertz
Number of cores : 3
Resistivity of the insulation : 100000.0 ohm-mile
Diameter over insulation : 1.7320 inch
Conductor insulation Thickness : 0.1560 inch
Return path : Through both ground and sheath
Return path : Through ground
Conductor type : 2
(Material used for the conductor - Aluminium)
Distance among conductor centers (a-b) : 0.6040 inch
Distance among conductor centers (b-c) : 0.6040 inch
Distance among conductor centers (c-a) : 0.6040 inch
System voltage : 1000 volts
Earth resistivity : 100.0 ohm-m
Dielectric constant : 3.7
Shield : 1
(3 core ,shielded cable)
Belt insulation : 0.0780 inch
Output option : 0 - ohm(Mho)/mile
Base MVA : 100.000
-----
POSITIVE SEQUENCE IMPEDANCE : 0.98961+j0.20265
POSITIVE SEQUENCE SUSCEPTANCE : 0.00008
NEGATIVE SEQUENCE IMPEDANCE : 0.98961+j0.20265
NEGATIVE SEQUENCE SUSCEPTANCE : 0.00008
ZERO SEQUENCE IMPEDANCE : 2.89518+j1.87208
ZERO SEQUENCE SUSCEPTANCE : 0.00008
-----
Date and Time : Wed May 19 12:01:28 2010

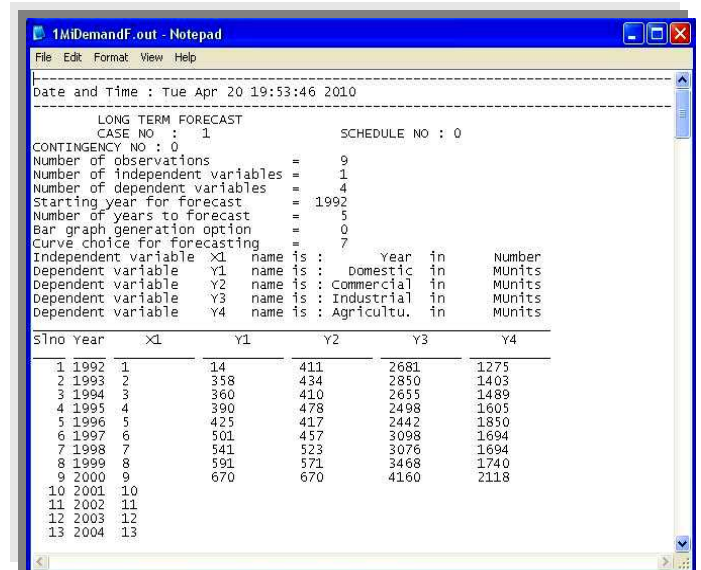
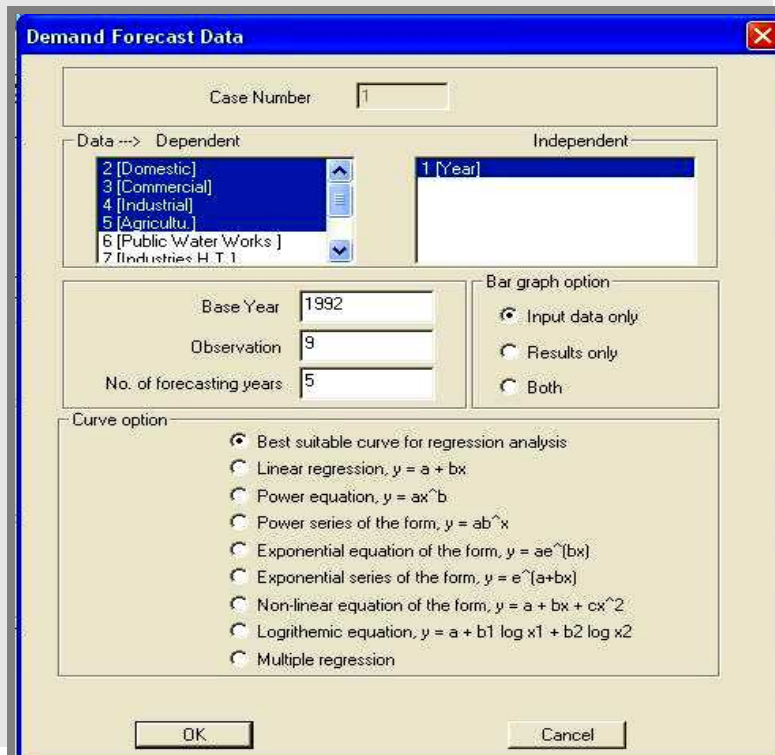
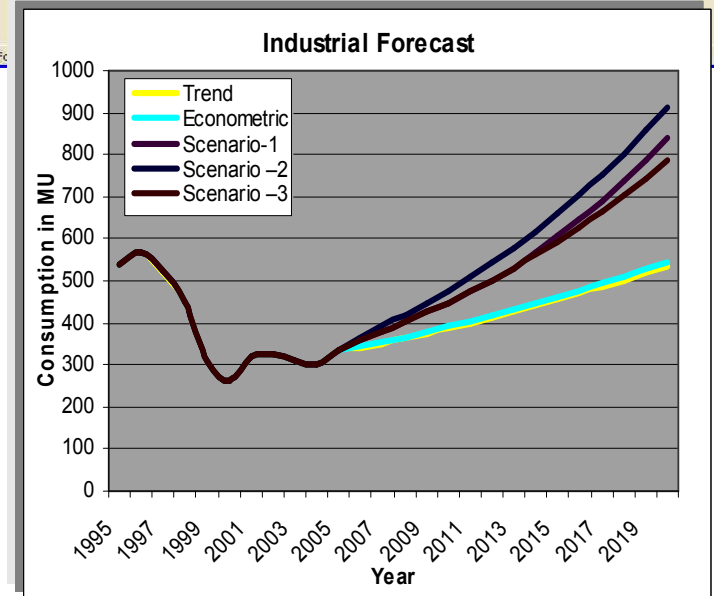
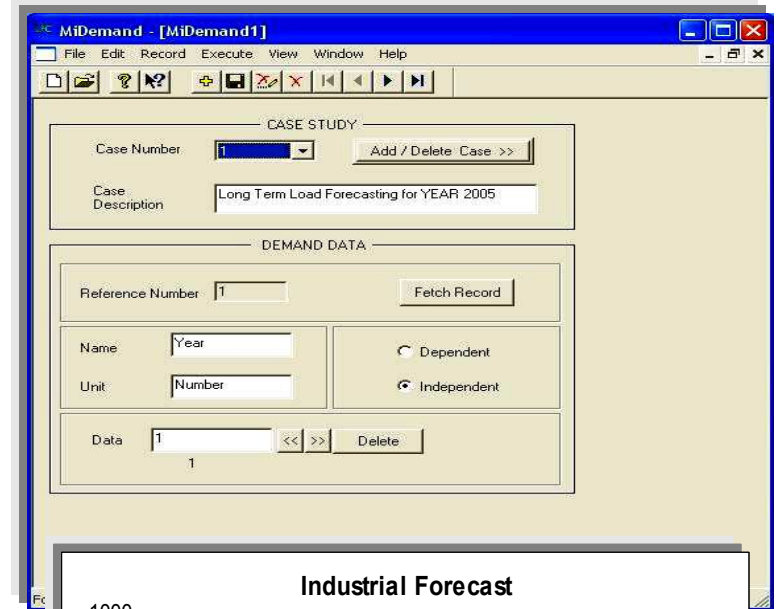
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Load Forecasting

Feature Highlights

- ☑ Forecasts the energy demand during the planning stages of a power system.
- ☑ Can be applied for any type of load data.
- ☑ Can accommodate any number of independent variables.
- ☑ Multivariate regression techniques for the forecasting.
- ☑ Uses the past data for the estimation of dependent variables with least error.
- ☑ Based on the user input value, the forecasting model is selected.
- ☑ Facility to accommodate more than one independent variable (maximum 18) like, population, per-capita income, number of consumers, etc.
- ☑ In the same data file it is possible to define more than one dependent variable (maximum 18) for example total electricity consumption by different categories like, domestic, commercial, and agriculture etc.
- ☑ Capable of selecting the best model out of various models.
- ☑ Facility to accommodate maximum of 48 observations for each category.
- ☑ Output includes reports and bar graph files.





Reliability Analysis

Feature Highlights

- RI Calculation
- SAIFI - System Average Interruption Frequency Index
- SAIDI - System Average Interruption Duration Index
- CAIFI - Customer Average Interruption Frequency Index
- CAIDI - Customer Average Interruption Duration Index
- Polling the tamper data from the ETV meter, daily, weekly, monthly or yearly
- Segregation data in to Header & Tamper Data - Parsing
- Parses hexadecimal to decimal
- Updation of the Data to Database
- UI screens for -Meter configuration and polling schedule
- No Of Tripping per n KM of Line for Sub Division
- Level, Sub Station Level, Feeder Level and Meter Level
- Subdivision Level Report
- Index calculations for the subdivision level
- Substation Level Report
- Index calculations for both subdivisions and substations
- Feeder Level Report
- Index calculations for subdivision, substation and feeder
- Meter Level Report
- Index calculations for subdivision, substation feeder and meter
- Meter Reading wise Report
- Index calculations for subdivision, substation, feeder, and meter contains the failure type, Date and time of failure occurrence, duration of failure, RY voltage, BY voltage, RY Current and BY Current

Meter Configuration - Configure Meter ID

Number: Name: Fetch Company ID List >>

Company Consumer Identifier Format

RIGHT TO LEFT

Total Number of Digits:

Level	Position	Digits	Ignore
SubDivision	1	2	<input type="checkbox"/>
SubStation	3	2	<input type="checkbox"/>
Feeder	5	2	<input type="checkbox"/>
Category	7	1	<input checked="" type="checkbox"/>

Meter

Polling Schedule

Status	Meter ID	Day Time (Hrs....)	Polling Flag	Polling Day
<input checked="" type="checkbox"/>	1233240213 [M1]	1:30	Continuous	0
<input type="checkbox"/>	0343433243 [m2]	1:0	Continuous	0
<input type="checkbox"/>	3243230342 [M3]	1:0	Continuous	0
<input type="checkbox"/>	0244230234 [M4]	1:0	Continuous	0
<input type="checkbox"/>	3243320234 [M5]	1:0	Continuous	0
<input type="checkbox"/>	4234343213 [M6]	1:0	Continuous	0
<input type="checkbox"/>	3444431234 [M7]	1:0	Continuous	0
<input type="checkbox"/>	0434431233 [M8]	1:0	Continuous	0
<input type="checkbox"/>	0343320213 [M9]	1:0	Continuous	0

Polling Day: 17/10/2008

OK Cancel

Tampered Meter Data

Meter Name: RAW DATA VIEW

Meter Header Data

Manufacturer Name	Date	Time	Meter Configuration	CT Ratio	PT Ratio	CT Tapping	Mode	Unit of
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Meter Failure Data

Failure Type	Date	Time	Total Duration in min	RY Phase Volt at Occurrence	RY Phase Occu
Y Phase C...	20/11/2007	11:18	10	112.941176	(
R Phase C...	20/11/2007	15:59	6	57.647059	-4
Y Phase C...	20/11/2007	15:59	5	57.647059	-5
Y Phase C...	20/11/2007	16:4	2	57.647059	(
Y Phase C...	20/11/2007	16:17	30	102.352941	-5
R Phase V...	20/11/2007	16:19	5	58.823529	-5
Y Phase C...	20/11/2007	16:58	3	108.235294	(
Y Phase C...	20/11/2007	17:6	3	109.411765	(
Y Phase C...	20/11/2007	17:12	7	109.411765	0
Y Phase C...	20/11/2007	17:22	6	0.0	(
Y Phase C...	20/11/2007	17:36	12	109.411765	0
Y Phase C...	20/11/2007	17:52	2	109.411765	0
Y Phase C...	20/11/2007	17:52	2	109.411765	0
Y Phase C...	20/11/2007	18:0	2	109.411765	0

Close

Database Text Editor - F:\shabhin\mca...

File Edit Help

DATE : 11-Aug-2008

Reliability Index Report

Case No : 13

Case Name : Case1

Study Date : 21-Aug-2008

Company ID

From Date

To Date

From Level

SUB DIVISION LEVEL

Name	Index Type	SAIFI	SAIDI	CAIDI	Trips/Ckt-Len
sd1	0.0000	0.0000	0.0000	0.0000	0.0000
sd2	2.0000	8.0000	2.0000	4.0000	0.0000
sd3	3.0000	1645.0000	3.0000	145.9333	0.0000
sd4	2.0000	0.0000	0.0000	0.0000	0.0000
sd5	2.0000	379.0000	2.0000	189.5000	1.0000

SUB STATION LEVEL

Name	Index Type	SAIFI	SAIDI	CAIDI	Trips/Ckt-Len
substation1	0.0000	0.0000	0.0000	0.0000	0.0000
substation2	2.0000	8.0000	2.0000	4.0000	0.0000
substation3	3.0000	1645.0000	3.0000	145.9333	0.0000
substation4	2.0000	0.0000	0.0000	0.0000	0.0000
substation5	2.0000	379.0000	2.0000	189.5000	1.0000

FEEDER LEVEL

3-Phase Load Flow

Feature Highlights

- ✓ Newton Raphson Algorithm
- ✓ Provision for both balanced and unbalanced power flow.
- ✓ Provision for modeling single, double and quad circuits
- ✓ Computation of positive, negative and zero sequence voltages as well as currents and also degree of unbalance in the system
- ✓ Plotting of 3 phase load flow results on GUI.

