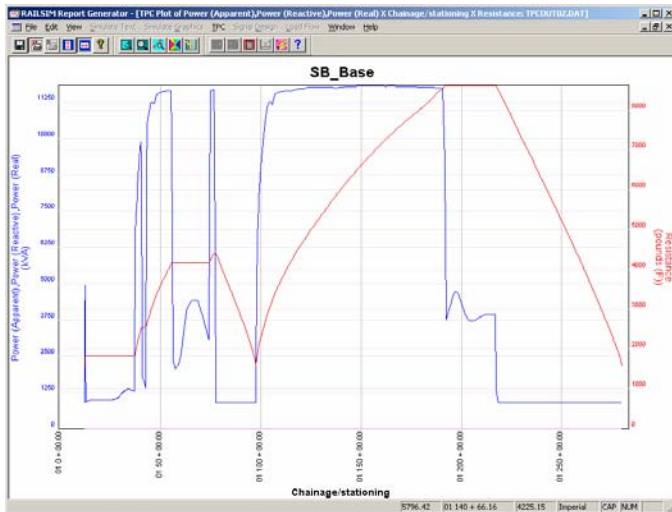


RAILSIM® Train Performance Calculator (TPC) accurately and easily simulates a single train on a single track and is most useful for:

- Rail Network Planning
- Rolling Stock Design/Evaluation



Train Plot showing real, reactive, and apparent power components versus location

### Capabilities

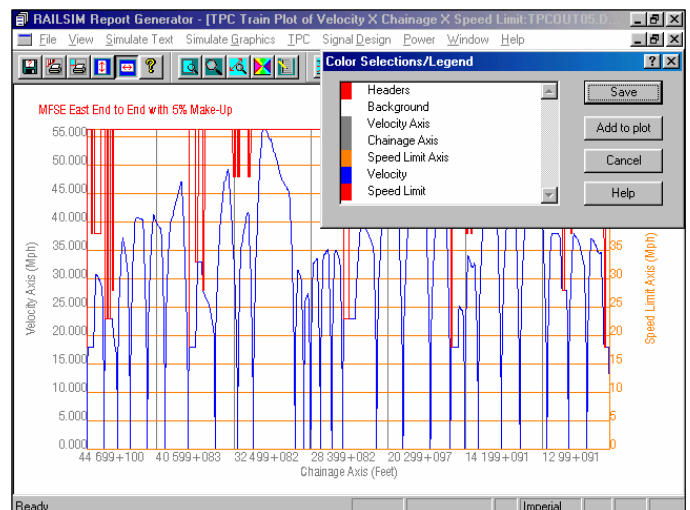
- Calculate curve speed limits where engineering calculations are not available.
- Analyze skip-stop operations, alternative stopping patterns, and the impacts of global or station-specific dwell time improvements.
- Calculate peak power and energy consumption to evaluate energy savings from coasting strategies and more energy-efficient rolling stock.
- Compare the performance and trip times of different rolling stock models, including off-the-shelf and custom-built models.
- Determine power to weight ratios under a variety of adhesion conditions where severe grades and curves are an issue.
- Evaluate trip time adjustments when low adhesion conditions prevail.



This TPC Train Plot shows speed and velocity versus location.

### Features Summary

- 8 run types
- Complete user control of the run parameters allow for fast and easy changes for each simulated train run (calculation timestep, schedule margins, train loads, tractive/braking force curves, jerk rate limiting, etc.)
- Real-world rolling stock model data (or create your own) for precise train composition-specific analysis



TPC accurately models resistance against train movement, including the effects of flange, journal and bearing resistance, aerodynamic resistance in open air and tunnel environments, grade effects, and curve effects.

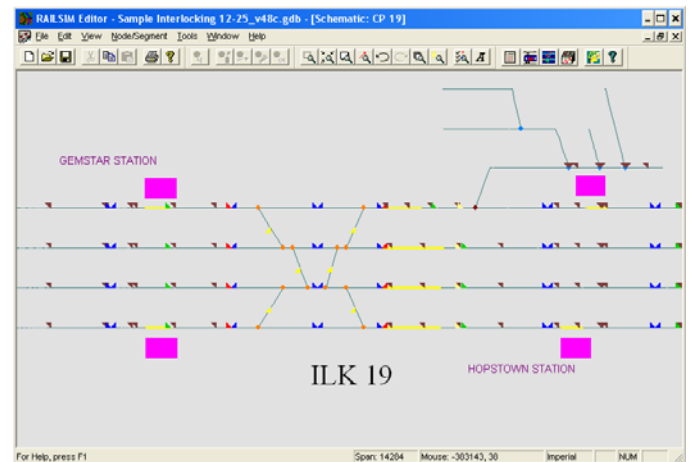
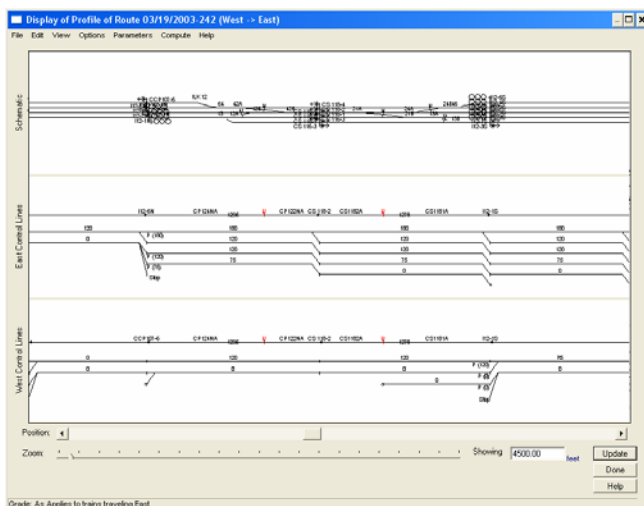
RAILSIM Editor is the single-source, user-friendly tool for defining rail network simulation models including infrastructure, control systems, equipment, and operations.

### Capabilities

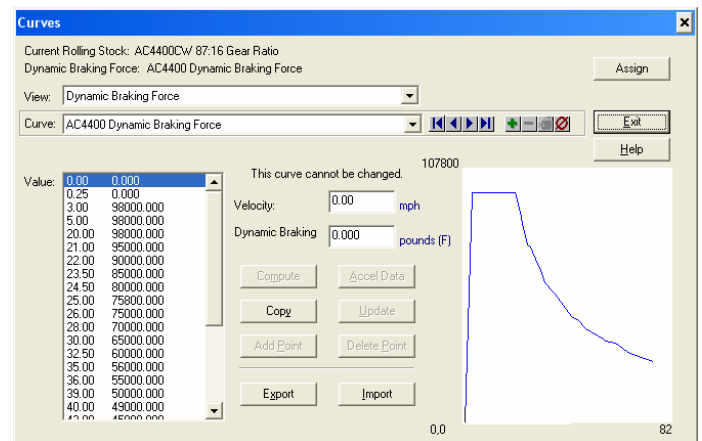
- Model any rail network from the simplest to the most complex multi-line, multi-modal network.
- Store all departments' engineering data in a single repository
- Define multiple operating plans within a single model
- Specify train routes interactively
- Define schedule patterns and subsequent associations with individual trains or train classes.
- Replicate specific train trips at specified intervals.
- Assemble train consists from RAILSIM Rolling Stock Libraries and/or user-defined models, complete with user-defined or computed performance curves.
- User-defined signal aspects/operating rules
- Wayside/no cab, wayside/cab, cab/no wayside and Communications-Based Train Control (CBTC)
- Mixture of cab signal equipped and non-equipped vehicles operating on the same system
- Track warrant/manual block systems

### Track Profile Editor

- Isolate train routes to edit/analyze
- Define purpose-specific engineering drawings for export to CAD-compatible files
- Access the RAILSIM Headway, Safe Braking Distance and Control Line Calculators



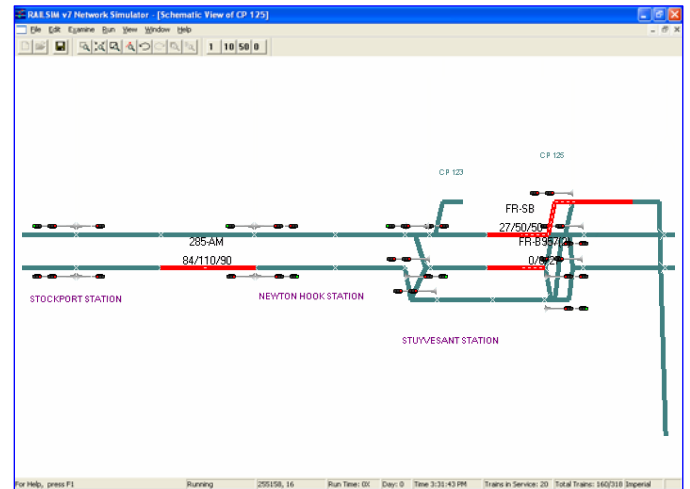
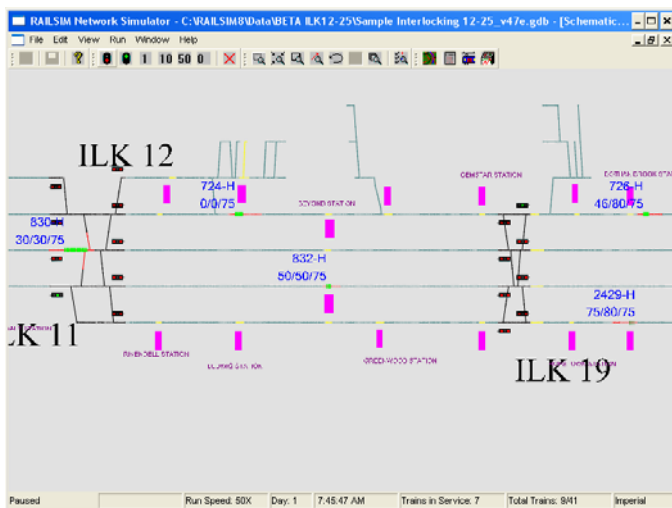
Schematic view of a complex rail network



The screenshot shows the 'Node Property Editor' window. It displays various settings for a node, including Length, Grade, Track ID, and Track Circuit. The window is divided into several tabs: Node, West Segment, East Segment, West Signal, and East Signal. The 'Node' tab is currently selected. It includes fields for Length (173.72 feet), Grade (0.060 %), Track ID (2), and Track Circuit (CP192SA). It also includes checkboxes for North Rail, South Rail, Unsignaled Territory, Moving Block (CBTC) Territory, and Hidden Track. The 'Structure' section includes options for At Grade/Open Cut, Tube, Box Tunnel, and Elevated. The 'Curvature' section includes options for Spiral and Super-elevation. The window includes buttons for OK, Cancel, Apply, and Help.

RAILSIM Network Simulator is models train operations on virtually any train control system over a virtually-unlimited rail network of multiple corridors and multiple modes. RAILSIM 'NS' is most useful for:

- Rail Network Planning
- Capital Improvements Planning
- Timetable and Operating Plan Validation
- Line Capacity Analysis
- Signal Design Validation



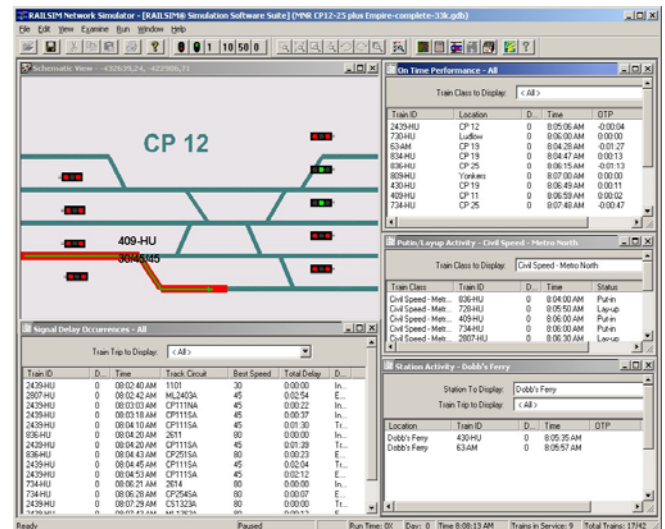
RAILSIM Network Simulator simulates complex interactions between passenger and freight operations for existing and emerging high-speed rail networks.

### Features Summary

- Automatic conflict detection and resolution
- 'Optimizer' to diagnose model issues
- Cab and wayside signaling (and wayside with cab)
- Advanced interlocking processing
- Operational randomization (dwell times, train put-in times, and tractive effort)

### Capabilities

- Evaluate critical capacity limitations due to signal block spacing and solutions for eliminating these constraints.
- Test new train control systems or retrofits.
- Verify capacity requirements for line extensions and new designs.
- Evaluate infrastructure changes (upgraded track speeds, reconfigured interlockings, modified yard configurations, line extensions, double tracking, and new terminals).
- Test operational alternatives and their potential sensitivity to minor perturbations as well as completely different operating strategies in routings, direction of traffic, terminal manipulations, and station stops.
- Analyze line capacity given the operating constraints of multiple train classes, stopping patterns, signal systems, and dispatching strategies, identify bottleneck locations, and test alternative solutions.



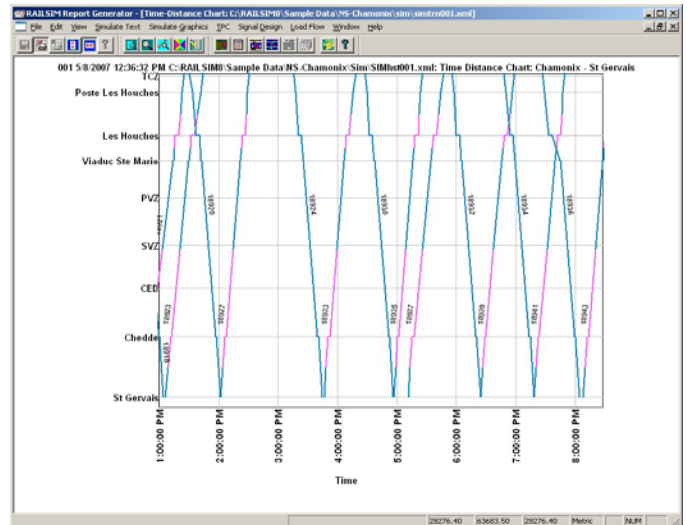
RAILSIM Network Simulator supports multiple run-time windows — geographic views, schematic views, and many types of text windows — all dynamically updated as the simulation progresses.

Utilize detailed and site-specific diagnostic reports to calibrate the simulation model to real-world, field-measured acceleration and braking rates, terminal-to-terminal run times, observed signal code restoration clearing times, and run time impacts resulting from diverging routes.

## Output

Using Report Generator, many graphical and text reports can be created, including:

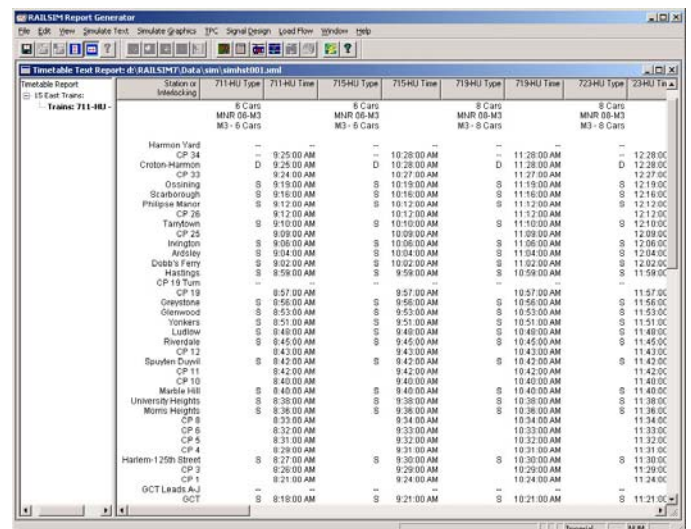
- Delay Analysis Report
- Delay Summary Report
- Failures and Operating Events Report
- Interlocking Report
- Lateness Report
- Passenger Flow Report
- Passenger Statistics Report
- Passenger Loading Report
- Signal Clear Report
- Signal Delay Report
- Station Report
- System Lateness Report
- Timetable Report
- Track Use Report
- Train Report
- Train Detail Report
- Time-Distance Plot (String Chart)
- Graphic Passenger Flow Report
- Graphic Passenger Loading Report
- Graphic Station Report
- Graphic Train Report



Sample Graphic Time-Distance Plot (String Chart)

Train ID Inbnd	Train ID Outbd	Event Type	Track Number	Previous Train(s)	Scheduled Time	Simulated Time	Time Difference
1340-NH	1365-NH	No Stop	4			3:12:21 PM	
	1567-NH	No Stop	4			3:21:20 PM	
		No Stop	3			3:28:42 PM	
	564-HA	Arrival	4		3:31:00 PM	3:32:27 PM	-0:01:27
	564-HA	Scheduled Depart	4		3:31:25 PM	3:32:52 PM	-0:01:27
	1367-NH	No Stop	4			3:45:21 PM	
549-HA		Arrival	3		3:43:00 PM	3:45:50 PM	-0:02:50
549-HA		Scheduled Depart	3		3:43:25 PM	3:46:15 PM	-0:02:50

An excerpt of a typical text format Station Report



Station or Interlocking	711HU Type	711HU Time	715HU Type	715HU Time	719HU Type	719HU Time	723HU Type	723HU Time
Harmon Yard	---	---	---	---	---	---	---	---
CP 34	S	9:25:00 AM	D	10:28:00 AM	S	11:28:00 AM	D	12:28:00 AM
Croton-Hampton	D	9:25:00 AM	D	10:28:00 AM	D	11:28:00 AM	D	12:28:00 AM
CP 33	S	9:24:00 AM	S	10:27:00 AM	S	11:27:00 AM	S	12:27:00 AM
Ossining	S	9:19:00 AM	S	10:19:00 AM	S	11:19:00 AM	S	12:19:00 AM
Scarsborough	S	9:16:00 AM	S	10:16:00 AM	S	11:16:00 AM	S	12:16:00 AM
Philippe Manor	S	9:12:00 AM	S	10:12:00 AM	S	11:12:00 AM	S	12:12:00 AM
CP 26	S	9:12:00 AM	S	10:12:00 AM	S	11:12:00 AM	S	12:12:00 AM
Tarrytown	S	9:10:00 AM	S	10:10:00 AM	S	11:10:00 AM	S	12:10:00 AM
CP 25	S	9:09:00 AM	S	10:09:00 AM	S	11:09:00 AM	S	12:09:00 AM
Wington	S	9:08:00 AM	S	10:08:00 AM	S	11:08:00 AM	S	12:08:00 AM
Ardley	S	9:04:00 AM	S	10:04:00 AM	S	11:04:00 AM	S	12:04:00 AM
Dobb's Ferry	S	9:02:00 AM	S	10:02:00 AM	S	11:02:00 AM	S	12:02:00 AM
Haverhill	S	9:02:00 AM	S	10:02:00 AM	S	11:02:00 AM	S	12:02:00 AM
CP 19 Turn	---	---	---	---	---	---	---	---
CP 19	S	8:57:00 AM	S	9:57:00 AM	S	10:57:00 AM	S	11:57:00 AM
Glenview	S	8:56:00 AM	S	9:56:00 AM	S	10:56:00 AM	S	11:56:00 AM
Glenwood	S	8:53:00 AM	S	9:53:00 AM	S	10:53:00 AM	S	11:53:00 AM
Vonkers	S	8:51:00 AM	S	9:51:00 AM	S	10:51:00 AM	S	11:51:00 AM
Ludlow	S	8:48:00 AM	S	9:48:00 AM	S	10:48:00 AM	S	11:48:00 AM
Riverdale	S	8:45:00 AM	S	9:45:00 AM	S	10:45:00 AM	S	11:45:00 AM
CP 12	S	8:43:00 AM	S	9:43:00 AM	S	10:43:00 AM	S	11:43:00 AM
Spuyten Duvel	S	8:42:00 AM	S	9:42:00 AM	S	10:42:00 AM	S	11:42:00 AM
CP 11	S	8:42:00 AM	S	9:42:00 AM	S	10:42:00 AM	S	11:42:00 AM
CP 10	S	8:40:00 AM	S	9:40:00 AM	S	10:40:00 AM	S	11:40:00 AM
Marble Hill	S	8:40:00 AM	S	9:40:00 AM	S	10:40:00 AM	S	11:40:00 AM
University Heights	S	8:38:00 AM	S	9:38:00 AM	S	10:38:00 AM	S	11:38:00 AM
Morris Heights	S	8:36:00 AM	S	9:36:00 AM	S	10:36:00 AM	S	11:36:00 AM
CP 8	S	8:33:00 AM	S	9:33:00 AM	S	10:33:00 AM	S	11:33:00 AM
CP 6	S	8:32:00 AM	S	9:32:00 AM	S	10:32:00 AM	S	11:32:00 AM
CP 5	S	8:31:00 AM	S	9:31:00 AM	S	10:31:00 AM	S	11:31:00 AM
CP 4	S	8:28:00 AM	S	9:28:00 AM	S	10:28:00 AM	S	11:28:00 AM
Harlem-25th Street	S	8:27:00 AM	S	9:27:00 AM	S	10:27:00 AM	S	11:27:00 AM
CP 3	S	8:26:00 AM	S	9:26:00 AM	S	10:26:00 AM	S	11:26:00 AM
CP 1	S	8:21:00 AM	S	9:21:00 AM	S	10:21:00 AM	S	11:21:00 AM
GCT Leads A-2	---	---	---	---	---	---	---	---
GCT	S	8:18:00 AM	S	9:21:00 AM	S	10:21:00 AM	S	11:21:00 AM

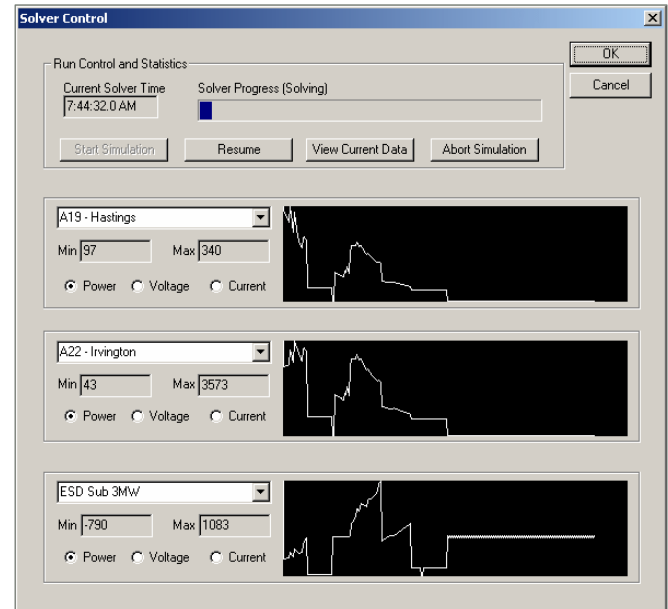
The Timetable Report generates schedule data in a publishable format. Options are included for train consist, train class, previous equipment trains and previous crew trains.

Load Flow Analyzer – DC is used for comprehensive and flexible modeling of any direct current (DC) electrical network and analyzes:

- System Electrical Capacities
- Power Demand
- Power Costs
- Effects of Regenerative Braking

### Capabilities

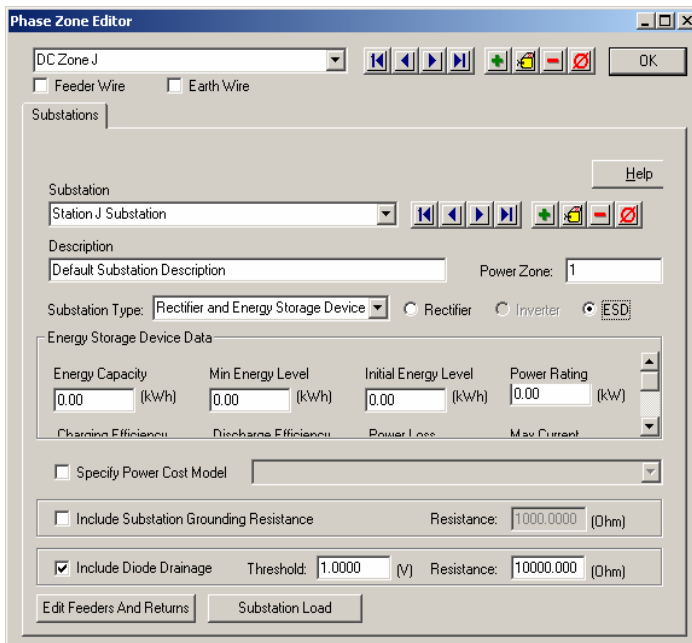
- Support for rail networks of any complexity
- Mixed fleet operations
- Deterministic (non-variable) and stochastic (variable) train operation/headways
- Headway-based inputs with identical train types
- Unlimited train types, train lengths and schedules
- Zone-specific power, energy and cost analysis
- Overall and train-specific regenerated power receptivity analysis
- Train Volume Monitoring by Location



RAILSIM LFA lets you graphically monitor up to 3 independent locations and variables during the solution process.

### Summary of Features

- Rail to earth leakage
- Location-specific single rail return for traction current
- Static loads (including import capability for load profiles that vary by time of day)
- Varying overhead conductors (trolley wires and contact wires) in different sections
- Different sizes of running and third rail sections
- Cross track connections between running rails
- Conductor gaps (bridgeable or unbridgeable by the train) in overhead or running rails
- Overhead trolley wire isolation switch status (on or off at given time duration)
- Substation outages for specified time durations
- Positive / negative feeder outages
- Connections between different tracks (jumper wires)
- Positive and Negative Feeder Conductor Locations
- Track Circuit Section Boundaries (Supply Conductor Gaps)
- Overhead Line/Track Resistance Change Points
- Generic Load and Resistance Point Locations





- Track (Supply Conductor) Isolation Switches
- Track Leakage Resistance Change Points
- Supply/Return Jumpers
- Energy storage devices, such as flywheels and storage batteries, and substation diode drainage
- Substation Loads
- Power Cost Models (with Peak Power tariff charges of three types: Instantaneous, Fixed Interval, Sliding Interval)

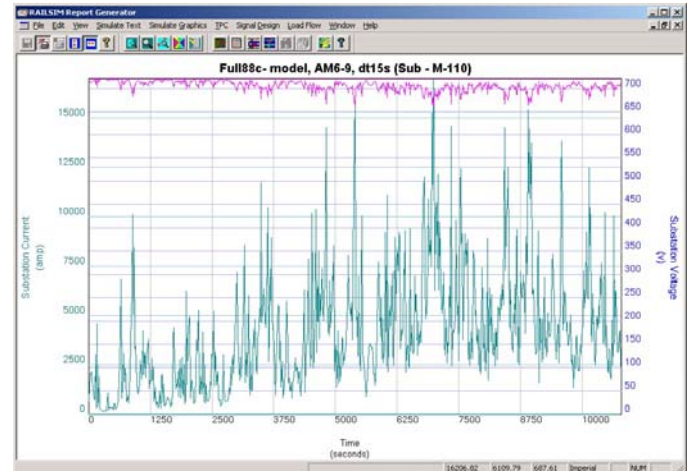
### Output

Text and graphical output is easily generated in RAILSIM Report Generator. The Load Flow Text Report Wizard supports the simultaneous specification of detailed and summary reports, including:

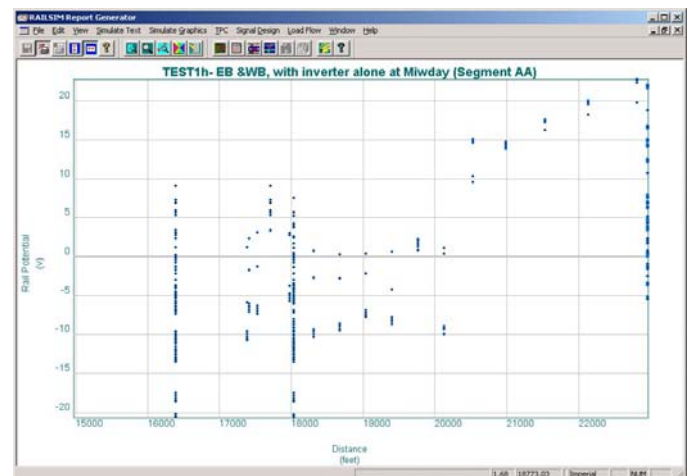
- Train reports with time and distance-based electrical demand
- Voltage at train pantograph or third rail shoe
- Substation loads and voltages
- System electricity costs predictions, including energy consumption and a variety of demand-based rate structures

The Load Flow Plot Wizard permits simultaneous specification of up to 11 different plots per selected analysis. Typical output includes:

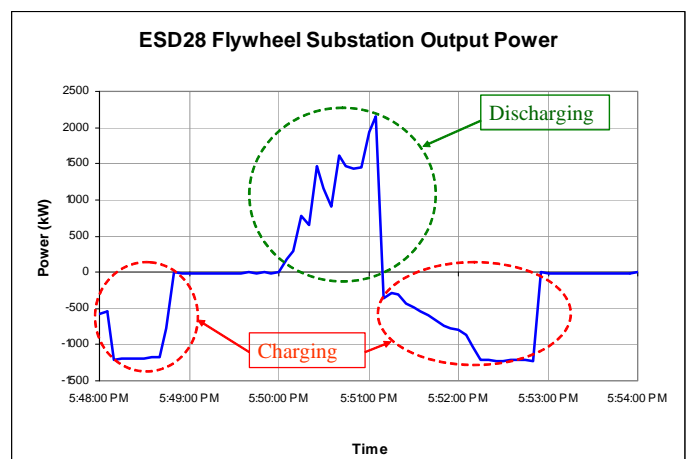
- Detailed train reports with time and distance-based electrical demand
- Voltage and current at train pantograph or third rail shoe
- Substation loads and voltages
- Time over current ("current limit") reports that highlight potential breaker trip occurrences
- Low voltage report highlighting all occurrences of trains experiencing less than desired voltage at the third rail shoe or pantograph
- Prediction of system electricity costs, including energy consumption and a variety of demand-based rate structures (which can vary within the simulated territory by substation utility feed)



LFA plot of substation current and voltage over time.

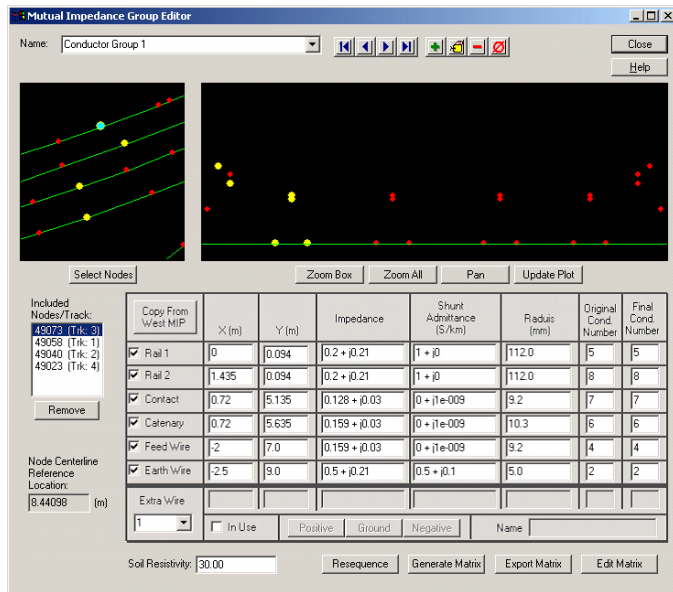


LFA scatter plot of rail potential over distance.



Load Flow Analyzer – AC (LFA-AC) expands the capabilities of LFA-DC to include Alternating Current (AC)

- Different sizes of running rails (different size/composition of third rail sections) in different sections
- Power, energy and cost analysis for each power zone that supplies a group of traction substations
- Receptivity of regenerated power (for each train simulated and for the overall system)
- Energy saving due to regenerative braking (for each train simulated and for the overall system)



RAILSIM LFA supports detailed modeling of mutual impedances through the Mutual Impedance Group Editor shown here.

system analysis.

## Capabilities

LFA AC supports the definition of:

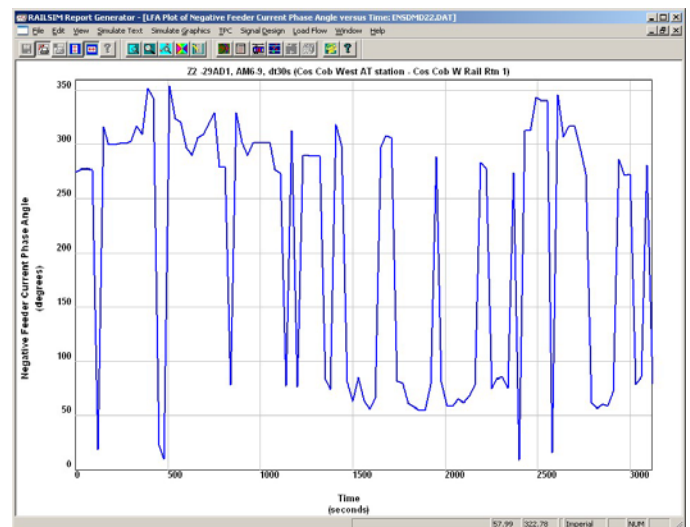
- AC substations
- Autotransformers
- Booster Transformers
- Capacitors
- Mutual Impedances at user-controlled intervals, using a graphical cross-sectional diagram.

AC LFA uses unconstrained power demand profiles for each simulated train from RAILSIM TPC. These power demand profiles reflect user specification of:

- AC substations
- Power Factor Curves, detailing real versus reactive power demand as a function of train velocity, and
- Power Factor for Auxiliary kW Load, specified individually for each locomotive, multiple unit car or passenger coach in the train.
- Different size of overhead conductors (trolley wires and contact wires) in different sections

## Output

LFA-AC analysis reports are generated via the same text report and plot wizards used for DC reports. The added information required for AC analysis interpretation is automatically included.



Negative Feeder Currents plot of current phase angle over time.

Substation Name	Voltage (RMS V)	Phase Angle (degrees)	Current (RMS amp)	Current Phase Angle (RMS amp)	Power (W)	Power Factor
Sasco Creek-Devon 27.8kV supply	12753.88	299.72	141.43	221.04	1803.85	0.95
East Horwath AT station feed	0.00	N.A.	0.00	50.98	48.68	-1.00
Bridgeport west (Bishop Ave) AT	0.00	N.A.	16.36	42.38	208.35	-0.96
Sasco Creek AT station	0.00	N.A.	12.08	38.70	165.61	-0.93
Blue Road AT station	0.00	N.A.	13.90	43.48	177.03	-0.96
Load Node/Bridgeport Switch heater	10099.27	299.57	14.98	299.57	148.00	1.00
Load Node/Bridgeport Yard load	12724.45	299.49	0.00	N.A.	0.00	N.A.
Load Node/Bridgeport switch heater load	12720.91	299.49	26.85	299.49	367.00	1.00
Substation/Sasco Creek-Devon 27.8kV supply	12753.88	299.72	0.00	N.A.	0.00	N.A.

The LFA System Snapshot, in polar and complex formats, for an AC