VENTANA systems, inc.

Vensim Update 2013

July 24, 2013

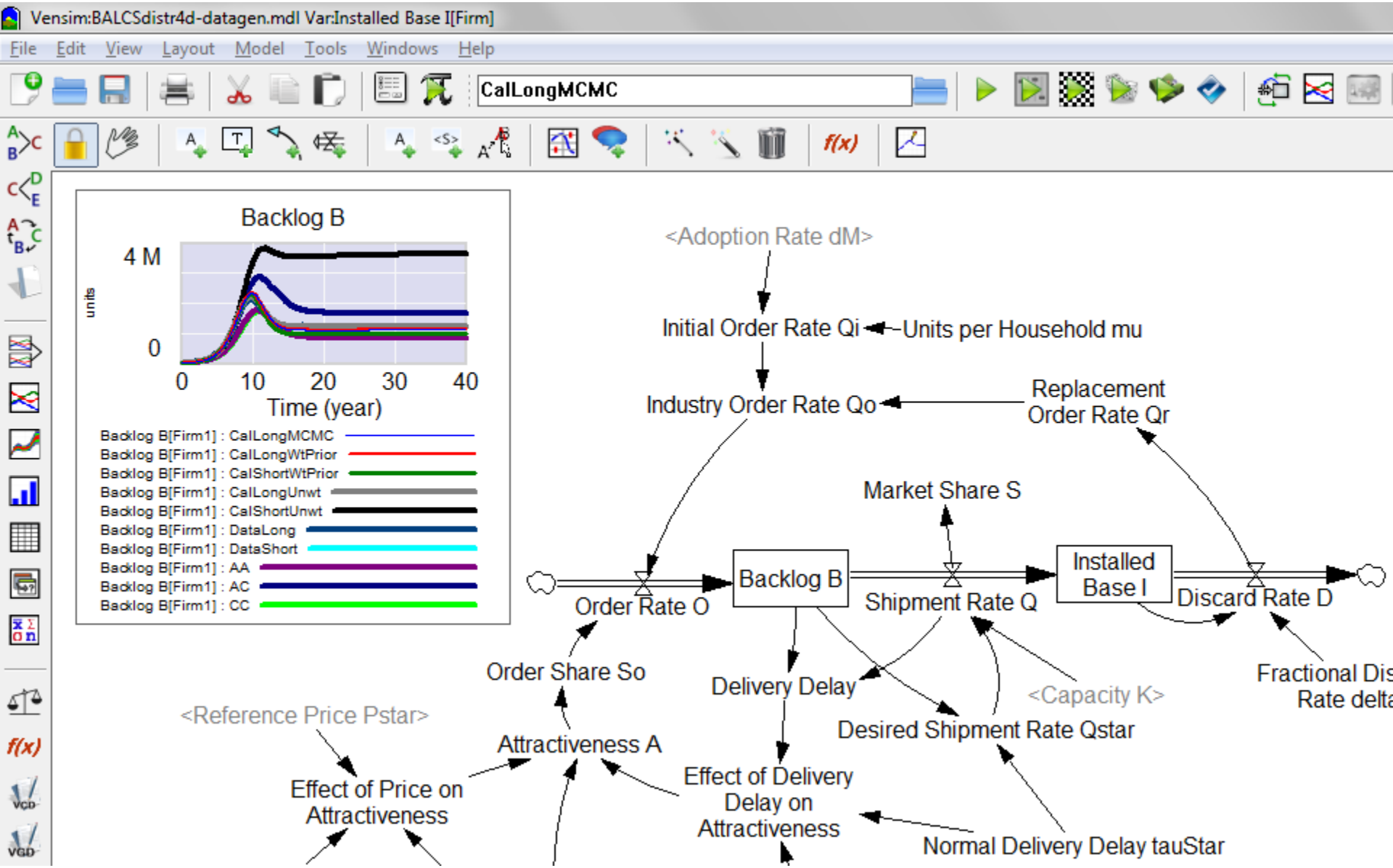
Vensim Core Features

- **Instant results and structural experiments with SyntheSim™**
- **Patented technology for model analysis and quality control**
- **Flexible array syntax with mapping and sparse matrix functions**
- **Extensive options for data connection and calibration**
- **Robust functions for allocation problems, delays, and other dynamics**
- **Optimization, Monte Carlo simulation, Kalman filtering**
- **Rich diagramming and rapid interface prototyping**
- **External functions, DLL and interface solutions for redistribution and server deployment**

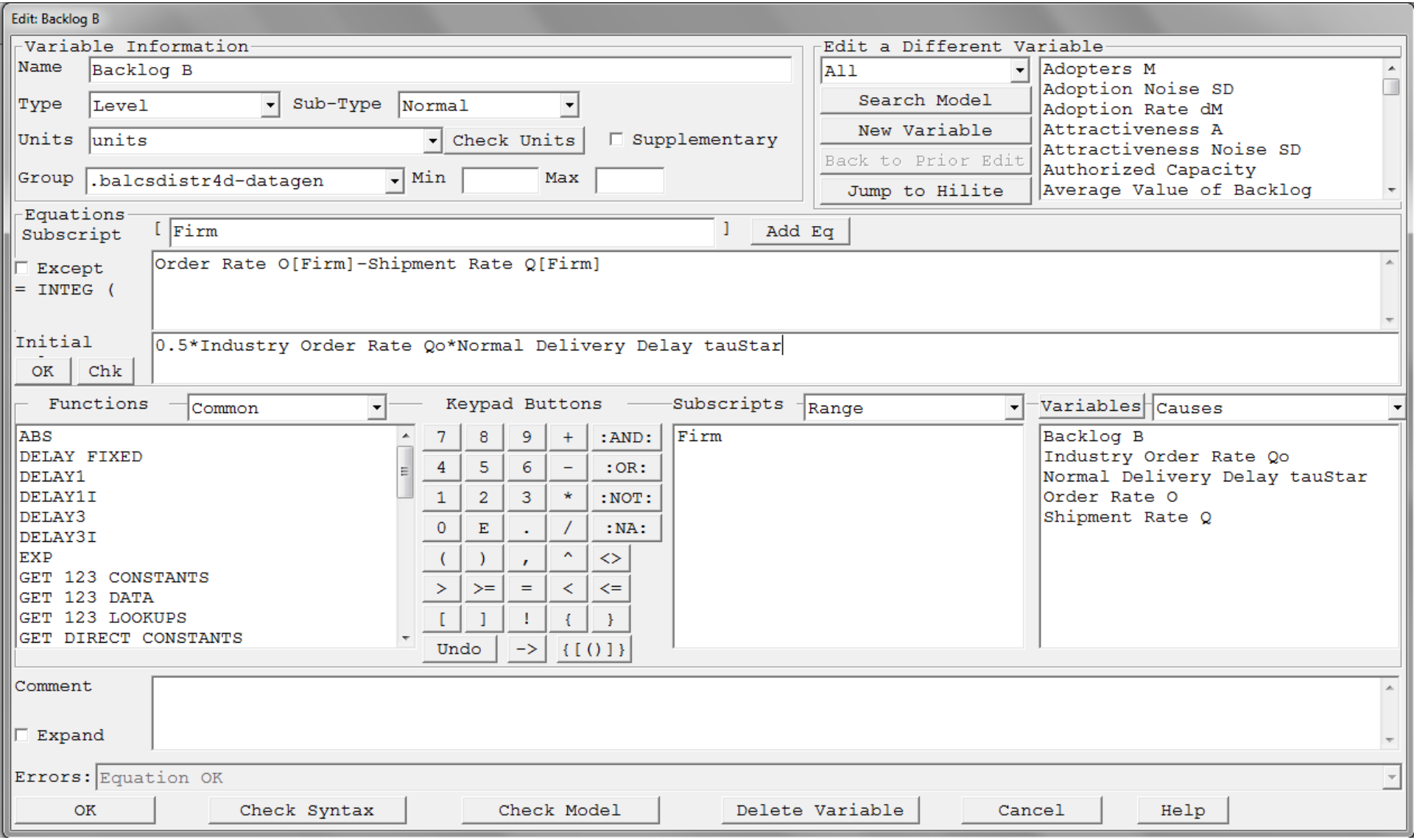
Vensim 6 (2012)

- **Toolbars**
- **Equation editor**
- **Help system upgrades**
- **Advanced/Experimental Features**
  - Stochastic Optimization
  - Discrete Variables
  - Extended Payoffs
  - New Payoff Report Items
  - Markov chain Monte Carlo & Simulated Annealing

New Toolbars



New Equation Editor



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Help System Upgrades & Sample Models

Vensim Help

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  - Functions
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    - Simultaneous Functions
    - Test Inputs
      - PULSE TRAIN
      - PULSE
      - RAMP
      - STEP
    - Time Functions

PULSE TRAIN(start,width,tbetween,end)
TRAIN of repeated PULSEs

Returns 1.0, starting at time **start**, and lasting for interval **width** and th
than **width** then 1 will be returned between **start** and **end**. If **width** is

The value returned by PULSE TRAIN depends only on te arguments p
expressions in which case the actual output pattern may not be regula

With `PULSE`, Vensim Creates `time plus` internally to avoid rounding er

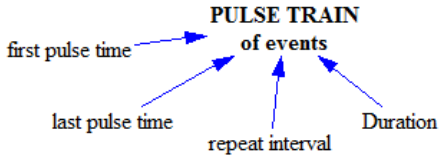
NOTE The value returned by PULSE TRAIN does not change except

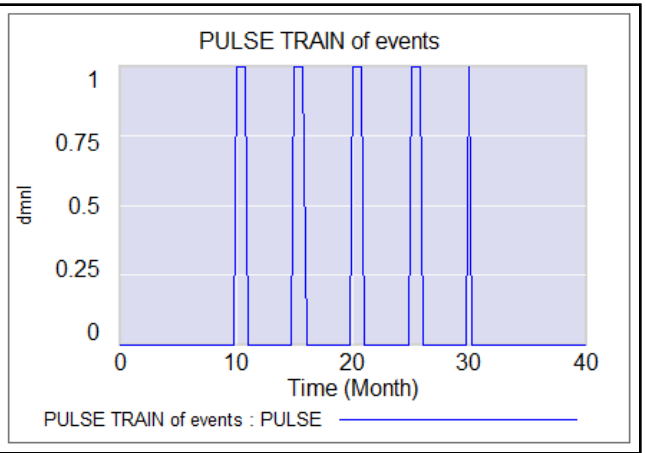
Units: **PULSE(time, time) --> dimensionless (start and width**

Example

```
is daytime = PULSE TRAIN(8,12,24,FINAL TIME)
```

See also: PULSE
Sample model: PULSE+PULSE TRAIN.mdl in FunctionExamples





Stochastic Optimization

- **Maximize or minimize over an ensemble of Monte Carlo simulations**
  - Example: maximize return on an investment, given uncertainty about oil prices and competitor behavior
- **Payoff is the sum of payoffs from the individual runs**
  - FP error in any realization is treated as an error in the whole ensemble
- **Simple to implement:**
  - Supply the usual optimization files - .vpd & .voc
  - Add sensitivity control files - .vsc & .lst
  - Add the :STOCHASTIC keyword to the .voc

Discrete Variables

- **Challenge: optimize f(x) with x discrete (e.g., integer or binary)**
  - Powell optimizer wastes cycles evaluating non-integer values of x
  - Discreteness creates payoff surface roughness
- **Partial solution:**
  - New DIS keyword for optimization control file parameters, e.g. 0 <= x[i] <= 10|DIS=1
  - Revise concept of distance for optimizer tolerance checking, to skip moves that make no progress given discreteness
- **Caveat: doesn't solve the roughness problem (random multistart or stochastic methods needed)**

Extended Payoffs

- **Avoid the hassle of building complex model structures for payoffs**
- **Provide new calibration error models (lognormal, robust/Laplace)**
- **Permit mixing of calibration and policy payoff elements, so that (for example) calibration can be combined with penalty functions or priors on some parameters**
- **Implementation: new payoff sub-types, which can be combined as needed**
  - Policy: logarithmic, initial, final (*P, *PL, *PI, *PLF, etc.)
  - Calibration: logarithmic, ABS(…) errors, Kalman-compatibility (*C, *CL, *CK, *CLR, etc.)

Markov chain Monte Carlo & Simulated Annealing (MCMC & SA)

- **MCMC: explore a calibration likelihood surface**
  - Perform a random walk over the payoff surface, with moves chosen according to point likelihoods; stationary distribution of the Markov process reflects likelihood surface
  - Problem: determining scale of proposed jumps
  - Solution: Differential Evolution (run multiple Markov chains and recombine from population to propose jumps)
- **SA: optimize in presence of many local optima**
  - Same as above, but start with a high 'temperature' (tolerance for uphill moves), and cool according to some schedule

vensim.com/workbench/

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The Workbench

SEARCH

This page is a repository for Vensim plugins (external function libraries) and tools that have been built around Vensim, exploiting the capabilities of the Vensim .dll or similar features.

Much of the material on this page, particularly plugins, will require Vensim DSS. Other items may work with the Model Reader .dll or directly on Vensim files. For the moment, most of what we provide is Windows-specific, though it is generally possible to recompile external functions for Mac and Linux.

Site Map

Vensim 6.1

- **Import / Export CSV Files**
- **Optimization Payoffs Available to DLL**
- **GUI Improvements**
  - Keyboard shortcuts
  - Dialogs
- **Operational Improvements**
  - CIN file Double vs Single
  - Ini file defaults improved
  - Support for compiled simulation on 64-bit machines
- **Improved Reliability**

Vensim 6.4

- **Native 64-bit Vensim is now running**
- **Beta version expected in September 2013**
  - Included with Vensim DSS and Vensim Pro licenses
- **Able to read VDFs produced by 32-bit Vensim**
- **Double precision data support is standard**
- **Support for very large models and very large arrays**
- **64-bit DLL provides improved access to 64-bit applications**

Deployment Options

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Forio Simulate

forio.com/simulate/convergestory/clearn/overview/

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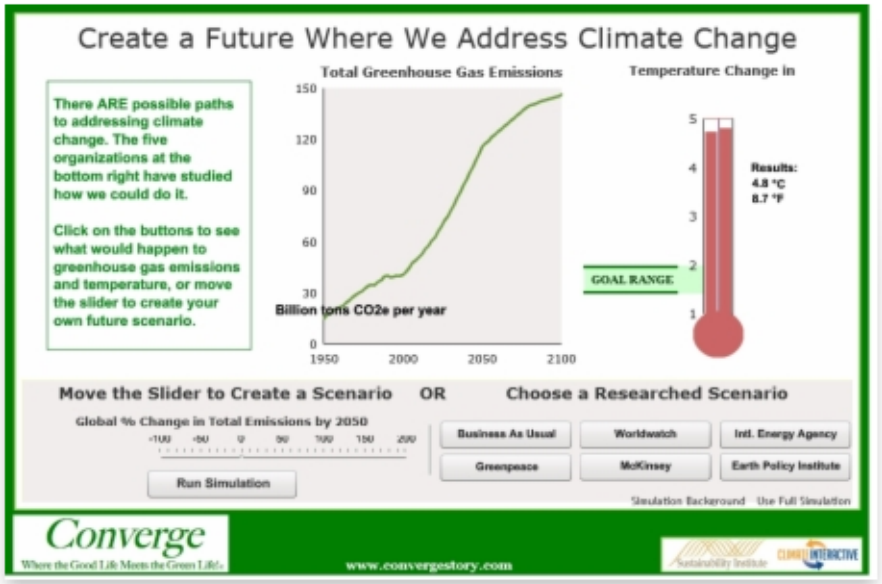


C Learn

By Converge Story

Sim URL: http://forio.com/simulate/convergestory/clearn

Sim access: All users may copy the simulation and explore the model.

Sim plan: Simulate Basic

Sim stats: This sim has been run 10448 times.

Your Rating:

Average Rating:

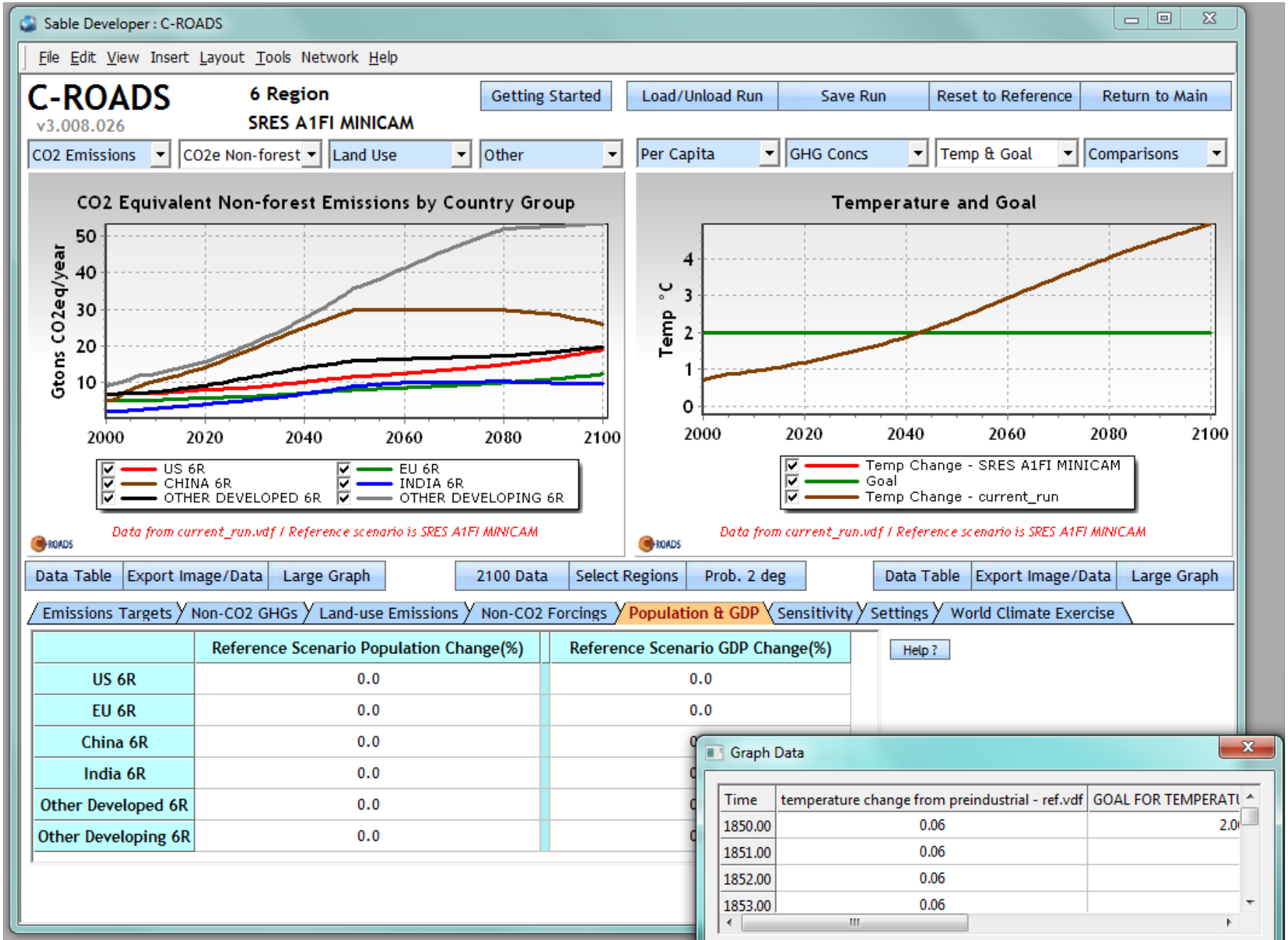
Converge Story

See other simulations by the same author

Recent comments:

Facebook game for Rio by CodeSustainable, powered by server multicontext shared library

C-ROADS in Sable



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Our Vision for the Future of Dynamic Simulation

- **Build realistic and important models of large and complex dynamic systems that can be used to improve the quality of the world in which we live.**

- **Our emphasis is in the areas of policy and strategic decision making.**

Some Examples

- **Environment, Energy, Economy, and Society**
- **Health Care and Disease Management**
- **City, Regional, Country Planning and Policy**
- **Financial Systems**
- **Management Steering Platforms**
- **Risk Management and Mitigation**
- **Large Projects and Project Portfolios**

Ventana's Product Development Plans

- **We are committed to maintaining Vensim as the leading SD toolset**
- **We have significantly increased our investment in product development**
- **Major new capabilities will be released in July 2014**

Modularity

- **Ability to build modular and reusable components that may correspond to real world objects, entities and relationships**
  - Team and distributed development
  - Large scale granularity
  - Improved productivity
  - Reuse across many models and projects
- **Collections of these modular components will largely replace the use of arrays and subscripts**
- **These modular components will provide a transparent replacement for MACROs**

Dynamic Structure and Relationships

- **Ability to dynamically create new components during a simulation**
  - Enables agent-style modeling
- **Support for dynamic changes in aggregations and relationships**
  - Current array structures at fixed at the beginning of each run

Additional Improvements

- **Discrete time transactions simplify simulation of one-time events**
- **Improved scenario management**
- **Improved definition and presentation layer**
  - More charting options
  - Ability to open multiple views at one time