TAGWeb™

Software Demonstration and Training

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Via Webcast

WebEx Call-In Details:
Call-in Phone #: +1-855-797-9485
Meeting #: 649 836 680

TAGWeb™ Training Agenda

1. TAGWeb™ Overview
2. Logging In and Getting Help
3. Structure and Basic Functions
4. Quick Search
5. Customization
6. Reporting

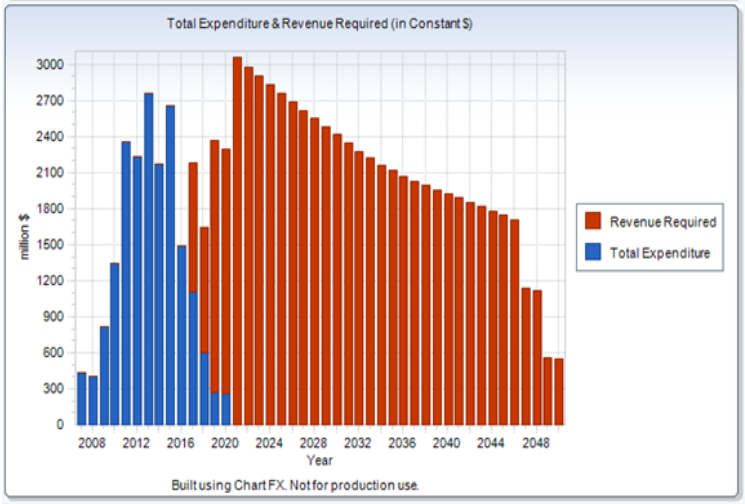
TAGWeb™ Overview

EPRI's TAGWeb™ Software

- TAGWEB™ is a web-based software package used to create customized technology cost & performance estimates for power generation and storage technologies (e.g., fossil-fired and renewables).
- TAGWeb ™ provides the necessary information in a concise and credible format to conduct preliminary evaluations of power generation and storage technology options.
- TAGWeb provides a sound basis to understand and compare technology cost and performance estimates, and to validate results of more detailed, engineering studies.
- The database that underlies TAGWeb is derived from EPRI's renowned *Technology Assessment Guide (TAG)* – an industry standard reference for technology cost and performance data and information.
- TAGWEB™ is a key component of PSET 178A and is available to PSET 178A members at no extra charge. It is also available as a supplemental project for $US 85,000 per year (SDF eligible).

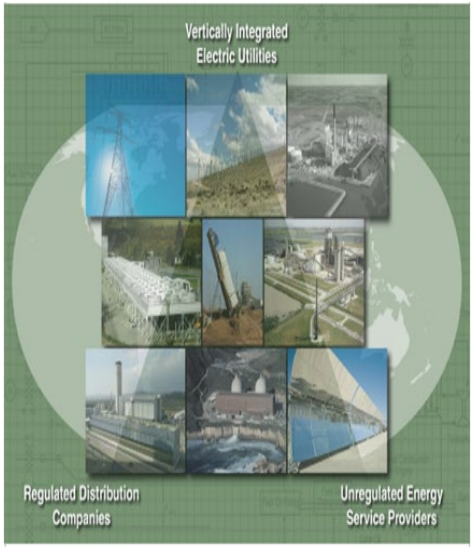
Benefits of TAGWeb™ Software

- Single, comprehensive data and information source and analytic tool for capital investment planning in the electric power industry.
- TAGWeb uses a consistent analytic approach, and contains a comprehensive database and technology trends
- Facilitates analysis and customization



- TAGWeb has established credibility. Many electric companies have used TAGWeb to support their IRPs and similar regulatory filings.
- State PUCs and other regulators are familiar with TAGWeb and have accepted it to support company IRPs and related regulatory decisions
- TAGWeb ™ is a planning tool that can be used for many purposes:
  - Marketing
  - Financial Evaluation
  - Investment Analysis
  - Integrated Resource Planning (IRP)
  - Energy Evaluation
  - Business Planning
  - Technology Forecasting

How Members Use TAGWeb™ Results



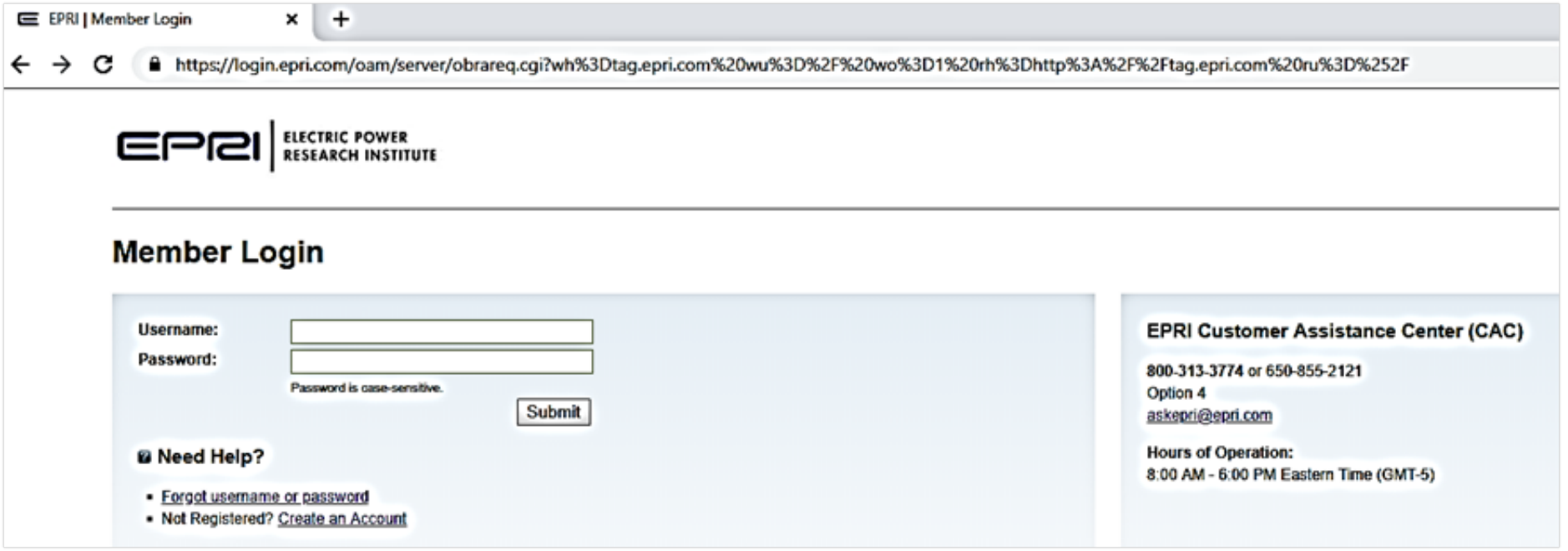
- TAGWeb often is used to support company IRPs, technology strategy, and capital investment planning
- Larger electric companies often use TAGWeb results to validate internal data and information obtained from 3rd party contractors. The *granularity* and *transparency* of the data facilitates validation.
- Smaller companies often use information and data included in TAGWeb as their primary source for technology cost and performance data.
- It is common practice to companies to share TAGWeb results among planning, engineering, marketing, and other key staff.
- Employee education and staff development
- Be aware of the status of commercial technologies and near -term advancements

Power Generation and Storage Technologies Included in TAGWeb™

- **Central Stations**
  - Pulverized coal
  - Fluidized bed combustion
  - IGCC
  - Nuclear
  - Combustion turbine
- **Renewables**
  - Wind
  - Solar photovoltaic (PV)
  - Solar thermal
  - Geothermal
  - Renewables combustible
- **Small Scale Generation**
  - Fuel cell
  - Internal combustion engine
  - Small combustion turbine
  - Micro turbine
- **Storage**
  - Compressed Air Energy Storage (CAES)
  - Pumped hydro
  - Flywheel
  - Batteries (Li-Ion; Flow)
  - Superconducting Magnetic Energy Storage (SMES)

TAGWeb™ Log-on and Help

Part 1: Log on to Member Center on EPRI.com



Logging on to TAGWeb™ – Part 1

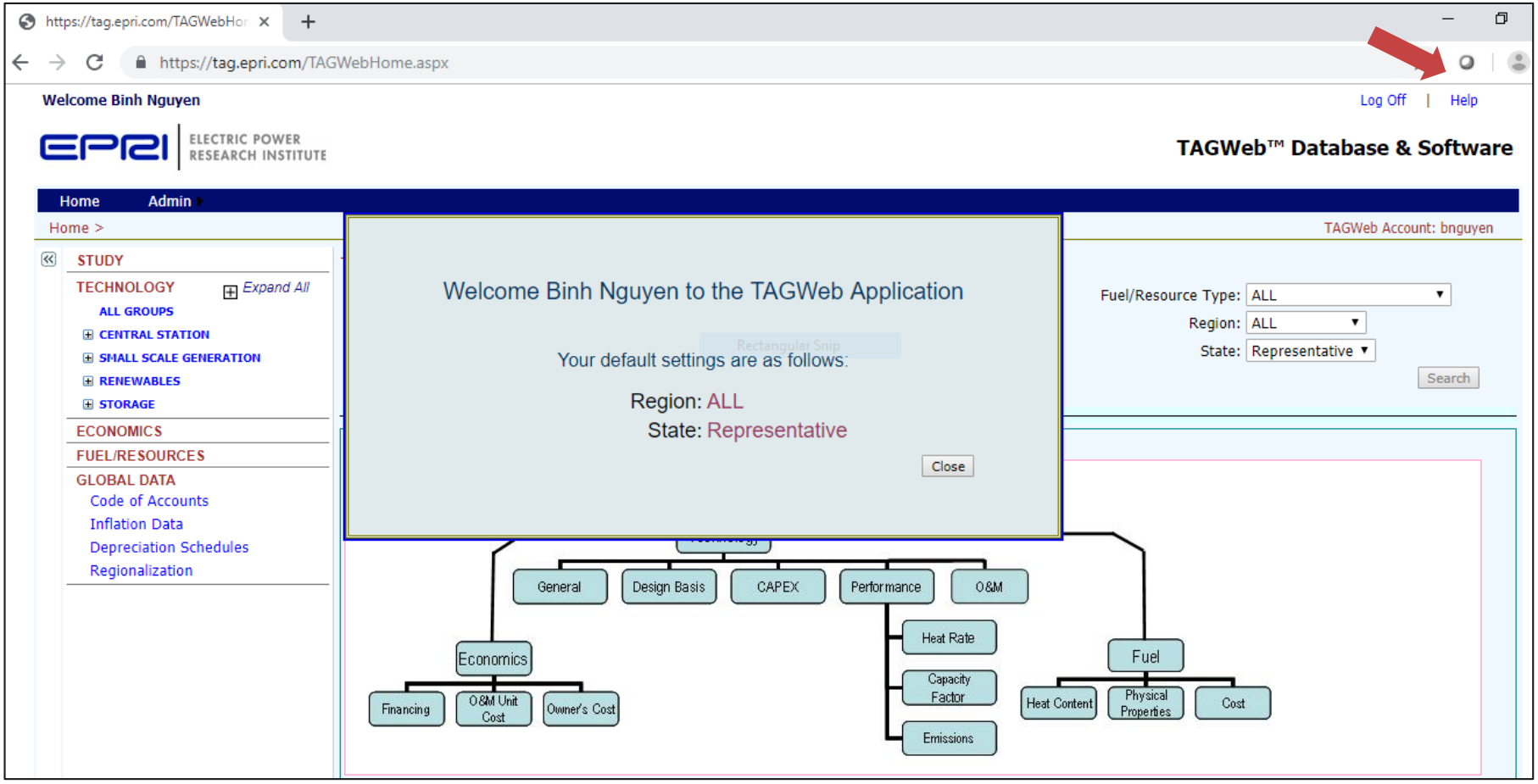
- Step 1 – Open a webpage
- Step 2 – Input "**tag.epri.com**" into the address bar and hit "enter".
  You will be redirected to EPRI's Member center.
- Step 3 – Log on to Member Center with your **EPRI Member UserID and Password**
  (Note: Do not use your TAGWeb UserID and Password.)
  You will automatically be redirected to the TAGWeb Log-on screen.

Part 2: Log on to TAGWeb™ Software

Logging on to TAGWeb™ – Part 2

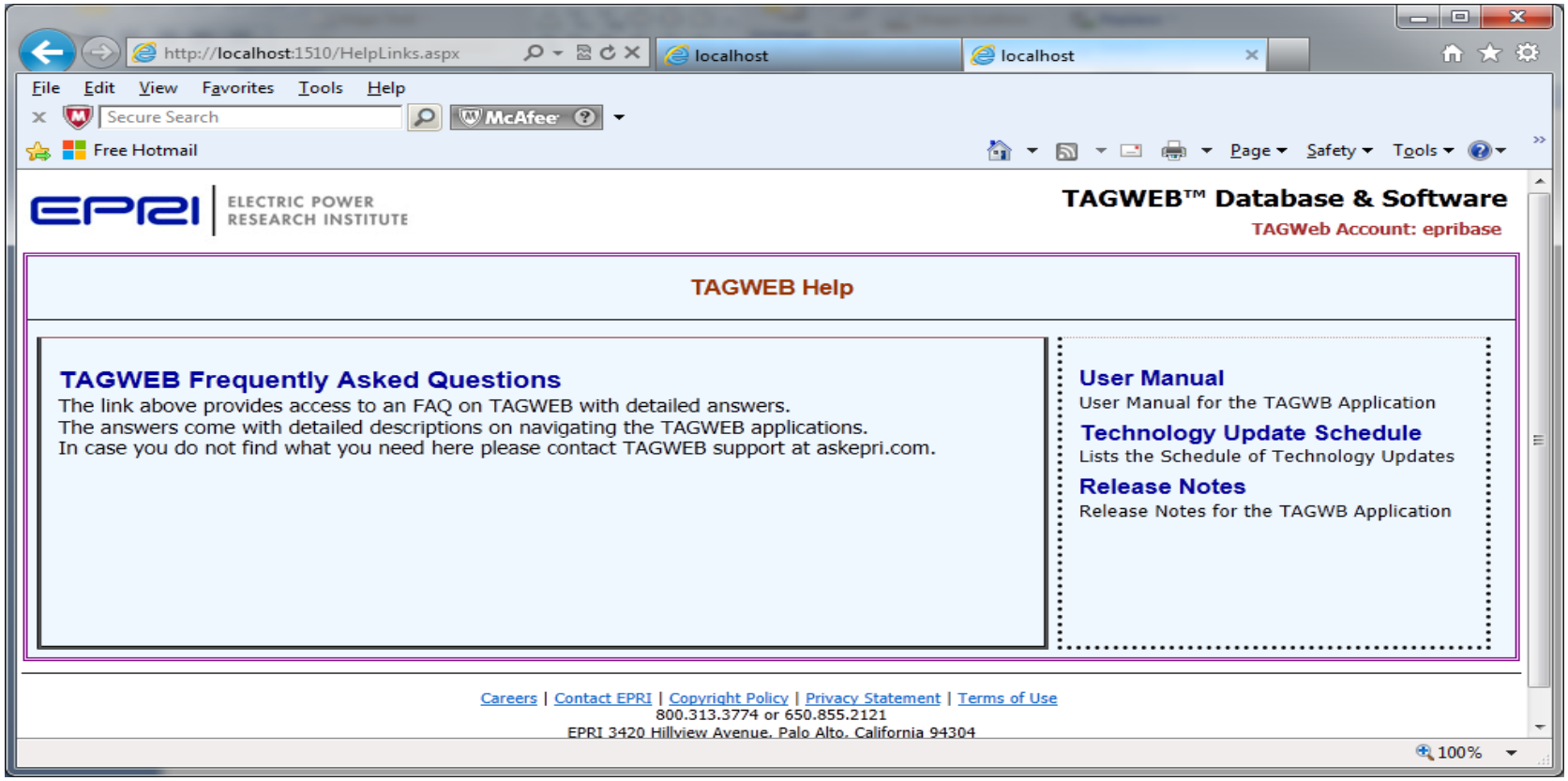
- Step 4 – Enter your TAGWeb™ **UserID and Password** on the TAGWeb™ screen
- Step 5 – Read and Accept the TAGWeb™ software licensing agreement.
- Step 6 – You should now be logged on to TAGWeb™

TAGWeb™ Help



Click on the **Help link** to see FAQs, user manual, and technology update schedule

TAGWeb™ Help

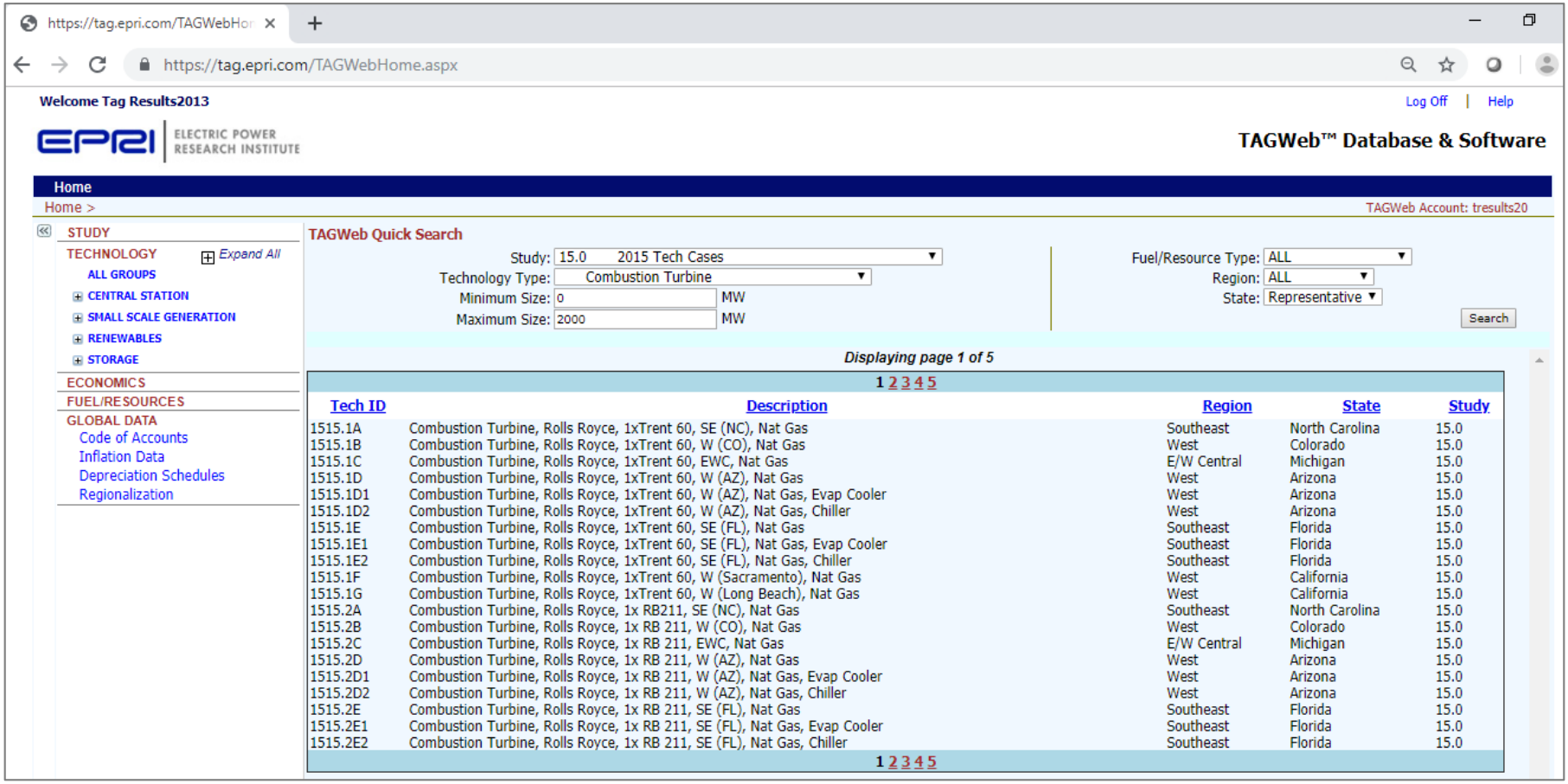


- The FAQs link will open a list of questions. The user can click on a question to open a PDF file containing the answer / explanation
- The User Manual is a complete guide on how to use TAGWeb™ and its capabilities.

TAGWeb™ Frequently Asked Questions

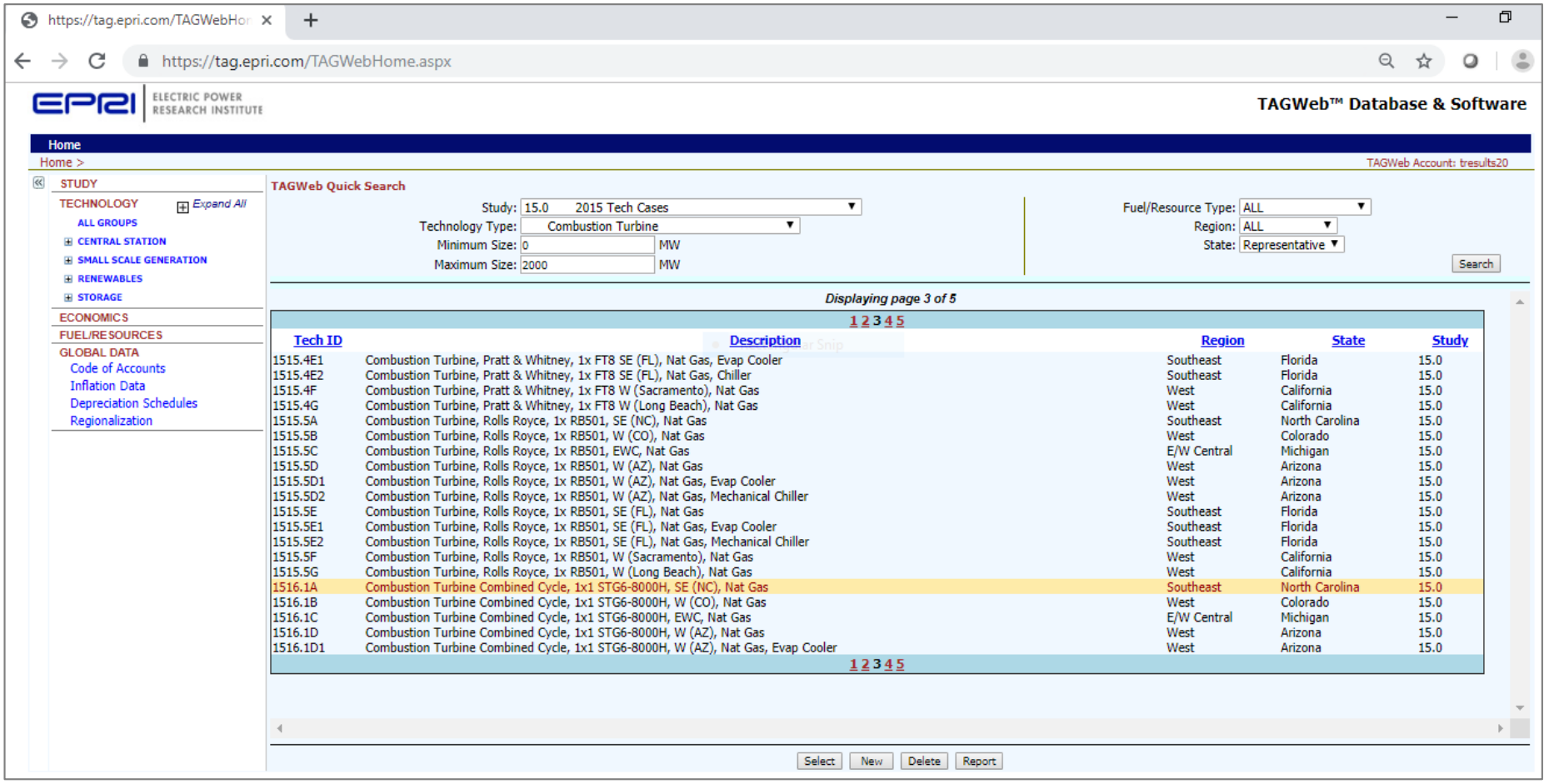
1. How is the TAGWeb™ database structured?
2. How do I make changes to Technology Design Basis (unit capacity, site, configuration, design parameters)?
3. How do I make changes to Capital Costs data?
4. How do I make changes to O&M data?
5. How do I make changes to Performance data (capacity factor, heat rate, emissions data)?
6. How do I make changes to Economics Financial data (financing structure, inflation, timing)?
7. How do I make changes to Economics O&M unit cost data?
8. How do I make changes to Fuel (cost and physical properties)?
9. How do I do Adjust Design?
10. How do I save the changes made to a technology record?
11. How do I generate a Technology Summary report?
12. How do I generate a Comparison report?
13. How do I copy a record from another account?
14. How do I copy a study from another account?
15. What is the Reference Year?
16. What is the Technology Input Year?
17. What is the Year Dollars for Input Data

Loading a TAGWeb Technology "Case"



- **Select Study 15.0** from the Study dropped down menu
- Select **Combustion Turbine** from the Technology Type dropped down menu
- Click Select

Loading a TAGWeb Technology "Case"



- Highlight **record 1516.1A** and click Select to open the case

TAGWeb™ Structure and Basic Functions

Note: Some screenshots in this presentation may display older dates. These screenshots are only meant to be illustrative.

TAGWeb™ – The Basics (1 of 2)

- TAGWeb ™ is a planning tool to facilitate preliminary screening for electricity generation and storage technologies
  - Incorporates the widely known and used conventions in EPRI's *Technical Assessment Guide (TAG)*
  - Provides a standard economic methodology, uniform cost-estimating premises, and financial assumptions
  - Includes technical and economic characteristics of the technologies, economic parameters for preliminary screening, and fuel price forecasts

- With TAGWeb ™, users are able to:
  - Revise the technical data
  - Customize the core technical data for their specific region (US only)
  - Conduct sensitivity studies of costs for electric generation and storage technologies
  - Generate reports comparing technologies, fuels, and economic scenarios
  - Export data, plots, tables, text files, and graphics

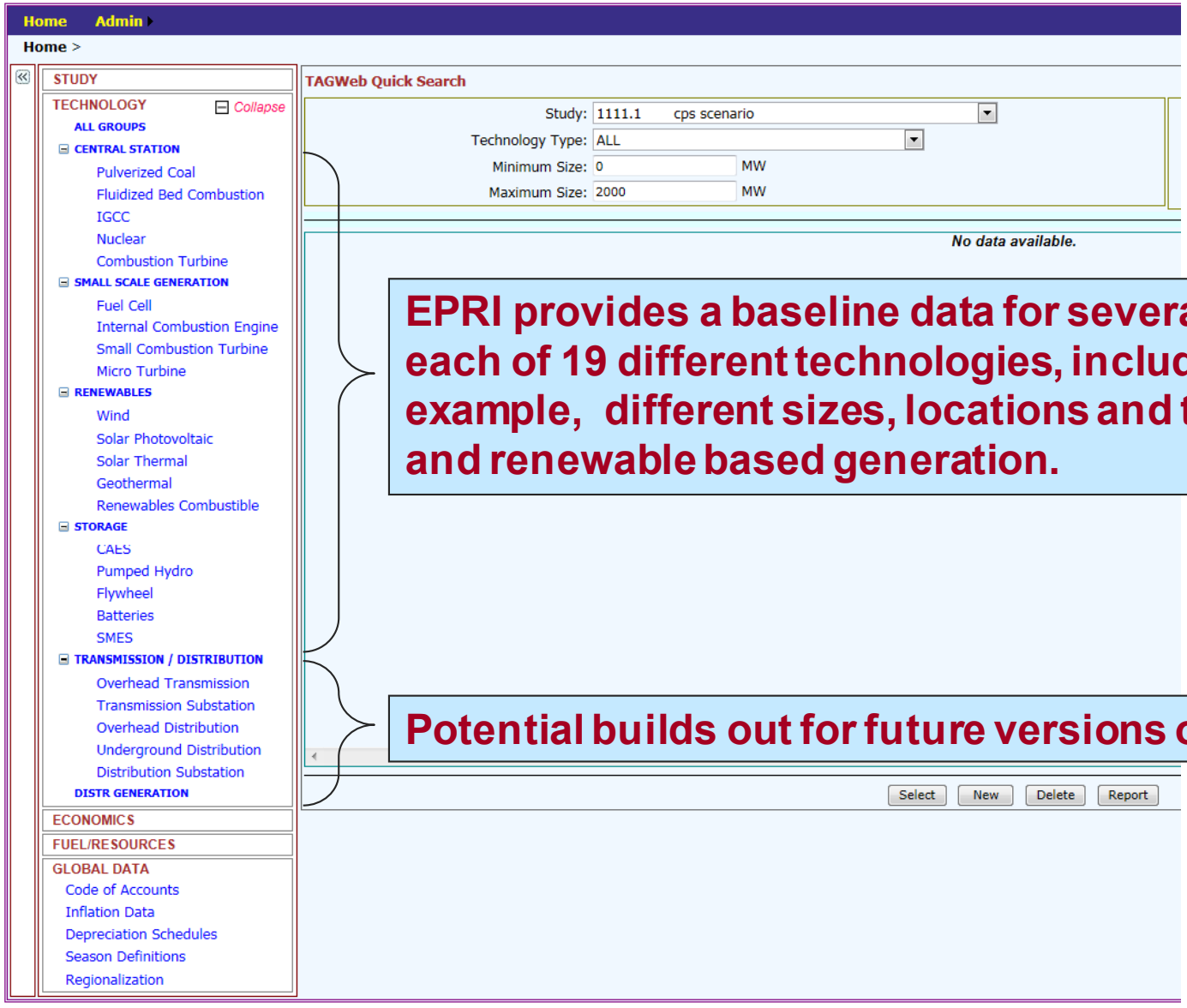
- TAGWeb ™ has been well-tested and validated. Cost and performance findings are based on recent, high-quality, and unbiased data

TAGWeb™ – The Basics (2 of 2)

- The database underlying TAGWeb™ uses a Microsoft SQL server housed at EPRI's HQ in Palo Alto, CA
  - Contains multiple tables containing data records for technologies, fuels, and economic parameters.
  - Global data records in each database define the basic parameters used in all analyses

- TAGWeb™ software includes the following technology types:
  - Central station > 50MW for fossil and nuclear
  - Small-scale generation <50MW
  - Renewable energy and storage technologies
  - Project participants receive the updated information for generic plant locations in six regions of the country

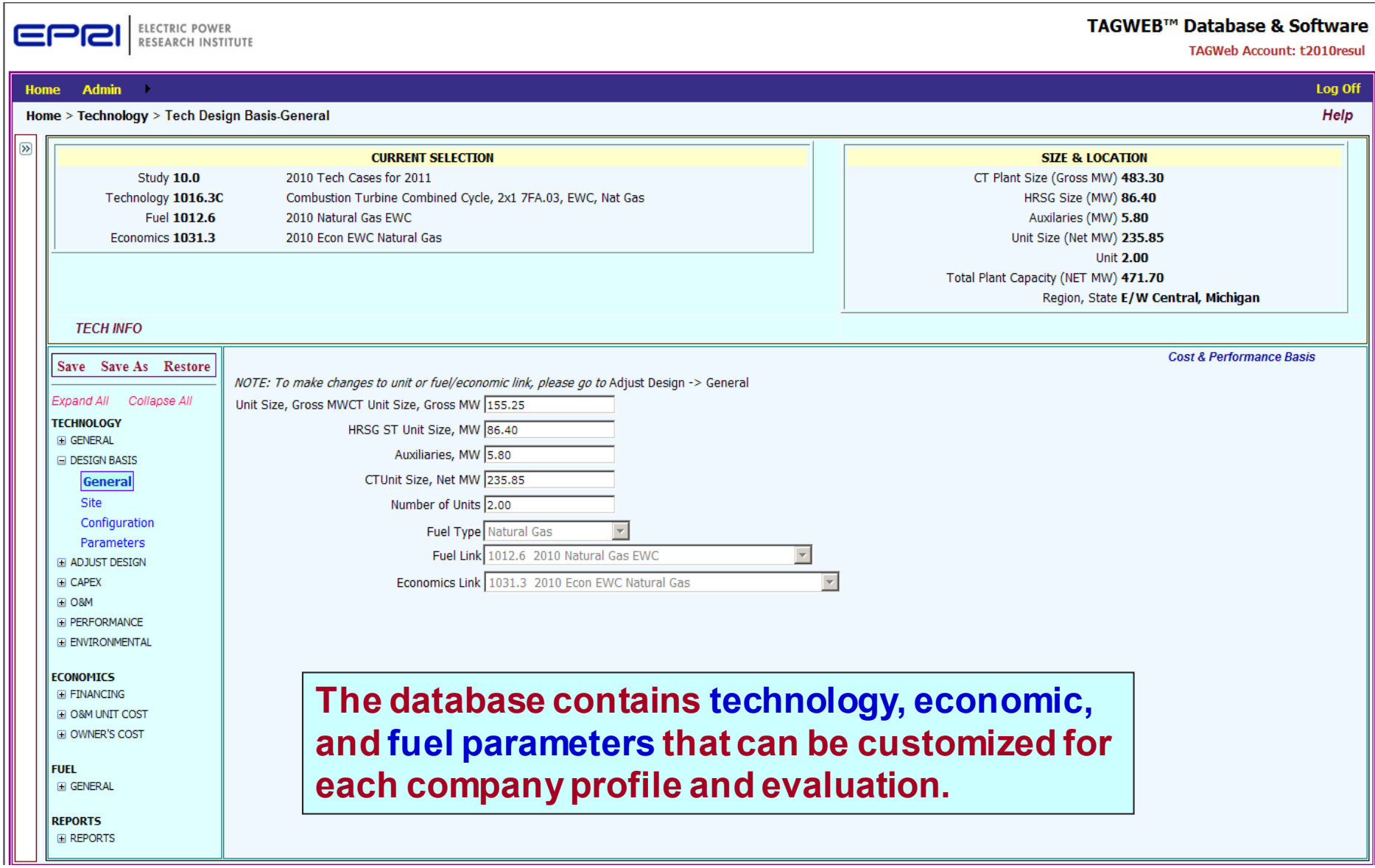
Baseline Data for 19 Different Technologies



EPRI provides a baseline data for several cases for each of 19 different technologies, including, for example, different sizes, locations and types of coal and renewable based generation.

Potential builds out for future versions of TAGWeb™

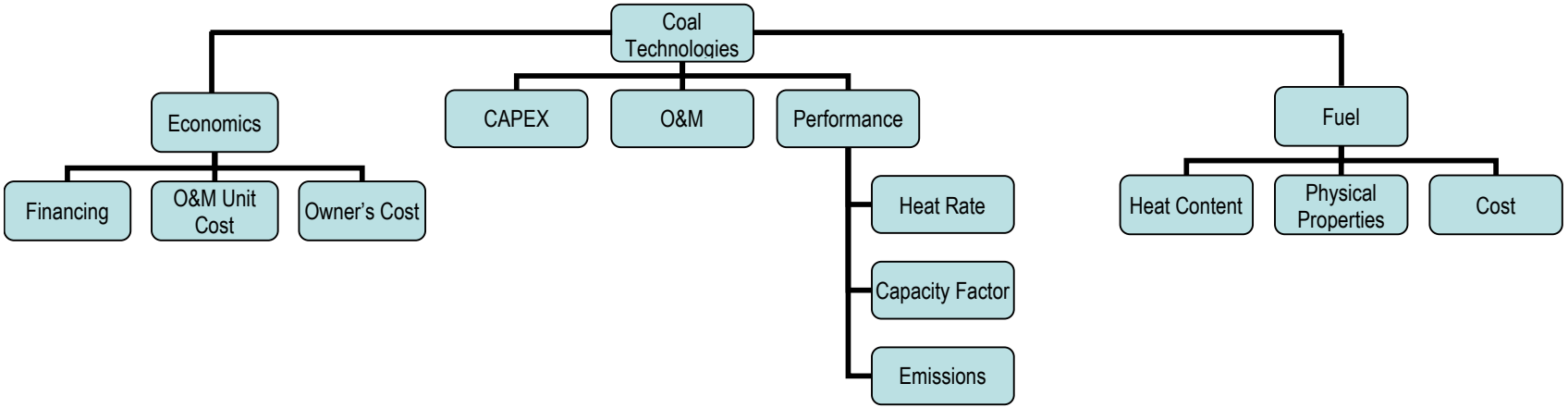
Technology, Economic and Fuel Parameters



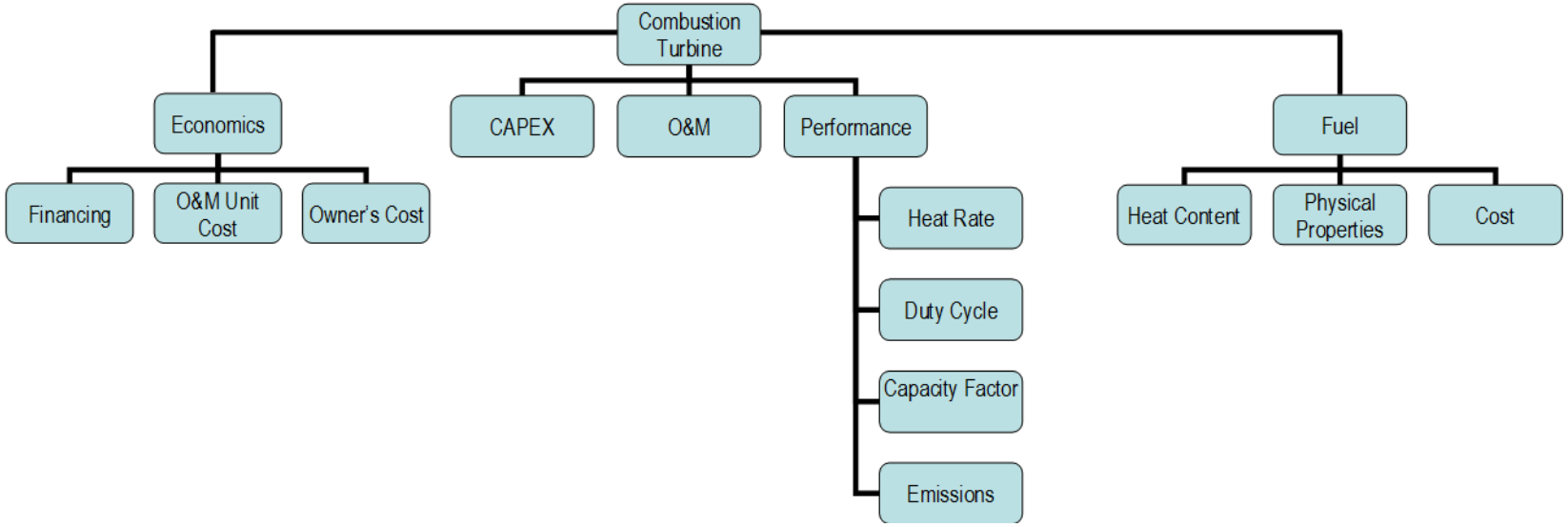
The database contains technology, economic, and fuel parameters that can be customized for each company profile and evaluation.

TAGWeb™ Structure for Coal and GT Generation

- TAGWeb ™ navigation for coal technologies

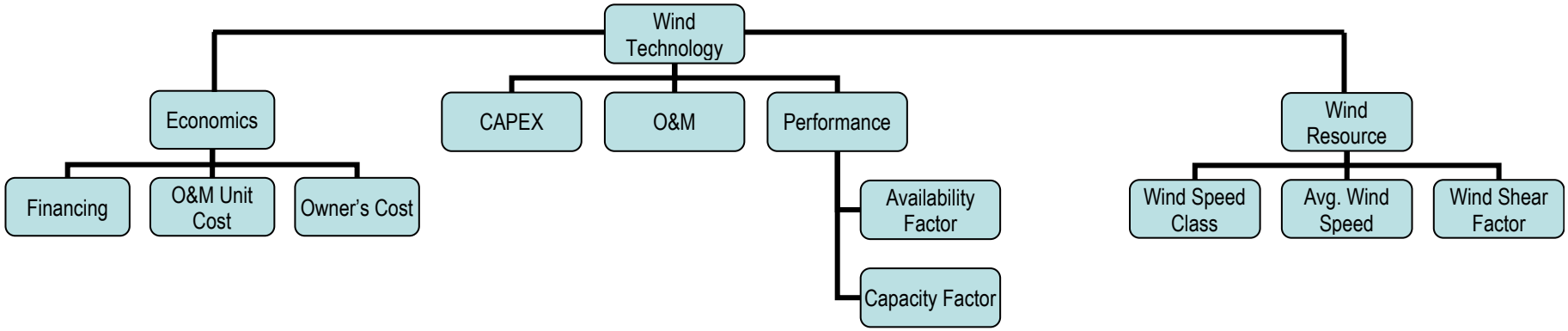


- TAGWeb ™ navigation for combustion turbine technologies

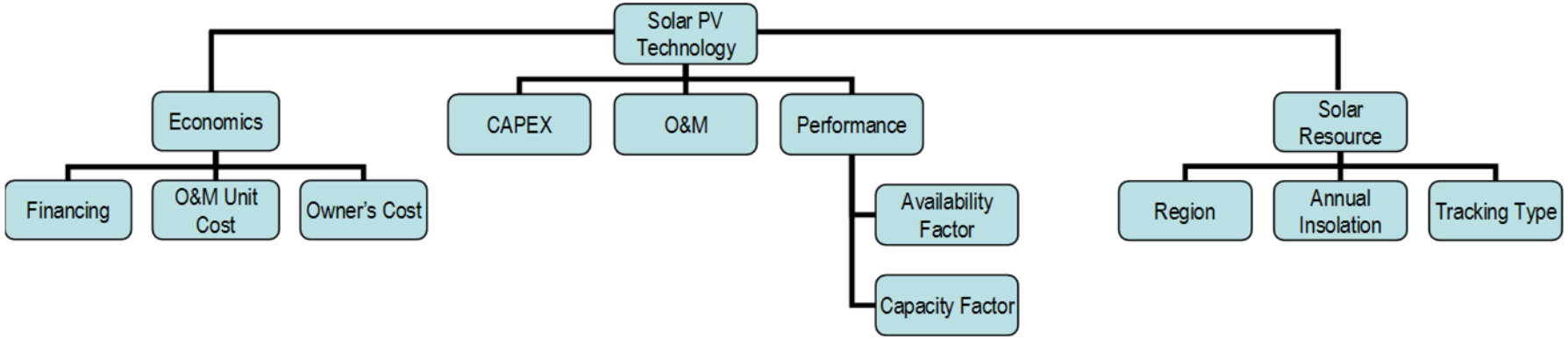


TAGWeb™ Structure for Wind and Solar PV

- TAGWeb™ navigation for wind technologies

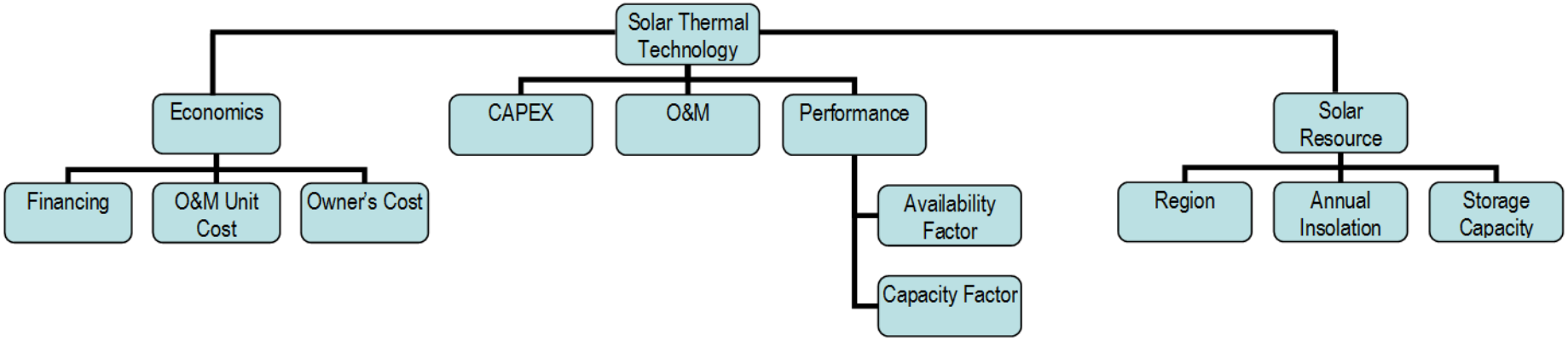


- TAGWeb ™ navigation for solar PV technologies

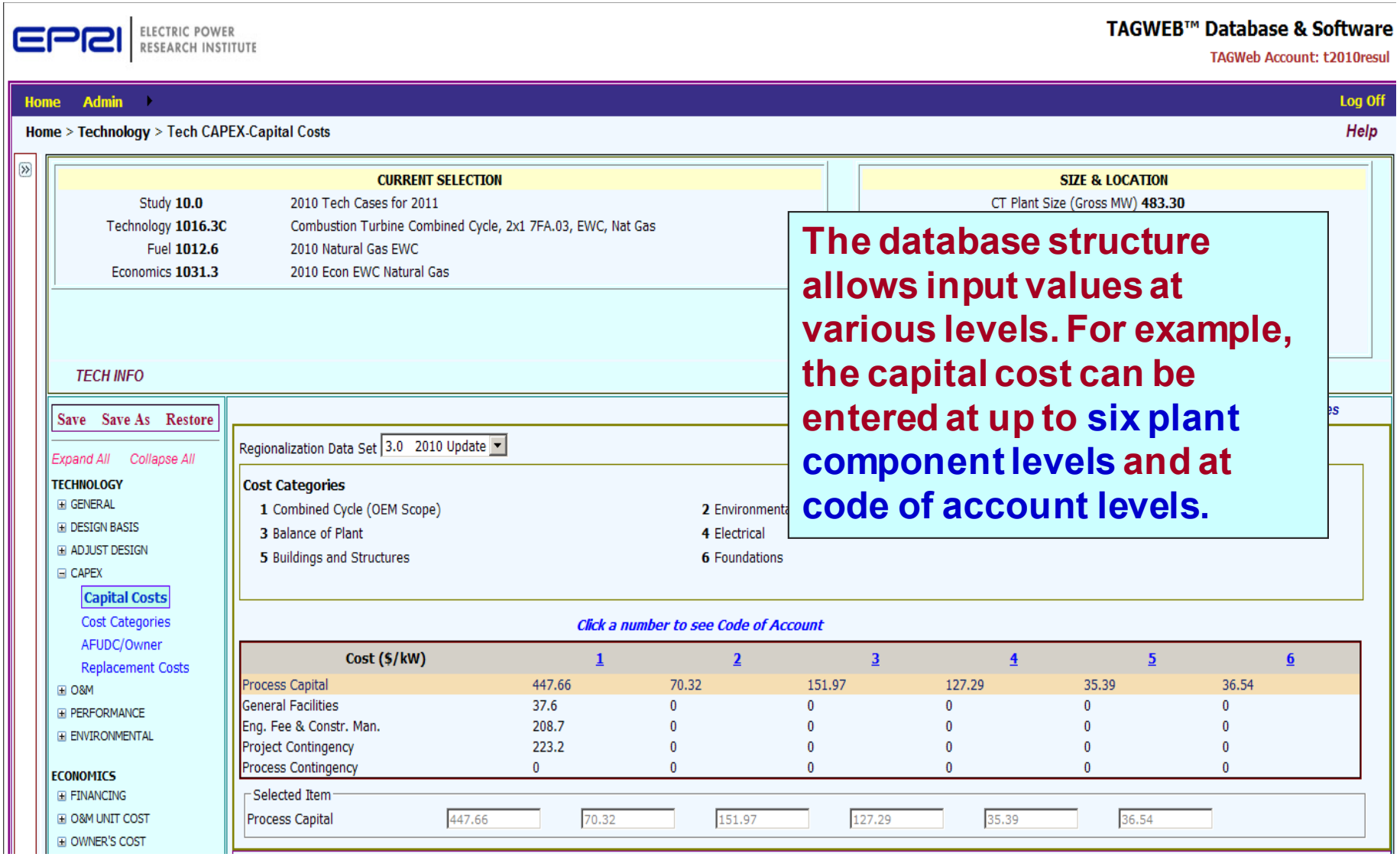


TAGWeb™ Structure for Concentrating Solar

- TAGWeb™ navigation for concentrating solar technologies

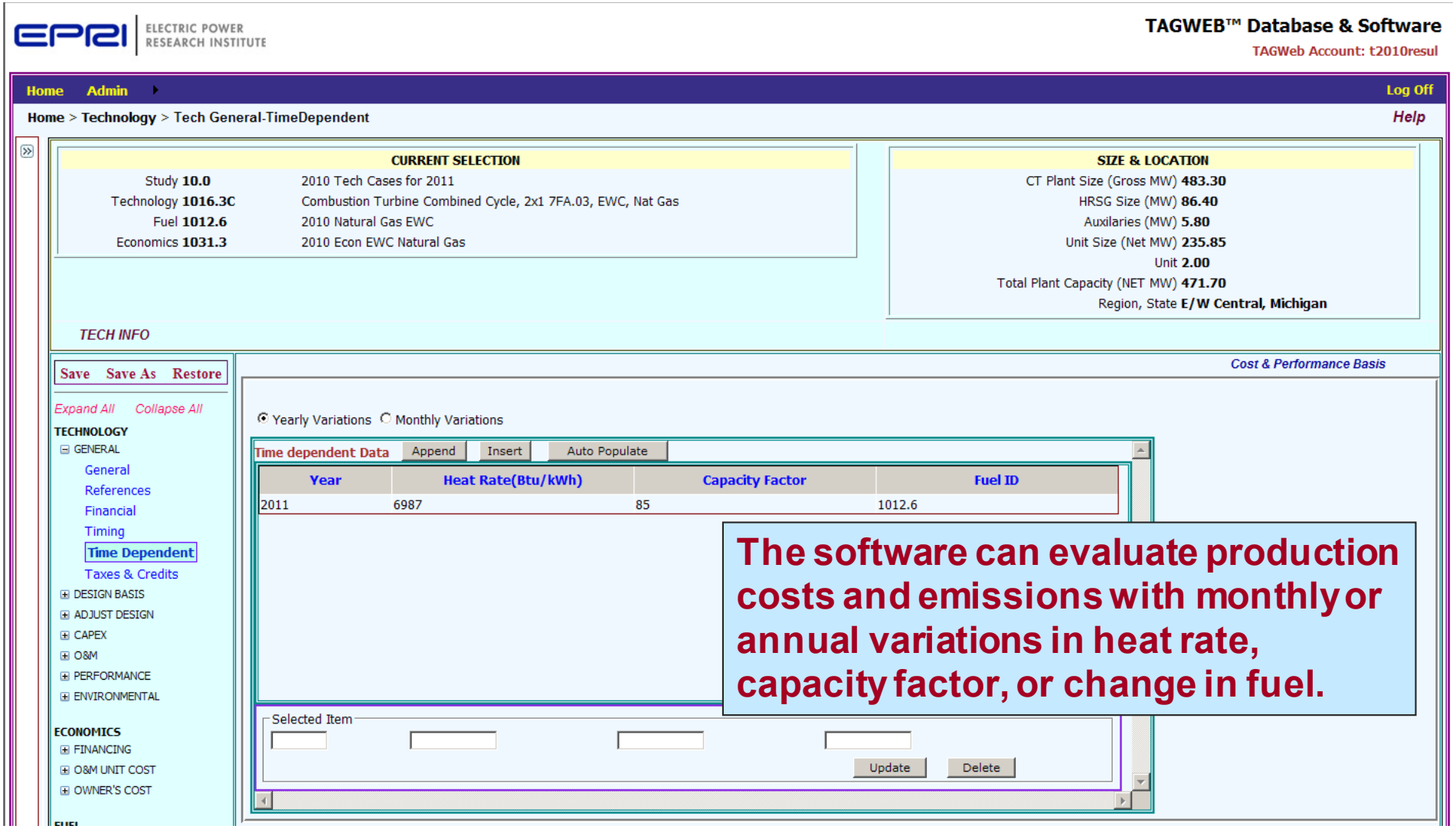


TAGWeb™ Database Structure

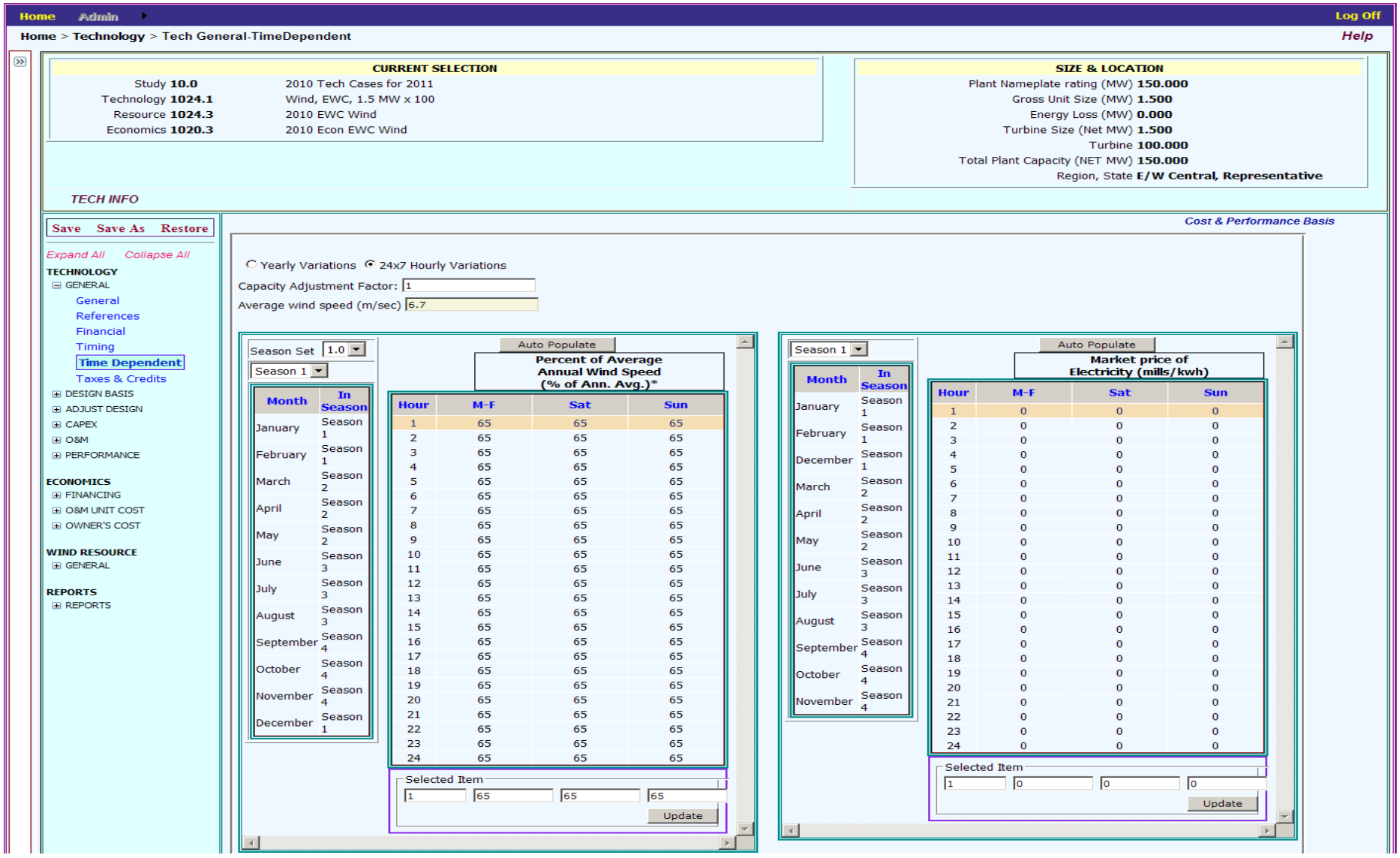


The database structure allows input values at various levels. For example, the capital cost can be entered at up to six plant component levels and at code of account levels.

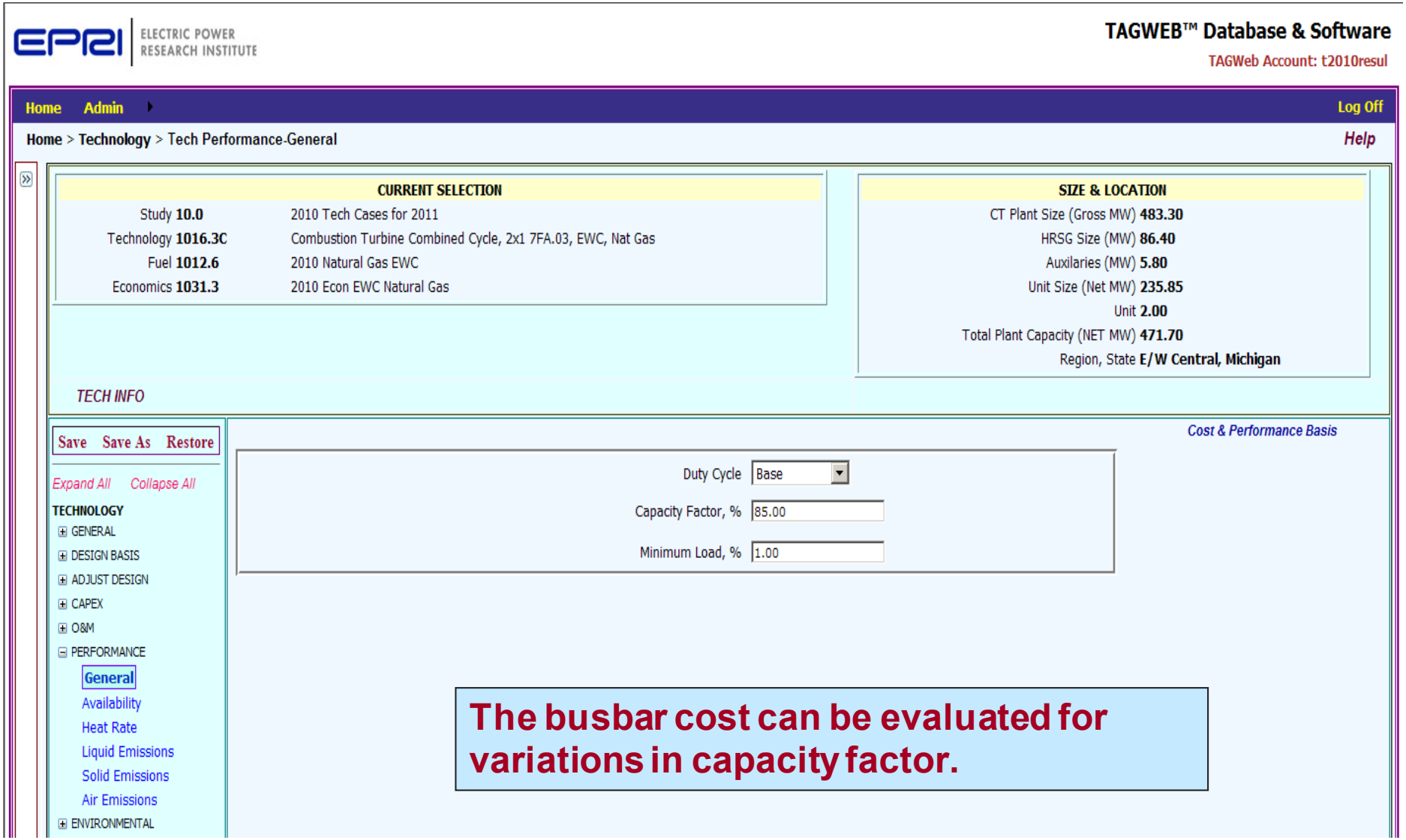
Production Costs and Emissions



24x7 Data Input with Auto-population

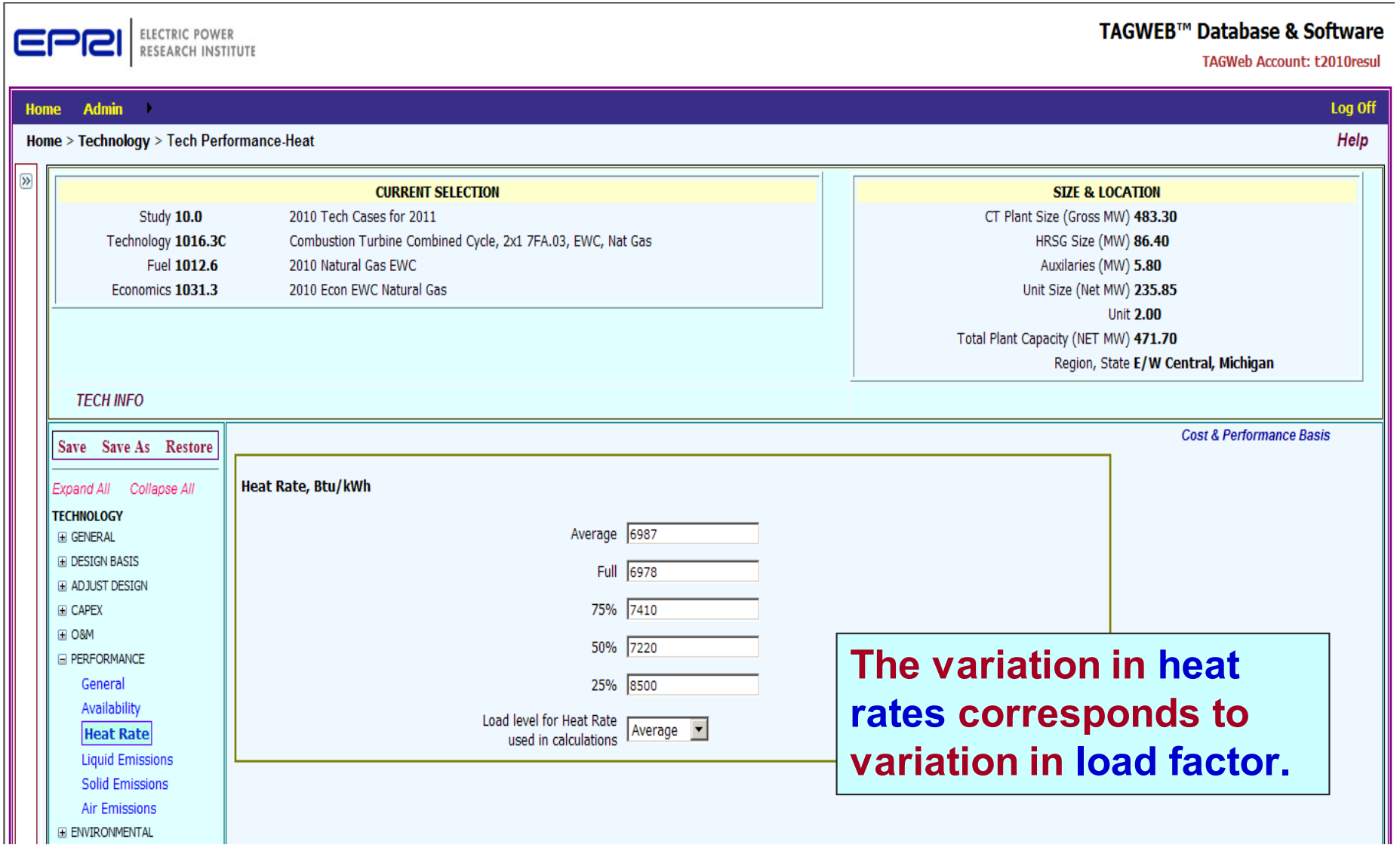


Busbar Cost and Capacity Factors



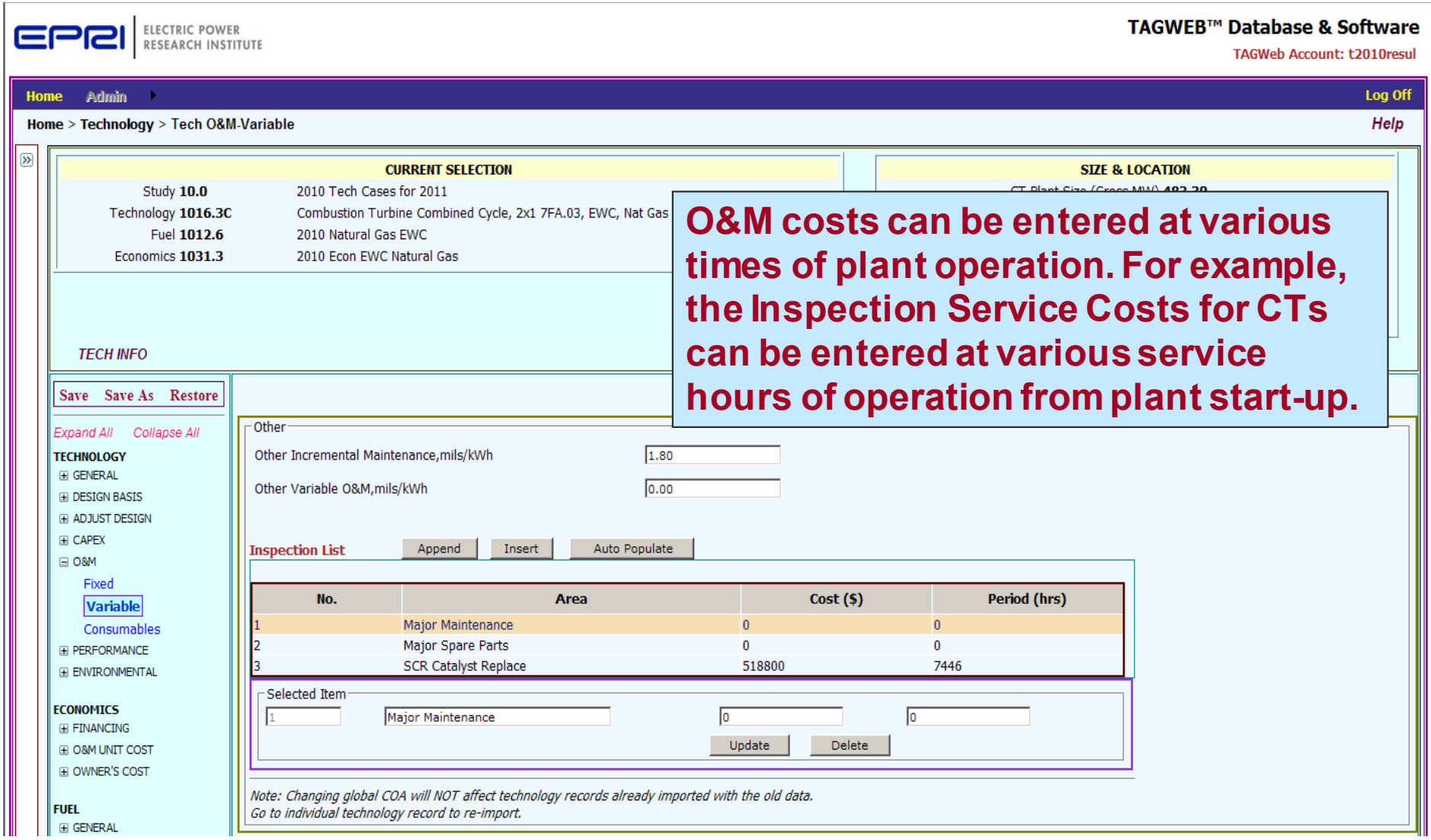
The busbar cost can be evaluated for variations in capacity factor.

Heat Rates and Load Factors

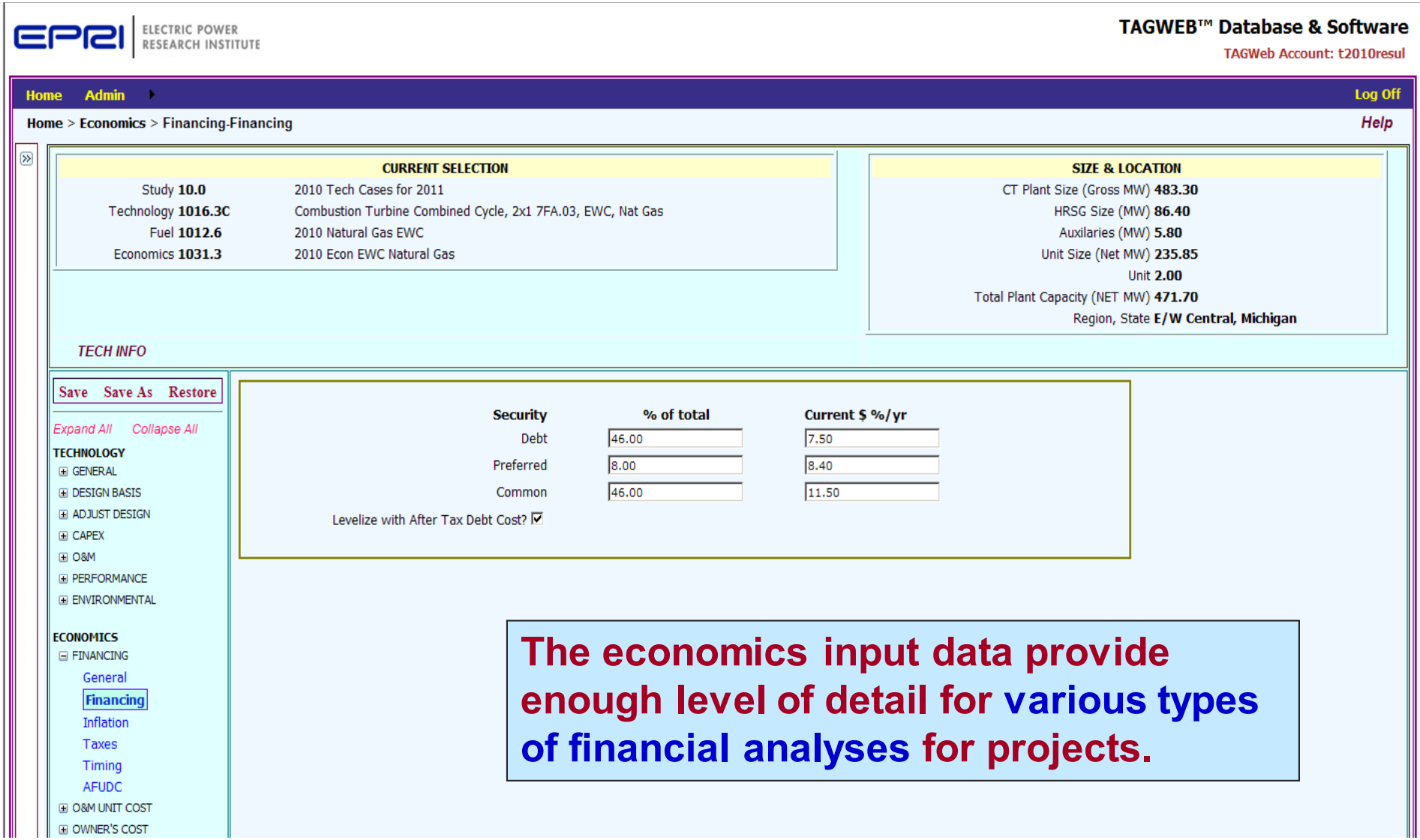


The variation in heat rates corresponds to variation in load factor.

Operations & Maintenance Costs

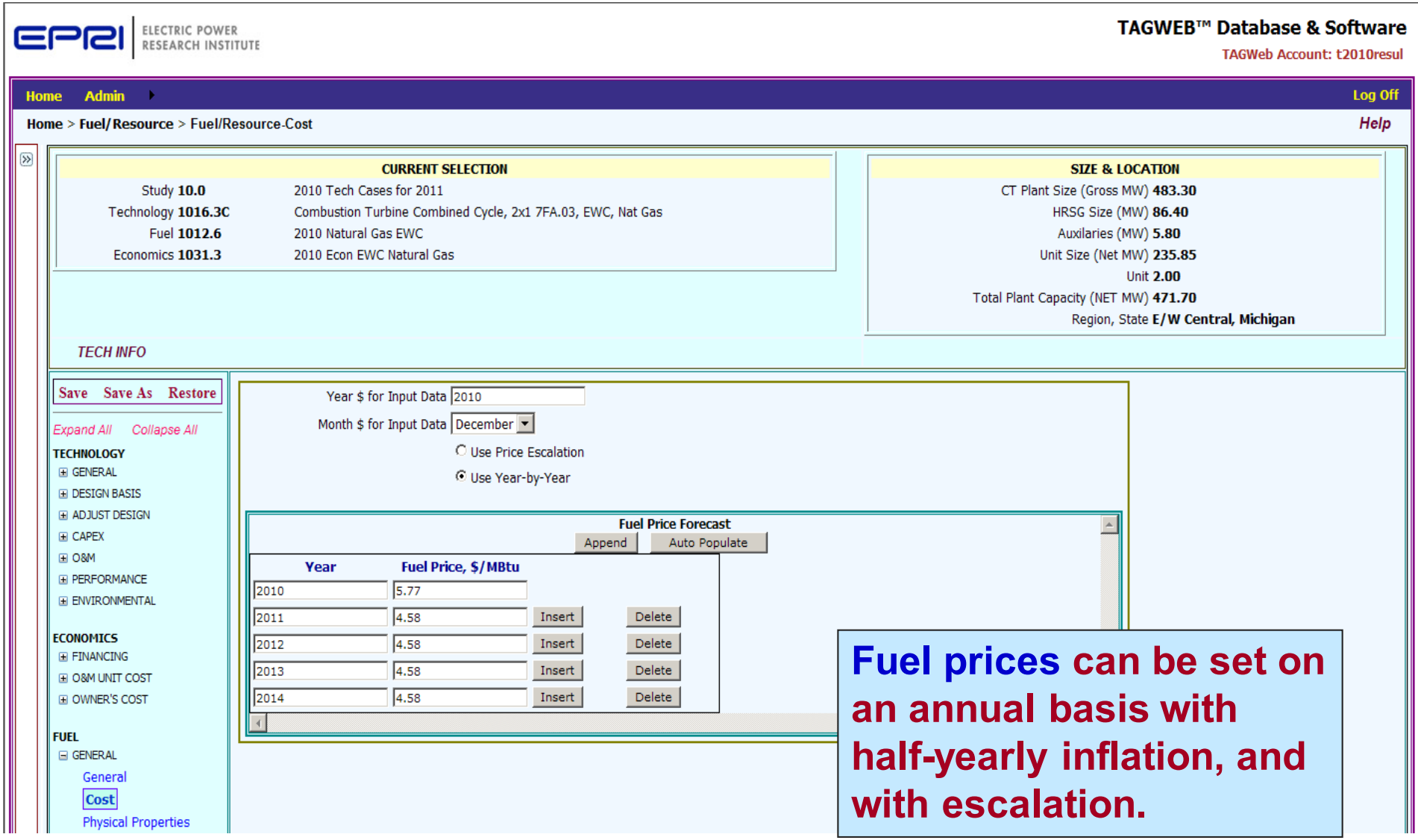


Financial Analysis



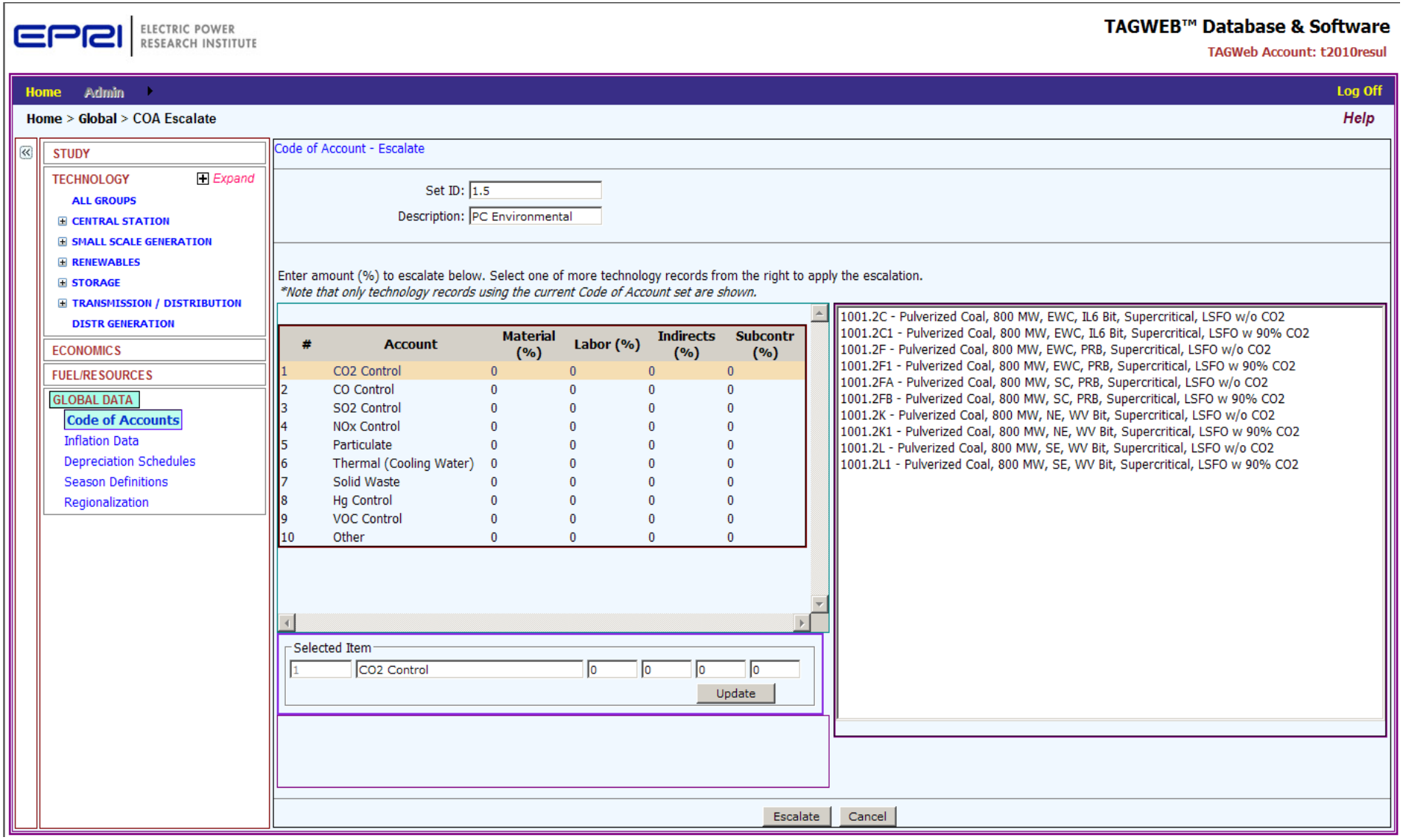
The economics input data provide enough level of detail for various types of financial analyses for projects.

Fuel Prices



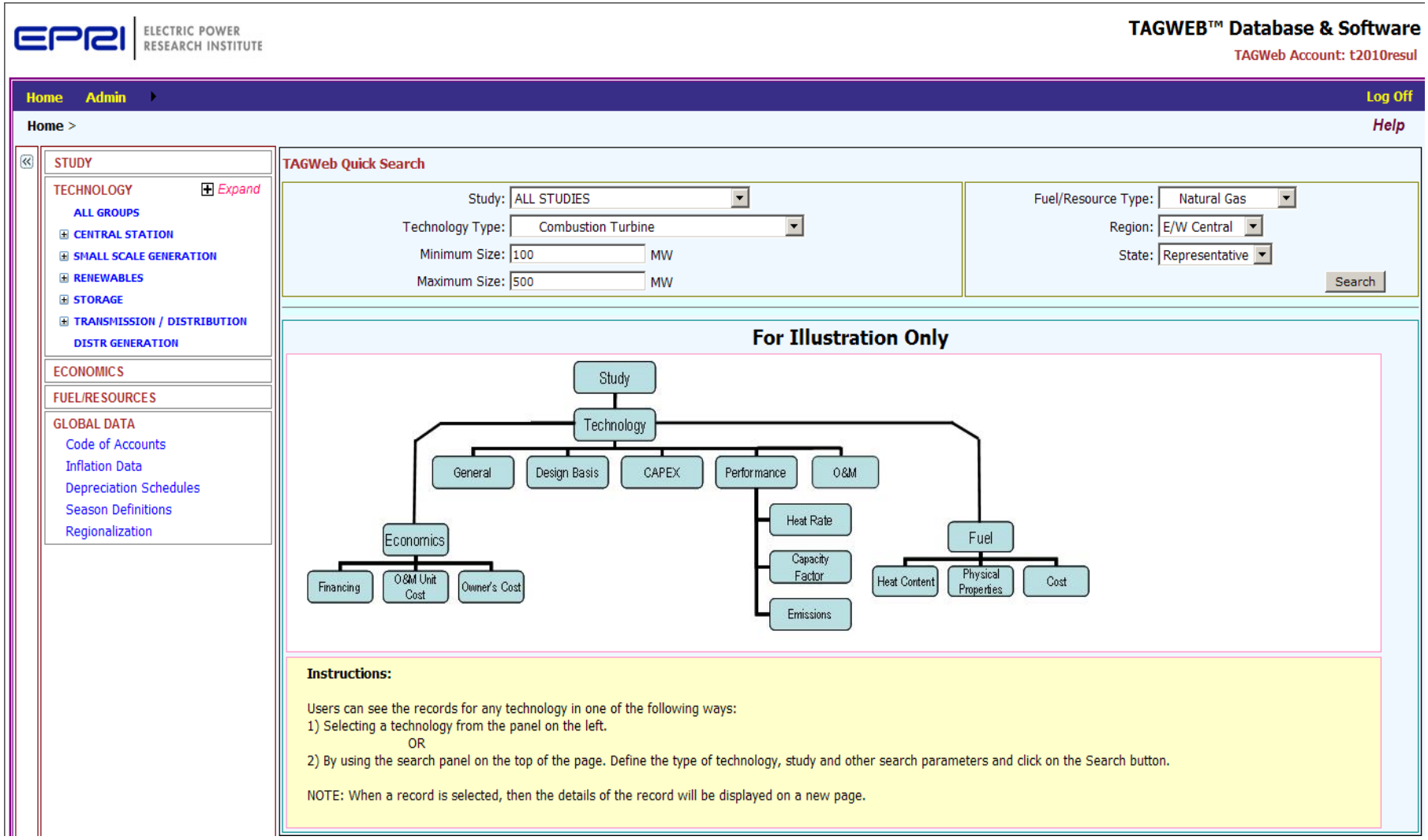
Fuel prices can be set on an annual basis with half-yearly inflation, and with escalation.

Code of Account Escalation



TAGWeb™ Quick Search

Technology Search Capability



Technology Search helps choose and run an analysis for a technology very quickly.

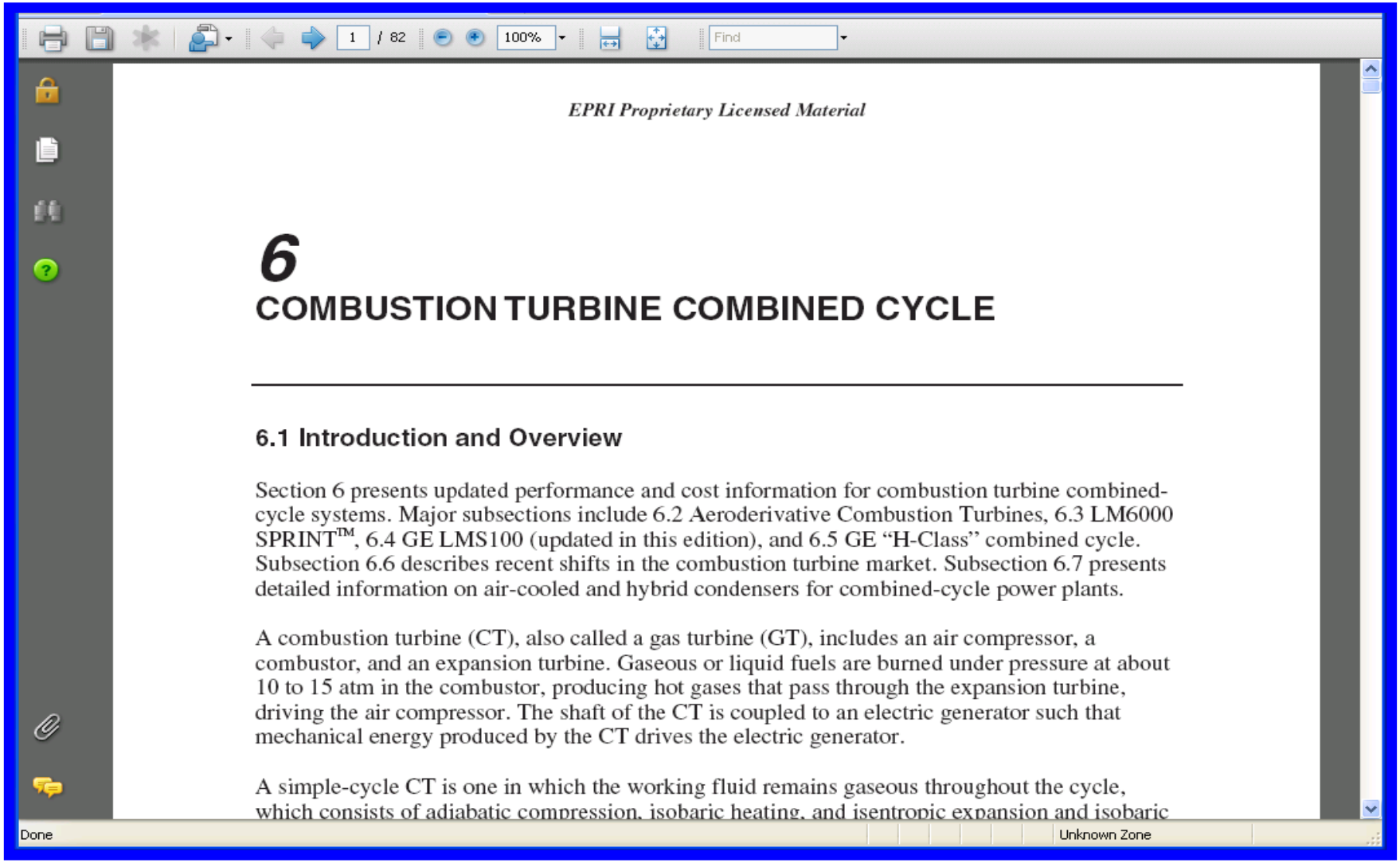
TAGWeb™ Quick Search

- Exercise 1: Complete a search within TAGWeb™
  - Select a technology that meets the following criteria
    - Combustion technology
    - Natural gas fuel
    - 50 – 100MW capacity
    - East/West Central location

Finding a current technology record in the TAGWeb™ database is the start of a beautiful relationship!

TAGWeb™ Includes Technical Information About Each Power Generation and Storage Technology

Technical Description for Each Technology



EPRI Proprietary Licensed Material

6
COMBUSTION TURBINE COMBINED CYCLE

6.1 Introduction and Overview

Section 6 presents updated performance and cost information for combustion turbine combined-cycle systems. Major subsections include 6.2 Aeroderivative Combustion Turbines, 6.3 LM6000 SPRINT™, 6.4 GE LMS100 (updated in this edition), and 6.5 GE "H-Class" combined cycle. Subsection 6.6 describes recent shifts in the combustion turbine market. Subsection 6.7 presents detailed information on air-cooled and hybrid condensers for combined-cycle power plants.

A combustion turbine (CT), also called a gas turbine (GT), includes an air compressor, a combustor, and an expansion turbine. Gaseous or liquid fuels are burned under pressure at about 10 to 15 atm in the combustor, producing hot gases that pass through the expansion turbine, driving the air compressor. The shaft of the CT is coupled to an electric generator such that mechanical energy produced by the CT drives the electric generator.

A simple-cycle CT is one in which the working fluid remains gaseous throughout the cycle, which consists of adiabatic compression, isobaric heating, and isentropic expansion and isobaric

Block Diagram for Each Technology and Plant Configuration

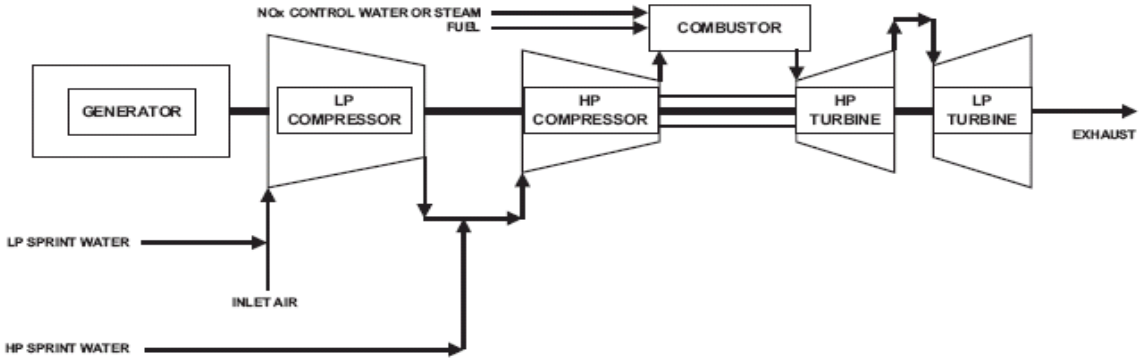


Figure 6-10
SPRINT™ Process Flow Diagram

Intercooling improves turbine output in three ways. First, it reduces the work of compression since the cooler HP compressor inlet temperature reduces the work required for HP compression. Second, it reduces the temperature of air entering the combustor, allowing more fuel to be burned before reaching combustor or turbine temperature limits. Third, a significant quantity of compressor discharge air, in the area of 20%, is used as turbine coolant and must bypass the combustor. An intercooled compressor has a lower air discharge temperature; consequently, less cooling air is required, allowing more fuel to be burned in the larger quantity of combustion air. Demineralized water is required for SPRINT operation to minimize solids deposition on the compressor blades.

SPRINT is available as an option on the water/steam injected LM6000PC and may be employed with natural gas firing or fuel oil firing. SPRINT also is offered on the dry low- NO_x LM6000PD, but at this time it must be switched off when firing fuel oil. Also, at this time

Qualitative Assessment of Technical Aspects for Each Technology

		Leading Developers of the Science or Technology					
Technologies	**R&D Intensity**	**Government Organizations**	**Nonprofit Organizations**	**Leading Vendors**	**Major Trends**	**Changes To Watch For**	**Unresolved Issues**
Conventional subcritical CFBC	Low		EPRI	Various CFBC boiler and steam turbine vendors	Addition of polishing scrubbers to new units. Existing units: co-firing "opportunity" fuels like biomass	Increasing price of natural gas, improving economics of coal-fired plants over CT plants. Stricter regulations	CO2 emission control systems and associated costs. Impact of CO2 tax.
Conventional supercritical CFBC	Low			Various CFBC boiler and steam turbine vendors	First supercritical unit being built	Increasing price of natural gas, favoring coal-fired plants. If first and subsequent supercritical	Construction of more supercritical units dependent on experience of first
Advanced supercritical CFBC	Limited	DOE/ORNL (much of research in high pressure/ temperature alloys will applicable to CFBC pressure parts)		Primarily one CFBC vendor steam and turbine vendors	New alloys - higher temperature and pressure. Research at ORNL will be applicable to CFBC	Advanced supercritical possible in the future, but is a number of years away.	Depends on the experience at Lagisza, Poland.

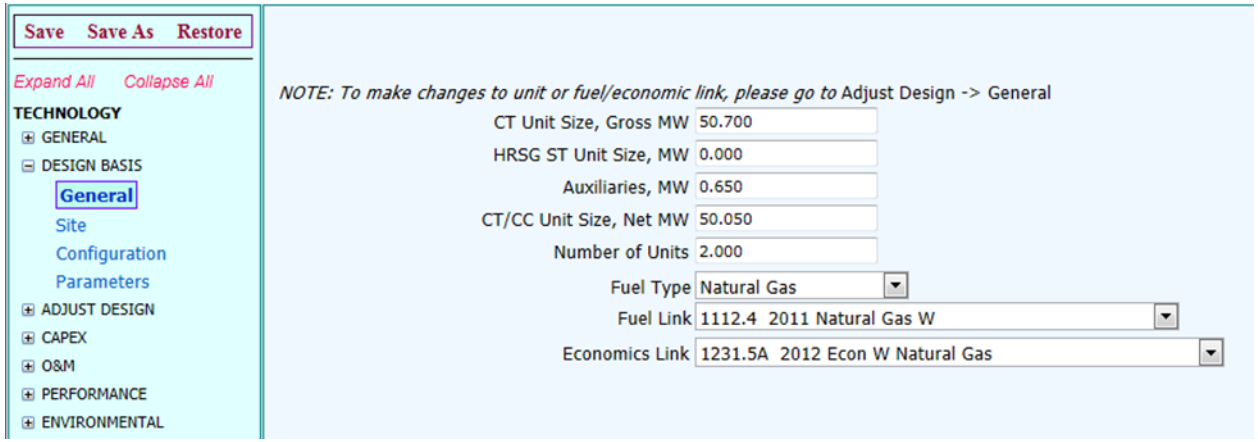
Qualitative Assessment of Business Aspects for Each Technology

	First Generation	*Second Generation*	*Third Generation*	*Fourth Generation*
Process Identification **Usual capacity** **Steam Conditions**	Conventional non-reheat and subcritical CFBC 50-150 MW 1200 psig/950°F & 2400 psig 1000°F/1000°F	Conventional subcritical CFBC 150-300 MW 2400 psig 1000°F/1000°F	Subcritical CFBC 300-500 MW 2400 psig 1000°F/1000°F	Supercritical CFBC; 500 MW 3500 psig 1000°F/1000°F
NO_x control	None	SNCR	SNCR	SNCR
Sulfur control	In-bed 70-80% control	In-bed 85-95% control	In-bed 95-98% control. Efficiency greater than 95% may require polishing scrubber	In-bed 95-98% control. Efficiency greater than 95% may require polishing scrubber
Mercury control	None	None	Activated carbon	Enhanced activated carbon
Fly ash control	ESP	Fabric filter	Fabric filter	Fabric filter
Other Characteristics	Initial commercial experience	Maturing operating experience	Commercial operating experience	Needs to be proven
Heat Rate, HHV	10,000-12,000 Btu/kWh	9500-10,000 Btu/kWh	9500-9800 Btu/kWh	Needs to be shown
Major Disadvantages Environmental	Solid waste disposal Fine particulate emission CO_2 emissions NO_x emissions Mercury emissions	Solid waste disposal Fine particulate emission CO_2 emissions NO_x emissions Mercury (Hg) emissions	Solid waste disposal in most cases CO_2 emissions Trace compound emissions (other than Hg)	No supercritical experience yet. Same disadvantages as third generation.
Others	Limited efficiency. High capital cost compared to NGCC.	Improving efficiency. High capital cost compared to NGCC.	Move toward more waste coal and fuel firing.	
Key technology needs	Reducing O&M costs and minimizing tube erosion	Reducing O&M costs and increasing plant size	Proving commercial viability of 500-MW single boilers	Proving commercial viability of 500-MW supercritical boilers
Development Timing				
Research	1960s	1970s	1990s	2001-2003
Development	1970s	1990s	Late 1990s	In progress
Demonstration	1980s	1990s	Early 2000s	2006
Commercialization Date for Large Units	1990-1995	1995-2000	2002-2007	Future
Key Issues	Improving performance	Reducing capital cost Improving performance, availability	Improving performance. Competing with PC & IGCC	Competing with PC & IGCC

TAGWeb™ Customization

TAGWeb™ Customization

- Exercise 2: Creating a new record/Making changes technology design basis
  - Save As function
  - Copy function



You can obtain new technologies from another user's account!

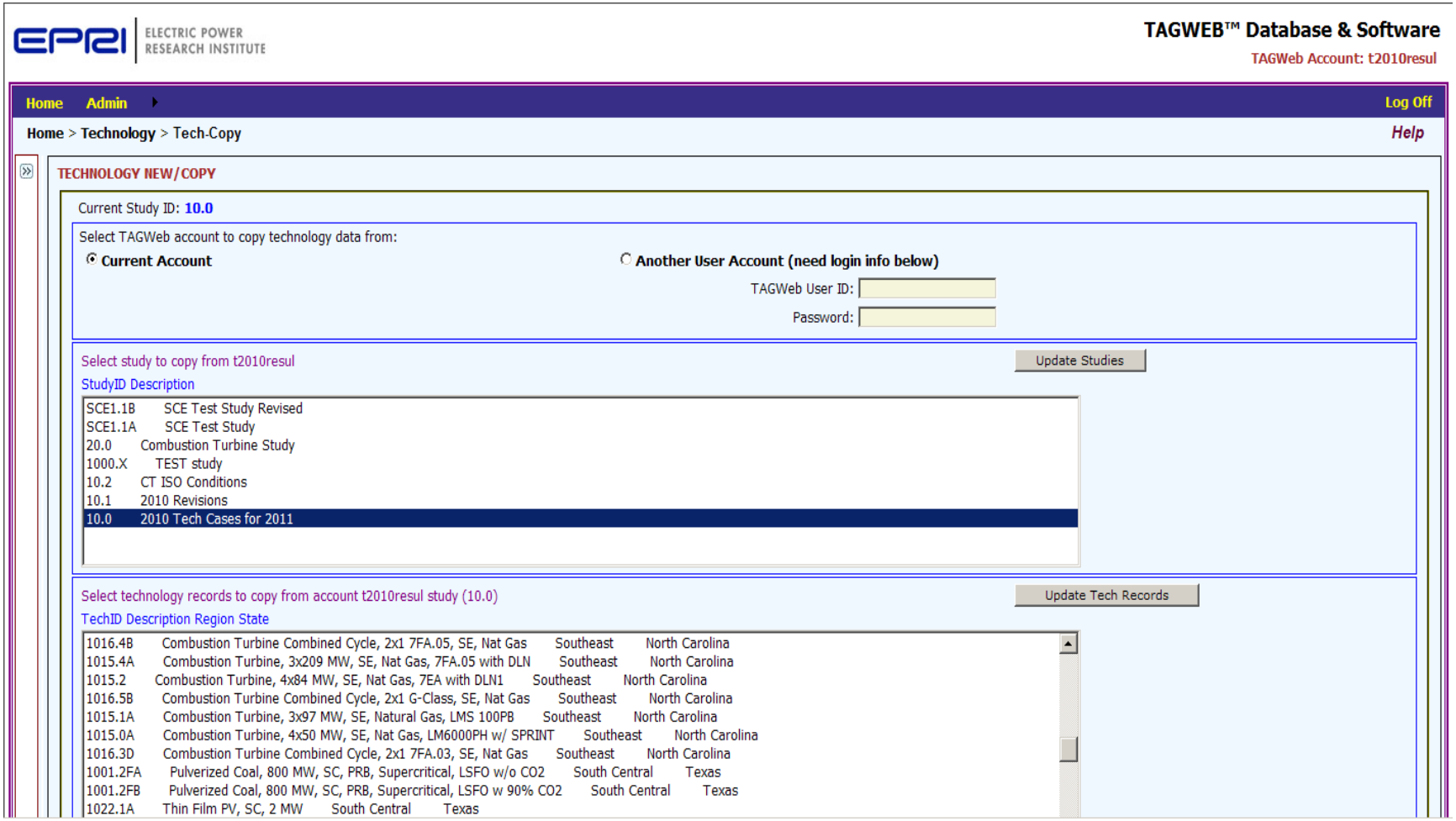
Select a current technology record, make changes, and save the results to a new technology ID.

TAGWeb™ - Moving Records Between Studies and Copying Records from Other User Accounts

- Exercise 3: Moving/Copying files from other TAGWeb™ user accounts

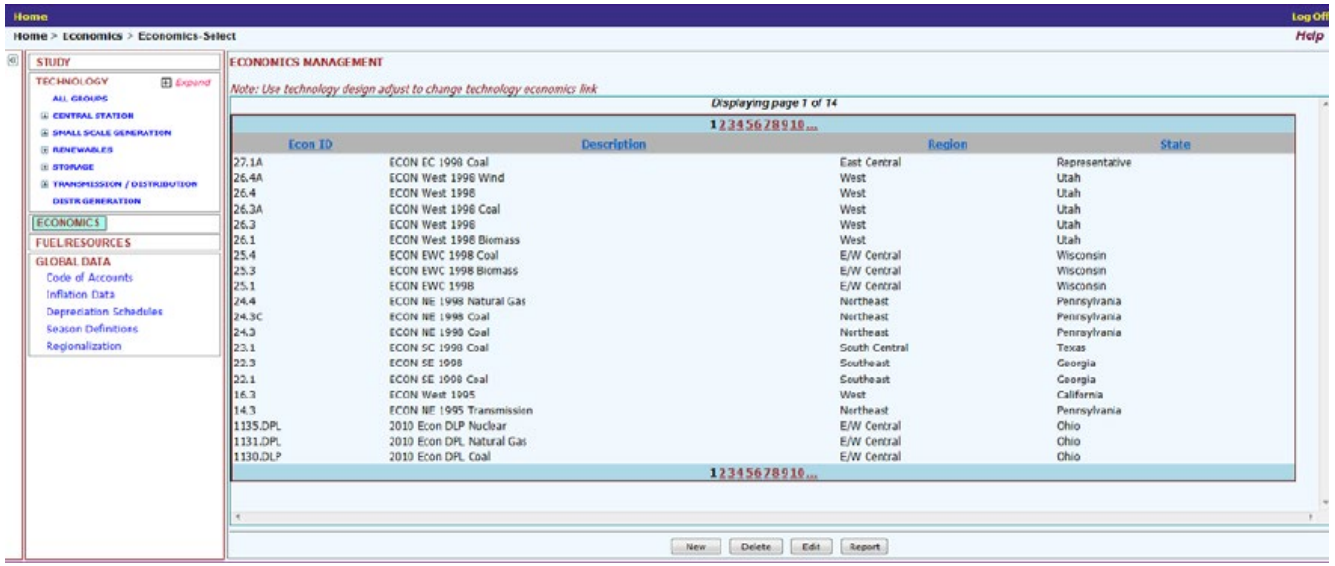
Building from other user accounts can save time!

TAGWeb™ - Moving Records Between Studies and Copying Records from Other User Accounts



TAGWeb™ Customization

- Exercise 4: Modifying base assumptions
  - Reference Year
  - Technology Input Year
  - Economic Year Dollars



Edit key economic parameters that drive the financial calculations in TAGWeb™

TAGWeb™ Customization

- Exercise 5: Modifying capital costs at the code level

Save Save As Restore

Expand All Collapse All

TECHNOLOGY
- GENERAL
- DESIGN BASIS
- ADJUST DESIGN
- CAPEX
  - Capital Costs
  - Cost Categories
  - AFUDC/Owner
  - Replacement Costs
- O&M
- PERFORMANCE
- ENVIRONMENTAL

Cost & Performance Basis

Cost Category 1 - Steam Generator System

Delete COA

COA: 1.0	Material	Dir Labor	Indirects	SubContr	Total
StmGenSys	148.5	165.4	0	35.8	*349.7*
CombAirPht	1	1.1	0	0.2	*2.3*
AirFlueGas	14.2	15.9	0	3.4	*33.5*
FuelOil	1.3	1.4	0	0.3	*3*
AuxBlrSys	2.1	2.4	0	0.5	*5*
Total ($/kW)	*167.1*	*186.2*	*0*	*40.2*	*393.5*

Selected Item

StmGenSys | 148.5 | 165.4 | 0 | 35.8 | 349.7 | Update

Close

Decompose capital costs to code of accounts level that can be escalated at different values – think "REGIONALIZATION"

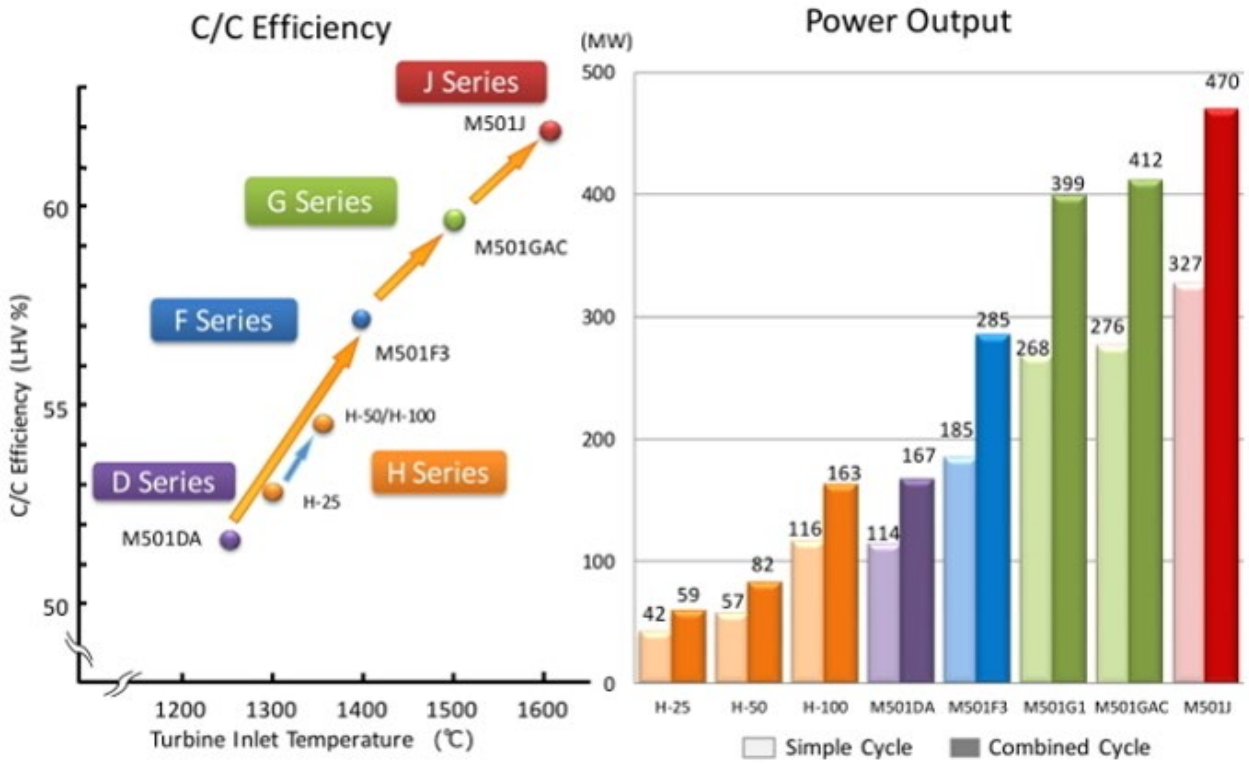
TAGWeb™ Customization

- Exercise 6: Modifying O&M data
  - Fixed & Variable O&M: Includes data to calculate fixed and variable O&M costs *(Quantities go here – think "how much?")*
  - O&M unit costs: Includes labor rates, consumables and disposal costs *(think "how much does it cost/unit?")*

Input key O&M parameters to calculate both fixed and variable O&M costs.

TAGWeb™ Customization

- Exercise 7: Modifying performance data



For Illustration purposes only
Source: MHPS Gas Turbine Performance

Change key performance parameters to better meet customized plant operational expectations

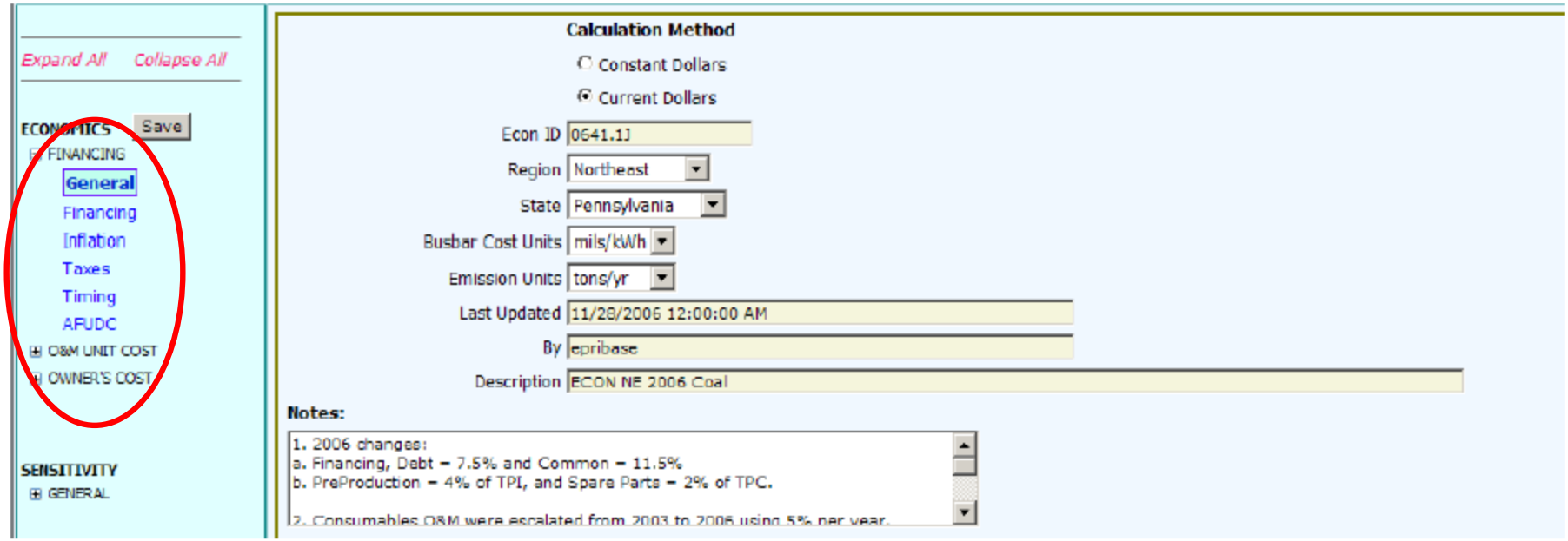
TAGWeb™ Customization

- Exercise 8: Adjusting design features…
  - *temperature and elevation parameters* to evaluate the impact on plant output and heat rate for a CTCC plant
  - *plant location* and evaluate impact on capital cost
  - *number of units*

Customize plant conditions and compare impacts of various parameters

TAGWeb™ Customization

- Exercise 9: Setting economic assumptions



Set important economic assumptions to best meet the needs of the financial analysis

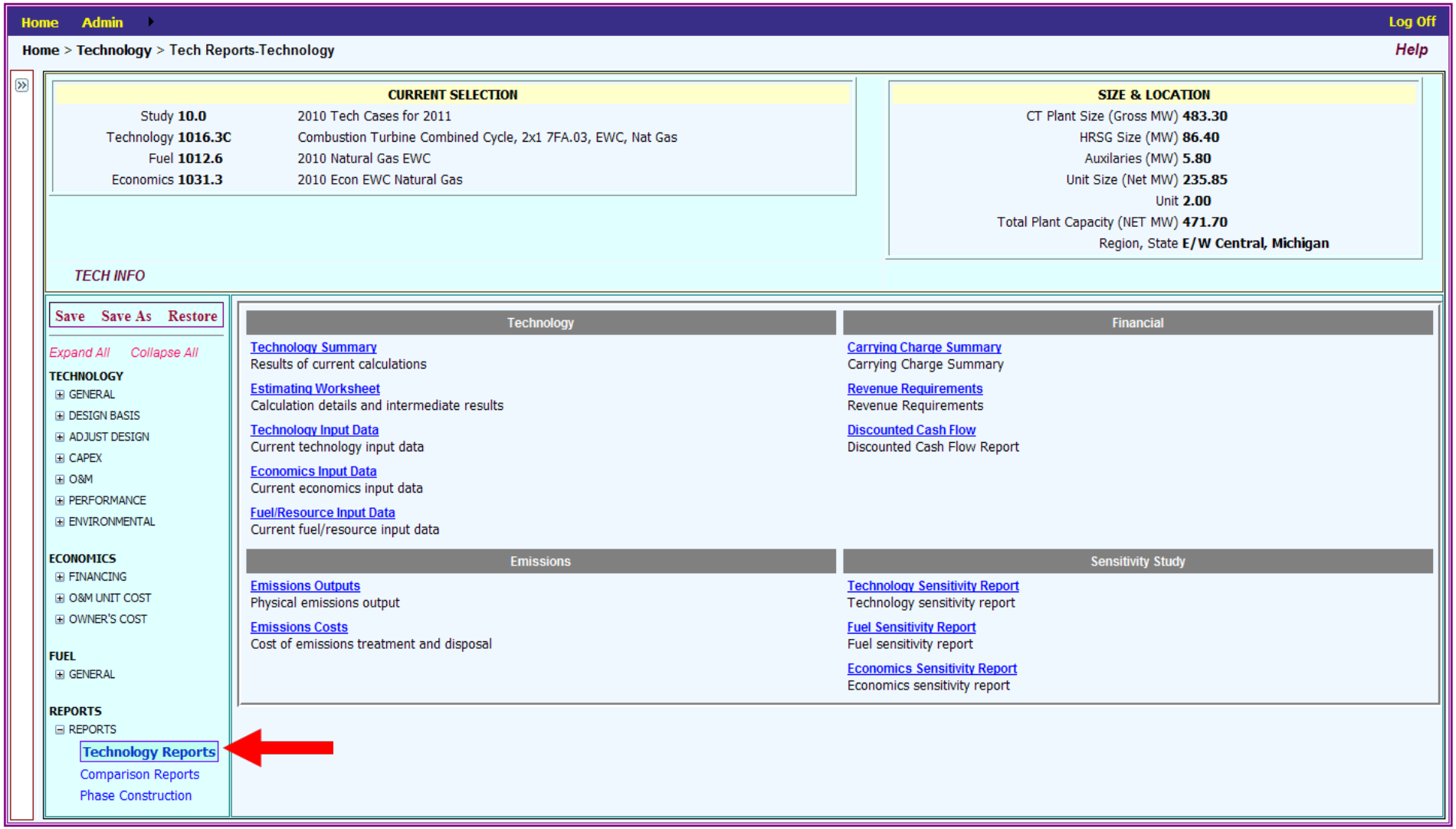
TAGWeb™ Customization

- Exercise 10: Adjusting fuel cost data input

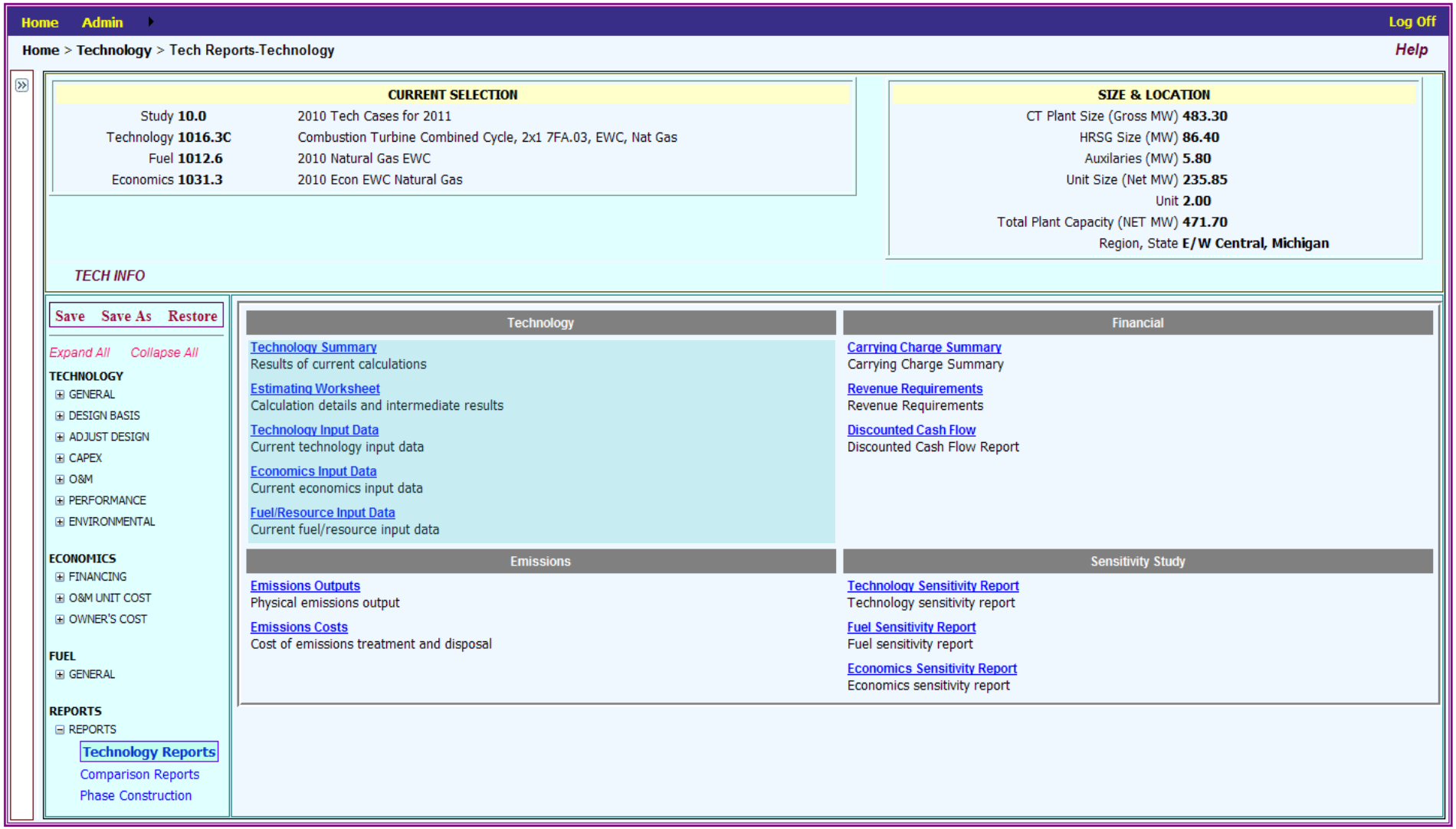
Adjust fuel cost data to match the company's forecast

TAGWeb™ Reporting

TAGWeb™ Report Generation



TAGWeb™ Report Generation – Technology



TAGWeb™ Report Generation – Technology

- **Technology Summary**: Displays key data about the currently selected technology, including *capital*, *O&M*, and *busbar costs*
- **Estimating Worksheet** : Displays data about the currently selected technology, including intermediate calculations made during the simulation that are ***not*** included in other TAGWeb™ outputs
- **Input Data**: Displays the inputs for the currently selected technology
  - Technology
  - Emissions
  - Fuel/Resource

TAGWeb™ Report Generation – Technology *(Example)*

Study	10.0	2010 Tech Cases for 2011
Technology	1001.2C	Pulverized Coal, 800 MW, E/W/C, IL6 Bit, Supercritical, LSFO w/o CO2
Economics	1030.3A	2010 Econ E/W/C Coal
Fuel	1033.0	2010 Illinois No. 6
Region	E/W Central	
State	Wisconsin	
Unit Size (Net MW)	800	
Number of Units	1	

Capacity Factor (%)	85.00
Pre-construction Time (Yrs)	1
Plant construction Time (Yrs)	4
Unit Life (Yrs)	30
Technology Development Rating	Mature
Design, Cost Estimate Rating	Preliminary
Commercial Service Year	2011
Tech Input Year $	Dec, 2010
Econ Input Year $	Dec, 2010
Reference Year $	Dec, 2010
Time-dependent Input Type	Annual

Capital Costs ($/kW) - R = Refrence Year, M = Mixed Year

Steam Generator System	407.5
Turbine Island System	439.2
Coal Handling System	126.0
Balance of Plant	53.5
Misc Indirects	191.0
Environment	522.4
Total Process Capital (R)	1739.6
General Facilities & Site Specific (R)	60.7
Engineering Fee & Constr. Man. (R)	223.0
Project Contingency (R)	196.0
Process Contingency (R)	0.0
Total Plant Cost(R)	2219.3
AFUDC (M)	618.9
Total Cash Expended (M)	2066.4
Total Plant Investment (M)	2685.3
Total Owner Costs (R)	193.1
Total Capital Required (M)	2878.4

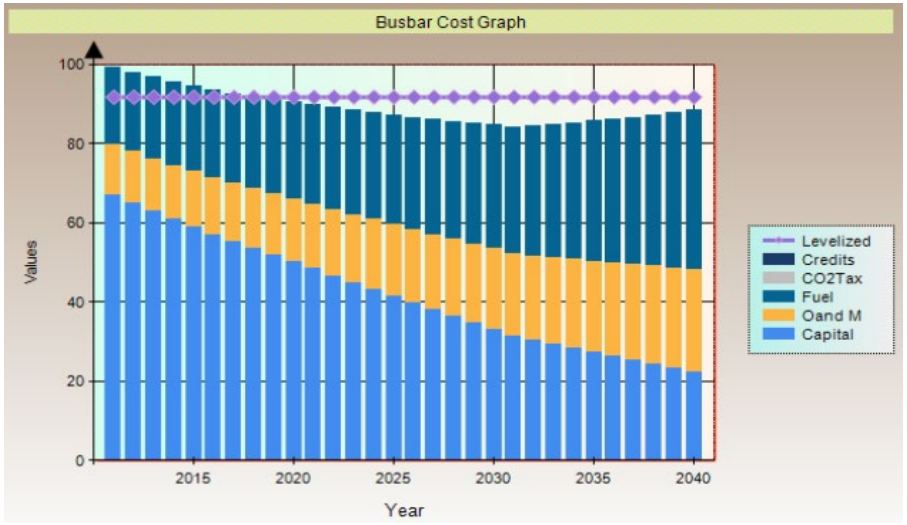
Operating, Maintenance, and Consumables (Reference Year)

Fixed O&M ($/kW-yr)	47.16
Variable O&M (mils/kWh)	6.39
Consumables (mils/kWh)	4.95
Land Required (acre)	935.1
Water Makeup @ 100% capacity (1000 gal/yr)	5193338

Current $ Busbar Costs (mils/kWh)

	2011	2012	2013	2014	2015	2020	2030	2040	Level
Capital	66.94	64.91	62.81	60.80	58.86	50.04	33.04	22.24	50.50
O&M	12.72	13.04	13.37	13.70	14.05	15.89	20.34	26.04	16.24
Fuel	19.55	20.04	20.54	21.05	21.58	24.41	31.25	40.00	24.95
CO2 Tax	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Byproduct Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Production Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Emission Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ROC Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	99.21	97.99	96.72	95.55	94.48	90.34	84.63	88.29	91.69

Levelized from 2011 To 2040 Using After Tax Discount Rate of 8.10 %



TAGWebTM users can print this report directly from TAGWeb™!

TAGWeb™ Report Generation – Technology *(Example)*

Economic Parameters

		Current $		Constant $	
Security Type	**% of Total**	**Cost (%)**	**Return (%)**	**Cost (%)**	**Return (%)**
Debt	46.0	7.5	3.5	4.9	2.2
Preferred Stock	8.0	8.4	0.7	5.8	0.5
Common Stock	46.0	11.5	5.3	8.8	4.0
Total Annual Return			9.4		6.7
Inflation Rate (%)	2.5				
Income Tax Rate (%)	38.0				
Discount Rate (%)	38.0				
After Tax			8.1		5.9
Before Tax			9.4		6.7

Net Heat Rate (Btu/kWh):

25% Load	11620
50% Load	9670
75% Load	9180
Full Load	9020
Average	9050

Unit Availability:

Equivalent Planned Outage Rate (%)	4.8
Equivalent Un-planned Outage Rate (%)	3.7
Equivalent Availability (%)	92.0
Capability Ratio	1.1
Capacity Factor (%)	85.00
Minimum Load (%)	25.0

Cost and performance data updated in 2010 based on data from PCCost.

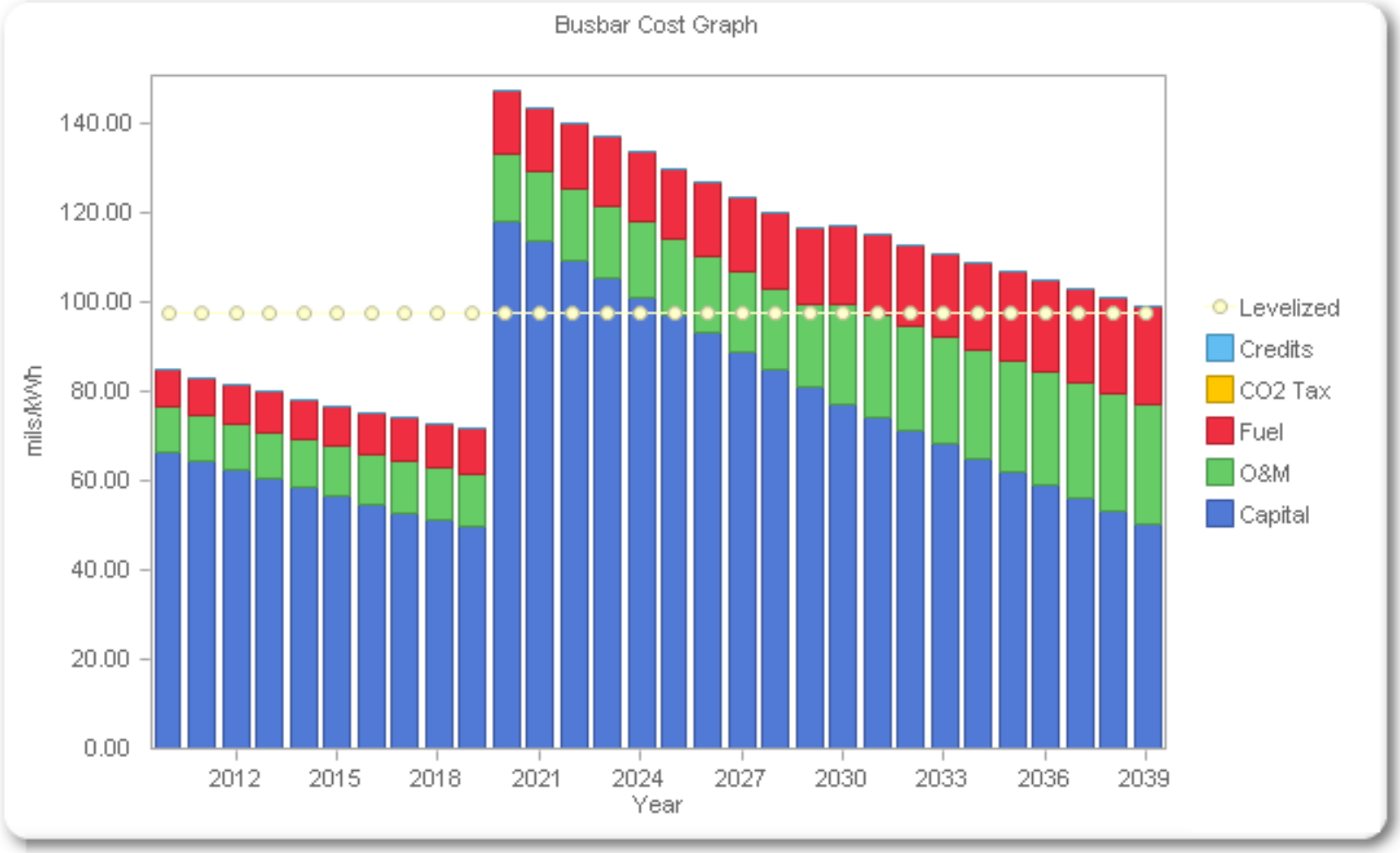
Gen Options: lengthened construction profile to 4 years.

1. Activated Carbon Injection for Mercury removal is included in capital cost.
2. Substation was added to General Facilities (category 1)
3. Raw Water Make up costs was added to General Facilities (category 2).
4. Rail Spur added to General Facilities (category 3).
5. Engineering & Construction Managment Fee is 10% of Process Facilities Capital.
6. Project Contingencies calculated at 10% of Total Plant Cost.
7. Availability numbers are for reference only and do not affect total costs.

Key assumption data supplied to model to perform key TAGWeb™ analysis

Helpful notes to provide insight on plant cost and performance results

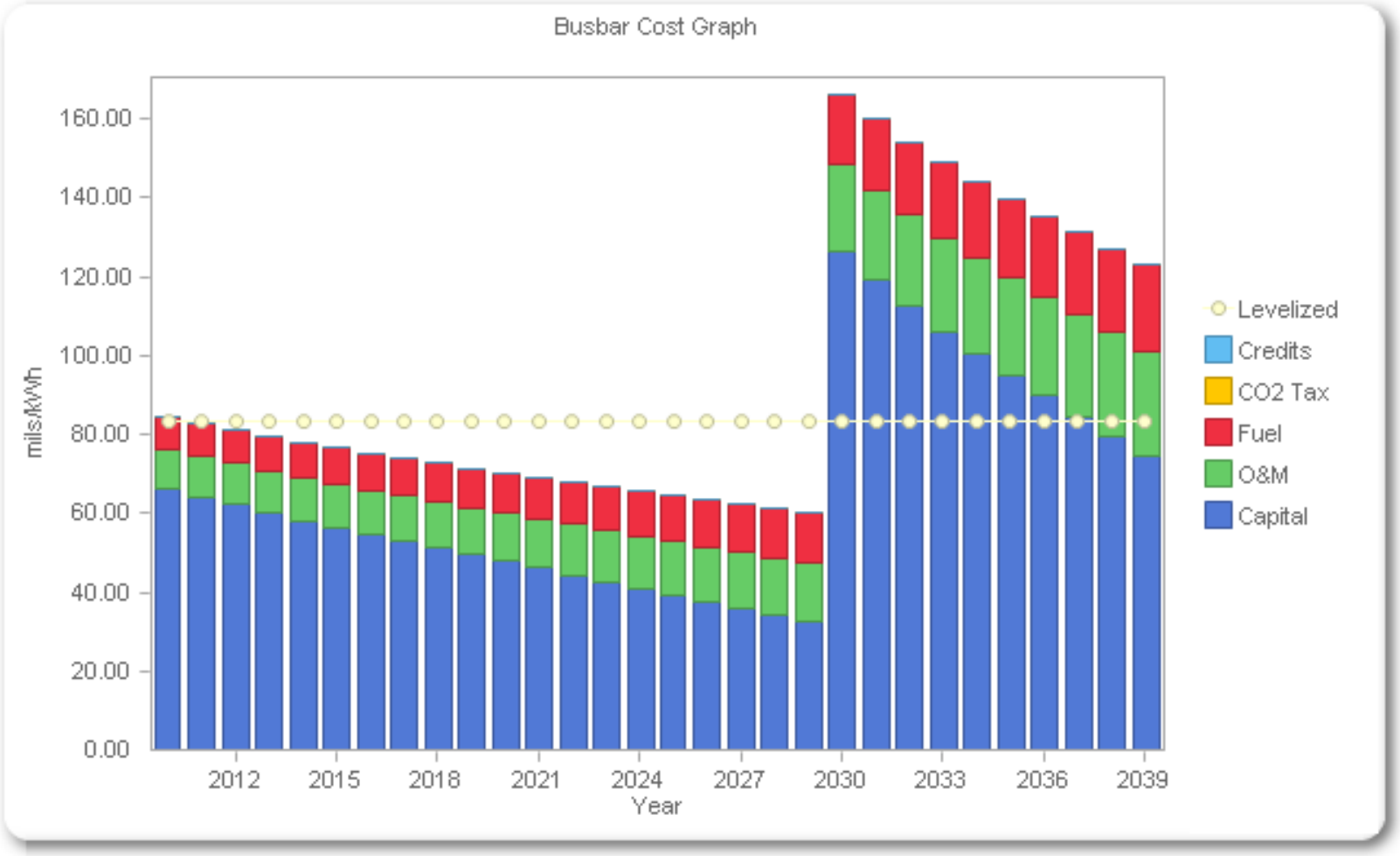
TAGWeb™ Report Generation – Technology *(Example)*



- 800 MW PC Plant with hybrid cooling (30% wet / 70% dry) installed upfront
- PC plant is retrofitted with 90% CO_2 capture **after 10 years of operation**

Deferred Capital, such as CO2 removal, fuel cell stack removal, etc. can be analyzed for different scenarios!

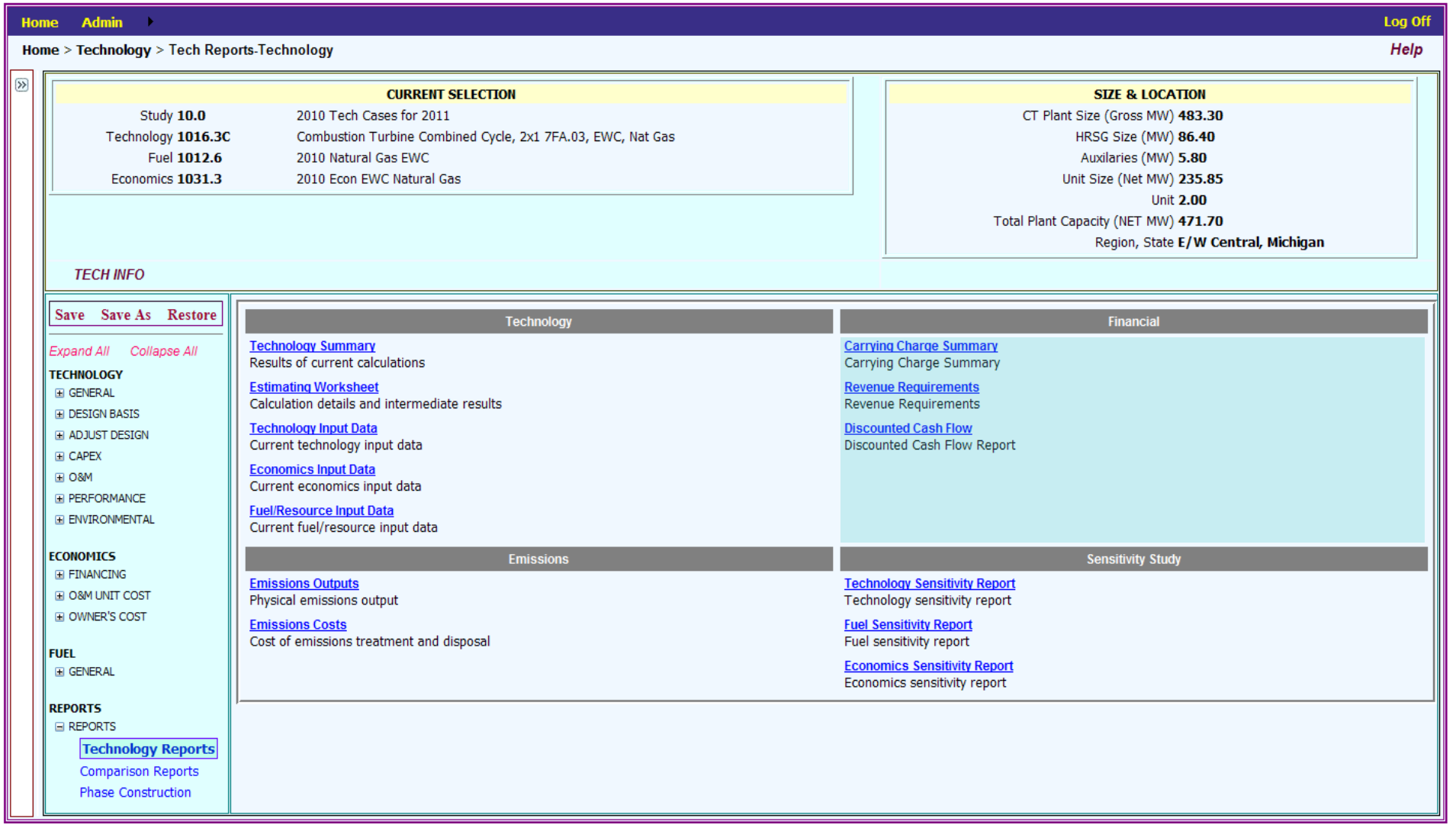
TAGWeb™ Report Generation – Technology *(Example)*



- 800 MW PC Plant with hybrid cooling (30% wet / 70% dry) installed upfront
- PC plant is retrofitted with 90% CO_2 capture **after 20 years of operation**

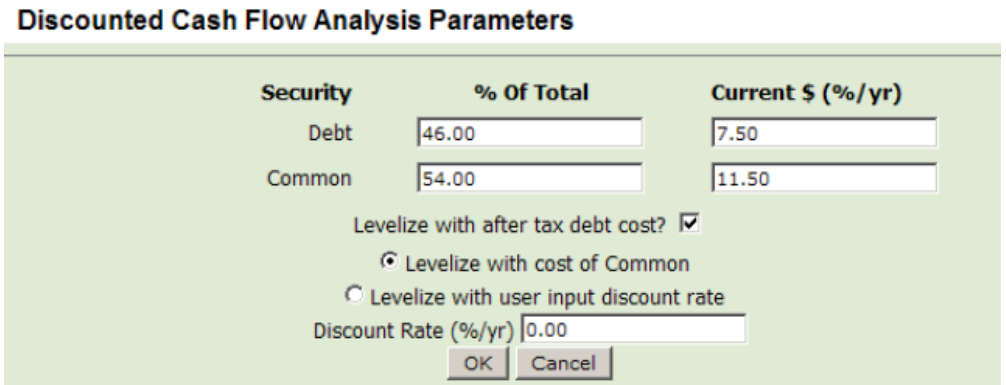
Deferred Capital, such as CO2 removal, fuel cell stack removal, etc. can be analyzed for different scenarios!

TAGWeb™ Report Generation – Financial



TAGWeb™ Report Generation – Financial

- **Carrying Charge Summary (CC)**: Annual capital costs contributing to the carrying charge requirements for the plant
- **Revenue Requirements (RR)**: Annual costs for all items contributing to revenue requirements for the plant, such as capital carrying charges, O&M expenses, and fuel costs *(intended for investor owned utilities - IOUs)*
- **Discounted Cash Flow (DCF)**: Annual cash flow requirements for major plant cost categories such as taxes, capital recovery costs, O&M expenses, and fuel costs *(intended for Non-Utility Generation – NUGs)*



Users can modify key economic input parameters used in DCF analysis

TAGWeb™ Report Generation – Financial

- **Discounted Cash Flow Analysis for Unregulated Power Projects**

DISCOUNTED CASH FLOW REPORT

Study	10.0	2010 Tech Cases for 2011
Technology	1016.3C	Combustion Turbine Combined Cycle, 2x1 7FA.03, EWC, Nat Gas
Economics	1031.3	2010 Econ EWC Natural Gas
Fuel	1012.6	2010 Natural Gas EWC
Region	E/W Central	
State	Michigan	
Unit Size (Net MW)	235.85	
Number of Units	2	
Capacity Factor (%)	85.00	
Dec 2010 $		

Revenue Requirements Schedule
For an Investor-Owned Utility
(Thousands of $)
Current $ Analysis

Study Year	Year	Return on Common Equity	Interest on Debt	Income Taxes	Other Taxes and Insurance	Capital Recovery	Fuel Cost	Charging Cost	O&M Cost(%)
1	2011	45903.1	25501.7	20267.7	11903.5	29235.5	115204.4	NA	17054.8
2	2012	44054.0	24380.3	18049.5	11903.5	30320.4	118084.5	NA	17481.2
3	2013	42137.6	23221.4	18155.3	11903.5	29040.0	121036.6	NA	17918.2
4	2014	40300.7	22106.7	18213.8	11903.5	27855.7	124062.5	NA	18366.2
5	2015	38537.3	21032.8	18228.6	11903.5	26760.1	127164.1	NA	18825.3
6	2016	36842.0	19996.8	18202.8	11903.5	25746.8	130343.1	NA	19295.9
7	2017	35209.6	18995.7	18139.7	11903.5	24809.4	133601.7	NA	19778.3
8	2018	33635.4	18026.9	17872.2	11903.5	24112.1	136941.8	NA	20272.8
9	2019	32104.5	17082.3	16933.9	11903.5	24112.1	140365.3	NA	20779.6
10	2020	30573.6	16137.6	15995.6	11903.5	24112.1	143874.4	NA	21299.1

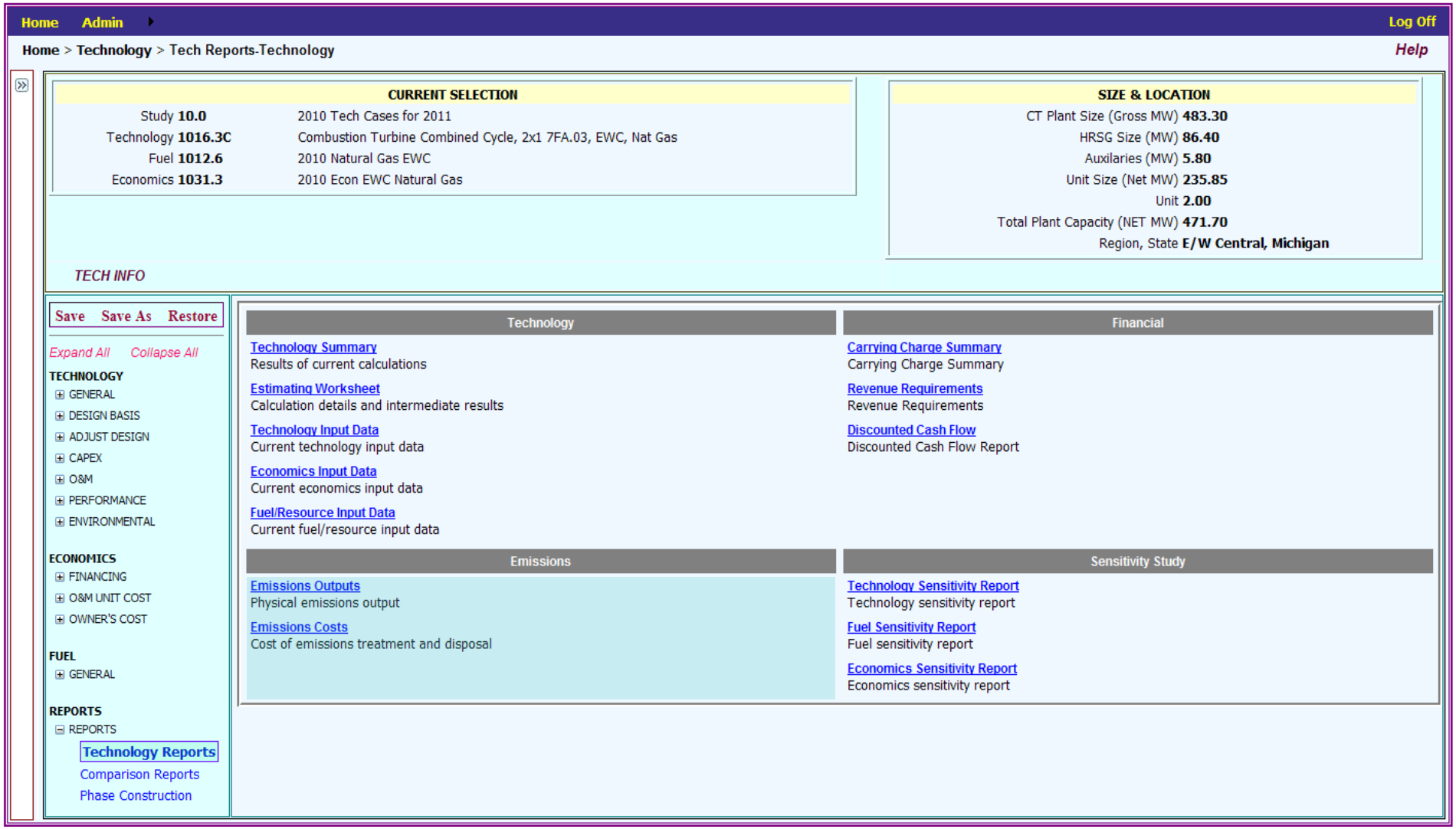
TAGWeb™ Report Generation – Financial

- **Busbar Costs based on DCF Analysis**

Year-by-Year Revenue Requirements Schedule
For a Non-Utility Company
(Thousands of $)
(See Note Below)
Current $ Analysis

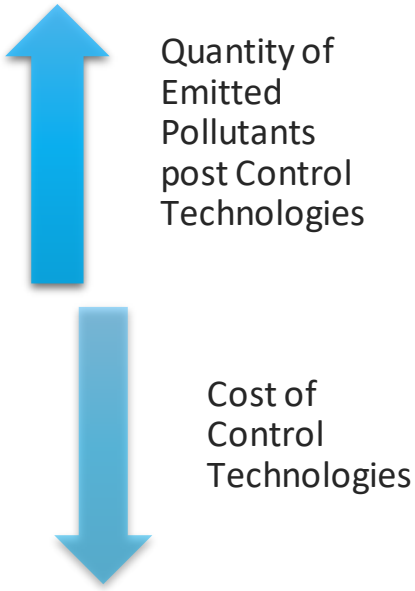
Study Year	Year	Sub-total	CO2 Tax	Byproducts Credit	Production Credit	Emission Credit	ROC Credit	Total Revenue Required	mils/kWh Current $ Analysis	mils/kWh Constant $
1	2011	265070.7	0.0	0.0	0.0	0.0	0.0	265070.7	75.470	73.629
2	2012	264273.3	0.0	0.0	0.0	0.0	0.0	264273.3	75.243	71.617
3	2013	263412.6	0.0	0.0	0.0	0.0	0.0	263412.6	74.998	69.643
4	2014	262809.0	0.0	0.0	0.0	0.0	0.0	262809.0	74.826	67.788
5	2015	262451.7	0.0	0.0	0.0	0.0	0.0	262451.7	74.724	66.045
6	2016	262331.0	0.0	0.0	0.0	0.0	0.0	262331.0	74.690	64.405
7	2017	262438.0	0.0	0.0	0.0	0.0	0.0	262438.0	74.720	62.859
8	2018	262764.7	0.0	0.0	0.0	0.0	0.0	262764.7	74.813	61.403
9	2019	263281.2	0.0	0.0	0.0	0.0	0.0	263281.2	74.960	60.023
10	2020	263895.9	0.0	0.0	0.0	0.0	0.0	263895.9	75.135	58.696
11	2021	264611.4	0.0	0.0	0.0	0.0	0.0	264611.4	75.339	57.419
12	2022	265430.1	0.0	0.0	0.0	0.0	0.0	265430.1	75.572	56.192
13	2023	266354.6	0.0	0.0	0.0	0.0	0.0	266354.6	75.835	55.012
14	2024	267387.5	0.0	0.0	0.0	0.0	0.0	267387.5	76.129	53.879
15	2025	268531.7	0.0	0.0	0.0	0.0	0.0	268531.7	76.455	52.790
16	2026	269789.8	0.0	0.0	0.0	0.0	0.0	269789.8	76.813	51.743
17	2027	271164.6	0.0	0.0	0.0	0.0	0.0	271164.6	77.205	50.739
18	2028	272659.2	0.0	0.0	0.0	0.0	0.0	272659.2	77.630	49.774
19	2029	274276.5	0.0	0.0	0.0	0.0	0.0	274276.5	78.091	48.848
20	2030	276019.7	0.0	0.0	0.0	0.0	0.0	276019.7	78.587	47.959
21	2031	277891.7	0.0	0.0	0.0	0.0	0.0	277891.7	79.120	47.107

TAGWeb™ Report Generation – Emissions



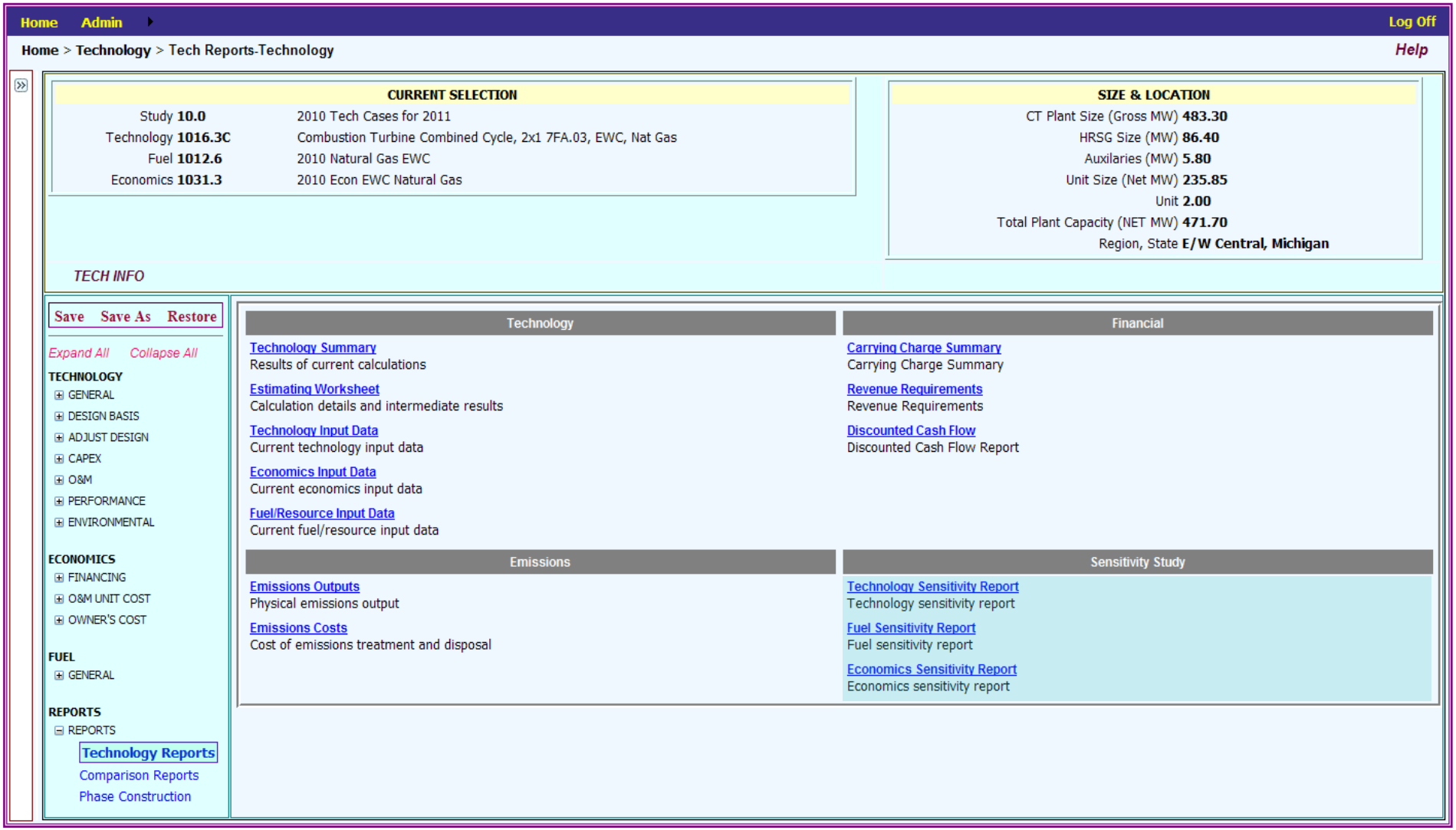
TAGWeb™ Report Generation – Emissions

- **Emissions Output**: Displays the *physical air, liquid, and solid emissions* from the plant. It does ***not*** include the calculated or inputs costs of emissions controls.



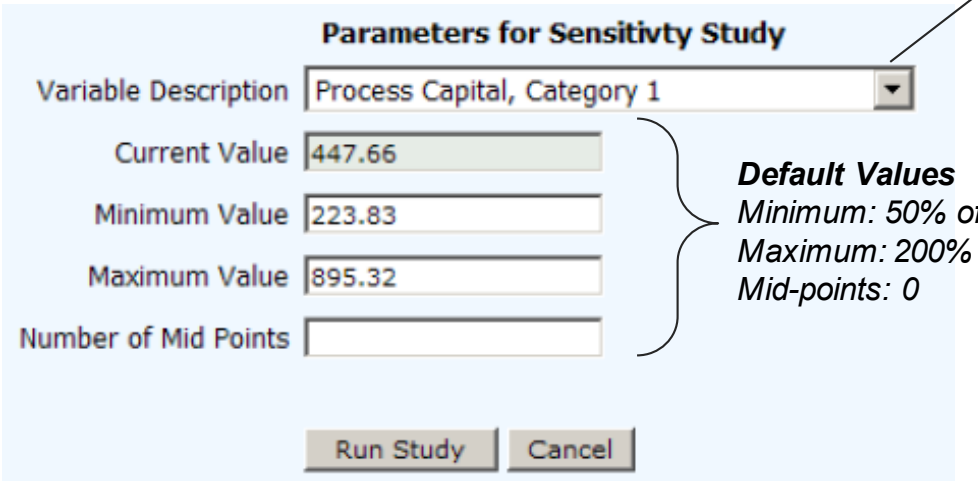
- **Emissions Cost**: Displays the *capital and O&M costs associated with emissions controls* for the selected technology. It does ***not*** include the physical emissions quantities.

TAGWeb™ Report Generation – Sensitivities



TAGWeb™ Report Generation – Sensitivities

- **Sensitivity Analysis**: Allows users to examine sensitivities on key TAGWeb™ input variables
  - **Technology**



Users can use the drop-down box to select the variable for the sensitivity simulation.

Default Values
Minimum: 50% of "Current Value"
Maximum: 200% of "Current Value"
Mid-points: 0

  - **Economics**
  - **Fuel**
- "0" for midpoint, TAGWeb™ will run the simulation twice – once at the minimum and maximum values
- "1" for midpoint, TAGWeb™ will run the simulation 3 times – once at the minimum, the maximum, and at a value halfway between the maximum and minimum

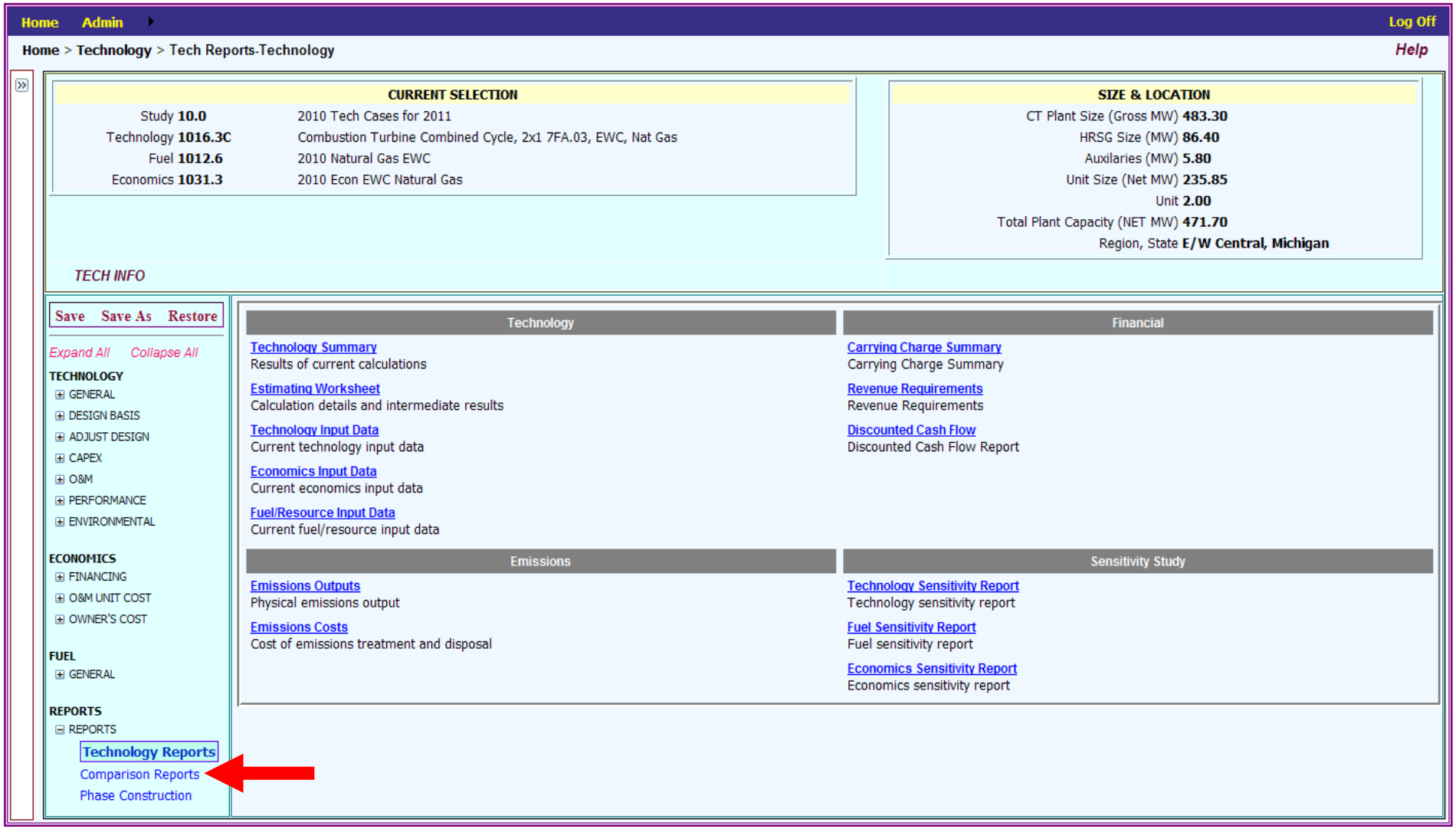
TAGWeb™ Report Generation – **Sensitivities** *(Example)*

Study	10.0	2010 Tech Cases for 2011
Technology	1001.2C	Pulverized Coal, 800 MW, EWC, IL6 Bit, Supercritical, LSFO w/o CO2
Economics	1030.3A	2010 Econ EWC Coal
Fuel	1033.0	2010 Illinois No. 6
Commercial Service Year	2011	

Process Capital, Category 1		
TCR ($/kW)	2617.708	3399.705
FOM ($/kW-yr)	44.799	51.889
VOM (mils/kWh)	6.390	6.390
Consumables (mils/kWh)	4.951	4.951

Levelized Busbar Cost (mils/kWh)		
Capital	45.932	59.627
O&M	15.838	17.054
Fuel	24.954	24.954
CO2 Tax	0.000	0.000
Byproduct Credit	0.000	0.000
Production Credit	0.000	0.000
Emission Credit	0.000	0.000
ROC Credit	0.000	0.000
Total	86.725	101.635

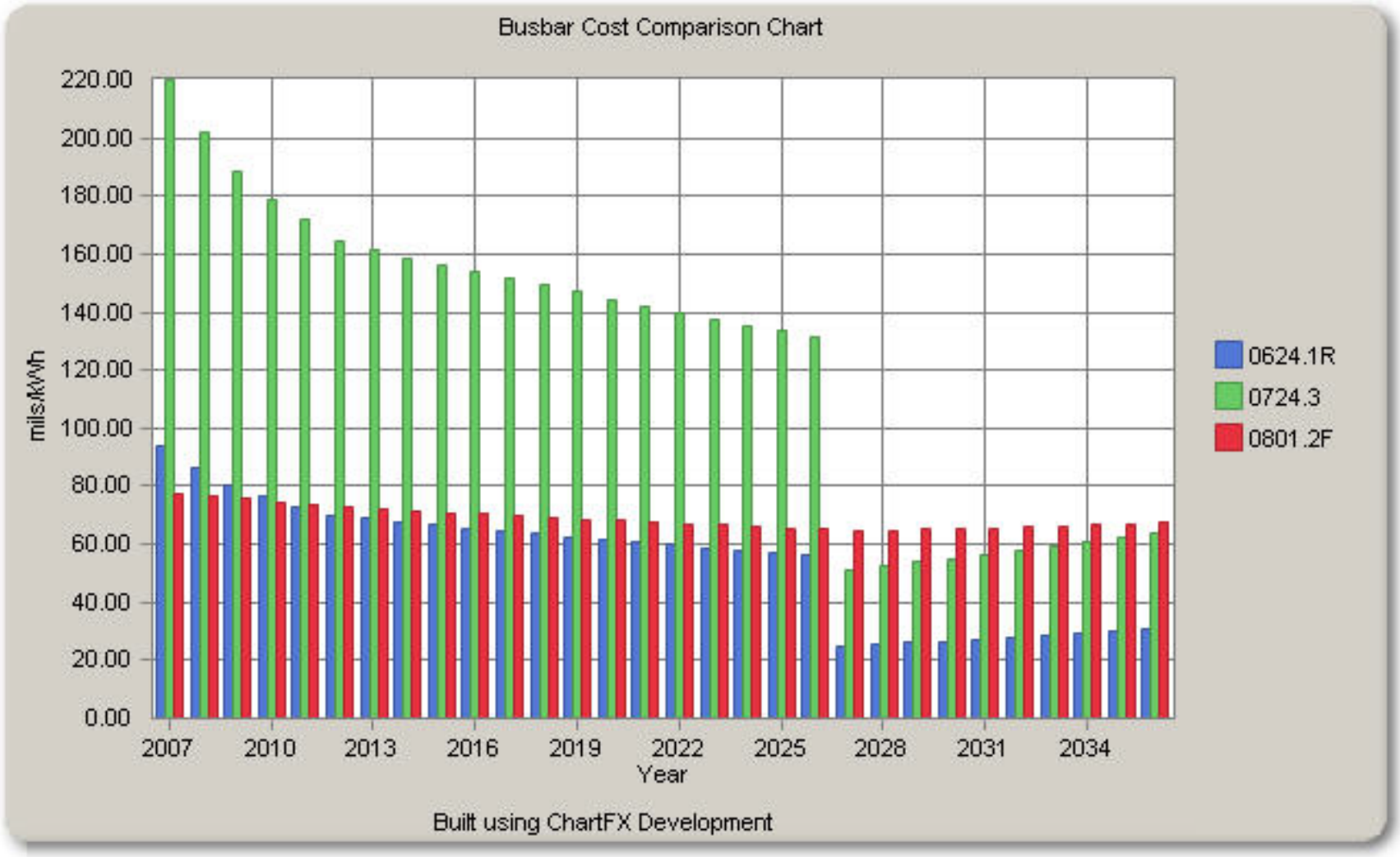
TAGWeb™ Report Generation – Comparison Reports



TAGWeb™ Report Generation – Comparison Reports

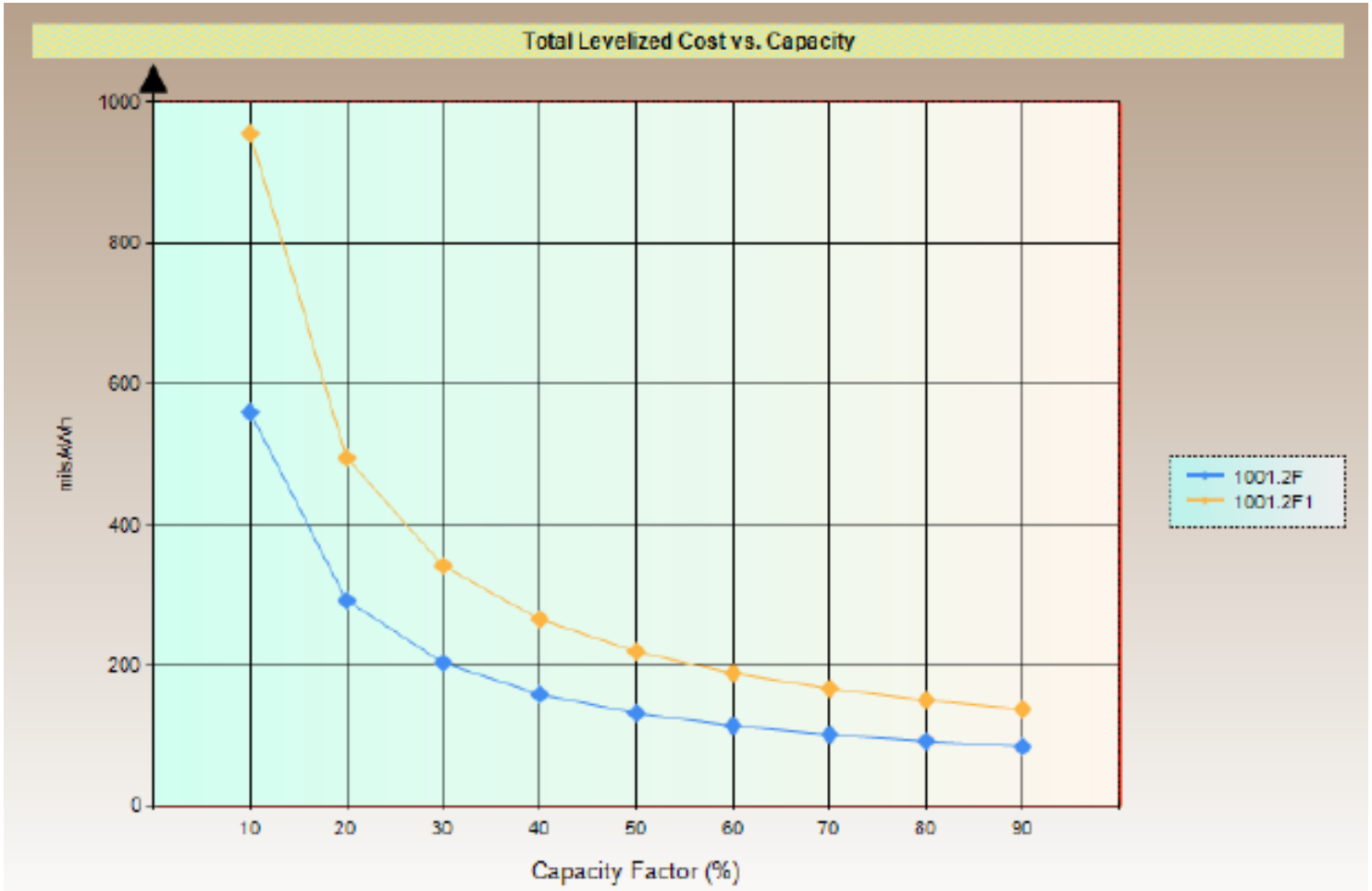
- This feature allows TAGWeb ™ users to compare data for various technology records side-by-side
- Comparison Reports
  - Summary Technologies Comparison: Key data comparing selected Technologies, including capital, O&M, and busbar costs.
  - Detailed Technologies Comparison: Detailed data about the selected Technologies, including capital and O&M costs, performance, emissions, and busbar costs.
  - Busbar Chart: A chart comparing busbar costs over the life of the plant for the Technologies that have been selected
- Screening Curves: A graph showing the totallevelized plant cost versus capacity factor for selected technologies.

Busbar Comparison Chart Compares Cost of Electricity for Different Technologies

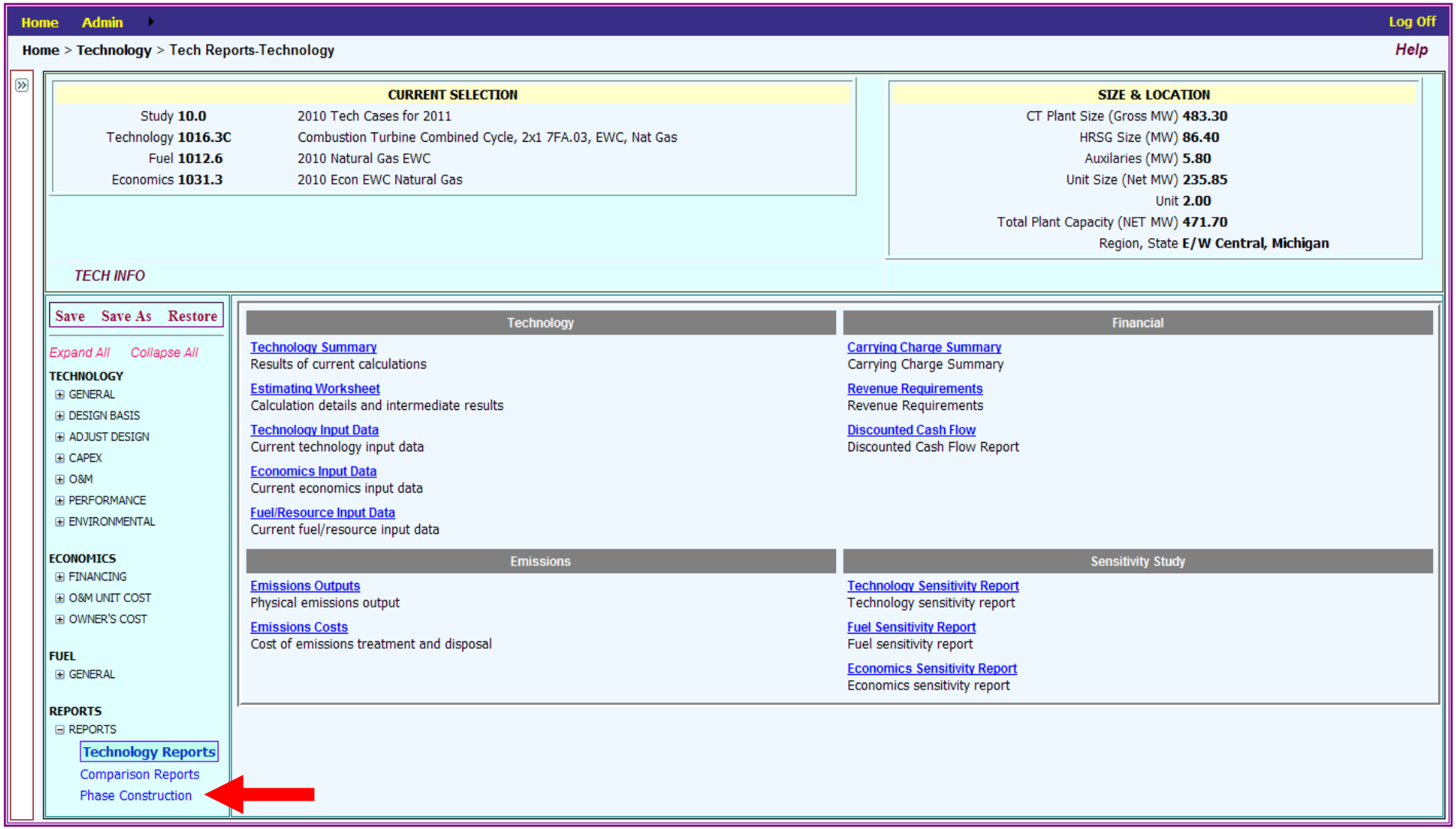


TAGWeb™ Report Generation – Comparison Reports

- This feature allows TAGWeb ™ users to compare data for various technology records side-by-side



TAGWeb™ Report Generation – Phase Construction

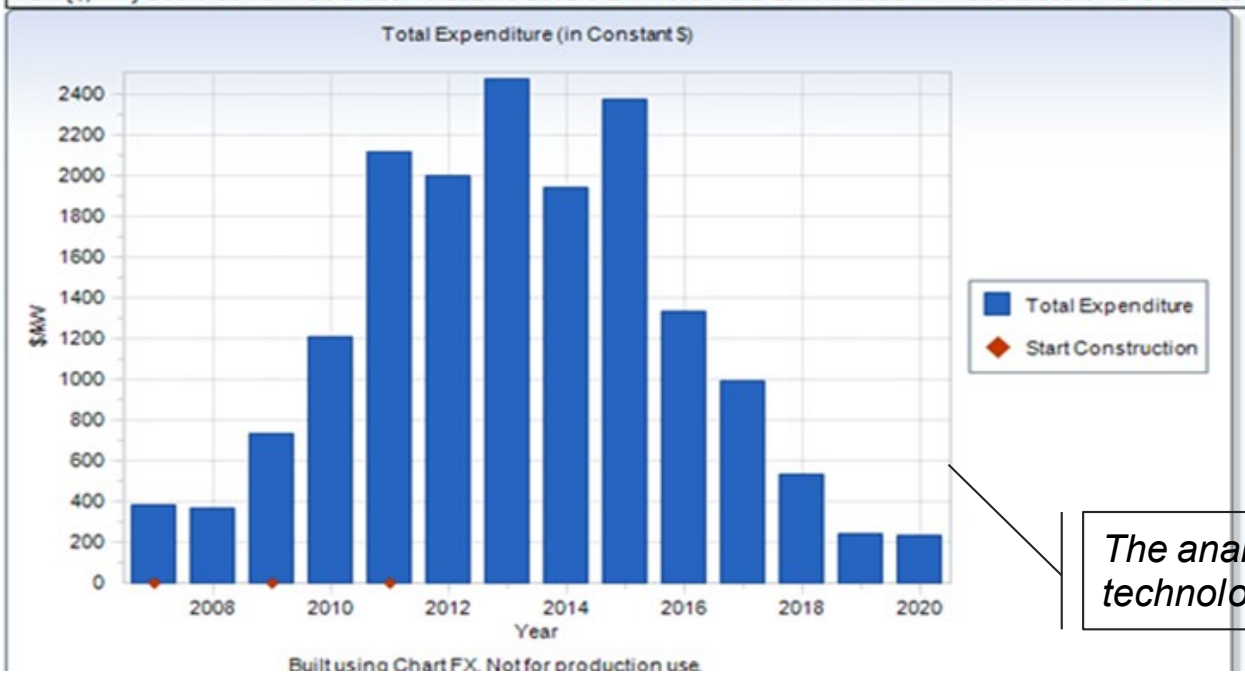


TAGWeb™ Report Generation – Phase Construction

- This feature allows TAGWeb ™ users to create **expenditure** and revenue requirements for multiple unit projects with sequential unit construction

Expense Schedule in Sequence of Construction

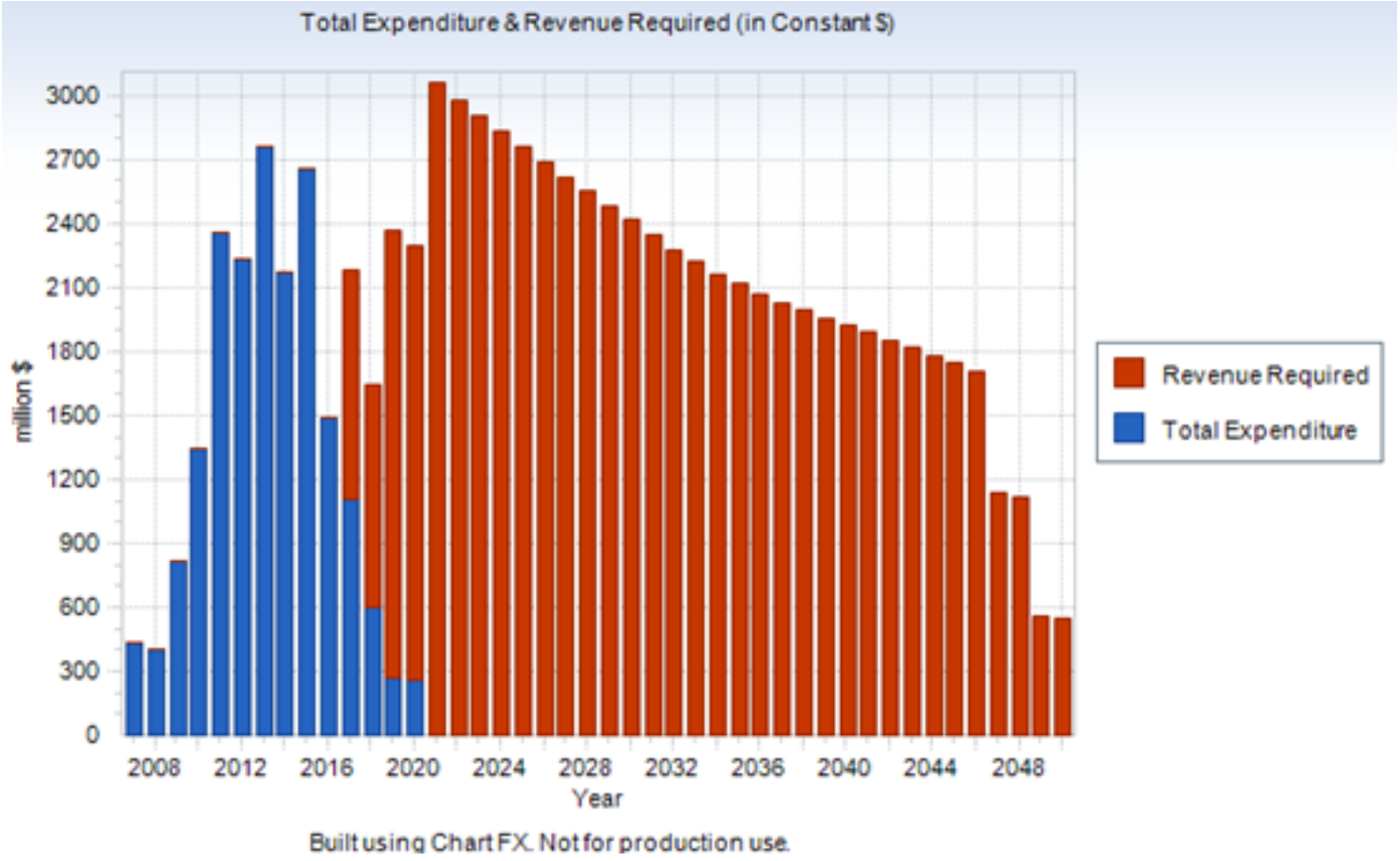
Tech/Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1028.3A	5.0%	5.0%	5.0%	14.0%	25.0%	15.0%	15.0%	6.0%	5.0%	5.0%	**Startup**				
1028.3B			5.0%	5.0%	5.0%	14.0%	25.0%	15.0%	15.0%	6.0%	5.0%	5.0%	**Startup**		
1028.3C					5.0%	5.0%	5.0%	14.0%	25.0%	15.0%	15.0%	6.0%	5.0%	5.0%	**Startup**
Total %	5.0%	5.0%	10.0%	19.0%	35.0%	34.0%	45.0%	35.0%	45.0%	26.0%	20.0%	11.0%	5.0%	5.0%	
TCR ($/kW)	386.8	364.9	731.1	1207.8	2116.8	2003.3	2477.9	1942.1	2378.9	1331.4	993.2	535.9	245.3	232.3	



The analysis can be performed for similar technologies or different technologies

TAGWeb™ Report Generation – Phase Construction

- This feature allows TAGWeb ™ users to **create expenditure and revenue requirements** for multiple unit projects with sequential unit construction



Summary – TAGWeb's Value

- Cost effective approach to having access to data and information on the detailed costs of a broad range of power generation and storage technologies
- The data and information in TAGWeb can be used to support resource planning activities and regulatory decisionmaking.
- Unit performance and costs can becustomized by location, instead of a national average or "typical" unit
- Sensitivity analysis to support initial planning scenarios and risk mitigation

Together...Shaping the Future of Electricity

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