ELECTRIC POWER RESEARCH INSTITUTE

Introduction to EPRI's Technical Assessment Guide for the Web (TAGWeb™)

Clarence Lyons
EPRI, Project Manager

Binh Nguyen
Nexant, Project Engineer

Original EPRI Webcast
October 16, 2014

Slides Revised by Adam Diamant
October 2, 2018

Today's Discussion

- TAGWeb's Capability
- Customization
- Training and Support

© 2018 Electric Power Research Institute, Inc. All rights reserved.

What is TAGWeb™ ?

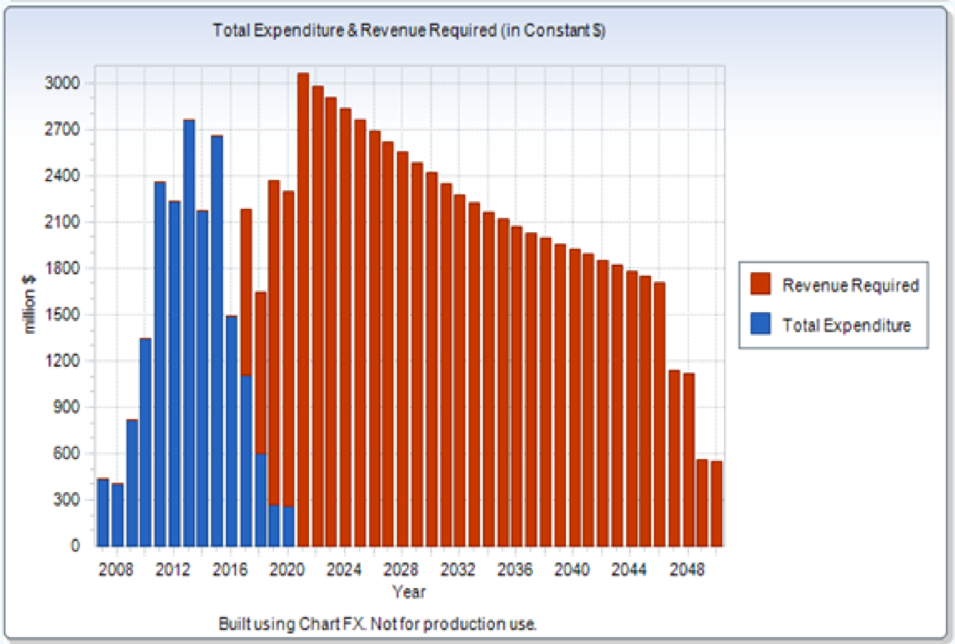
- TAGWEB™ is a key component of Project Set 178A. It is also available as a supplemental project.
- TAGWEB™ is an internet-based software package for creating customized technology cost & performance estimates. This information provides a sound technology basis for understanding and comparing technology cost estimates and validating results of more detailed, engineering studies.
- TAGWeb™ software provides the necessary information in a concise and credible format to conduct preliminary evaluations of power generation and storage technology options.




© 2018 Electric Power Research Institute, Inc. All rights reserved.

Benefits of TAGWeb™ Software

- “One-stop” information source and analytical tool for capital investment planning in the electric power industry.
- It contains a comprehensive database and technology trends
- It facilitates analysis and customization

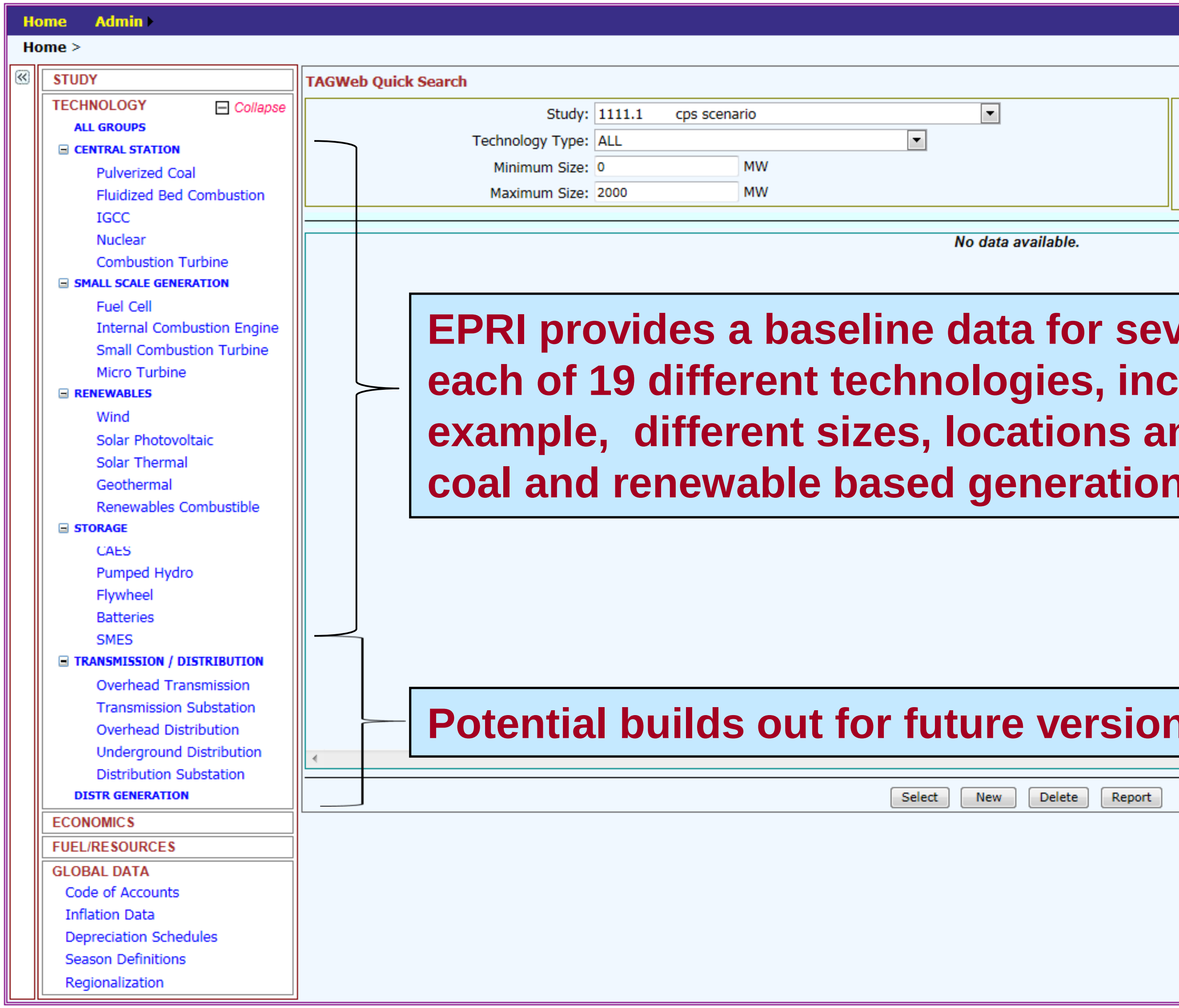


- TAGWeb® is a planning tool for energy professionals. It can be used for the following purposes:
  - Marketing
  - Financial Evaluation
  - Investment Analysis
  - Integrated Resource Planning (IRP)
  - Energy Evaluation
  - Business Planning
  - Technology Forecasting

© 2018 Electric Power Research Institute, Inc. All rights reserved.

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Baseline Data for 19 Different Technologies



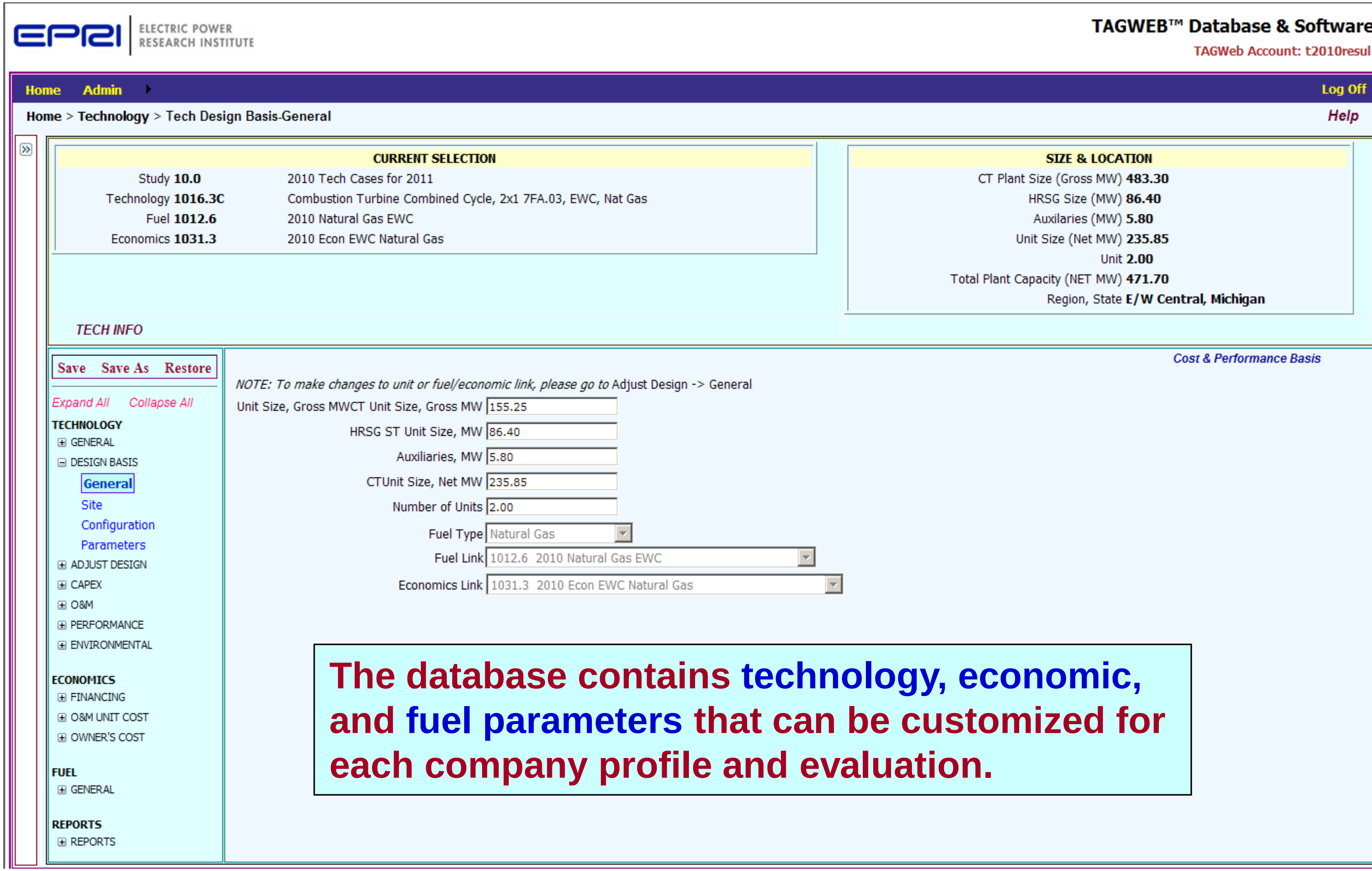
EPRI provides a baseline data for several cases for each of 19 different technologies, including, for example, different sizes, locations and types of coal and renewable based generation.

Potential builds out for future versions of TAGWeb.

© 2018 Electric Power Research Institute, Inc. All rights reserved.

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Technology, Economic and Fuel Parameters

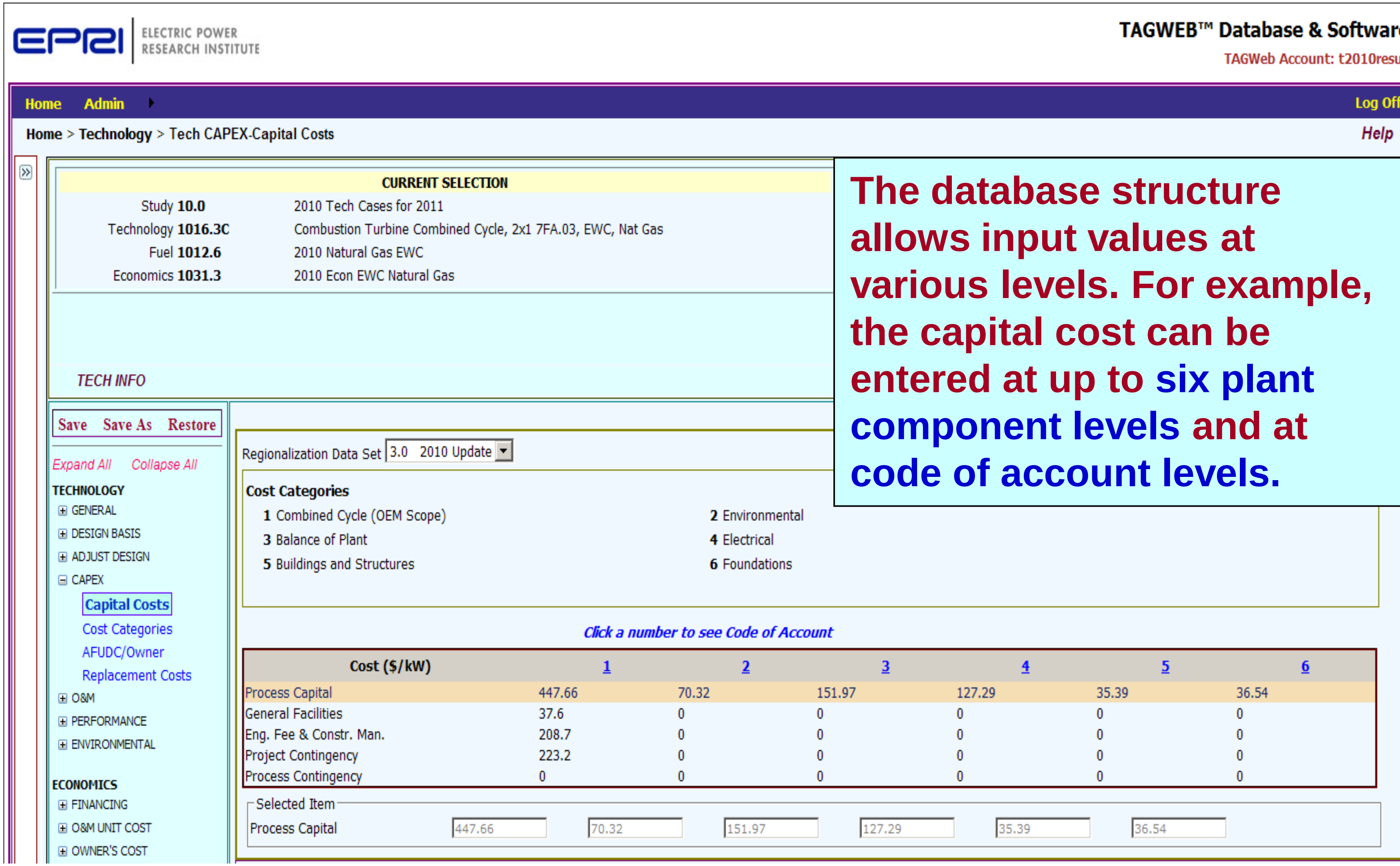


The database contains technology, economic, and fuel parameters that can be customized for each company profile and evaluation.

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

TAGWeb™ Database Structure

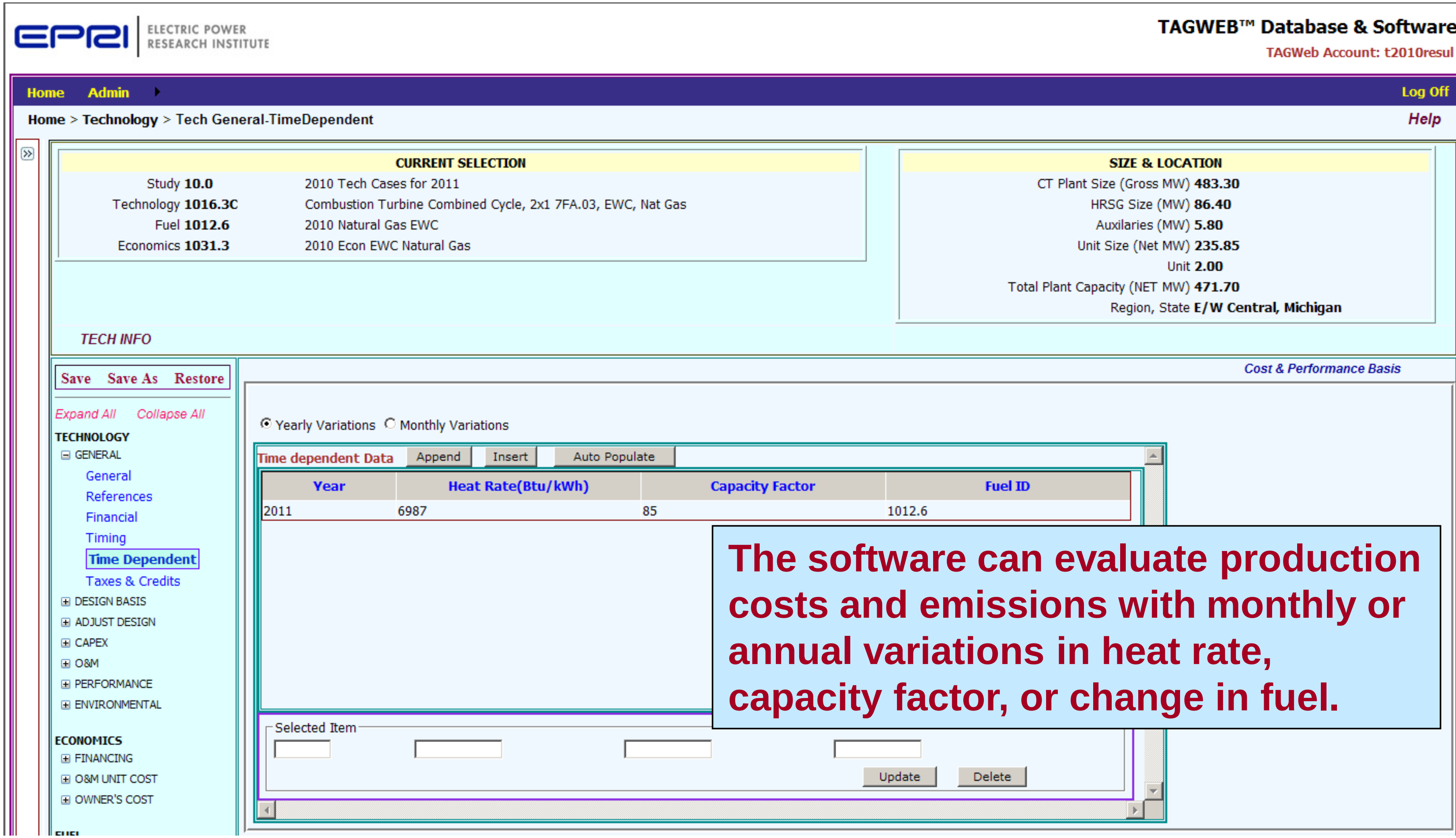


The database structure allows input values at various levels. For example, the capital cost can be entered at up to six plant component levels and at code of account levels.

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

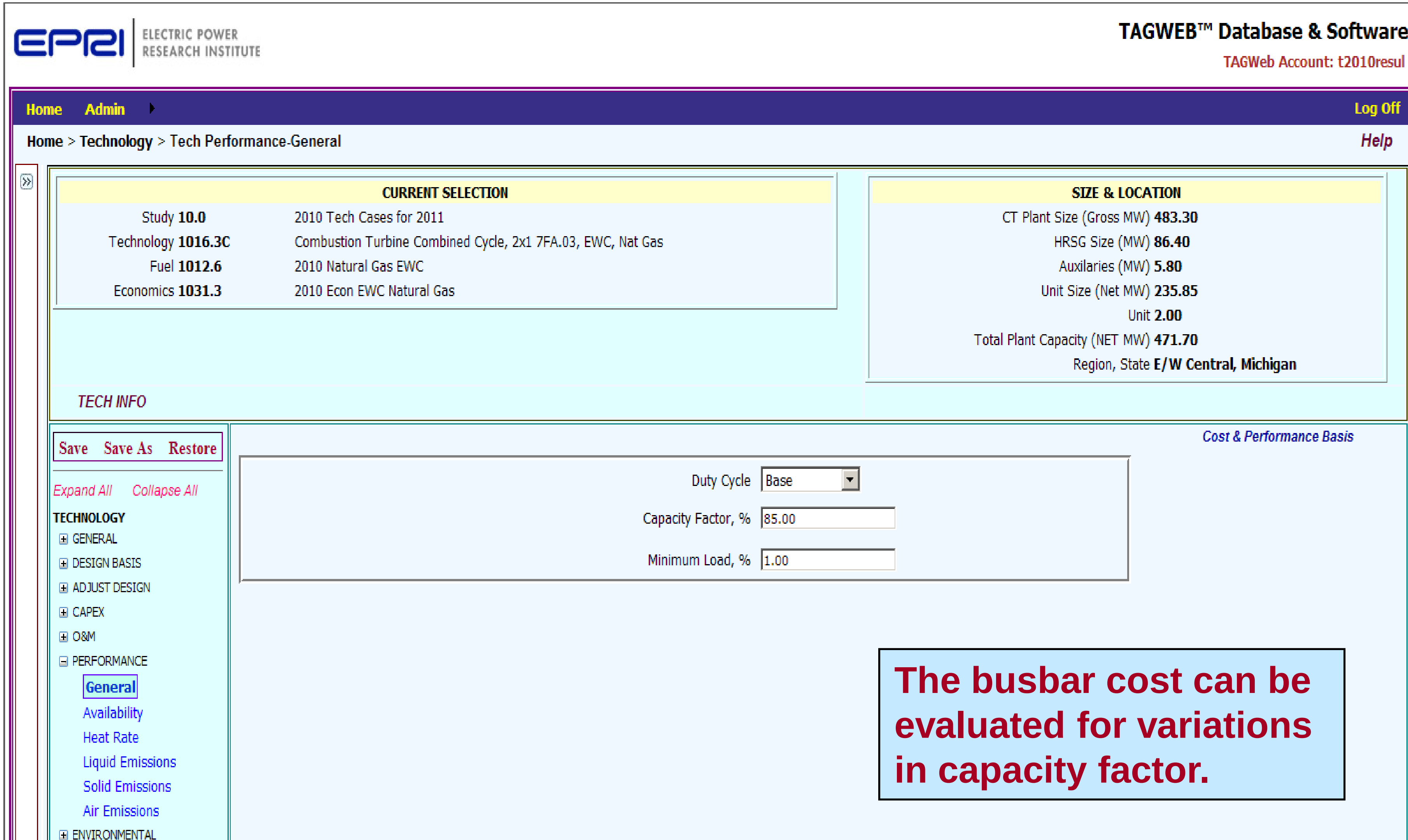
Production Costs and Emissions



The software can evaluate production costs and emissions with monthly or annual variations in heat rate, capacity factor, or change in fuel.

© 2018 Electric Power Research Institute, Inc. All rights reserved.

Busbar Cost and Capacity Factors

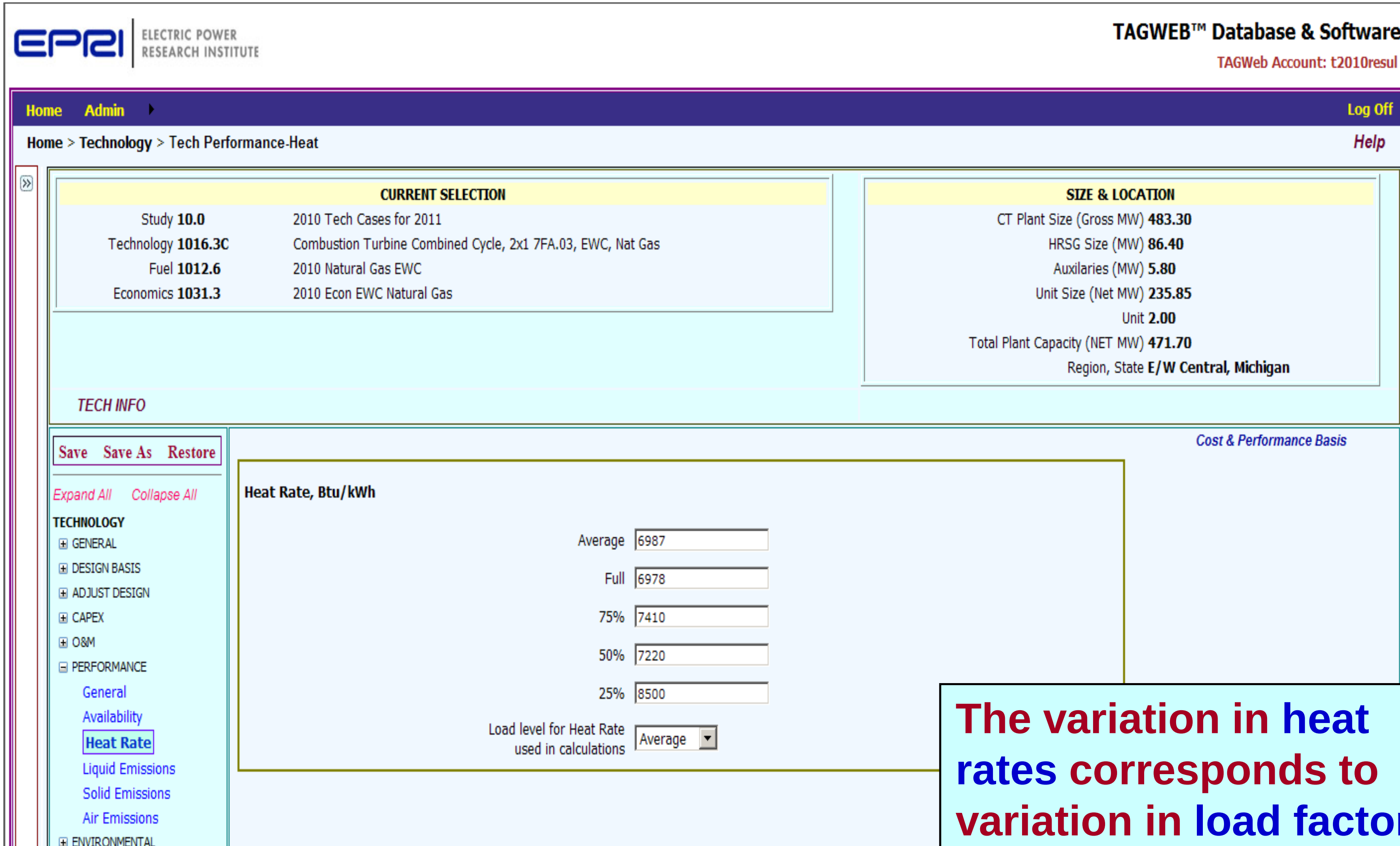


The busbar cost can be evaluated for variations in capacity factor.

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

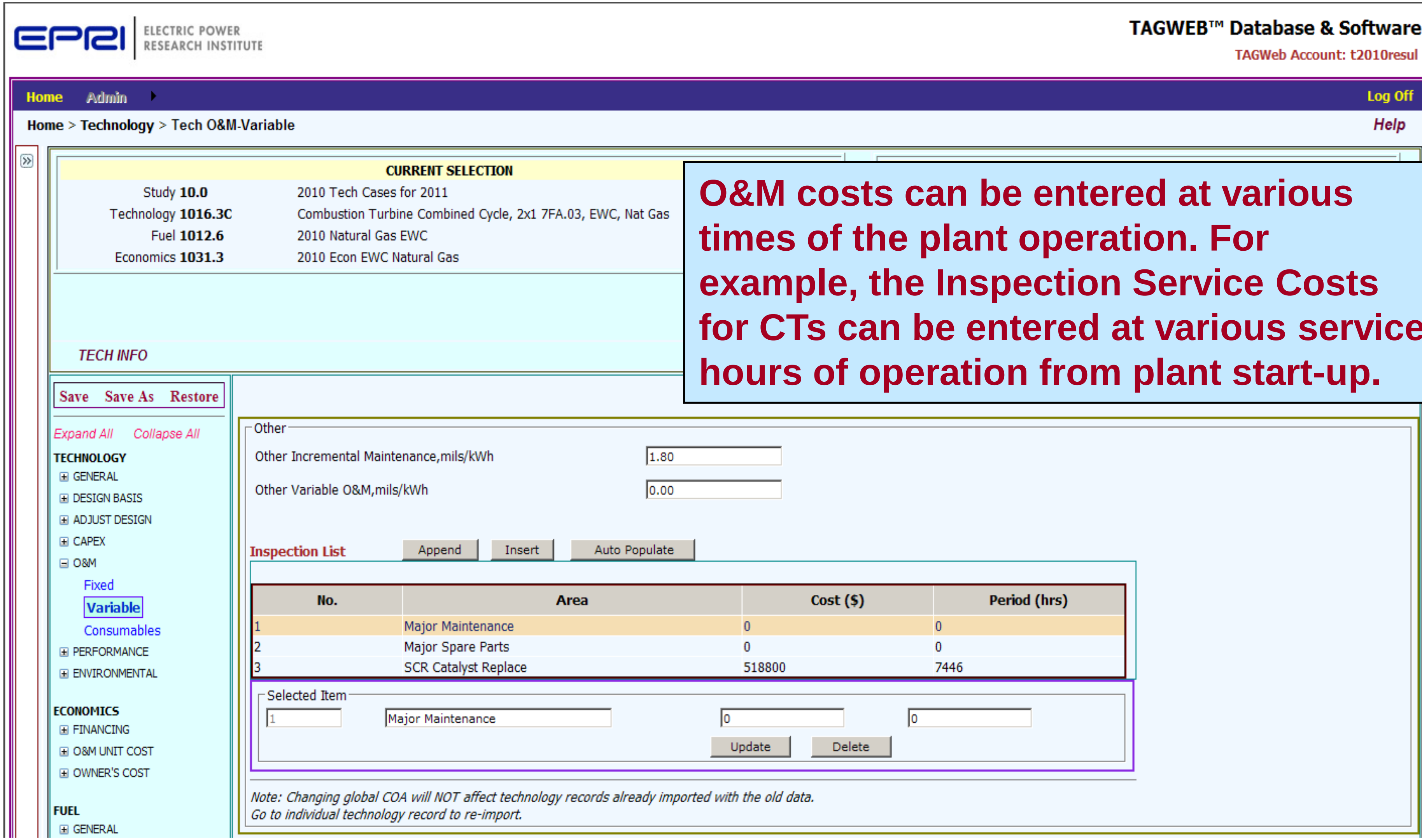
Heat Rates and Load Factors



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

© 2018 Electric Power Research Institute, Inc. All rights reserved.

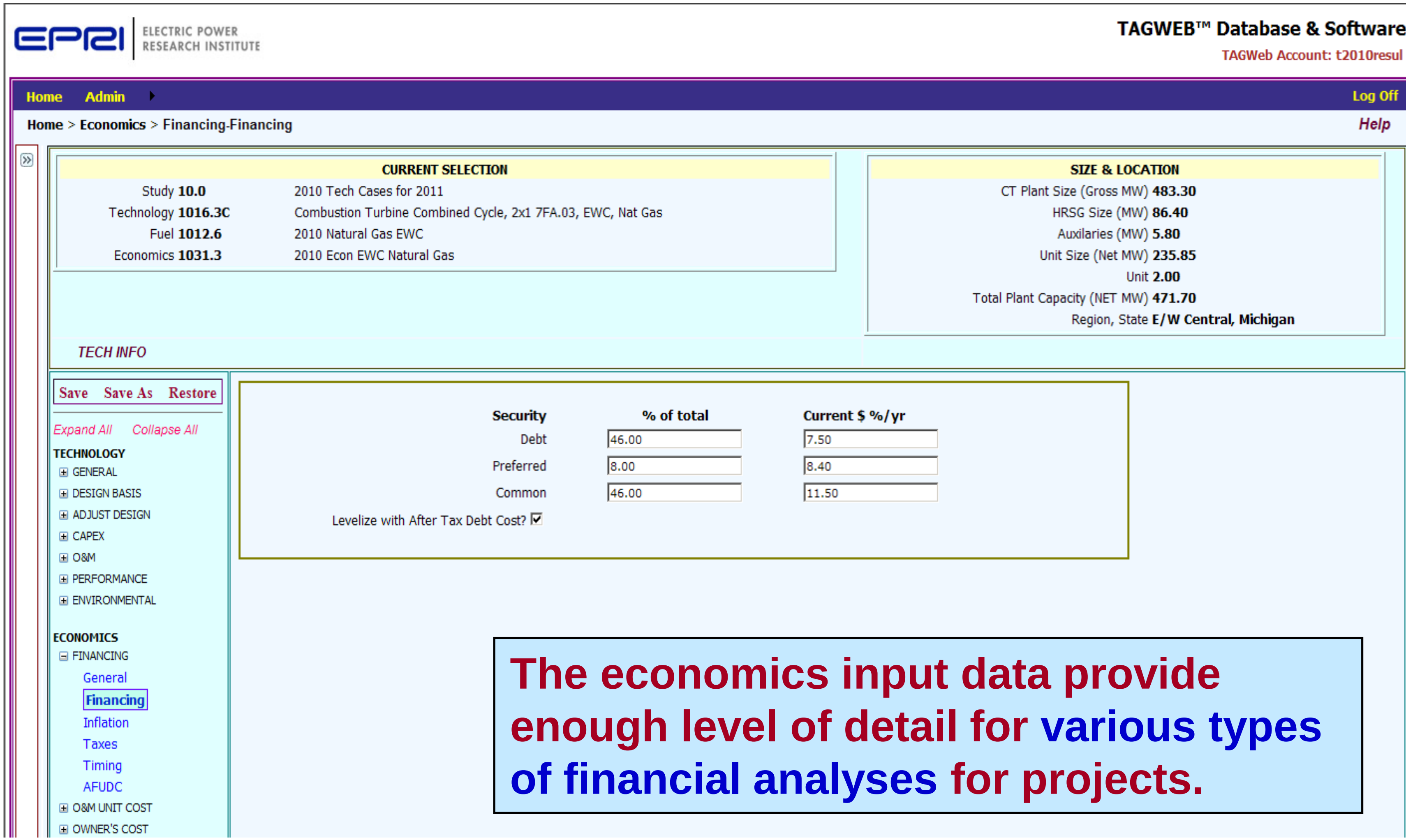
Operations & Maintenance Costs



O&M costs can be entered at various times of the plant operation. For example, the Inspection Service Costs for CTs can be entered at various service hours of operation from plant start-up.

© 2018 Electric Power Research Institute, Inc. All rights reserved.

Financial Analysis

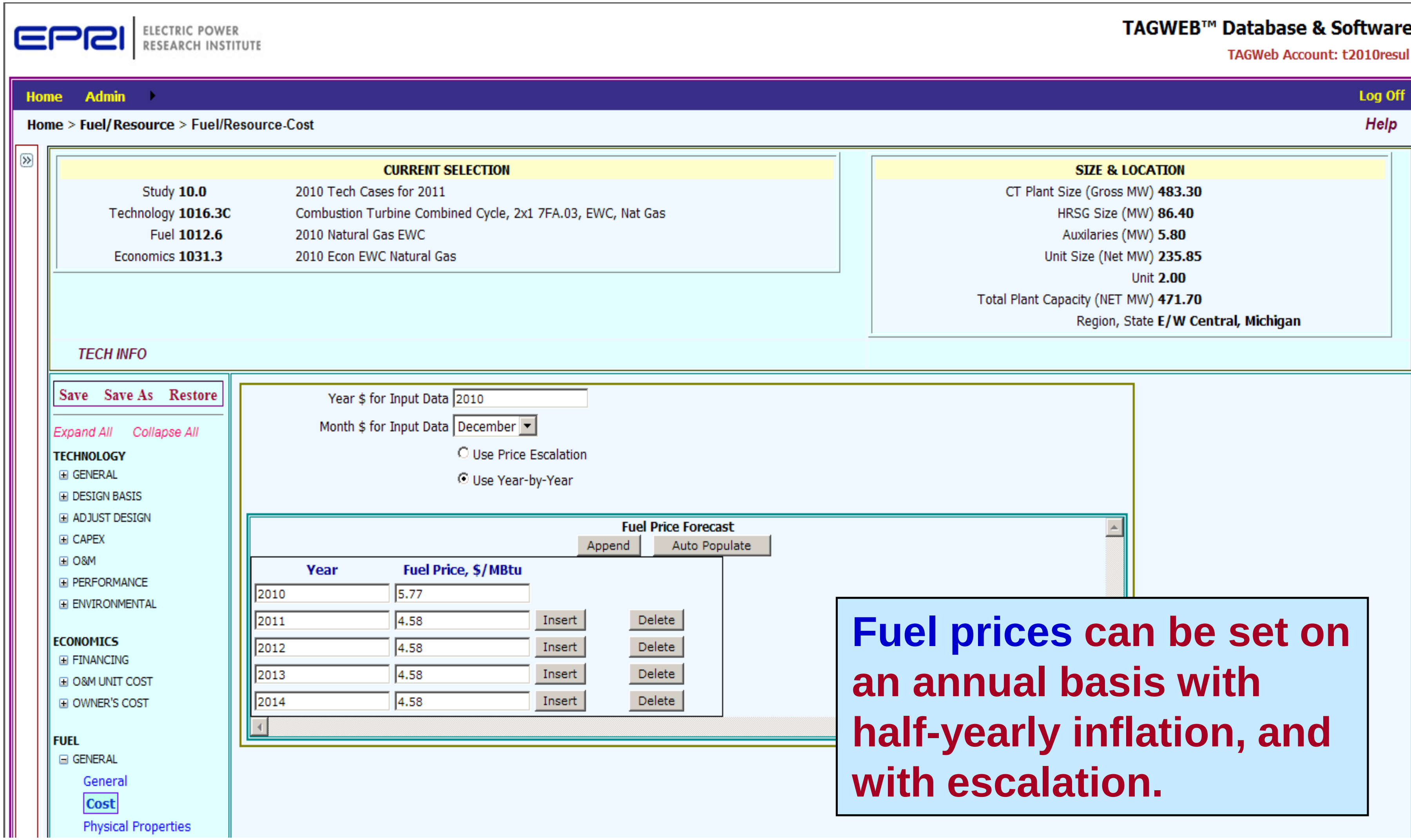


The economics input data provide enough level of detail for various types of financial analyses for projects.

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

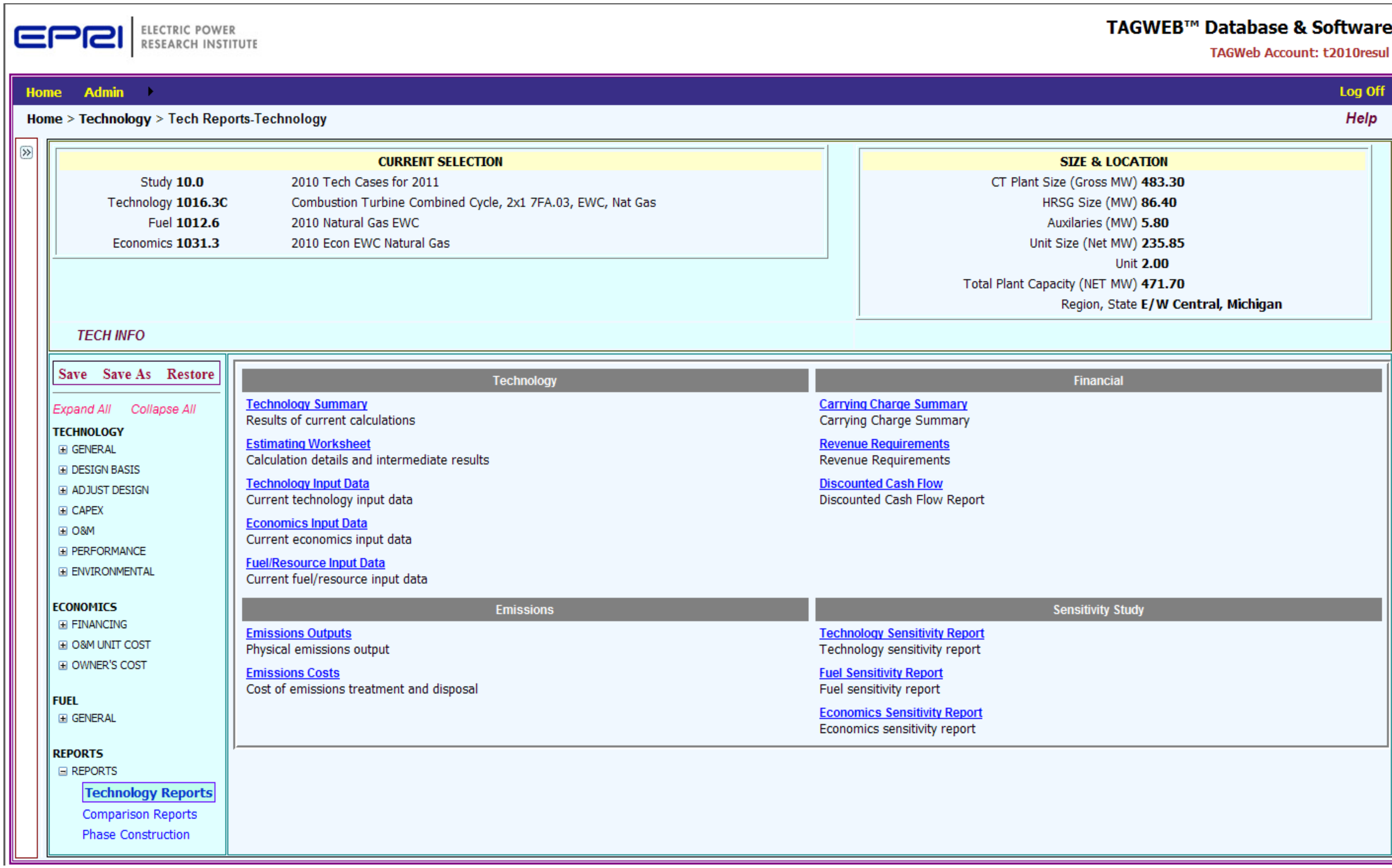
Fuel Prices



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

© 2018 Electric Power Research Institute, Inc. All rights reserved.

TAGWeb™ Report Generation



© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

Hands on Demonstration Tutorial

© 2018 Electric Power Research Institute, Inc. All rights reserved.

Technical Information About Each Power Generation Technology

ELECTRIC POWER RESEARCH INSTITUTE

TAGWEB™ Database & Software

TAGWeb Account: t2010resul

Technical Information - Combustion Turbine

Combustion Turbine Update - 2010
Combustion Turbine Update - 2009
Combustion Turbine Update - 2008
Combustion Turbine Update - 2007
Fixed and Variable O&M Inputs for CTCC

Introduction - 2010
Cost and Performance Basis - 2010
Technology Risks and CTCC Market Impact - 2010
Generation/Transmission Capacity Impacts - 2010
Table of Contents/Product Description - 2010
Carbon Dioxide Capture Technologies - 2008
Hybrid and Dry Cooling Systems - 2008
Technology Improvements for 2020+
Environmental Controls - 2007
Bulk Percentages and Quantities - 2008
Method of Escalation - 2008
MACRS Depreciation Schedule
Availability - 1993

© 2018 Electric Power Research Institute, Inc. All rights reserved.

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

© 2018 Electric Power Research Institute, Inc. All rights reserved.

Block Diagram for Each Technology and Plant Configuration

17 / 82 100% Find

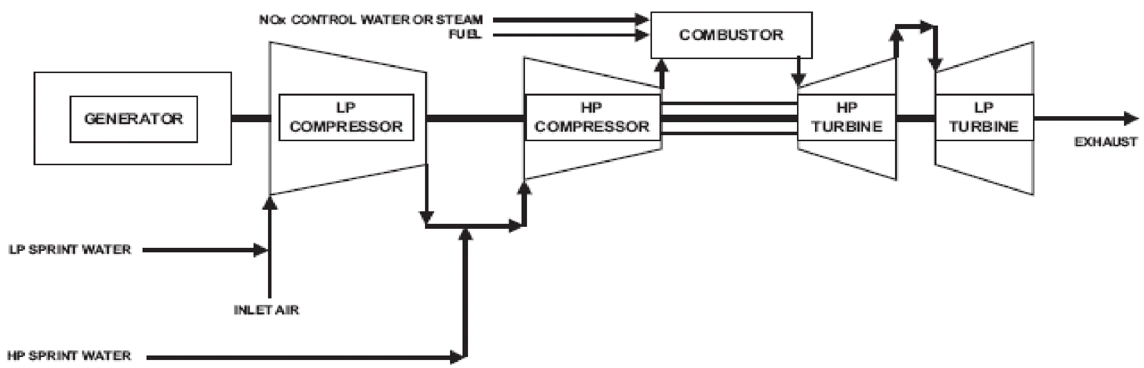


Figure 6-10
SPRINT™ Process Flow Diagram

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

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

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.

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

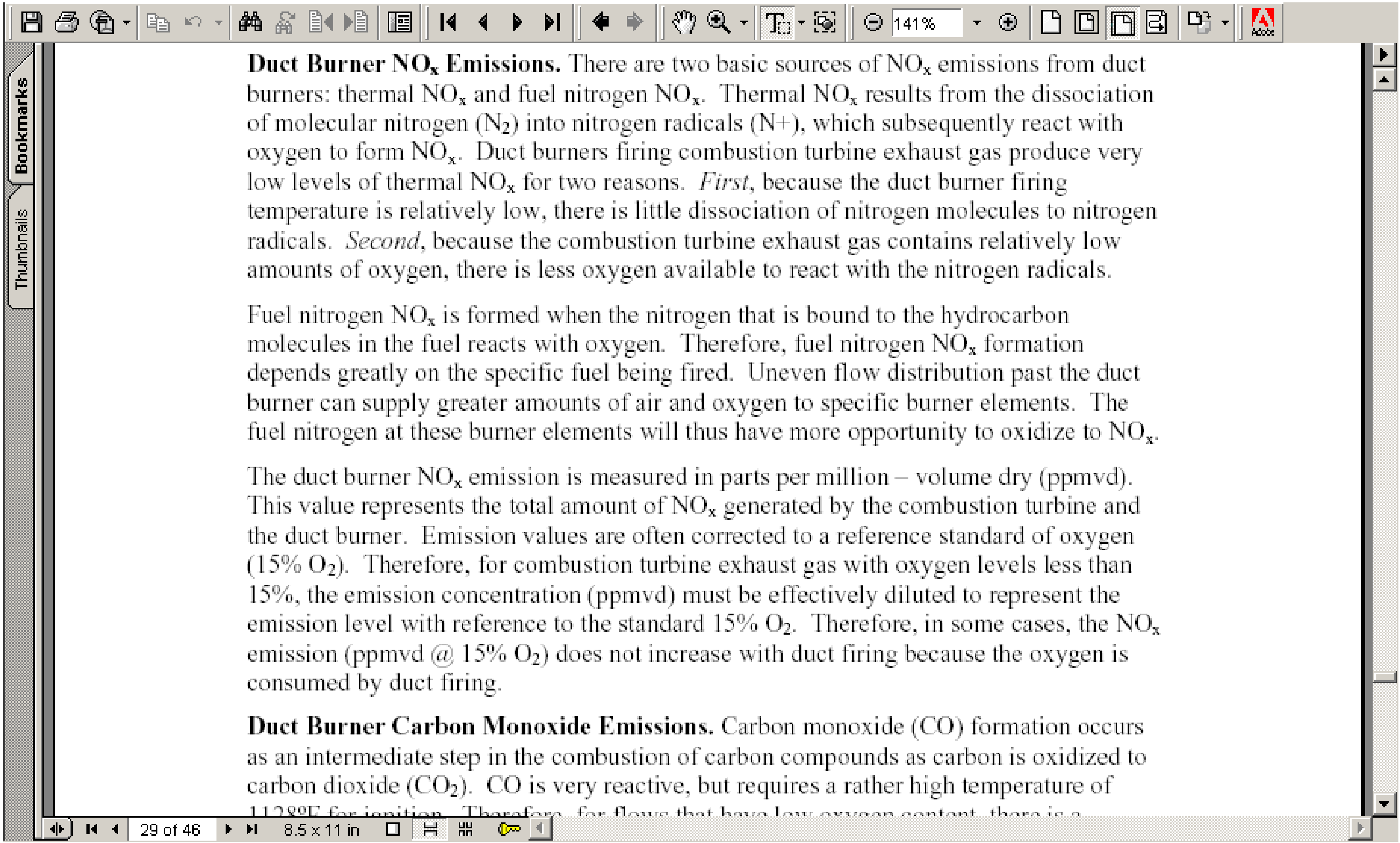
Qualitative Assessment of Business Aspects for Each Technology

	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

© 2018 Electric Power Research Institute, Inc. All rights reserved.

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Emissions Overview for Each Technology



Duct Burner NO_x Emissions. There are two basic sources of NO_x emissions from duct burners: thermal NO_x and fuel nitrogen NO_x. Thermal NO_x results from the dissociation of molecular nitrogen (N_2) into nitrogen radicals (N+), which subsequently react with oxygen to form NO_x. Duct burners firing combustion turbine exhaust gas produce very low levels of thermal NO_x for two reasons. *First*, because the duct burner firing temperature is relatively low, there is little dissociation of nitrogen molecules to nitrogen radicals. *Second*, because the combustion turbine exhaust gas contains relatively low amounts of oxygen, there is less oxygen available to react with the nitrogen radicals.

Fuel nitrogen NO_x is formed when the nitrogen that is bound to the hydrocarbon molecules in the fuel reacts with oxygen. Therefore, fuel nitrogen NO_x formation depends greatly on the specific fuel being fired. Uneven flow distribution past the duct burner can supply greater amounts of air and oxygen to specific burner elements. The fuel nitrogen at these burner elements will thus have more opportunity to oxidize to NO_x.

The duct burner NO_x emission is measured in parts per million – volume dry (ppmvd). This value represents the total amount of NO_x generated by the combustion turbine and the duct burner. Emission values are often corrected to a reference standard of oxygen (15% O_2). Therefore, for combustion turbine exhaust gas with oxygen levels less than 15%, the emission concentration (ppmvd) must be effectively diluted to represent the emission level with reference to the standard 15% O_2. Therefore, in some cases, the NO_x emission (ppmvd @ 15% O_2) does not increase with duct firing because the oxygen is consumed by duct firing.

Duct Burner Carbon Monoxide Emissions. Carbon monoxide (CO) formation occurs as an intermediate step in the combustion of carbon compounds as carbon is oxidized to carbon dioxide (CO_2). CO is very reactive, but requires a rather high temperature of 1128°F for ignition. Therefore, for flows that have low oxygen content, there is a

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

Overview of Costs and Performance for Each Technology

65 / 82 100% Find

EPRI Proprietary Licensed Material

Combustion Turbine Combined Cycle

Exhibits 6-1: Combustion Turbine 45 MW NE NG Aeroderivative

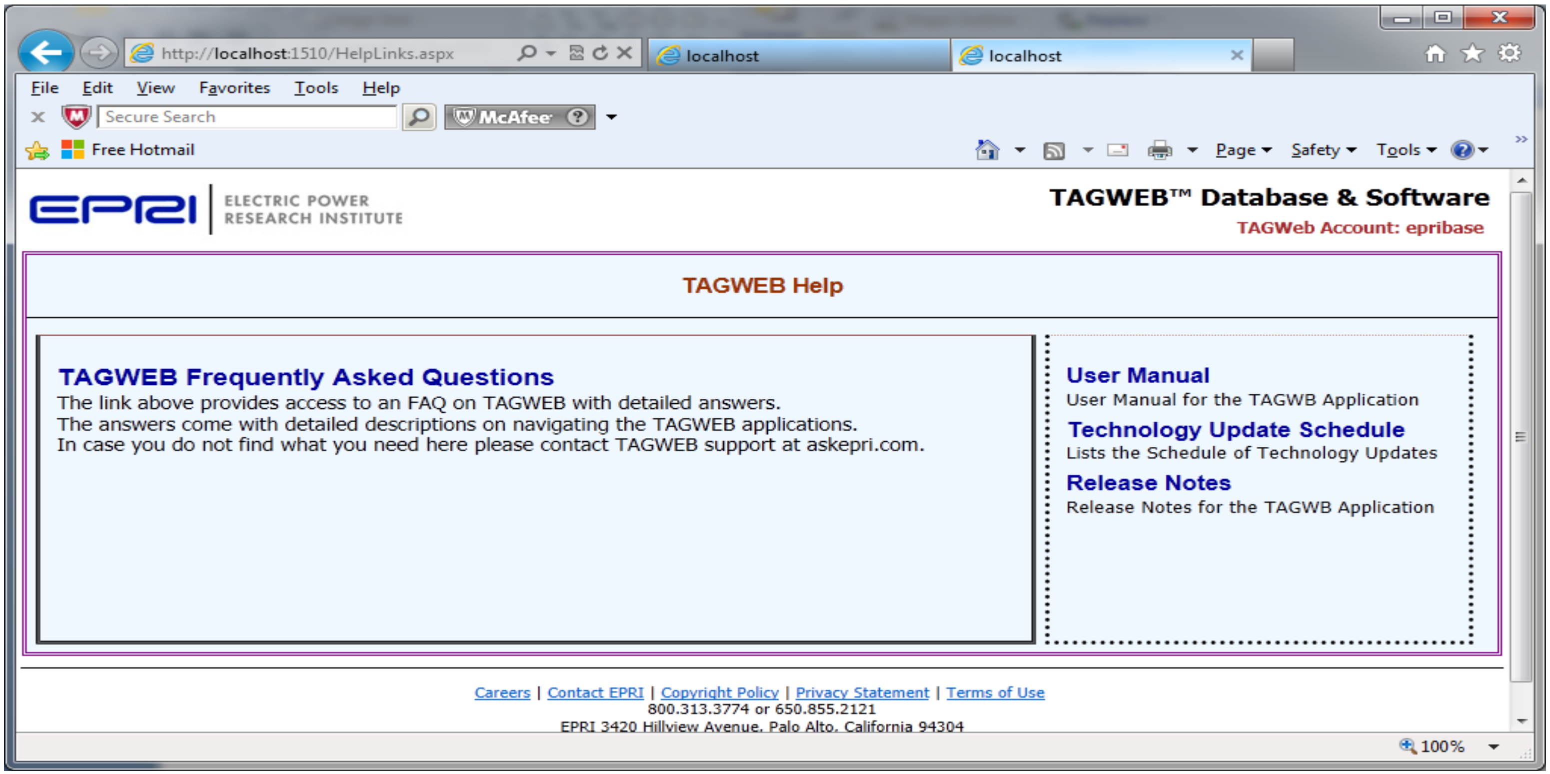
Technology ID	**0615.7**
Technology Description	**Combustion Turbine 45 MW NE NG Aeroderivative**
Region	**Northeast**
Fuel Type	**2005 Natural Gas NE**
Plant Size (no. of units x unit size, MW)	**1 x 45.30**
Available for Commercial Orders, Year	**2005**
First Commercial Service, Year	**2007**
Plant Capital Cost, $/kW	
Month/Year Dollars	**Dec, 2006**
Combustion Turbine & Aux.	**447.0**
Balance of Plant	**124.0**
Buildings	**13.0**
Environmental	**0.0**
General Facilities and Engineering Fee	**75**
Project and Process Contingency	**35.0**
Total Plant Cost	**694.4**
Total Cash Expended (mixed year $)	**694.0**
AFUDC (interest during construction)	**0.0**
Total Plant Investment (Includes AFUDC)	**694.0**
Total Owner Costs	**43.9**
Total Capital Requirement, Hypothetical In-Service Year (includes AFUDC)	**737.9**
Total Capital Replacement (for Unit Life)	**-**
Costs for Hypothetical In-Service Year	
Fixed, $/kW-yr	**22.00**
Incremental, mils/kWh	
Variable (includes consumables)	**38.25**
Consumables (includes byproducts)	**0.03**
Byproducts (- indicates credit)	**0.00**
Net Heat Rate, Btu/kWh	
Full Load	**9385**
75% Load	**10061**
50% Load	**11459**

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

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



© 2018 Electric Power Research Institute, Inc. All rights reserved.

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?

© 2018 Electric Power Research Institute, Inc. All rights reserved.

TAGWeb Frequently Asked Questions

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?

© 2018 Electric Power Research Institute, Inc. All rights reserved.

TAGWeb Frequently Asked Questions

15. What is the Reference Year?
16. What is the Technology Input Year?
17. What is the Year Dollars for Input Data?

© 2018 Electric Power Research Institute, Inc. All rights reserved.

Questions & Answers

Clarence Lyons
704-595-2788
clyons@epri.com

Binh Nguyen
650-855-8592
bnguyen@contractor.epri.com

Together…Shaping the Future of Electricity

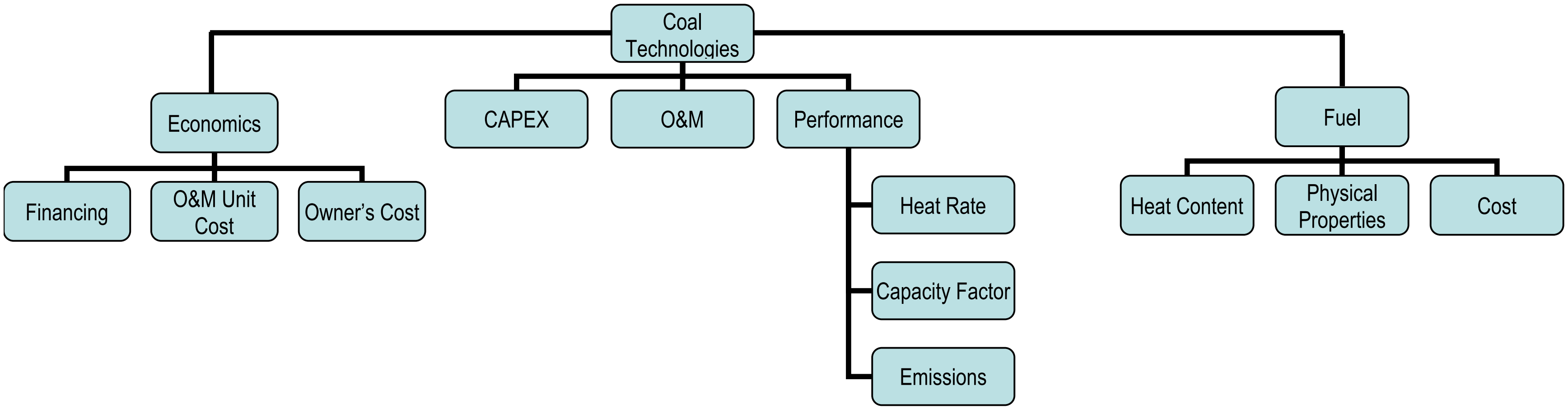
EPRI ELECTRIC POWER RESEARCH INSTITUTE

Additional TAGWeb Slides

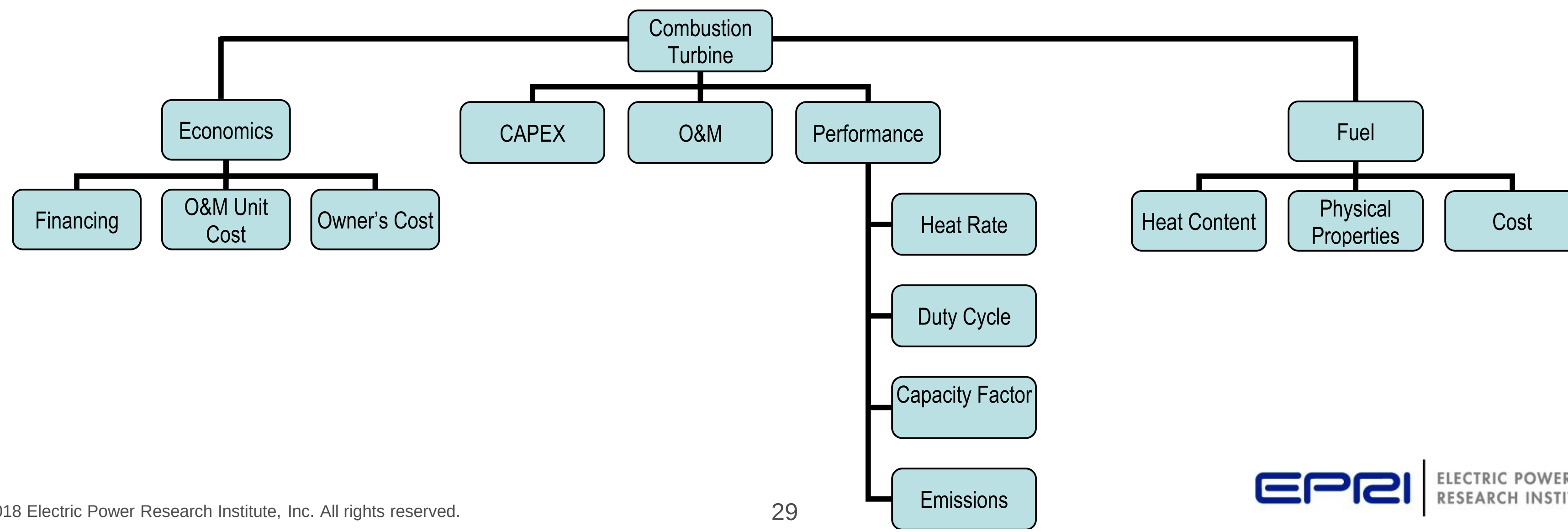
© 2018 Electric Power Research Institute, Inc. All rights reserved.

TAGWeb™ for Coal and CT Generation

TAGWEB Navigation for Coal Technologies



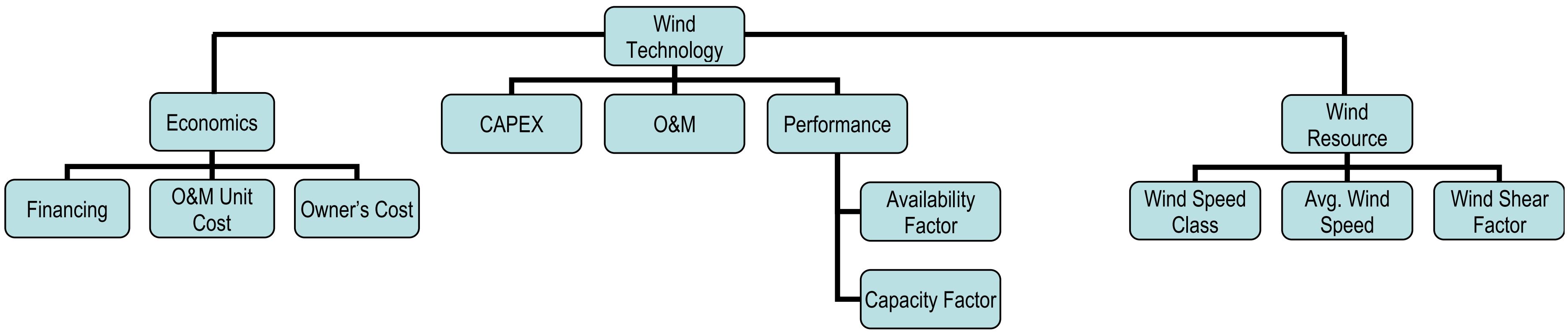
TAGWEB Navigation for Combustion Turbine Technologies



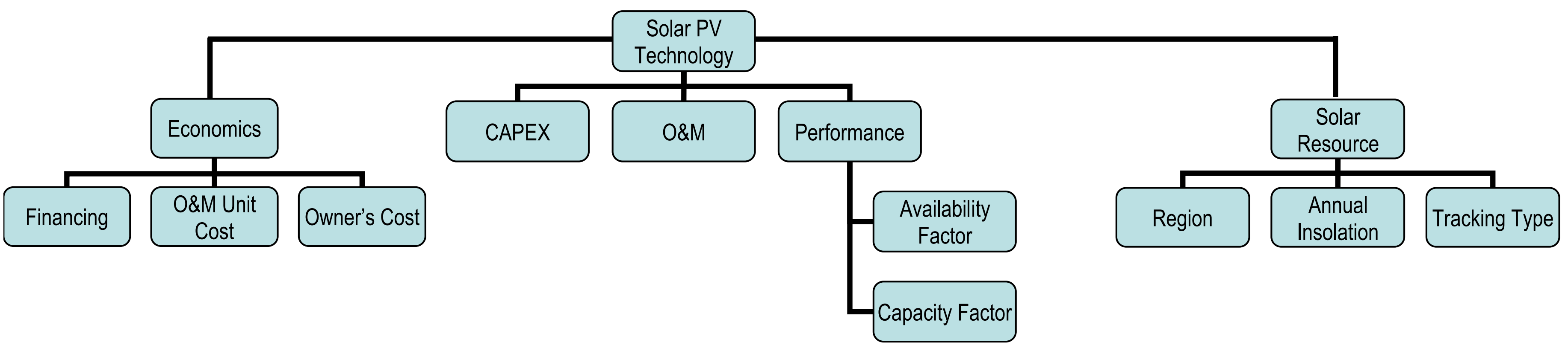
© 2018 Electric Power Research Institute, Inc. All rights reserved.

TAGWeb™ for Wind and Solar PV

TAGWEB Navigation for Wind Technologies



TAGWEB Navigation for Solar PV Technologies

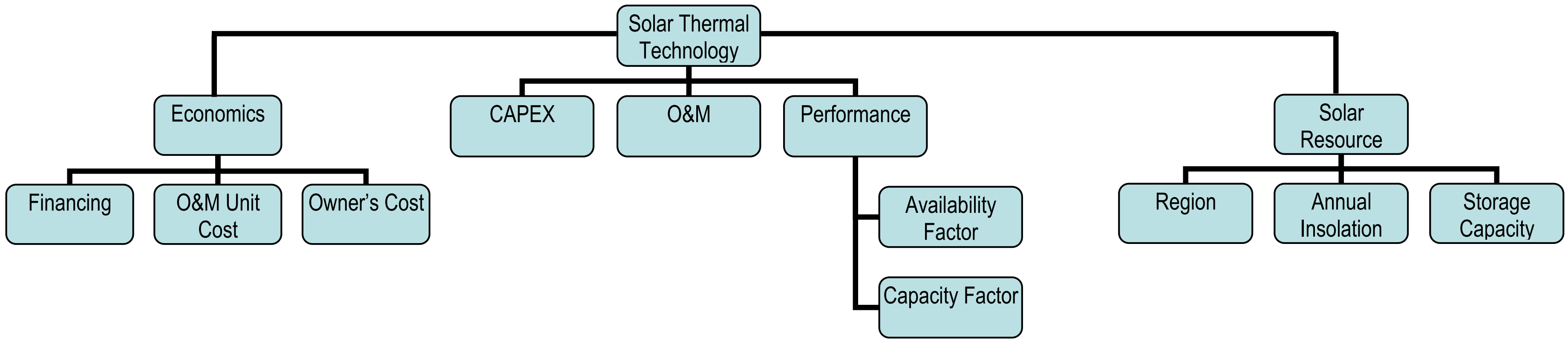


© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

TAGWeb™ for Solar Thermal Generation

TAGWEB Navigation for Solar Thermal Technologies



© 2018 Electric Power Research Institute, Inc. All rights reserved.

EPRI ELECTRIC POWER RESEARCH INSTITUTE

TAGWeb™ Reporting (1 of 3)

Technology Reports:

- Technology summary: Key data, including capital, O&M, and busbar costs
- TAG exhibit: Displays data in the format used in the EPRI TAG publication
- Estimating worksheet: Displays data, including intermediate calculations made during the TAGWeb run that are not included in other TAGWeb outputs

Emissions

- Emissions output: Pysical air, liquid, and solid emissions from the plant
- Emissions cost: Capital and O&M costs associated with emissions controls for the selected technology

© 2018 Electric Power Research Institute, Inc. All rights reserved.

TAGWeb™ Reporting (2 of 3)

Financial

- CC (Carrying Charge Summary): Year-by-year listing of the capital costs contributing to the carrying charge requirements for the plant
- RR (Revenue Requirements): Year-by-year costs for all items contributing to the revenue requirements for the plant, such as capital carrying charges, O&M expenses, and fuel costs. Intended for Investor-Owned Utilities (IOU).
- DCF (Discounted Cash Flow): Includes the year-by-year cash flow requirements for the major plant cost categories such as taxes, capital recovery costs, O&M expenses, and fuel costs. Intended for Non-Utility Generating (NUG) plants;

Sensitivity Analysis

- Performs technology, economics, or fuel sensitivities by varying key input variables

© 2018 Electric Power Research Institute, Inc. All rights reserved.

TAGWeb™ Reporting (3 of 3)

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 total levelized plant cost versus capacity factor for selected technologies.

Phase Construction Report: Graphs of expenditure and revenue flows for multiple unit projects built with a sequential approach to project expenditure

© 2018 Electric Power Research Institute, Inc. All rights reserved.

EPRI ELECTRIC POWER RESEARCH INSTITUTE

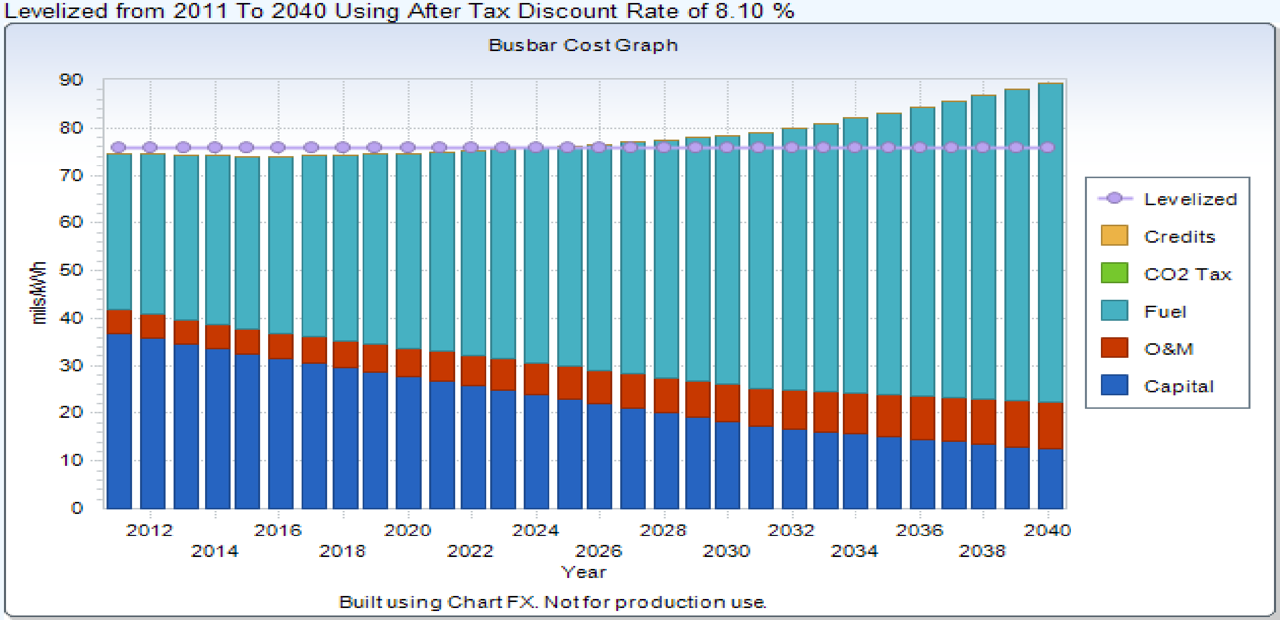
Busbar Costs

Current Dollars Busbar Costs (mils/kWh)

	2011	2012	2013	2014	2015	2020	2030	2040	Levelized
Capital	36.97	35.85	34.68	33.56	32.48	27.61	18.24	12.44	27.88
O&M	4.86	4.98	5.10	5.23	5.36	6.06	7.76	9.94	6.20
Fuel	32.80	33.62	34.46	35.32	36.21	40.96	52.44	67.12	41.87
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	74.63	74.44	74.24	74.11	74.05	74.64	78.44	89.50	75.95

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

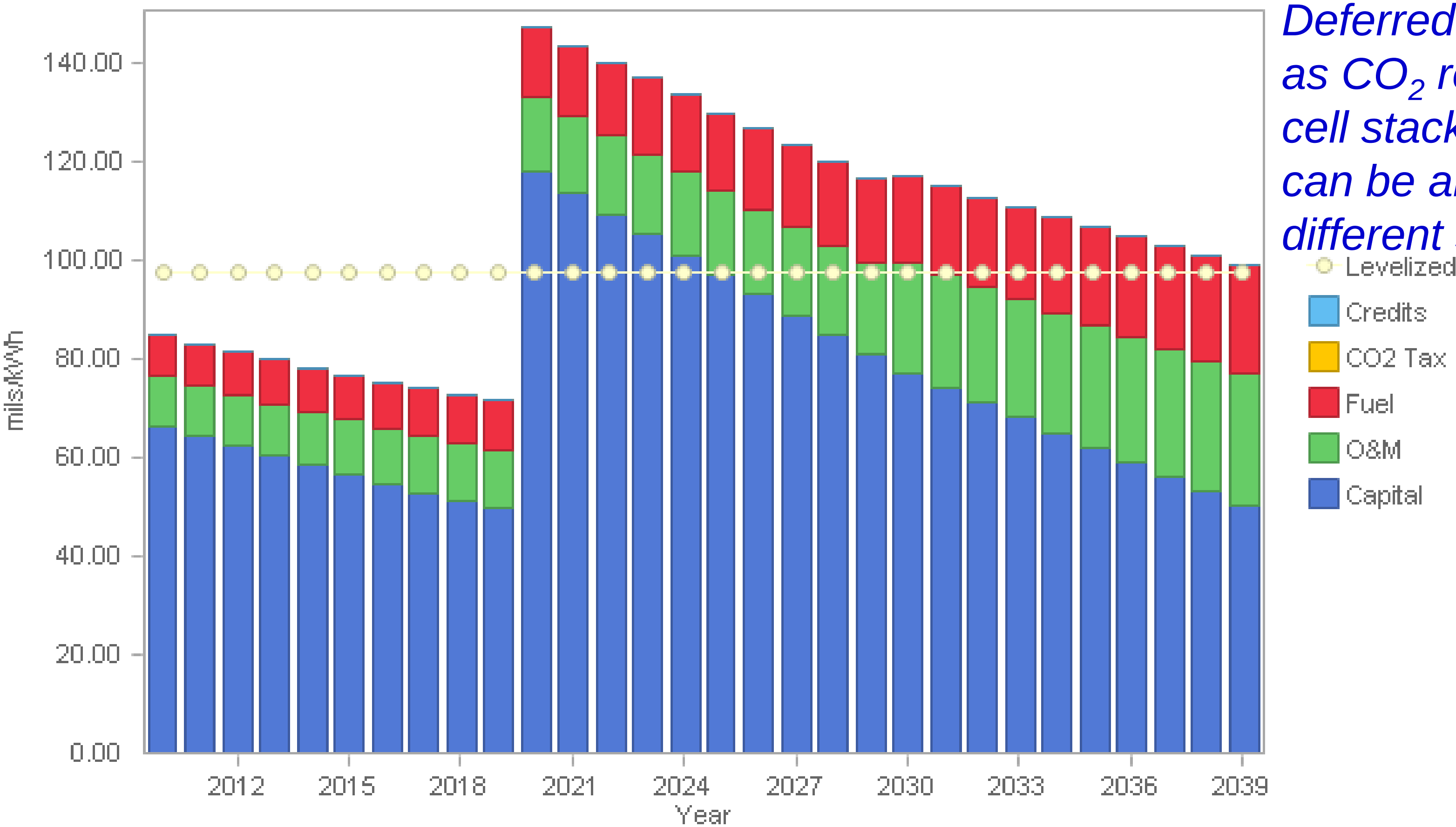
Busbar costs are presented on an annual basis.



© 2018 Electric Power Research Institute, Inc. All rights reserved.

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Busbar Cost Graph 1

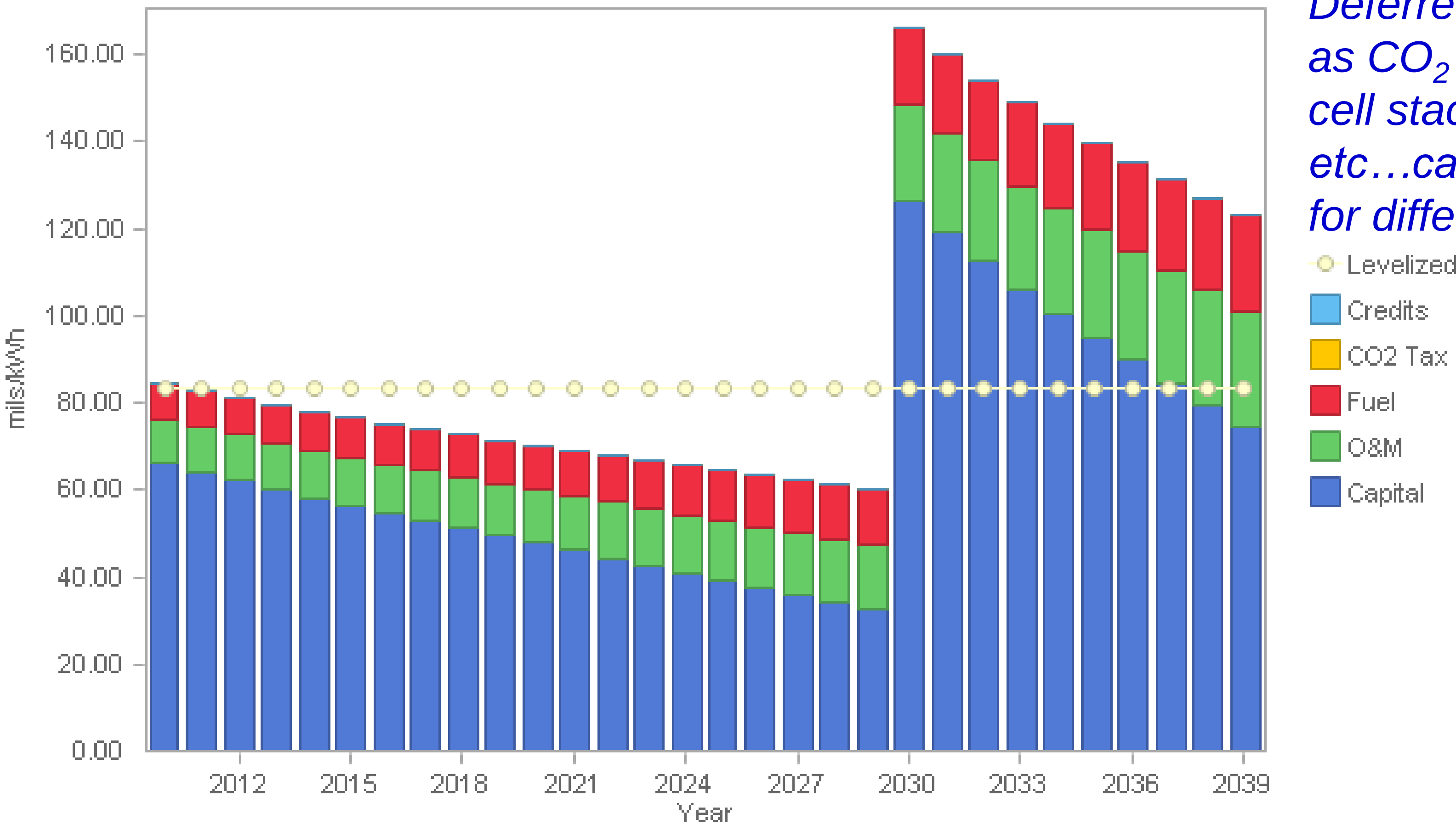


Deferred Capital, such as CO_2 removal, fuel cell stack removal etc… can be analyzed for different scenarios

- 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

© 2018 Electric Power Research Institute, Inc. All rights reserved.

Busbar Cost Graph 2



Deferred Capital, such as CO_2 removal, fuel cell stack removal etc…can be analyzed for different scenarios

- 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

© 2018 Electric Power Research Institute, Inc. All rights reserved.

Discounted Cash Flow Analysis for Unregulated Power Projects

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

TAGWEB™ Database & Software

TAGWeb Account: t2010resul

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

© 2018 Electric Power Research Institute, Inc. All rights reserved.

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

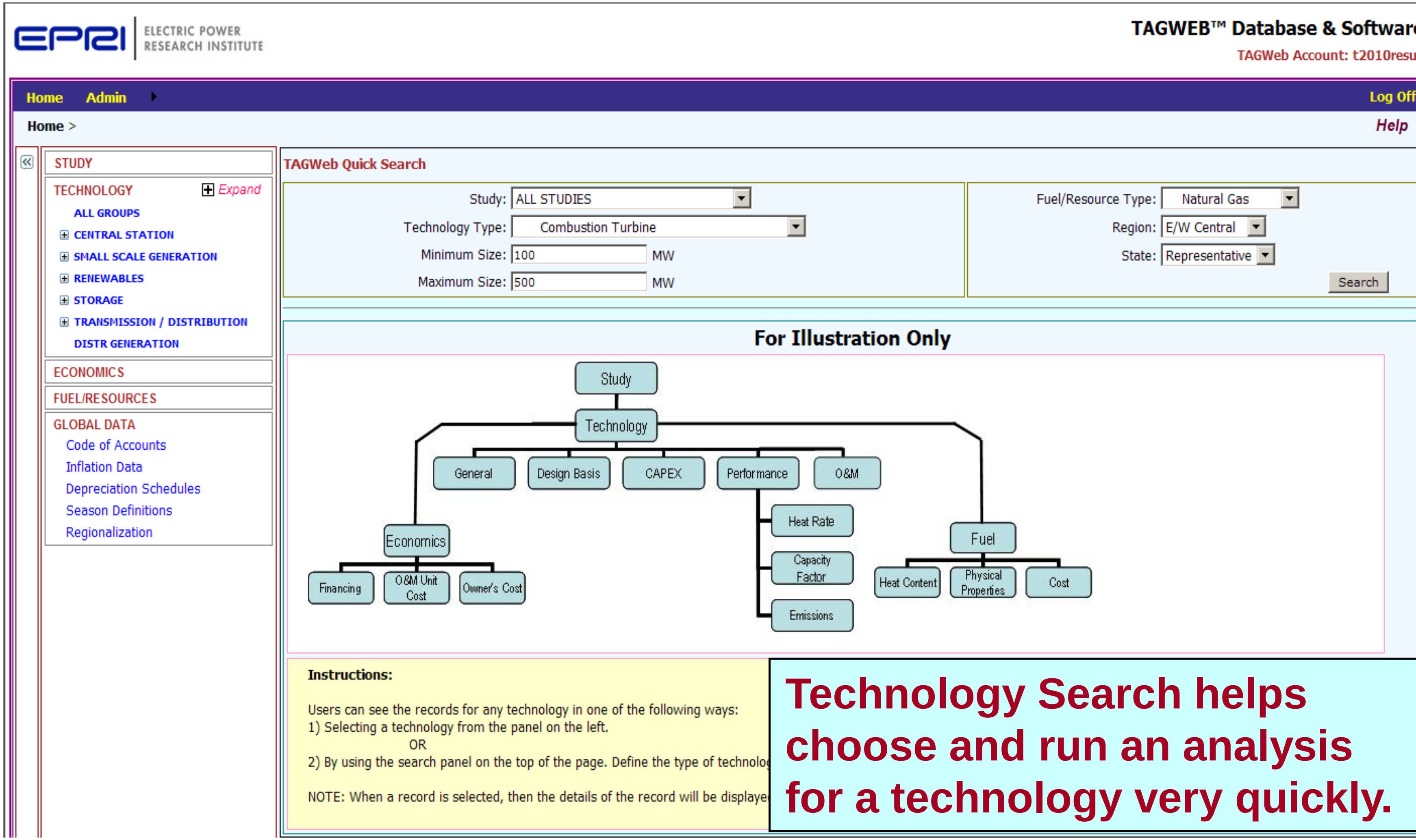
Busbar Costs Based on DCF Analysis

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

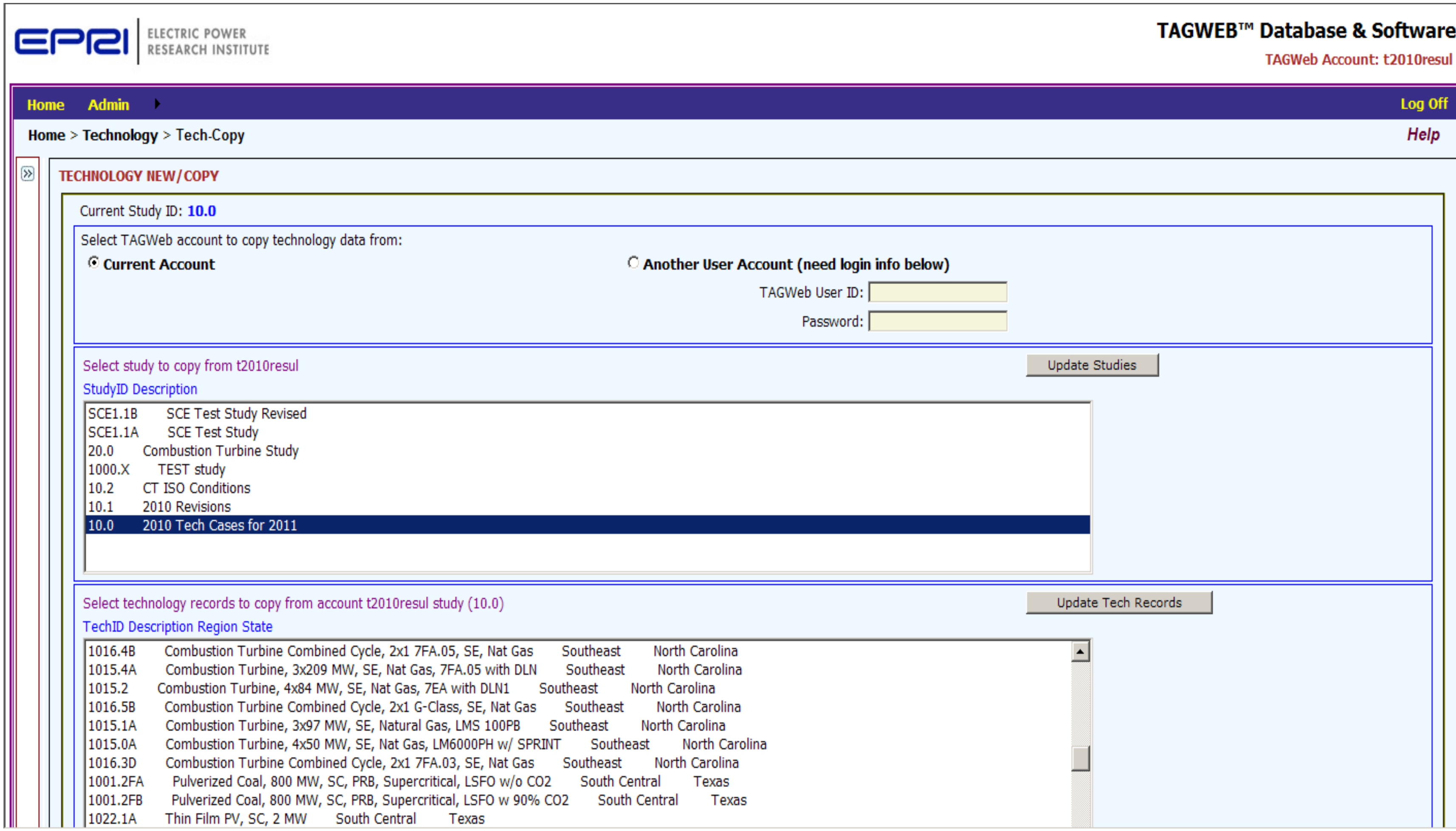
© 2018 Electric Power Research Institute, Inc. All rights reserved.

Technology Search Capability



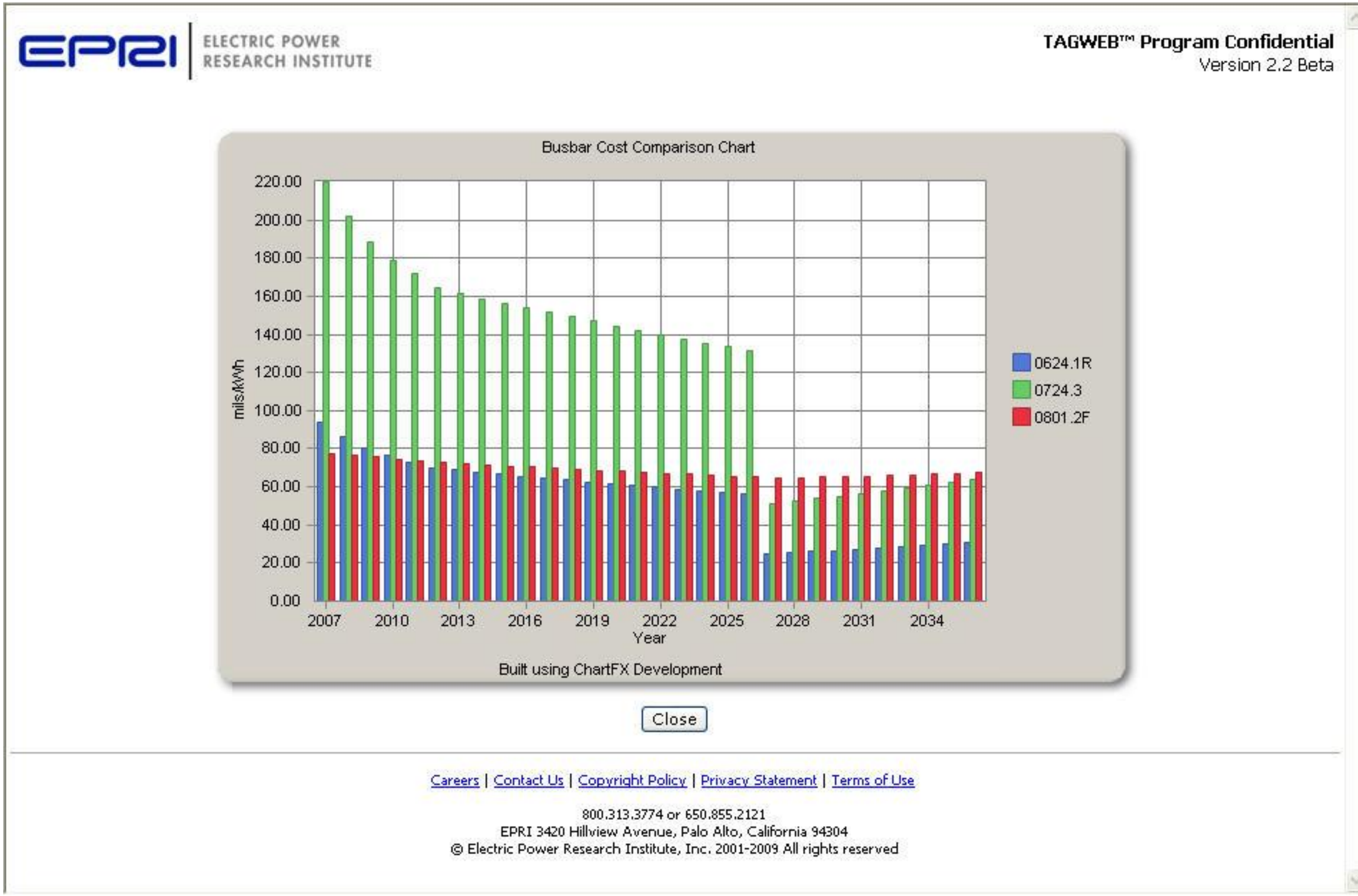
Technology Search helps choose and run an analysis for a technology very quickly.

Ability to Move Records Between Studies and Copy Records from Other User Accounts



© 2018 Electric Power Research Institute, Inc. All rights reserved.

Busbar Comparison Chart Compares Cost of Electricity for Different Technologies



© 2018 Electric Power Research Institute, Inc. All rights reserved.

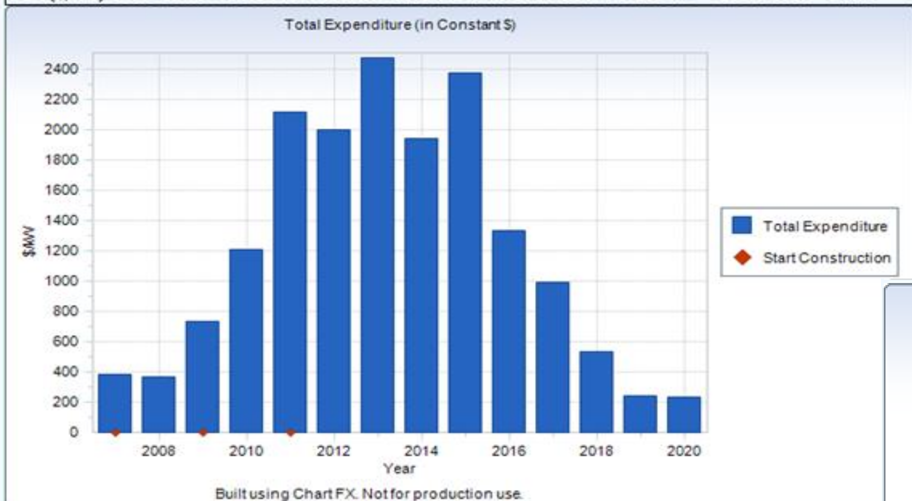
ELECTRIC POWER RESEARCH INSTITUTE

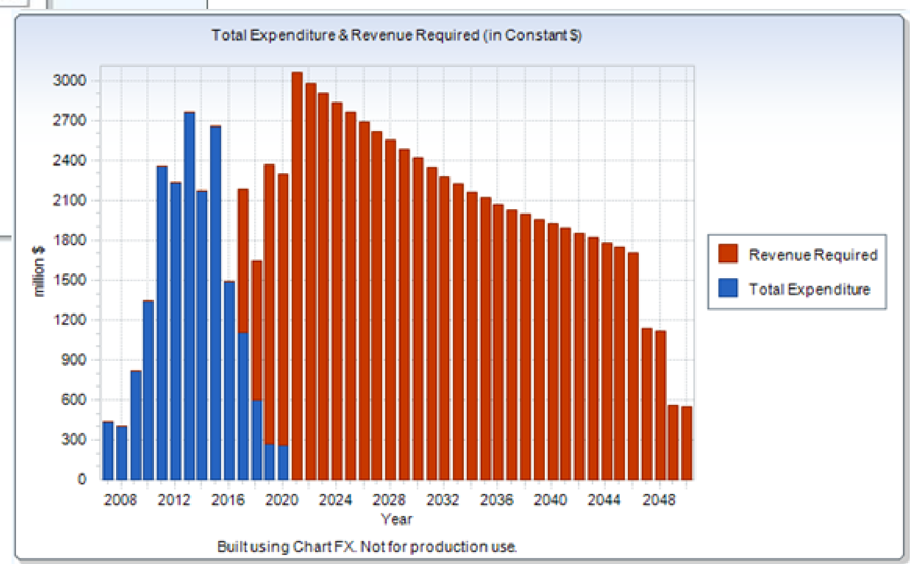
Phase Construction Report

PHASE CONSTRUCTION REPORT

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	





© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

24x7 Data Input with Auto-population

Home | Admin | Log Off

Home > Technology > Tech General-TimeDependent | Help

CURRENT SELECTION

Study	**10.0**	2010 Tech Cases for 2011
Technology	**1024.1**	Wind, EWC, 1.5 MW x 100
Resource	**1024.3**	2010 EWC Wind
Economics	**1020.3**	2010 Econ EWC Wind

SIZE & LOCATION

Plant Nameplate rating (MW)	**150.000**
Gross Unit Size (MW)	**1.500**
Energy Loss (MW)	**0.000**
Turbine Size (Net MW)	**1.500**
Turbine	**100.000**
Total Plant Capacity (NET MW)	**150.000**
Region, State	**E/W Central, Representative**

TECH INFO

Save | Save As | Restore

Expand All | *Collapse All*

TECHNOLOGY
- GENERAL
  - General
  - References
  - Financial
  - Timing
  - Time Dependent
  - Taxes & Credits
- DESIGN BASIS
- ADJUST DESIGN
- CAPEX
- O&M
- PERFORMANCE

ECONOMICS
- FINANCING
- O&M UNIT COST
- OWNER'S COST

WIND RESOURCE
- GENERAL

REPORTS
- REPORTS

Cost & Performance Basis

○ Yearly Variations ◉ 24x7 Hourly Variations

Capacity Adjustment Factor: 1

Average wind speed (m/sec) 6.7

Season Set 1.0 | Season 1

Auto Populate

Percent of Average Annual Wind Speed (% of Ann. Avg.)*

Month	In Season
January	Season 1
February	Season 1
March	Season 2
April	Season 2
May	Season 2
June	Season 3
July	Season 3
August	Season 3
September	Season 4
October	Season 4
November	Season 4
December	Season 1

Hour	M-F	Sat	Sun
1	65	65	65
2	65	65	65
3	65	65	65
4	65	65	65
5	65	65	65
6	65	65	65
7	65	65	65
8	65	65	65
9	65	65	65
10	65	65	65
11	65	65	65
12	65	65	65
13	65	65	65
14	65	65	65
15	65	65	65
16	65	65	65
17	65	65	65
18	65	65	65
19	65	65	65
20	65	65	65
21	65	65	65
22	65	65	65
23	65	65	65
24	65	65	65

Selected Item: 1 | 65 | 65 | 65

Update

Season 1

Auto Populate

Market price of Electricity (mills/kwh)

Month	In Season
January	Season 1
February	Season 1
December	Season 1
March	Season 2
April	Season 2
May	Season 2
June	Season 3
July	Season 3
August	Season 3
September	Season 4
October	Season 4
November	Season 4

Hour	M-F	Sat	Sun
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0

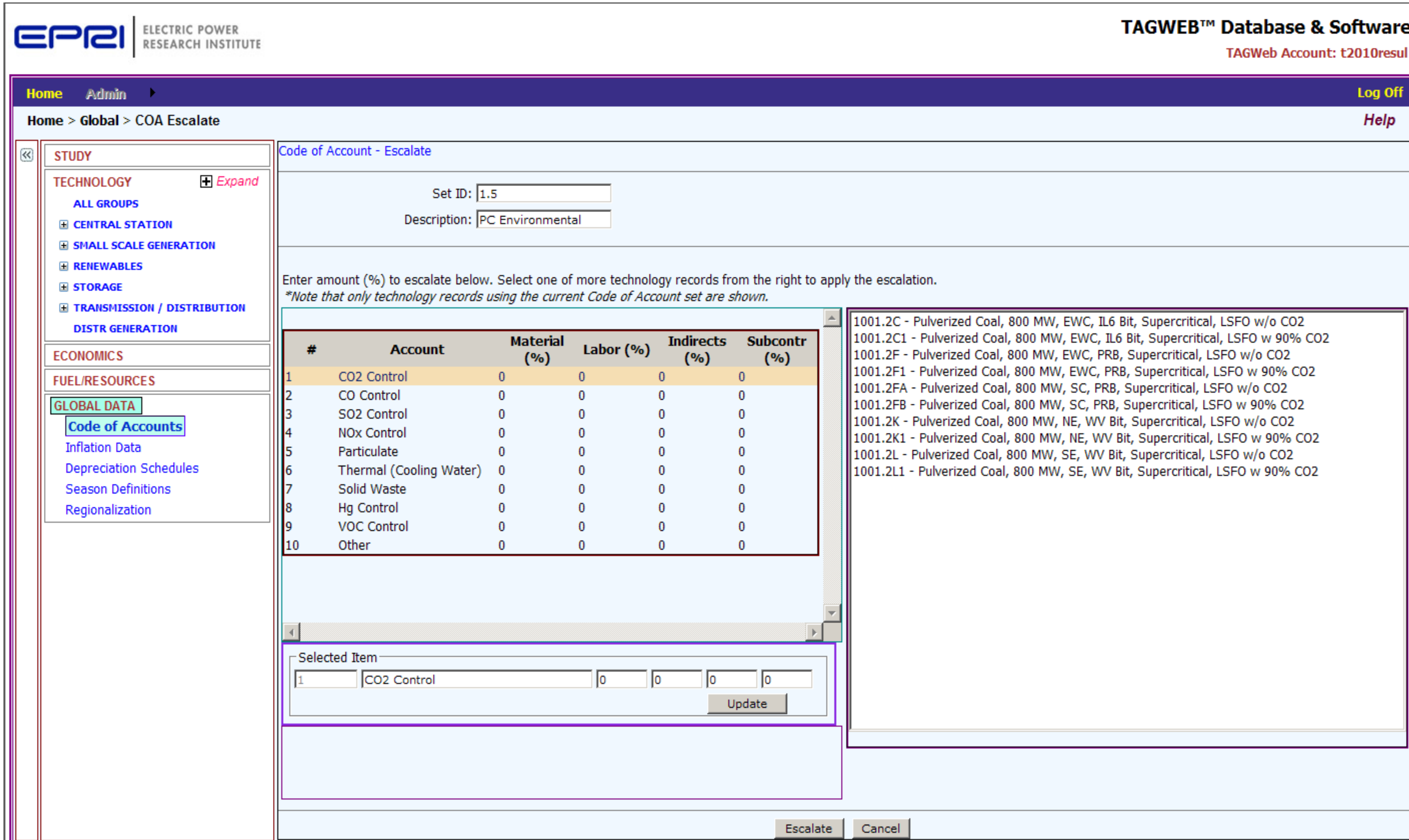
Selected Item: 1 | 0 | 0 | 0

Update

© 2018 Electric Power Research Institute, Inc. All rights reserved.

ELECTRIC POWER RESEARCH INSTITUTE

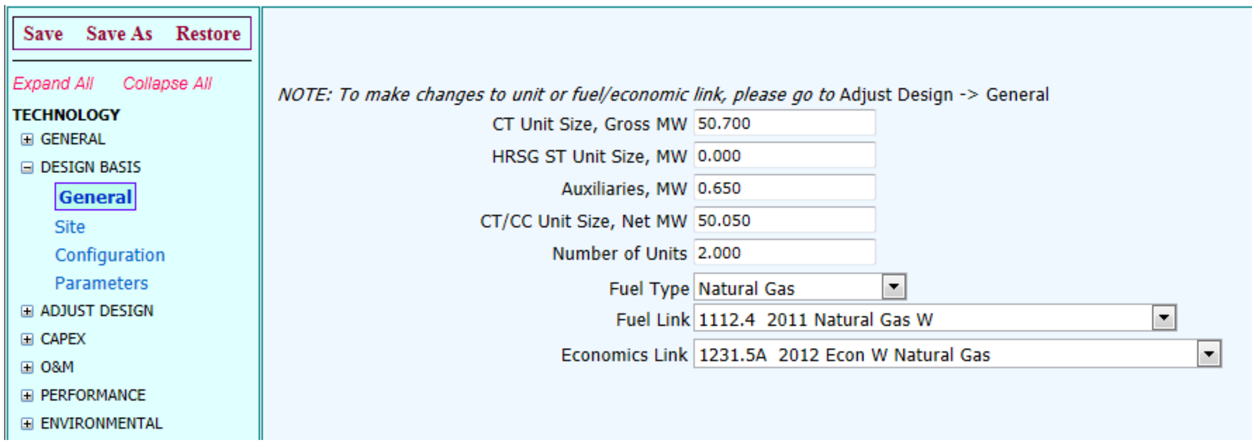
Code of Account Escalation



© 2018 Electric Power Research Institute, Inc. All rights reserved.

Making changes to Technology Design Basis (unit capacity, site)

Gross Unit Capacity can be revised by editing the Technology > Design Basis > General screen. Auxiliary data can also be revised. If any changes are made to the gross unit capacity and/or auxiliaries, then TAGWeb will recalculate the net capacity.



Please note that if you want to scale the unit capacity up or down, you must use **Adjust Design** function in order to scale the capital costs appropriately.

© 2018 Electric Power Research Institute, Inc. All rights reserved.