

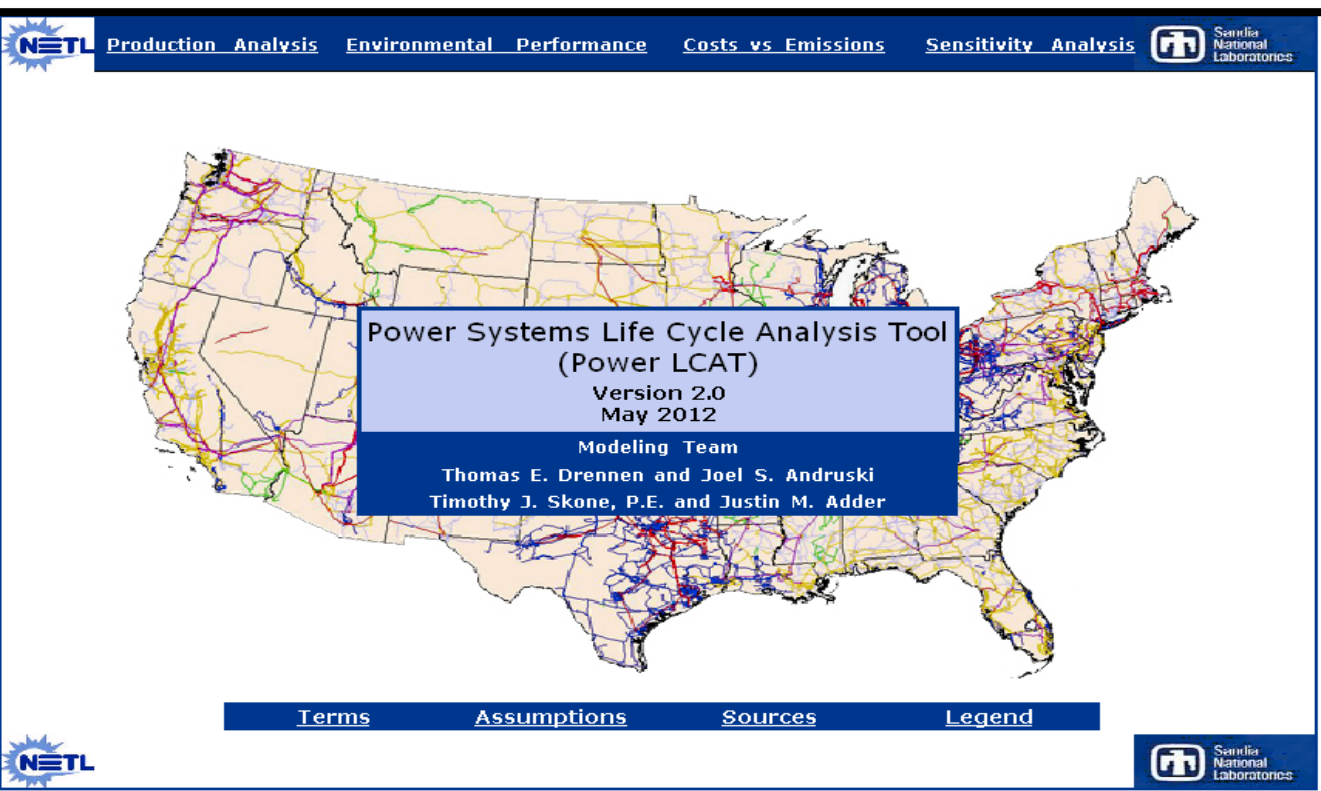
# POWER SYSTEMS LIFE CYCLE ANALYSIS TOOL (POWER LCAT)



Dr. Thomas E. Drennen, Sandia National Laboratories

Joel Andruski & Ryan Williams, Hobart and William Smith Colleges

Timothy J. Skone, P.E., and Justin Adder, National Energy Technology Laboratory



## Introduction

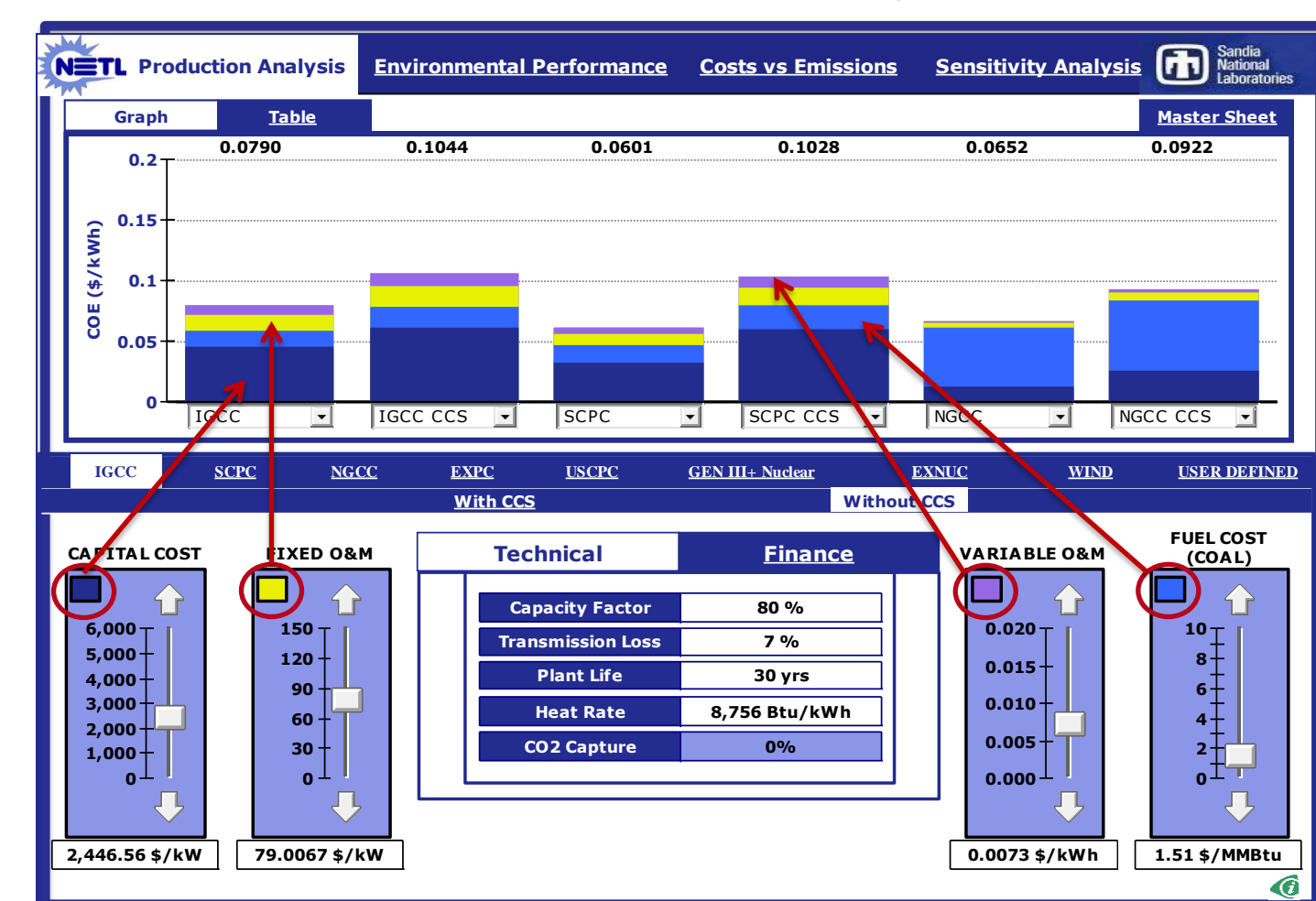
- The Power Systems Life Cycle Analysis Tool (Power LCAT) calculates production costs and tracks environmental performance for a range of electricity generation technologies.
- Includes four main sections:
  - The **"Production Analysis"** section calculates the cost of electricity (in \$/kWh) for each option and allows users to explore key sensitivities.
  - The **"Environmental Performance"** section estimates aggregate greenhouse gas and non-greenhouse gas emissions, as well as water usage at each stage in the life cycle of electricity production.
  - The **"Costs vs. Emissions"** section explores the tradeoffs between costs (in \$/kWh) and greenhouse gas emissions (in kg CO<sub>2</sub> equivalent/MWh).
  - The **"Sensitivity Analysis"** section of Power LCAT allows variation of several assumptions, such as capital costs, operations and fuel costs, interest rates, efficiency, and capacity factors.

## Power LCAT Technologies

- The technology options are based on detailed life cycle analysis reports conducted by NETL and include (all fossil fuel options include a carbon capture and sequestration option):
  - Natural Gas Combined Cycle (NGCC)
  - Integrated Gasification Combined Cycle (IGCC)
  - Supercritical Pulverized Coal (SCPC)
  - Existing Pulverized Coal (EXPC)
  - Existing (EXNUC) and new Nuclear (Gen III Plus), and
  - Onshore Wind (with and without backup power).
- The life cycle stages include:
  - Raw Material Acquisition
  - Raw Material Transport
  - Energy Conversion Facility
  - Product Transport
  - End Use

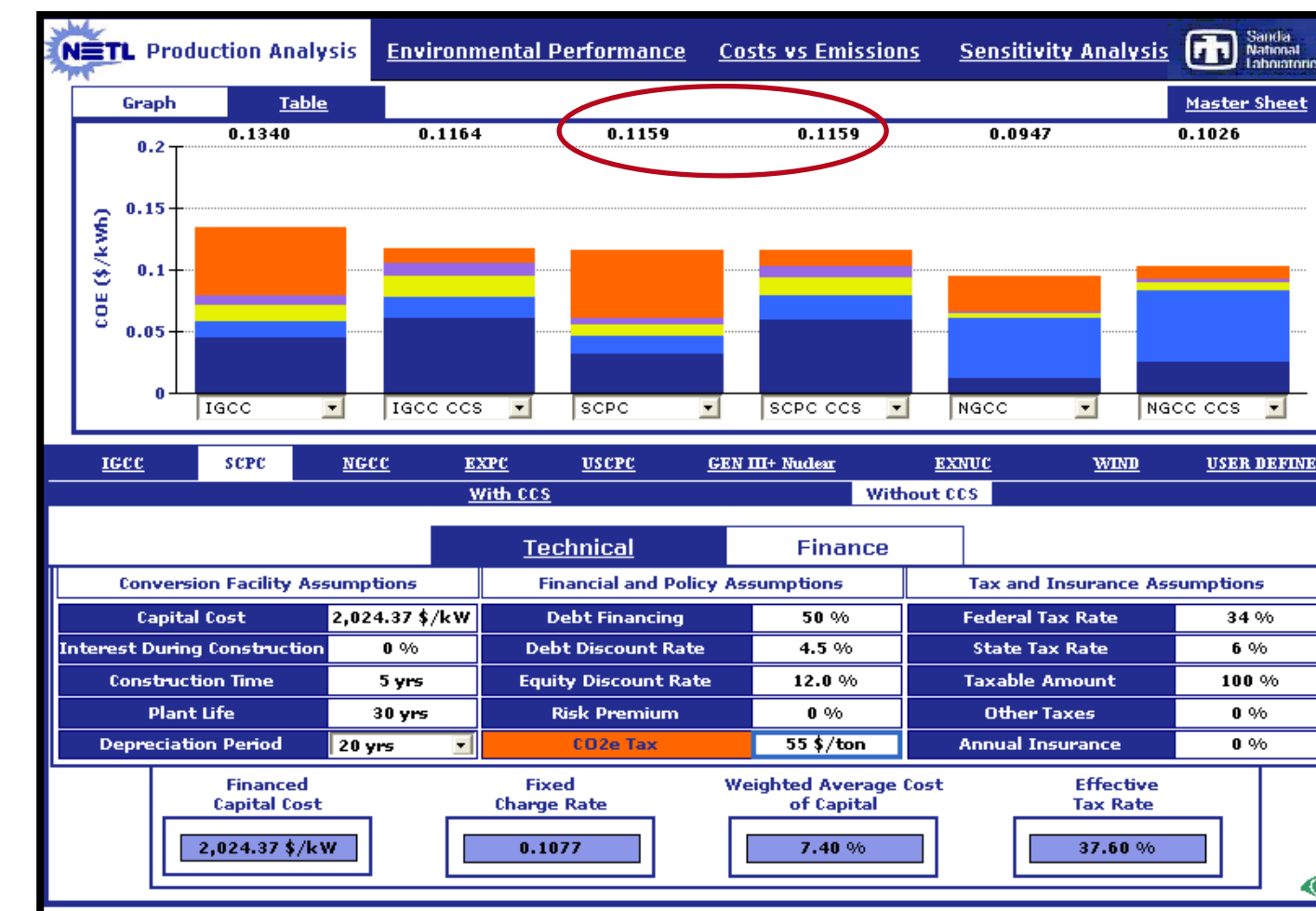
## Production Analysis

This section calculates the cost of electricity (in \$/kWh) for each option and allows users to explore key sensitivities. Color-coded cost components allow for quick understanding of key sensitivities.



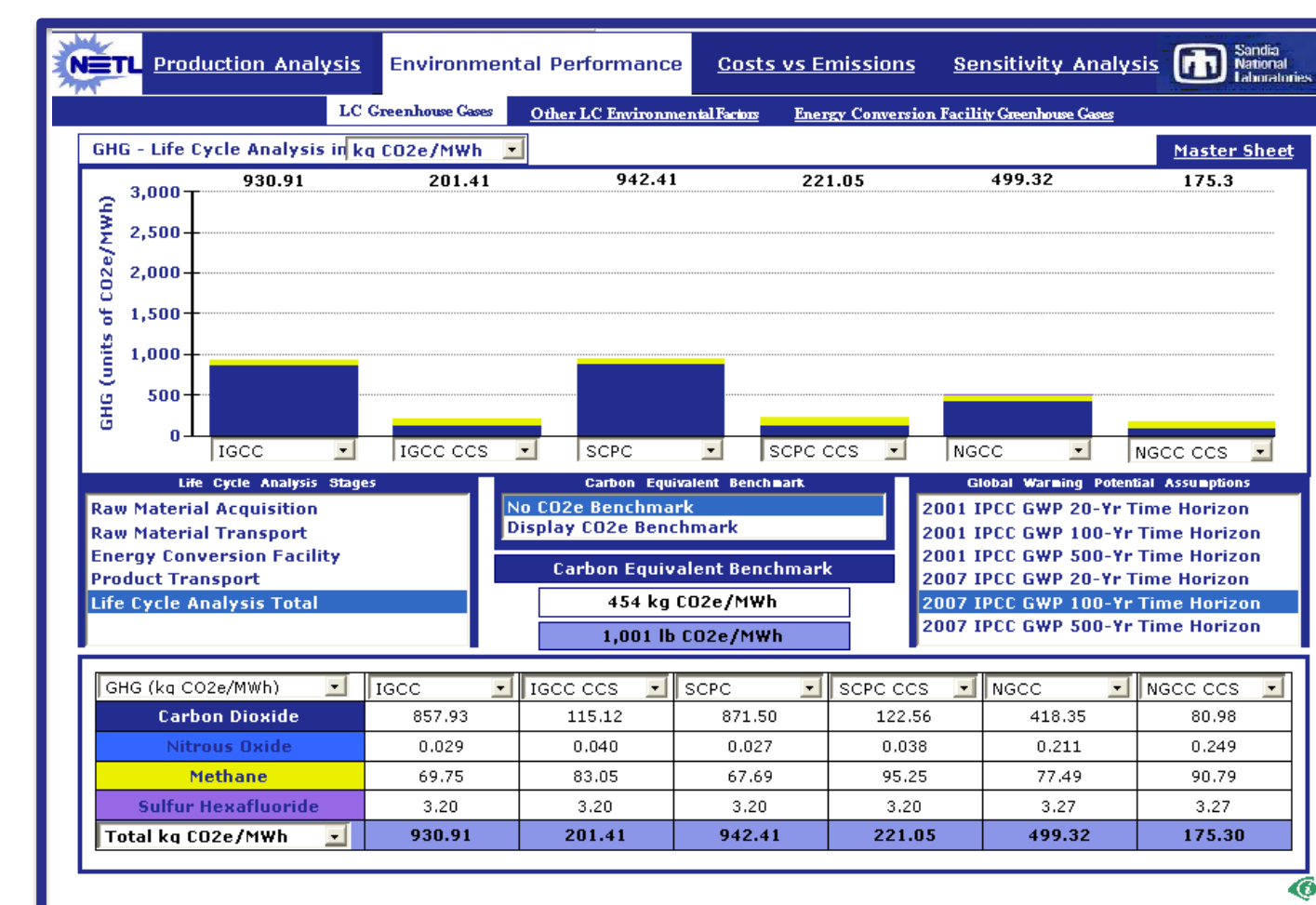
## Production Analysis

This example illustrates the effect of CO<sub>2</sub> taxes on the relative economics. A \$55/tCO<sub>2</sub> tax makes SCPC with CCS cost competitive with SCPC without CCS.



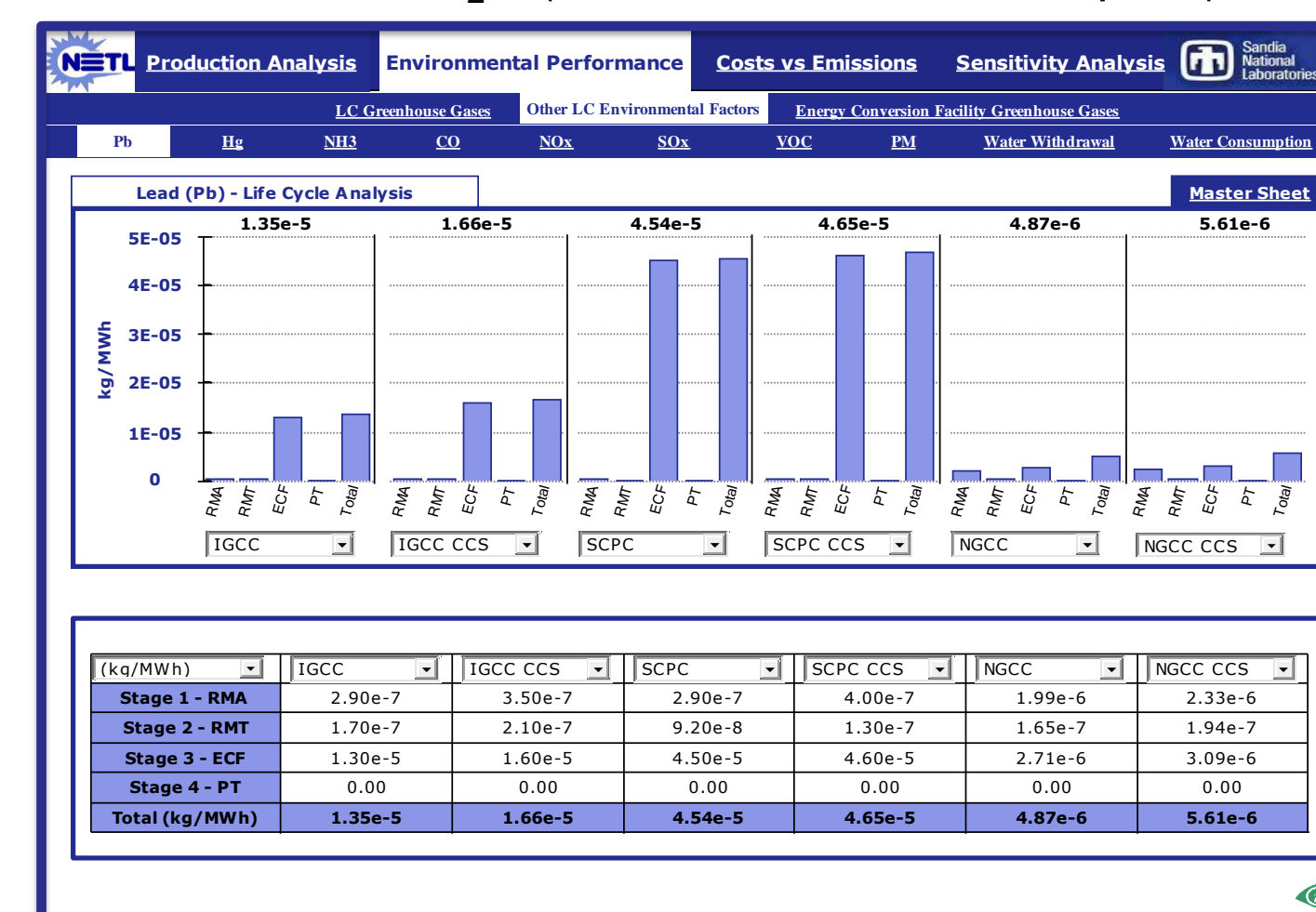
## Environmental Performance

This section tracks the life cycle emissions of key greenhouse gases (GHG), other pollutants, and water withdrawals and consumption.



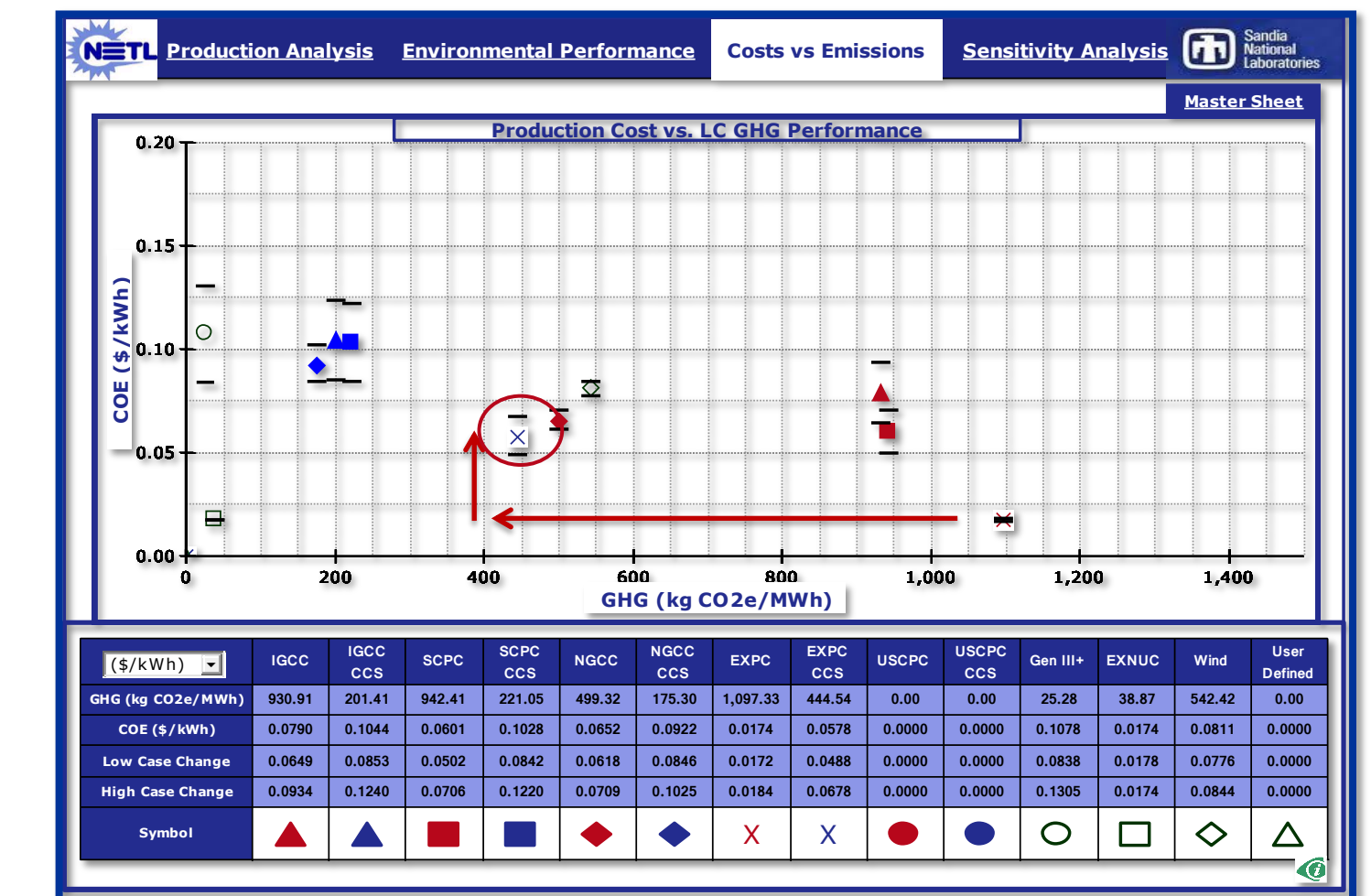
## Environmental Performance

This section also reports emissions metrics for several other environmental factors on a life cycle basis: Pb, Hg, NH<sub>3</sub>, CO, NO<sub>x</sub>, SO<sub>x</sub>, VOC, PM, and H<sub>2</sub>O (withdrawals and consumption).



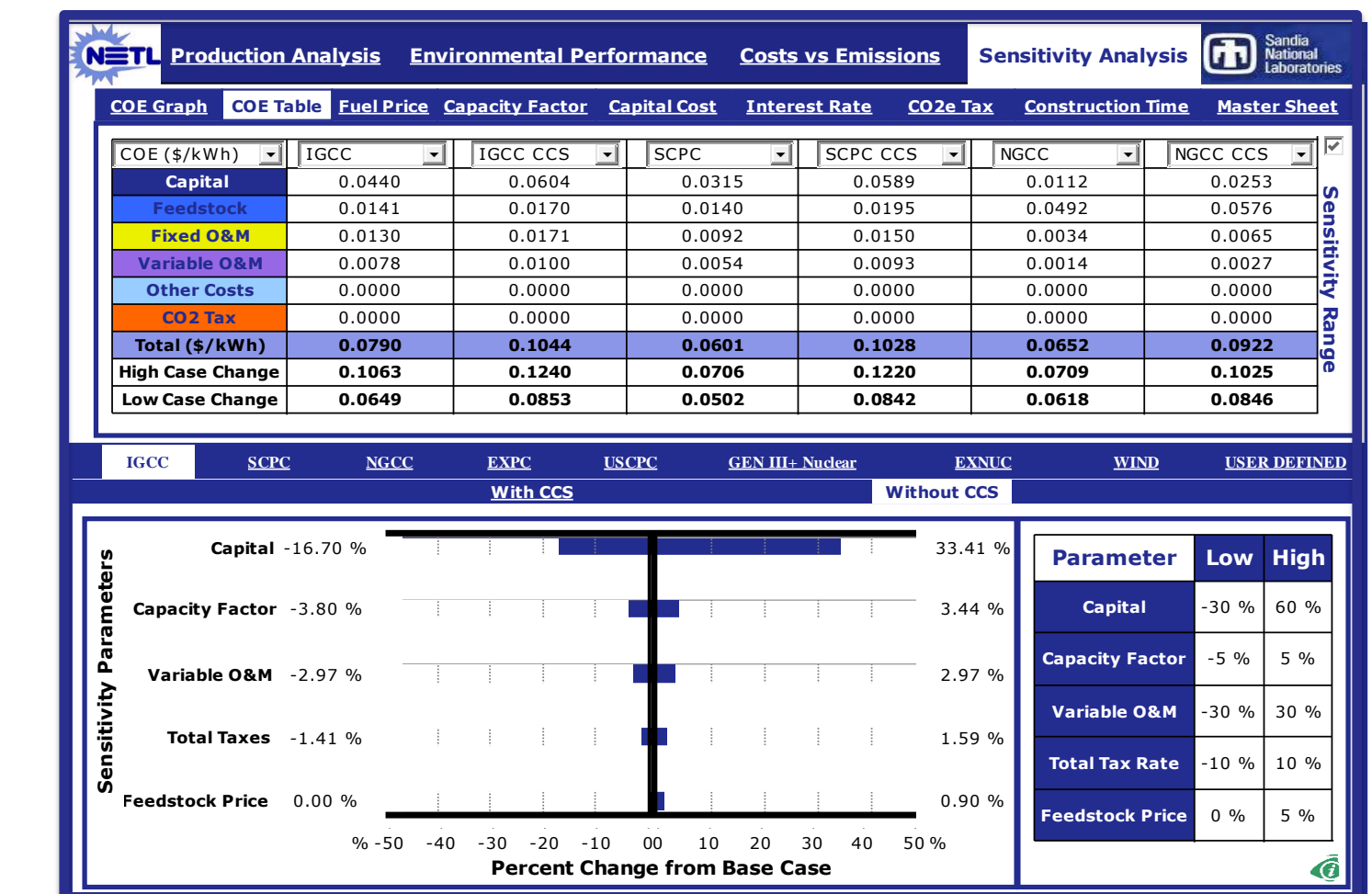
## Costs vs. Emissions

This section explores the tradeoffs between production costs (\$/kWh) and Life Cycle (LC) GHG performance (kg CO<sub>2</sub>e/MWh). Adding CCS to an EXPC plant lowers the emissions, but increases the costs.



## Sensitivity Analysis

This section allows one to vary several assumptions simultaneously. Tornado plot shows sensitivity by cost category.



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Power Systems Life Cycle Analysis Tool  
(Power LCAT) is now available at:

[www.netl.doe.gov/PowerLCAT](http://www.netl.doe.gov/PowerLCAT)

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