From Unit Processes to Completed LCAs: NETL Life Cycle Analysis Library

the ENERGY lab

Website: www.netl.doe.gov
Customer Service: 1-800-553-7681

Life Cycle Analysis at NETL

- Methodology includes the critical analysis of scope, assumptions, level of detail, data quality, interpretation of results, etc.
- Purpose is to perform and publish a transparent LCA
- NETL LCA studies are ISO 14040 compliant

Figure 1. Life Cycle Stage Definition

Power Systems LCA Tool (Power LCAT)

- A high-level dynamic model that calculates production costs and tracks environmental performance for a range of electricity generation technologies
- Joint effort between Sandia National Laboratories (SNL) and the National Energy Technology Laboratory (NETL)
- Allows for quick sensitivity analysis on key technical and financial assumptions, such as: capital, O&M, and fuel costs; interest rates; heat rates; etc.

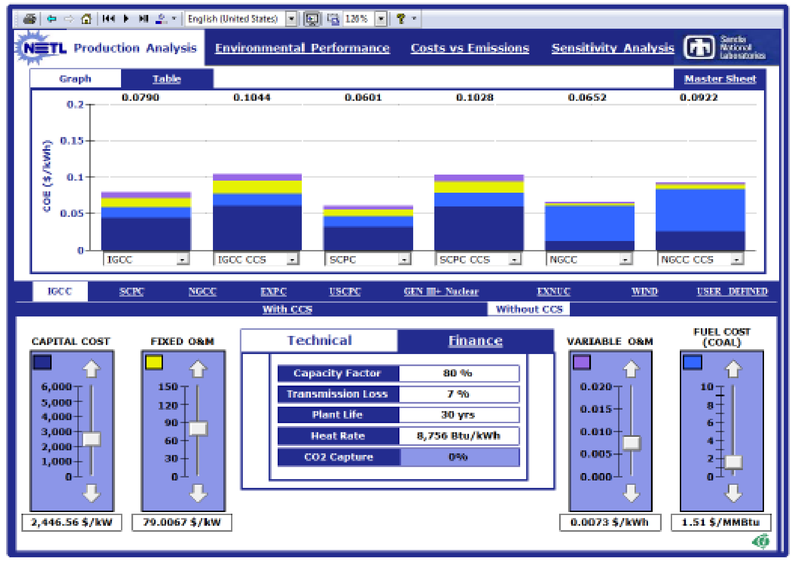

Figure 2. Power LCAT Screenshot

NETL Unit Process Library

- Available on the NETL Energy Analysis website, complete with full documentation
- 420 unit processes are contained in the NETL library
- Includes unit processes from all 5 life cycle stages and a range of technologies
- Rollup unit processes represent a collection of smaller unit processes that provide cradle-to-gate inventory results for a more complex process (e.g. production of hybrid poplar or refined diesel fuel)

NETL unit processes can be accessed at:

www.netl.doe.gov/LCA

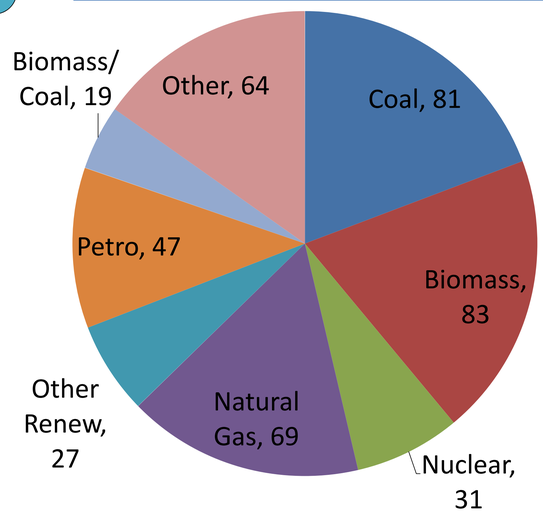

Figure 3. Unit Process Breakdown by Technology

"Other" includes: water processing, CO_2 management, and generic transport processes

"Other Renew." includes: ethanol, geothermal, hydro, solar thermal, and wind

Upstream Dashboard Tool

- Updating with Monte Carlo analysis in 2013
- Provides users access to stage-wise life cycle inventory for a variety of feedstock options including coal, natural gas, biomass, uranium, and petroleum
- Built using unit processes from the NETL library
- Allows users to vary default parameter values (e.g. transportation distance, production rate, etc.) and view real-time inventory results
- Results include GHGs, criteria and other air emissions, water emissions, and water and energy use

NETL LCA Product Library

- Production of Zero Sulfur Diesel Fuel from Domestic Coal: Configurational Options to Reduce Environmental Impact (Under Review)
- Synergistic Production of Transport Fuels (Diesel, Jet, Gasoline) from Coal (Under Review)
- CTL Pathway Study (Under Review)
- Cost and Performance Baseline for Fossil Energy Plants Volume 4: Coal-to-Liquids via Fischer-Tropsch Synthesis (Under Review)
- Baseline Analysis of Subbituminous Coal and Biomass to Gasoline (Indirect Liquefaction by Methanol Synthesis) Revision 2 (Under Review)
- Analysis of Natural Gas-to Liquid Transportation Fuels via Fischer-Tropsch (2013)
- Recommendations for Assessing the Environmental Performance and Costs of CO_2-EOR Systems (Under Review)
- Gate-to-Gate Life Cycle Inventory and Model of CO_2-Enhanced Oil Recovery (Under Review)
- Gate-to-Grave Life Cycle Analysis Model of Saline Aquifer Sequestration of Carbon Dioxide (Under Review)
- Cradle-to-Gate Life Cycle Analysis Model for Alternative Sources of Carbon Dioxide (Under Review)
- Role of Alternative Energy Sources Technology Assessments (2012):
  - -Coal/Biomass Co-firing
  - -Geothermal
  - -Hydropower
  - -Natural Gas
  - -Nuclear
  - -Solar Thermal
  - -Wind
  - - Technology Compilation
- NETL Upstream Dashboard Tool (2012; 2013 Update)
- Life Cycle Greenhouse Gas Analysis of Advanced Jet Propulsion Fuels: Fischer Tropsch Based SPK-1 Case Study: Report and Model (2012)
- Life Cycle Greenhouse Gas Inventory of Natural Gas Extraction, Delivery, and Electricity Production (2011)
- Life Cycle Analysis: Ethanol from Biomass (2011)
- Life Cycle Analysis: Existing Pulverized Coal (EXPC) Power Plant (2010)
- Life Cycle Analysis: Natural Gas Combined Cycle (NGCC) Power Plant (2010; 2013 Update)
- Life Cycle Analysis: Integrated Gasification Combined Cycle (IGCC) Power Plant (2010; 2013 Update)
- Life Cycle Analysis: Supercritical Pulverized Coal (SCPC) Power Plant (2010)
- An Evaluation of the Extraction, Transport, and Refining of Imported Crude Oils and the Impact on Life Cycle Greenhouse Gas Emissions (2009)
- Development of Baseline Data and Analysis of Greenhouse Gas Emissions of Petroleum-Based Fuels: Report and Model (2008)

LCA reports and products can be accessed at:

www.netl.doe.gov/energy-analyses