# Calculator: Energy Technologies Life Cycle Assessment

http://www.springsustainability.org

## Summary

The Energy Technologies Life Cycle Assessment (ETLCA) is a spreadsheet tool which allows quick and easy estimation of the life cycle environmental impacts of potential future electricity mixes for the UK.

**Developers:** University of Manchester in collaboration with City and Southampton Universities as part of the Sustainability Assessment of Nuclear Power: An Integrated Approach (SPRIng) project

| Applicable sectors | | | | | | | Themes | | |
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| All Infrastructure | Buildings | Roads | Water | Energy | Transport | Construction | Materials | Ecology | Wastewater |
| | | | | | | | Potable Water | Carbon/GHG | Other |

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| **Countries** | International | **Access** | Free to download |
| **Compatibility with other tools** | The SPRIng project Multi-criteria Decision Analysis. | **Methodology** | The ETLCA spreadsheet tool allows quick and easy estimation of the life cycle environmental impacts of potential future electricity mixes for the UK. It enables estimation of:<br>- Direct carbon emissions;<br>- Carbon footprint (global warming potential);<br>- Ozone layer depletion potential;<br>- Acidification potential;<br>- Eutrophication potential;<br>- Photochemical smog potential;<br>- Water eco-toxicity potentials (freshwater and marine);<br>- Terrestrial eco-toxicity potential;<br>- Human toxicity potential;<br>- Human health impacts from radiation; and<br>- Depletion of resources (elements and fossil fuels).<br>The tool is based on 4 possible Scenarios (A, B, C, D) for electricity generation that can lead to significant carbon reduction (100% or 80%) by 2070 compared to 1990 values. These scenarios have a different degree of reduction or increase in electricity generation coupled with degree of switch to low carbon generation methods.<br><br>*Continued on next page....* |
| **Inputs & outputs** | The user first selects Scenario A, B, C or D in terms of overall carbon and energy strategy. They are then able to experiment with different sub-scenarios, exploring the carbon footprint of different electricity mix options.<br>The user can specify % electricity contribution or electricity supply by technology (in GWh) for each of the following technologies/power options: nuclear, coal, natural gas, oil, offshore wind, onshore wind, solar, marine, biomass, hydro, coal carbon capture and storage (CCS), gas CCS, imports. Given user inputs, the calculator outputs the following:<br>- Whether the electricity mix is 'acceptable' or a 'problem' in terms of scenario targets;<br>- How far the electricity mix is from satisfying the carbon constraint in each particular year;<br>- Graphs of each sub-scenario, showing the contribution of each technology to the overall impact in each year;<br>- Graphical representation of how the defined sub-scenarios differ in respect to their environmental impacts over time.<br>This allows the user to identify trade-offs between the defined sub-scenarios and highlights areas of interest which can then be examined in more detail. | | |

*Note: "Free to download" does not necessarily imply that it is free for commercial use.*

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| **Guidance for users** | The calculator is accompanied by an *ETLCA Guidance document* which offers information on how the calculator is used. | **Methodology (continued)** | The tool is based on these 4 scenarios, which essentially represent different carbon reduction strategies. A different excel-based tool is offered for each scenario. Within each scenario, a possibility of 4 different sub-scenarios is offered, and these can be modified by the used. Each sub-scenario enables selection of different technologies for use in the electricity mix for 2008, 2020, 2035, 2050 and 2070, given electricity generation and carbon emission targets by each of these milestones.<br>The software then provides total and technology specific emissions and determines the extent to which these are acceptable or not, given the selected Scenario. |
| **Database library** | The tool contains an inbuilt database with values of the following: global warming potential, abiotic depletion, acidification potential, eutrophication potential, freshwater aquatic ecotoxicity potential, human toxicity potential, marine aquatic ecotoxicity potential, ozone layer depletion potential, photochemical ozone creation potential, terrestrial ecotoxicity potential and radioactive radiation potential for each of the following energy generation methods: nuclear, coal, natural gas, oil, offshore wind, onshore wind, solar, marine, biomass, hydro, coal CCS, gas CCS, imports. | **Data intensity & flexibility** | Data flexibility is high. The tool allows for use of pre-defined databases or for user defined values. Data intensity is reduced through the use of inbuilt databases. |

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