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## **Integrated and bottom-up LCA/TEA framework and its use to support research and policy – Hydrogen Case Study**

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A bottom-up sustainability assessment framework will be described providing granular comparison between multiple climate change solutions and identifying/quantifying critical R&D gaps. Economic and environmental assessments are performed under a single framework using the same system boundary, process flow diagram and functional unit. First, a technical characterization (“T” of TEA) is performed including process modeling and experimental data/information gathering. The output of this step is used as input for economic (TEA) and environmental (LCA) assessment steps. This integrated approach enables a transparent and harmonized framework to benchmark emerging technologies against mature technologies. Using different Technology Learning Curves (TLC), we will show how this framework could be used to quantify LCCA (levelized cost of carbon abatement). This will also enable to gauge current climate change policyies and identify gaps within both mature and emerging technology pathways, at process unit level. Specific case studies will be provided to illustrate this approach. As data quality and interoperability are the most critical aspects of LCA/TEA, we will also describe a newly launched collaboration server at NRC to help facilitate national/international collaborations to build quality data inventories using an open and secure information system.