Task 31: Polymer Electrolyte Fuel Cells

Task 31 is a research and development oriented Task with the objective to contribute to the identification and development of techniques and materials to reduce the cost and improve the performance and durability of polymer electrolyte fuel cells (PEFC), direct fuel polymer electrolyte fuel cells (DF-PEFC), and corresponding fuel cell systems. Major applications are in the automotive, portable power, auxiliary power units (APU), stationary power (residential, commercial), and combined heat-and-power (CHP) sectors.

The R&D activities in Task 31 cover all aspects of PEFC and DF-PEFC, from individual component materials to whole stacks and systems. These activities are divided into three major subtasks: 1) new stack materials, 2) system, component, and balance-of-plant, and 3) DF-PEFC.

Research in the new stack materials aims to develop improved, durable, lower-cost polymer electrolyte membranes, electrode catalysts and structures, catalyst supports, membrane-electrode assemblies, bipolar plates, and other stack materials and designs for PEFC.

The second subtask addresses stack, system, and balance-of-plant issues in PEFC systems. It includes systems analysis, stack/system hardware designs and prototypes, and modelling and engineering. This subtask also engages in testing, characterization, and standardization of test procedures related to end-user aspects, such as the effects of contaminants on durability, water and heat management, operating environments and duty cycles, and freeze-thaw cycles. The development of fuel processors for PEFC for CHP and APU applications is also addressed in this subtask.

The third subtask focuses on the research and development of DF-PEFC technology, including systems using direct methanol fuel cells, direct ethanol fuel cell, and direct borohydride fuel cells. It involves development of the cell materials, investigation of relationship between cell performance and operating conditions, stack and system design and analysis, and investigation of fuel-specific issues for these direct-fuel polymer electrolyte fuel cell systems.