



Collaborative Fuel Cell R&D Scoping Paper ILC-005-03

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- Polymer Electrolyte Membrane Fuel Cells (PEMFCs)
 - Advanced Membranes
 - Non-Platinum Electrocatalysts
 - Stack Components
- Alkaline Fuel Cells
- High Temperature Fuel Cells:
 - Molten Carbonate Fuel Cells (MCFCs)
 - Solid Oxide Fuel Cells (SOFCs)
- Standardized Testing Procedures/Protocols



Polymer Electrolyte Membrane Fuel Cells

- **Advanced Membranes**
 - Identify and understand *higher temperature (non-aqueous)* proton conducting mechanisms.
 - Identify and synthesize materials with high conductivity, thermal and mechanical stability across all operating conditions.
 - Devise methods of fabricating membrane electrode assemblies (MEAs) with advanced membrane materials.
- **Non-Platinum Electrocatalysts**
 - Understand platinum's unique catalytic properties and opportunities for recycle/reuse.
 - Identify and understand the nature of non-precious metal catalytic sites for O₂ reduction.
 - Improve the chemical stability of non-precious metal catalytic sites in PEMFC environments
- **Stack Components**
 - Investigate protective coatings for metallic *bipolar plates*.
 - Develop carbon/polymer binder composites for high temperature application.
 - Define requirements for *gas diffusion layers* and investigate performance in test cells.
 - Adapt sealing materials and technology for high temperature operation.



Alkaline Fuel Cells (AFCs)

- Investigate methods to lower cell resistance and improve *AFC stack performance*
- Optimize recirculated electrolyte AFCs for their intended application.
- Continue to investigate *non-platinum catalysts* to determine what trade-offs can be made to reduce cost while maintaining performance.
- Identify lower cost materials that can withstand alkaline electrolytes.



High-Temperature Fuel Cells: MCFC and SOFC

- **Develop low cost durable *seals***
- **Develop and characterize *lower-temperature oxide ion conductors*. Lower-temperature operation would reduce the thermal durability problems and allow use of cheaper materials.**
- **Develop electrodes with reduced thickness, improved sulfur tolerance, CTE match, and good interface performance**
- **Develop lightweight, oxidation-resistant metallic interconnects**



Standardized Testing Procedures/Protocols

- Harmonize existing test methods.
- Compile reports on testing methodologies that have been or are being developed by numerous organizations around the world.
- Benchmark and validate results from round robin testing.



Workshops to formulate proposals

SOFC - May 15 Quebec City

PEMFC - May 30 Brussels

AFC - need volunteer to host

Through the ILC, each country needs to decide which FC topics and activities it will join and determine who the participants will be

Workshop	US	Canada, France	Japan	Germany	Norway	EC	Australia	Brazil	Italy	Republic of Korea
PEMFC	x	x	x	?	?	?	?	?	?	?
SOFC	x	x	x	?	?	?	?	?	?	?

Potential proposal to ILC for IPHE Collaborative Project

Testing Procedures/Protocols

Are there other countries that are interested in the fuel cell activities?