

# Hydrogen and Fuel Cell Curriculum Development

*By Robert Mauro, General Manager, PATH*

At the last PATH Board Meeting it was decided to move forward with curriculum development for both engineering students and secondary school general science students. During a subsequent meeting among directors of the Hawaii Natural Energy Institute, University of Quebec – Trois Riveres Hydrogen Research Institute, and the hydrogen and fuel cell institute being formed at Yokohama National University, it was decided that PATH would pursue curriculum development for engineering students. In this regard, PATH will be conducting a workshop in late January to identify the topics for development, topic authors and the path forward.

There are several texts on hydrogen and more on fuel cells. Therefore, it is fair to ask why PATH and the research institutes are pursuing what one might perceive to be a duplicative activity. A portion of PATH's mission is to increase the level of knowledge about hydrogen and fuel cells. Developing educational material for those who will lead us into a hydrogen energy future is consistent with that mission, as is providing tools to spread the word about hydrogen beyond the borders of PATH members. PATH's curriculum will fill the gaps that exist in the educational materials currently available. The difference in this curriculum is in its scope, it is a four part activity which has a useable product at the end of each phase of the activity. The four phases in PATH's curriculum development are:

- Phase 1 involves developing a text on hydrogen and fuel cells. This is the most traditional of the tasks. This phase will identify one or more key concepts and equations in each chapter of the text. The unique elements in this task are that with the three PATH member institutes involved each chapter can be written by an expert on that topic, and the text will provide an international perspective.
- Phase 2 will expand on one or more critical equations and concepts in each chapter of the text. These equations will be demonstrated graphically and the effects will be shown to change interactively as the user changes the variables. In this way, it is hoped that more users will develop an intuitive understanding of each topic. The material will be presented on a CD.
- Phase 3 would expand the concept of Phase 2 to include virtual experiments that are also interactive and require click and drag setup of the experimental equipment. The idea is to have at least one experiment per topic that illustrates the core concept. Virtual experiments will eliminate barriers, such as the cost and availability of equipment, and will also allow schools in developing countries to conduct the course with only the CD and a laptop computer.
- Phase 4 would allow access to lectures by experts via the internet on each topic in the text. The lectures would be digitally recorded during a live lecture or seminar on the each topic.

The first step in this effort is to develop a syllabus for the text, select the topics for the text and determine the authors by the end of the summer 2004. The goal is to develop a text with approximately equal participation among Canadian, Japanese and U.S. authors. It is anticipated that the text will be the basis for similar courses on hydrogen and fuel cells for the research institutes in the three countries and serve as a guide for course development for other institutions as they develop programs in hydrogen and fuel cells.