

Research and development, funded both privately and federally is occurring on a limited scale in Canada, on specific aspects of materials technology, cell and module fabrication, and system development. Proof of concept and demonstration experiments are beginning, in one case with considerable electrical utility involvement and funding.

Three Canadian firms are capable of producing cells (single crystal silicon) and modules on a relatively small scale, and both these firms and others are capable of designing and fabricating the remainder of the system. Many Canadian firms are interested in developing applications technology, and some have already become active in developing countries with, for example, a unique water pump design. Canada also has acknowledged expertise in micro-electronics and communications technology, making it uniquely suited to developing that particular photovoltaic application, which will be of special use in the developing world. In addition, there is considerable experience in engineering design and systems development in Canadian industry, which will be the most important aspect of photovoltaic applications once the present concentration on cell technology has reduced unit costs to an economically attractive level.

#### 2.11 Biomass

Because of its immense forest resources, wood-based industries (including pulp and paper) are among the most important in Canada, generating about 8% of its gross domestic product. This, plus its vast primary agricultural interests, has put Canada in the forefront of much of the research, development and application activity that is concerned with the use of forest biomass, and wood and agricultural wastes, to produce energy and synthetic fuels.

Biomass now contributes perhaps 3.5% to total primary energy use in Canada. This comprises mainly the use of wastes in the forest and pulp and paper industries (for example, about 50% of the total mill wastes generated are used as fuel). There is also some use of fuelwood in the residential and other sectors. With rising energy prices and the present government programs available to encourage the use of wood and wood wastes, the total contribution of biomass is expected to increase to 6% of total energy by 1990.

Federal programs to encourage the use of biomass in Canada include R&D support, industrial assistance, demonstrations and consumer incentives. For example,

- Federal R&D expenditures are currently \$7 million per year, with increases expected to cover expansion of effort in the production of liquid fuels.