



INTELLECTUAL PROPERTY AND ACCESS TO CLEAN ENERGY TECHNOLOGIES IN DEVELOPING COUNTRIES: AN ANALYSIS OF SOLAR PHOTOVOLTAIC, BIOFUEL AND WIND TECHNOLOGIES

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EXECUTIVE SUMMARY

As part of the world's move to combat global warming, developing nations will be seeking to reduce their emissions of greenhouse gases, and particularly of carbon dioxide (CO₂). They need to obtain new technologies in order to do so. This paper explores whether there will be barriers, particularly intellectual property (IP) barriers, to access those technologies. To do so, it examines the industrial structure of three sectors, photo-voltaic (PV), bio-mass and wind energy. It concentrates on the more scientifically advanced developing countries such as Brazil, China, and India.

IP in the Renewable Energy Industries and in the Pharmaceutical Sector

Intellectual Property (IP) protection generally plays a quite different role in the renewable energy industries than it does in the pharmaceutical sector, the source of many developing nation perspectives on IP. In general, in the pharmaceutical sector, an individual patent may have a very substantial impact because a specific drug may not have any substitutes. In such circumstances, the patent holder is in a very strong market position and may be able to charge a price well above production cost. In contrast, in the three renewable sectors considered here (and in many other industrial sectors), the basic approaches to solving the specific technological problems have long been off-patent. What are usually patented are specific improvements or features. Thus, there is competition between a number of patented products – and the normal result of competition is to bring prices down to a point at which royalties and the price increases available with a monopoly are reduced. This will be particularly the case for the products considered here, where there is competition not only between the firms in the specific sector but also between the sectors and alternate sources of fuel or electricity. In effect the benefit of the technologies is shared with the ultimate customers.

Photo-voltaic (PV)

In the PV sector, developing nations are facing an oligopoly structure. But it is a somewhat loose oligopoly with lots of entrants. Thus, the benefits of the basic (silicon-slice) technology are likely to be available to developing nations even in the face of patents. But, even if they face patent issues entering the field as producers, they are likely to be able to obtain licenses on reasonable terms, because of the large number of firms in the sector.

The possibility of entry is demonstrated by Tata-BP Solar, an Indian firm, based on a joint venture, and Suntech, a Chinese firm, based on a combination of its own technologies and of purchases of developed world firms.

Bio-mass for Fuels

At this time, it appears as if developing nations have good access to the current generation of biofuel technology. The technologies are quite traditional, and there are many firms interested in bringing the technologies to developing nations. The harder question is with future biofuel technologies. It is likely that methods, or enzymes, or new micro-organisms for breaking down lignin will be patented. It is also likely that the holders of these patents will be willing to license their technology for use everywhere, and the licensing fees for these technologies are unlikely to be very high for very long. Thus, the key barriers are not likely to be associated with patents but rather associated with the tariffs and other restrictions related to the international sugar and ethanol markets.

Wind

The wind sector is competitive enough that developing nations will be able to build wind farms with equipment from the global market without enormous IP costs. However, it is much more difficult for developing nations to enter the global market for wind turbines; the existing industrial leaders are strong and hesitant to share their leading technology out of fear of creating new competitors.

Moreover, a new firm that seeks to create its own technology must face the pricing problem of recovering its research and development costs. Initially, new firms are likely to have a smaller number of sales than their global competitors. In spite of these barriers, two developing nations, China and India, have succeeded in building important firms over the last 10 years.

Overall Implications

- **For developing nations**
With respect to access to the benefits of the technology, i.e. for the markets for reducing CO₂ emissions or for providing emission offsets to developed nations, there seem to be insignificant IP barriers to developing nation access. For the exporting markets, including PV cells, ethanol (or other renewable fuel) or wind engines, the picture is slightly more mixed. Certainly, for ethanol, the key concerns will be tariff and similar barriers, not IP barriers. For PV, the IP system is still unlikely to

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be a significant barrier. For wind energy, the issue is slightly less clear, but there will still probably be little IP problem. However, because of the global concentration in some of the industries, all countries should be alert to the risks of cartel behavior.

There are other questions of importance to developing nations exploring these industries. Should developing nations strengthen their IP protection in order to make foreign investors more willing to transfer technology? The evidence suggests a possibility that stronger IP will help in the more scientifically-advanced developing nations, and offers little indication of risk associated with such strengthening. The answer may be different in poorer nations.

- **For lenders and donors**

For lenders and donors, one group of key issues is in the “software” area i.e. in designing the subsidies or legal requirements needed to make renewable energy economical. Obviously, it is important to decide wisely when such arrangements should be used and when the developed world should contribute to the cost of the subsidy that is often implicit. It is also important to make sure that the need for these arrangements is taken into account in the privatization of electrical grids.

These donors should ensure that their subsidies, and particularly their research subsidies, take developing-nation needs into account. New research is probably not a significant issue in the wind power area, but is certainly significant in PVs, where off-grid applications will probably be much more important than in the developed world. It is crucial in biofuels, where different nations are likely to have different feedstocks.

- **For international negotiations**

The most serious plausible patent issues are likely to arise from the new technologies, where there is a risk that some broad patent might complicate the development of a major category of new more efficient or less expensive technologies. The riskiest area, as noted above, is the wind energy area, where patents have already been used to attempt to protect markets from foreign competition, and where the industry is the most concentrated, compared to the other three sectors studied.

Concentration itself presents a most significant issue, should the relative small number of suppliers (of PV cell manufacture or manufacturing equipment, of biofuel manufacturing requirements such as enzymes, or of turbines or turbine equipment) cooperate in a way that would violate competition-law principles. Thus, there should be consideration of ways to ensure detection of possible violation of competition-law principles, especially in industries such as these where each nation may want to help its national champions.

Of particular importance in this sector is public support of technologies. Developed nation governments are likely to seek to ensure that patents are gained on the results of the research and then seek to ensure that national firms are favoured in the licensing process. In essence, part of the political basis for the technology support is the hope of helping national manufacturers. It is possible to resolve this problem by asking developed nations to agree to forego their national favouritism in licensing publicly funded inventions, at least with respect to technologies of global environmental importance. This is quite similar to the “humanitarian clauses” being considered in the medical and agricultural areas. It would be far better for developed nations to go even further and commit themselves to devote a portion of their technology development to the special needs of developing nations. They could also ensure that firms in developing nations have an opportunity to participate in such efforts. In any such arrangement it is crucial that the various research programmes leave space for many different strategies to bloom. An arrangement could be negotiated in either of two ways. One would be as part of climate change negotiations, in which the commitment to make the technology more readily available would be included, perhaps as a quid-pro-quo for stronger environmental constraints upon developing nations. This would require a stronger commitment than has been typical of global environmental agreements. The other approach would be as part of a stand-alone technology arrangement, with the quid-pro-quo based on reciprocity among research funders. This is envisioned in the proposed Treaty on a Global Scientific and Technological Commons.

Almost certainly the most important need is to remove unnecessary barriers to trade in the area, such as those that restrict Brazilian ethanol. In a sector such as renewable energy, it is economically wise to maintain some subsidies for the sake of the global environment (assuming the world does not move toward a carbon-tax or its economic equivalent). Although the subsidies serve environmental goals, they are often designed in response to domestic concerns, particularly domestic agricultural concerns, and may end up discriminating against developing countries. It would be ideal to design the subsidies in ways that do not distort trade or discriminate against developing nation firms. This would be a very difficult negotiation, but an extremely valuable goal to seek.

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