History of Roofpond Development

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In one theory, life was formed by electricity when lightning rearranged amines into genes. Thereafter, for millennia, lightning was a destroyer except for teaching the elements of fire and light. Man accepted fire as the first passive use of a renewable energy other than products from direct sun rays – warm water and evaporative cooling. After the first demonstration of static electricity, industry utilization of electricity marvelously eased Man's burdens. People capable of paying for it became addicted and accepted its now-revealed shortcomings and hyping.

Fifty years ago, this writer realized that half of the people in the world would live foreshortened lives without electricity, decent housing, or pure water. My work in developing countries indicated that even passive technology was not feasible for the big underclass except for the "fringe on top." Population growth keeps apace of industrialization so that the percentage of unfortunates remains about the same today.

Thirty-five years ago, President Nixon recognized an electricity and gasoline crisis. He funded renewable energy research and large installations but minimized passive heating and cooling (H/C). 15-35% energy saving was already produced passively for heating buildings. My 1968 development of roofpond heating plus cooling integrated various passive systems with the patented addition of movable insulation and water storage. It demonstrated the potential for 100% comfort with no electricity in the Southwest. This was confirmed in a 1973 university report on test results from a full-scale house.

Congress then passed the "Solar Heating and Cooling Act of 1974" in which passive thermal comfort in buildings received a substantial mandate. Roofponds were given several projects by the Department of Energy. In one sense, I was the cause of some failures in these projects. This will be treated in detail in the new website **www.2and50needles.com.**

The most significant study of solar *cooling* only was made by Trinity University in San Antonio, Texas. Published results were highly favorable for the roofpond system but reporting limitation to "cooling only" caused the system to be overlooked for heating by the public in the northern states. Most subsidies were for solar *heating* systems only. Combined H/C was not regarded as feasible. New technology was thought to be a future that came only from government and big industry sources.

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The fate of commercial passive heating and cooling will be discussed later. Here, mention is made that fragmenting and confusing government objectives soon turned political with installation of a different solar heating system in as many congressional districts as possible regardless of local climates.

Passive solar is climate sensitive. An understanding and use of local meteorological data (degree-days h/c, direct and diffused solar radiation, altitude and wind velocity) is essential but beyond the ken of minor solar enthusiasts. Architectural design implications on comfort are inadequately understood by those strongly advocating different ideas with minor energy saving. They did not aid solar and few survived.

The need for complex integration of interdisciplinary technologies in seemingly simple passive systems was recognized by Congress and SERI/DOE without top evaluation by a qualified research director. Government staffing, at a time when solar experts were rare, required employment of anyone who could spell "solar energy". These amateurs paid experts to disclose ideas that they put into grant proposals with little knowledge of what to expect. An "expert" whose ideas failed repeatedly, but were different, was sure to be considered highly qualified and was again funded. Such experts are protected by tenure.

It should not be expected that a highly productive research scientist should personally develop his/her idea, demonstrate and publish it, and then change successful personal orientation to become a business person. The best hope is to get an idea included in a side-by-side cost and performance evaluation with the best renewable energy system. My efforts to get direct comparisons through Congress and DOE were rejected. This procedure to gain public confidence will be increasingly pushed in the near future. It requires support from all passive advocates.

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Successful passive systems are low-cost and simple to apply in underdeveloped countries. Unfortunately, the officials there lack quality research directorship to evaluate and propagate appropriate systems. Too often they accept donations of high-tech systems which fill a need in poor villages for a short period then fail. With PV systems, the cost of replacing a burned out battery or inverter after three to five years can be prohibitive and terminate the value of the PV system Disillusionment extends to donors.

In the remaining minutes, I wish to informally show evidence that RE systems will never displace the best of the passive systems. In this graph (unavailable here) from The New York Times, dated February 9, 2003, data from the National Renewable Energy Laboratory show the success of renewable energy sources to reduce the cost per kilowatt-hour of electricity over the period of 1980 to 2,000. This seems impressive until it is realized that all RE systems are still in the development stage and their cost becomes asymptotic to the present national average cost of electricity. No cost saving may be expected and most RE systems have a high embodied cost of consumed energy for manufacture and operation.

On the other hand, one passive system over the same period did not drop in cost because it had already eliminated the need for electricity to produce comfortable H/C. Manual control for most developing countries and minimal use for automation in developed nations was effective. Construction costs of the passive buildings may favor passive systems in most climates. As a

challenge to RE systems, I will pay for a low-cost house type tested side-by-side with a corresponding RE H/C system. Any takers?

Next, I show the splendid graph that accompanied Amory Lovins' article in the September 2005 issue of Scientific American (unavailable here). This shows energy losses from coal conversion to water delivery. Only water value justifies losses from 100 units of input energy to 9.5 units available (and required) to circulate the water within a building. Similar diagrams should be published by NREL for the various RE systems.

Of significance is the latest idea of William Shurcliff before his passing. In regions where ground temperatures are low, he proposed that cold water entering a house be circulated in a pipe array to cool a room. The water passing for other household use would be slightly warmed and require less new energy input. I suggested that this idea can be used to cool an attached wine cellar and/or storage for food and medicines. The system is passive cooling and passive water heating! We need more like Shurcliff to disclose the obvious about passive energy potentials

The important distinction between passive and RE systems is that passive systems are ready now to reduce Climate Change and fossil fuel depletion. None of the RE systems are ready for economic use now -- most require years of additional research and then up to ten years for commercialization with only gradual decrease in pollution. In the meantime, China and India will add tremendously to Climate Change. Also, about 1.5 million new houses are being built each year in the United States that will add to the problem before RE even begins to help.

Climate Change cannot be delayed so long without adding its cost to the effort to develop renewable energies. From experience as a research director, I suggest that NREL could readily transfer one-third of its RE personnel to HUD for the implementation of passive H/C in houses as well as in institutional, commercial, and industrial buildings. We might receive a response to this suggestion from Ron Judkoff shortly.

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