CHAPTER 9
1996

100 Headrick Solar-Voltaic Dome™ Power Stations by 2000
A Competition of Discovery and Sharing US ~ EC ~ Japan
Athens ~ Paris ~ Denver ~ Miyazaki ~ Irvine

Centennial of the First Modern Olympics in Athens

I made it back to Athens and was happy to see the familiar staff faces at the Athens Hostel. One of the managers mentioned an interest in putting solar on their roof and so I provided some design sketches and figures. He had given me a briefcase on my way to Cairo, and I was extremely grateful for that gesture of assistance. My briefcase was worn out. On the way to my room, I noticed a sign indicating that Athens was celebrating the Centennial of the Modern Olympics at the original stadium in the city center. There was no charge. It was magnificent. They lit the stadium with torches as it was lit at the first Modern Olympics before electricity was prevalent. The singing performances in Greek and the dancing were beautiful. It was wonderful and I was blessed to be a part of this memorable event.

After a few days in Athens I returned to Paris where I visited the International Architects Association to explore partnering on building-integrated photovoltaic [BI-PV] design competitions. There was an excellent design contest exhibited at the Egyptian Solar Energy Society Conference featuring sustainable homes on the Canary Islands. They created a book depicting the top 25 designs. I had tried to initiate a BI-PV exhibit and book with the KCAIA, but smoldering political overtones stemming from the three rocky years at KU with Frank Zilm and Dennis Domer tainted the relationship after Linda Young resigned as executive director. She died a few months later from cancer. Frank Zilm was President that year and thus my relations with the KCAIA were left on tenuous ground. Hostile letters were common from Mr. Zilm until he finally resigned as my thesis chair so I could complete my thesis in peace. His hostility was reflected in a letter from the new director denying any cooperation for an exhibit with a copy to the National AIA Counsel. May 1996, I returned to Washington, DC long enough to complete my next paper.
ABSTRACT

Civilization has embraced a highly refined essence of culture for well over 2,000 years. Commerce and quality of life have danced in a delicate and at times bold interplay throughout the evolution of humankind, yet, never so precariously as it does, today. The earth with its abundant blessings and resources sways on a pendulum in orbit between the drive for survival and the corruptibility of commerce. Decisions regarding global resources are now -more than ever -intertwined with the very essence of global survival. We must put responsible energy products in reach and within budget, today. Sound market deployment of building-integrated photovoltaics are focused within core industrialized nations where the technology and related systems may be proven on a broad scale with closely monitored installations primarily self-financed with Solar Bond incentives.

The \textit{100 Headrick Solar-Voltaic Dome\textsuperscript{TM} Power Stations By 2000 Program} advances a unique mid-size 21,000 SF solar array to increase peak output on an acre four times (60 kWp to 260kWp) with 34,000 SF leasable. Formal ceremonial signing of this commitment by leaders of the United States, the European Commission and Japan is an important step to encourage commercial real estate industries of these nations advance this program to assure photovoltaics timely achieves its rightful position as a viable World Trade Commodity of the 21st Century.

KEYWORDS

Strategic Market Deployment of Building-Integrated Photovoltaics; Packing Density; Headrick Solar-Voltaic Dome\textsuperscript{TM} Power Station; Economics of Energy Resources
Due to low production and use world-wide building-integrated photovoltaics share a reputation with remote site PV of being considered an expensive form of renewable energy. There is a tendency in economic evaluations to insist photovoltaics adhere to economic formulas based on remote site formats characteristic of coal, nuclear, hydro, natural gas and petroleum energy resources. It is unnatural and unrealistic to focus economic formulas for photovoltaic deployment on remote site production because the primary benefits of building-integrated photovoltaics producing electricity from sunlight on location are unique. Solar energy through photovoltaics creates a unique structure of production, deployment management and economics. A program of incentives focused on restoration of existing buildings, new construction and large-scale deployment of building-integrated photovoltaics will produce attractive proformas for local and state commercial real estate developments.

US Primary Energy Used for Electricity Consumption 1975 & 1994

GRAPH – Summary of Pie Chart Created for Web Site

Figure 1 Photovoltaics is one line in other category of 0.6% US Electricity Consumption 1994
WORLD RENEWABLE ENERGY CONGRESS IV 15-26 June 1996

Production Level Must Be Emphasized In Energy Source Cost Comparisons

We strongly discourage continued cost evaluations comparing photovoltaic with fossil fuels and nuclear energy unless they include clear delineation of the market production levels represented by those comparative costs. Clarification of the cost/production ratio will help to consolidate fragmented efforts of small-scale cost reduction schemes that could more efficiently be integrated within strategic large-scale mainstream deployment programs naturally increasing the production level of PV, and thereby significantly reducing costs across a broad-scale marketplace. An energy pie chart in Primary Energy Used for Electricity Generation 1975 and 1994 United States National Energy Policy Plan, July 1995; Sustainable Energy Strategy -Clean and Secure Energy for a Competitive Economy clearly illustrates the extreme disproportion of production levels between photovoltaics and coal. (See Figure 1 - Similar to graph shown in 3D)

The pie chart indicates the other category constitutes only 0.6% of the entire energy marketplace of the United States. PV represents only one small line in the other category. Coal dominates with the highest production level representing 55% of the present United States energy pie. The other category was 0.5% in 1975. It has only grown 0.1% in twenty years, while coal consumption for electricity generation in the US has nearly doubled in the past twenty years. Even proponents for photovoltaics continue to falsely emphasize photovoltaics as an expensive commodity compared to depleting energy sources such as coal, natural gas, nuclear and hydro energy. Consumers often do not understand the dynamics of energy economics. PV has reduced from $500 watt in 1974 to $5 watt in 1990.

Often the price quoted for coal and nuclear production do not include known and significant externality expenses paid for by citizen taxes or increased utility rates for government funded clean-up, hazardous radioactive waste storage fees, decommission of nuclear plants or when coal plant damage the atmosphere. The threat of global warming due to depletion of the ozone layer has only been a measurable problem since 1979. In 1995, Professor Roland and an associate at the University of California in Irvine were awarded the Nobel Science Prize in Chemistry and Physics for identifying the substance of the ozone layer finally establishing significant proof of the seriousness of the changes in the ozone layer. Photovoltaics is the least expensive, cleanest, most flexible, sustainable and easy to maintain energy technology in existence, today.

STRATEGIC MARKETING PLAN FOR BUILDING-INTEGRATED PHOTOVOLTAICS [BI-PV]

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Figure 2 Market Incentives: Advent of Headrick Solar-Voltaic Dome™ Power Station
Solar Bonds enhance pay-pack strategy for six-year real estate proformas
30-Year Bonds Start PV at $5 Watt Peak (Wp) - Mature 2030 at Around 15 Wp $1
NOTE: Read BI-PV PEP USA in Chapter 10 for more information and the Advent of the Headrick Solar-Voltaic Dome(TM) Power Station in Chapter 9 to view this graph.

Deploy PV Through Commercial Real Estate Industry of Industrialized Nations

Historically, third World Nations rely on large-scale deployment of energy technologies embraced on a mass level in industrialized nations. (Wu Naito; Energy Sector Seeks More Foreign Cooperation, Beijing Review, April 1994). Coal, nuclear, hydro, natural gas and petroleum are widely deployed as primary energy technologies in Third World Nations because they are well known through billions of dollars of research and production. Coal has been a pollution problem since the 1800’s. Despite proven externality hazards and expense, fossil fuels and nuclear energy continue to be deployed in fresh markets as primary energy resources. From our research, it is clear that a realistic large-scale market deployment process for building-integrated photovoltaics must focus on core-industrialized nations to timely evolve photovoltaics as a viable World Trade Commodity of the 21st Century.

The missing incentive for rapid deployment of photovoltaics into the mainstream marketplace is attributed to the lack of a defined, affordable and significant market to accelerate mass production and use of PV electricity within industrialized nations. Decision-making analysis reveals a significant potential market for building-integrated photovoltaics within the commercial real estate industry of the United States, Europe and Japan that is virtually untapped. (Baumann, et al.1995) Solar Bonds provide real estate development and PV market push incentives to bridge the gap for up front production costs during market deployment of building-integrated photovoltaics. (See Figure 2) February, 1996 Washington Post article, Who’s Afraid of Global Warming?, indicated -global insurance and banking industries have come to realize CO2 emissions put at risk literally trillions of dollars worth of insured property and long-term investment. Government, utilities and/or insurance companies could guarantee the Solar Bonds for these projects. By 2050, utilities will be transformed from energy producers to grid managers as 50% of the energy mix is produced by building-integrated PV arrays. The 1000 PV Roofs Program in the German States established precedence for large-scale PV deployment installing over 6 MWp PV power. The Program proposed herein provides installation of over 26 MWp in three nations focused on one solar configuration demanding 630,000 meter squared of PV surface by 2000 world-wide.
Photovoltaics is an exciting frontier that will potentially transform not only energy production, related economics, and architecture; but along with computers and telecommunications, mass deployment of PV will transform a portion of our entire cultural milieu. I am pleased and honored to have your cooperation in presenting for signature this document herein at the World Renewable Energy Congress IV. It is a formal treaty, agreement and reminder of our opportunity and commitment to evolve photovoltaics through the Advent of the Headrick Solar-Voltaic Dome Power Station. It will create an important learning process as industrialized nations of the world embrace the unique energy resource of sunlight through increased technical and installation expertise timely positioning building-integrated photovoltaics as a viable World Trade Commodity of the 21st Century.

Rules of the 100 Headrick Solar-Voltaic Dome Power Station By 2000 Program

Everyone is a Winner! Share projects at local and international conferences.
100 to be built in primary borders of each nation.
Diverse locations: 2 each state of United States.

51% in each nation to be grid-connected with at least 25% stand alone sites.
Assure open access to PV incentives for equal opportunity and fair competition.
Comply with city planning, zoning and building code laws. Design for aesthetics.
Projects will be monitored for a ten-year period to evaluate products and issues.
Please provide Program Reports to the Solar Development Cooperative quarterly.
Projects will ideally be $1-5 million self-supporting proformas w/payoff in 5-7 years.
Develop a market inception plan similar to this one describing specific projects.

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Honorable Representative

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Although, I had written about evolving a competition at the conference in Nice, France October 1995, my WRENIV paper was to formally announce the Three-World-Powers BI-PV competition with ceremonial signing of the treaty by the US, EC and Japan. The plan was to use this particular focus as an international effort to dramatically reduce the price of photovoltaics across the market. Colleagues I had met in Cairo attended this conference and secured me for a Sunday sight seeing tour around the Denver area.

The day I arrived in Denver there was a man on the shuttle from the airport who introduced himself as a specialist in solar closets. He briefly explained what a solar closet was. I shared with him that my specialty is building-integrated photovoltaics [BIPV]. He immediately insisted that was a waste of time because PV was not market ready or affordable. I shared with him some reasons I didn’t share his convictions and that the paper that I was presenting provided a deployment scheme that would reduce the price of photovoltaics across the nation and around the world by the year 2000.

When I arrived at the Adam’s Mark Hotel, it was difficult to find economic accommodation near the hotel. One of the conference managers suggested I share a room with another Conference attendee. After calling around, I made arrangements to share with a lady, but she would not be there until the next day. There was a seminar on Women in Sustainable Energy the next morning at 8 am. We would meet there. When I couldn’t come up with an alternative for one day, I asked the concierge for ideas. He suggested that I sit up in the lobby until the next day. That was quite
feasible. I had papers to read and some writing to complete. I had done this in Cairo the night I arrived and it was a great experience. Being in the United States, I would have expected it to be less of a problem than in Cairo.

Everything went fine until around 4:30 am when the Solar Closet man suddenly appeared from an elevator in the lobby in his pajamas and started straight for my table. It was a rather awkward situation and I indicated that I was really busy making final edits to my paper to be presented at the conference. He again claimed I was wasting my time insisting the price of photovoltaics was too high. He got quite loud. I tried to excuse myself from the conversation, and thought it was very strange that he had come to the main lobby in is pajamas. He was a middle class middle-aged American Caucasian man, and it seemed he was intent upon causing me trouble. Just as I was excusing myself to go and talk to the concierge who had generously provided a soda earlier in the evening the security guard for the hotel came over and asked if there was a problem. I indicated that I was reading when the man came and started talking to me and that he was quite agitated. It was really too early in the morning to be engaged in a debate as he was suggesting. The man again insisted that photovoltaics was not affordable and went on about how he was trying to help me make better use of my time. He was very agitated. The guard asked if I had a room at the hotel, and I shared with him my situation and the fact that the concierge had instructed me to sit in the lobby where I could work on my paper until morning when I was to attend the Women in Sustainable Energy seminar at 8 am that morning. There I was to meet a lady and would make arrangements for my room for the rest of the week.

The guard indicated that I would need to leave the hotel until 7 am if I was not a paid guest even if the concierge had instructed me to stay in the lobby. I indicated that I would be glad to do that, but I did not know where I could go at 5:00 am in the morning in downtown Denver. I asked if there was a restaurant nearby. Since 11 pm I had sat there without a problem until the solar closet man came down to the lobby in his pajamas and started harassing me. The guard claimed that my asking about a restaurant was resisting an order to leave the premises and indicated that he was going to call the police and have me arrested. Downtown Denver is not an easy place to navigate even in broad daylight. There are a number of homeless people, prostitutes and persons on drugs in that area of Denver. I didn’t want to unnecessarily put myself at risk. I said if it was that much of a problem for me to be there for another hour and if there were no suggestions on restaurants where I could go until 7 am, I would try to find somewhere to have breakfast myself. I was not familiar with downtown Denver. He said it was too late I was not allowed to leave. An officer would arrest me soon as the police station was across the street.
The officer came and I explained my situation. By that time it was around 5:30 am, the solar closet man was still standing there in his pajamas insisting that if I would just abandon my efforts in photovoltaics my time could be better spent. I again offered to go to a restaurant if they would direct me in that regard and reminded them that I was scheduled to attend the Women in Sustainable Energy Seminar 7:30 am. The officer claimed that a complaint had been made about my being in the lobby and that the guard had filed charges against me for trespassing, and that I was going to jail. The concierge that had provided me permission to work in the lobby until morning had gone home around 2 am. At about 6:00 am the police officer handcuffed me and led me to the police car. As we drove away, he indicated that if I would just do the right thing, that I wouldn’t need to go to jail. His motions indicated he was soliciting oral sex. I said that I just didn’t know what the right thing was. I reported his solicitation to the officer that met us. He said to stay with him, and likely I wouldn’t be there long.

The jail situation was extremely stressful with over twelve women in an 8’ x 8’ room with one bed and one toilet. Most of the other people there were ill, drunk or on drugs and a few were highly agitated. I don’t take any drugs or drink alcohol. I don’t even drink coffee. I was extremely concerned at the way I had been treated. The room had no airflow and it felt like one might suffocate, especially, during the day, as the hot summer sun beat down into a full wall window with little relief. I tried to eat, but the food was terrible. I drank water to keep from getting dehydrated and reduce stress.

After 21 hours of pure hell my attempts to reach the Conference chairman who had not answered or returned my calls finally paid off. A guard indicated that a Mr. Noon from the Department of Energy had come and posted $100 bail at midnight and indicted I would be released by 2 am.

So, here it was a day later, I had missed the Women in Sustainable Energy Seminar and the colleagues from Cairo I had promised to take sightseeing were no doubt wondering what had happened to me. I was in a worse situation than when the solar closet man and the security guard decided to give me a hard time. It was strange that the solar closet man was not arrested even though he was wandering the hotel in his pajamas harassing women. The G in guest stands for good person. I wondered if his alleged business selling solar closets had more than one meaning. I went to the hotel and the same concierge that had instructed me to sit in the lobby was there. I told him what had happened and he was shocked and concerned for my safety. He said that it sounded very unusual. He had not been told. It felt like organized crime with an undercurrent tinge of terrorism.
He mentioned that it was odd they would let me out in the middle of the night instead of releasing me during the day. I told him I didn’t want to get into trouble and asked if there might be a restaurant where I could sit until dawn. He suddenly remembered that there was an all night restaurant about six blocks away. He hadn’t suggested it the night before, he said because it can be dangerous walking in downtown Denver at night and he really didn’t expect it to be a problem. I walked to the restaurant and called him to let him know I had arrived ok. That was June 18, 1996 as I remember it is the birthday of a good friend of mine. I had called her collect out of state from the jail to ask her to please call the hotel and insist that the conference chairman respond to the situation, immediately before I die from lack of air and miss my speaking engagement at the conference.

I called to let her know I was safe and though shaken would present my paper the next day. After going to a brief court conference with an attorney the Department of Energy had retained wherein the charges were dropped, a DOE attorney took me to lunch. I got my room figured out and slept the rest of the day. I gave my talk the next day, but had to pat my chest a few times as it was an emotionally charged event for me. There was no cooperation to facilitate the proposed treaty signing to initiate 100 Headrick Solar-Voltaic Dome™ Power Stations by 2000 Program. Was the arrest an attempt to suppress this program? Probably!

At that time, I did not understand oil cartels had taken over own 95% of the photovoltaic manufacturing worldwide. I traveled with limited resources on many occasions and had not had any problems. In Cairo, my sitting up reading in a café in the lobby of the hotel was invited. They spoiled me with fresh tea and good cheer every hour or so topped with a delicious breakfast.

On June 19th I spent most of the day at the Asia-Pacific Economic Cooperation [APEC] Renewable Energy Business Development Workshop. I missed the first day of presentations. This was APEC for renewables in lieu of OPEC, however oil cartels, utilities and government dominated the agenda. Mark J. Riedy, Esq. introduced one of my favorite seminars entitled Legal Issues in Financing Renewable Energy Projects. He discusses “BOO” financing an acronym for Build, Own and Operate. If poverty level citizens of developing nations are allowed to use BOO financing for do-it-yourself electric systems, surely Americans should have ready access to ‘BOO’ financing. The program he described involved bidding and negotiation. If global consumers want to own a demand-site renewable generator, they should be allowed ready financing with this financial BOO-ing rather than the type of booing provided by energy cartels and utilities in proceedings.154

Private sector participation in the financing of renewable energy projects in the developing world can occur in a variety of ways. Among the most frequently implemented schemes are: a government’s sale of an existing utility to private interests; build-own-operate [“BOO”] strategies, by which a government awards a concession, through pure negotiation or following competitive bidding, to a private party to build, own and operate a renewable energy facility; and build-own-transfer [“BOT”], where the ownership of the facility, after construction by the investor, is transferred to the power-purchasing utility after a specified period of operation. There are, of course, as many variations on these general themes as there are projects.

Where well-educated financially independent American consumers of renewable distributed generation systems are not being paid their buy-down reservations, then it is idealistic to think corporate and government agencies are going to respect the rights of impoverished illiterate consumers in developing nations. So, who is protecting the rights of consumers in developing nations living at poverty levels and above? In a later chapter I share with you a story about Clint Eastwood one of our favorite legendary motion picture stars that bought a solar system. He was granted a buy down rebate reservation, and Net Metering, but the incentives were not facilitated. He had to call a meeting with the Governor of California. Not even wealth, prestige and popularity swayed the energy agency conscience. That is why we need Neighborhood Energy Watch Groups whether it is to encourage timely repair of electric wires or getting a renewable rebate; consumers must coordinate their efforts to mediate related matters. I visited the Solarex Corporation the day of the Million Man March in 1995. If such an effort can be coordinated, then American consumers can surely organize themselves to reduce the risk of extorted electric prices and suppressed technology. Technologies in the APEC funding programs include Biomass, Wind Energy, Photovoltaics, Solar Thermal Generators and Water Heating, Hydro Electric and Geothermal Energy. This photograph is of the National Headquarters of the Sheet Metal Builders Association in Alexandria, Virginia.

I met with several people at the Association and I proposed converting this non-functional roof designed as a solar thermal generator to BI-PV. The initiator of the project had retired.
Photovoltaics is one of the fastest growing renewable energy resources in the world. More than 84 megawatts of modules were manufactured worldwide in 1995. That is the year, I published the Solar Development Cooperative’s 15-year $4 B business plan to install 700 MWp by 2010 or around 45 MWp a year. Lack of appropriate PV production levels makes this goal nearly impossible even ten years later.

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(714) 721-9116

July 8, 1996

Eileen Smith
Box 719
Washington D.C.
20044-0719

Dear Eileen:

I have been given information by Robert Dagenais at TENCOR that an architectural firm has now the contract to design the Union Station facilities in Kansas City MO.

They are: Keyes, Condon and Florence, architects in the Washington, D.C. area. Robert states that they intend to use a dome. He does not know if it is photovoltaic or not...

It would be an appropriate time to contact them and give them some of the material you have generated.

Lots of luck! Let me know.

I am still fighting off my illness which makes it very difficult to type, write or use the computer.

My best,

Richard

Richard T. Headrick

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HEADRICK TECHNOLOGIES INCORPORATED

HEADRICK SOLAR-VOLTAIC DOME™

Abstract

The Headrick patented system consists of a DOME which is of marine aluminum configured in a modified planar geodesic construction. The planar feature provides easily positioned concentric and parallel planes of RING RAILS at several levels on the dome. On this rail system rides a SPACE FRAME supported by POWERED BOGEYS (wheel system) and carrying pre-wired SOLAR ARRAY PANELS at angles and in accordance with a configuration in the subject patents and a continuation in part therefrom.

The array consists of large numbers of PHOTOVOLTAIC MODULES which generate power in the DC form and which are in SERIES and PARALLEL so as to multiply voltage which may be used in that form or may be processed by INVERTERS into an AC form compatible to the AC form of a power grid to which the VOIED ELECTRICITY may be sold and re-purchased in the hours of darkness. DC voltage may also be retained in a BATTERY to be used during darkness hours.

A unique feature of the Headrick array system is its THREE ANGLES, 60°, 45°, and 30° to the horizon. This forms an effective combination which makes the solar dome insensitive to latitude locations with electrical production in Norway only about 24% less than at Miami.

The solar dome system is not tied to a specific PHOTOVOLTAIC CELL. Therefore the lowest cost cell with relatively high efficiency may be used. The existence of the SOLAR-VOLTAIC DOME technology will generate competition among photovoltaic cell manufacturers, thus reducing cost.

DOME ELECTRICAL EFFICIENCY is based on an array which is 61% of the footprint and a PACKING DENSITY between four and five times as great as industry standards [60 KW (peak) per acre]. ECONOMIC ADVANTAGES include use of the DOME INTERIOR for lease income for a variety of possible types of clients.

The HEADRICK SOLAR-VOLTAIC DOME ADVANTAGE is most apparent in areas of the world with high energy costs but may also be used in the UNITED STATES effectively. The system BRINGS DESERT TEST FARMS to the city in a form that concentrates real estate use. Electrical production PARALLELS DEMAND WHERE THE DEMAND IS GENERATED.
SOLAR DEVELOPMENT COOPERATIVE
Lighting the Way With Creation’s Original Remedy

JOIN THE BUILDING-INTEGRATED PHOTOVOLTAICS (BI-PV) CHALLENGE, TODAY PROSPER AS AN INDUSTRY LEADER

Over 2000 BI-PV Roofs Installed in Germany 1993-95! 100,000 PV Roofs Proposed!
BI-PV Building Walls & Roofs Create Economic - Clean ElectriCity®!
PV Production Price $500 Watt in 1972 Reduced to $5 Watt in 1990!

8:30 am to 4:30 pm Sunday the 6th day of October, 1996
Georgetown University Conference Center
Washington, DC

WORKSHOP FOR PROFESSIONALS
Architects - Engineers - Developers - Builders
$80 Workshop Registration & Workbook Fee Due October 1st
Approved Provider by AIA for Architect’s Continuing Education Credit
Limited Number of Late & On-Site Registrations Available for $100

Historic Overview of Energy & Photovoltaic (PV) Technology
Economics of Mainstream Deployment of Building-Integrated PV Products - Design - Pricing - Warranty - Service - Accessibility

Lunch On Your Own

Georgetown InterCultural Center - Post Occupancy Review
Walking Tour of 300kWp Demonstration Project BI-PV Completed in 1984
The Advent of the Headrick Solar-Voltaic Dome Power Station 262kWp

SDC proposes 35kWp Standing Seam Roof for Outdoor Canopy of Historic Eastern Market in DC
Jim Young, Marketing Director w/United Solar Systems Corporation presents:
BI-PV Standing Seam & Batten Roof - Townhouse Demonstration in Bowie, Maryland

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ISBN 09741412-9-1
Upon my return to Washington, DC from the World Renewable Energy Congress IV, I began organizing a solar energy seminar for architects in the area. The course was approved for continuing education credits at the National Headquarters of the American Institute of Architects. There was a tremendous interest in my work and a significant curiosity regarding the suspiciously high price of BI-PV and the lack of PV in the marketplace. DC Architects were interested in seeing more responsible aesthetic BI-PV installations in buildings. There was also an interest to discuss the potential of developing modular solar electric building materials.

I had been accepted to speak at the 9th Photovoltaic Science and Engineering Conference [PVSEC] to be held in November 1996 at the SEAGIA Center in Miyazaki, Japan. I had met a few Japanese scientists at the conference in Nice, France in 1995. We found each other again at other conferences and had great discussions about their new choices in building-integrated photovoltaic colors. They were developing five color variations. Efficiency is minimally affected. Their affiliation with government and investment sources sounded promising as I was becoming increasingly interested in developing a manufacturing and research facility. Thus, I was in the process of writing a paper for PVSEC’s Technical Digest.

The Solarex Corporation and United Solar had both agreed to throw in $500 each to defray the costs for the AIA seminar upfront, in exchange for the opportunity to display, discuss and demonstrate their products to the architects that attended. The architects would get a balanced view of where the industry stood at that time, the products available, the cost and related balance of system components. It was a good niche to share information I was compiling from conferences while making a living as a speaker.

I was excited about putting together viable educational programs and seminars for architects because most of the ones I had discussed the BI-PV with had a limited understanding that there are three kinds of solar energy. They were not aware of the new products or how to integrate them.

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156 Seiji Wakamatsu, Managing Director of PVTEC, 1-22-12 Otowa Bunkyo-ku, Tokyo, 112 Japan
Prof. Kosuke Kurokawa, Dr.Eng., Faculty of Technology, Tokyo University of Agriculture and Technology, Tokyo, Japan and Chief Energy and Information Science Section Energy Technology Division 1-1-4 Umezono, Tsukuba-Shi; Ibaraki, Japan 305
gracefully into buildings. The seminar would include a tour of the Intercultural Center with a special section on the 30,000 SF BI-PV roof led by facility maintenance people who helped install and maintain the BI-PV roof.

Bill Rever a sales associate at the Solarex Corporation had been my primary contact since the first letter he wrote to Solar Doctors in 1994, a solar energy company in Kansas City that had provided consulting information about solar system components for the ECO TECHÉ program at Kansas City’s Union Station. When I called him about the BI-PV seminar for architects at Georgetown University, he indicated he was glad to see such a program being developed and agreed wholeheartedly to the requirements and the date. Then, I called United Solar’s sales agent. United Solar was ready and excited to share their new batten-seam and standing-seam solar electric roofing. Their products were some of the first solar electric building component products to come into the market. The date of October 6, 1996 was set and the location at the Georgetown Marriott was established. Then we would tour the Intercultural Center and discuss the 30,000 SF BI-PV roof with the facilities maintenance crew. The situation looked promising and the nightmares from the harassment I experienced in June began to fade away.

About a month before the Conference, I got a call from Bill Rever indicating that he would need to change the date of the workshop due to a time conflict he had overlooked. I rescheduled and indicated that 50% of the $500 fee was due that week so I could pay the deposit on the room. He said not a problem and indicated they were excited about the seminar. United Solar was able to change their date and the Marriott could accommodate the new date, but needed their $300 deposit. United and Solarex were to send the 50% deposit of $250 to me by the end of the week. When I confirmed the new date with Bill Rever he indicated that it was great and that he looked forward to the seminar. The next week Bill Rever called and indicated the second date was not going to work. I asked if there was some problem. He said, “I just don’t want United Solar on our territory.” I asked what he meant by that and he said he didn’t have time to explain, but that he was not going to be involved in the seminar at Georgetown University. He then indicated he had to get to a meeting and hung up.

I was a bit perplexed by this behavior and called another person I had met at Solarex, and he said he didn’t have a clue and would try to find out what was going on. I then called United Solar and asked Larry Slemenski why Solarex would not want United Solar at a workshop at Georgetown University. He said that it was likely because Solarex had been suing United Solar since 1993. I asked why would Solarex be suing United Solar. He said that I must understand, that the company was not Solarex, but Amoco-Enron. The lawsuit was one of the reasons United Solar’s batten-seam and
standing-seam roofing had been delayed into the market. There was an alleged patent infringement related to United Solar’s thin film products. I later discovered, Amoco-Enron had used the same excuse to sue Arco Solar out of business from 1988 to 1991. Allegedly Arco Solar had tried to settle the suit, but Amoco-Enron refused. An engineer I met in 1997 said that the attitude in that suit was ‘money was no issue, settlement not an option’.

Mr. Slemenski indicated Amoco-Enron had brought suits against other solar companies in the industry and to research it in the Federal Digest. He apologized for the fact that the seminar was derailed, but wasn’t sure how it could be resurrected. I asked about having it at another location, or to just have United Solar, but the cold shoulder by Amoco-Enron dba the Solarex Corporation threw cold water on United Solar’s enthusiasm. I was still assimilating this new reality. It was exceedingly frustrating for me as they were the primary PV manufacturing companies in the Washington, DC area. The suit didn’t seem to me to be a valid excuse for derailing this important educational forum for architects. Supposedly, it was only a debate about patent rights. What I later found out is that there are only a handful of manufacturing companies worldwide and most of them are owned and/or controlled by oil cartels and large multinational conglomerates. Most of the original founders or scientists had been taken over or sued out of business.

If Amoco had not taken over the Solarex Corporation in 1984 the year the Intercultural Center was built I wonder what the electricity industry would have been like in 1996 considering how the computer silicon semiconductor industry has grown. In the 1980’s photovoltaics was taken over by Amoco Oil and production was suppressed claiming PV was not market ready or affordable nearly five years after the Jet Propulsion Laboratory said it was market ready and affordable and would be fifty cents a watt by 1986.157 There were no consumer tax credits for computer silicon or PV satellite silicon so focusing on the loss of tax credits is really not a valid excuse to claim BI-PV is too expensive. Antitrust adjudication is necessary where oil cartels and utilities refuse to allow natural market growth. This is not good or bad, it is a fact. It is why in 1890 we legislated the Sherman Antitrust Act.

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Technical Characteristics and Benefits of the
Advent of the Headrick Solar-Voltaic Dome™ Power Station

100 Headrick Solar-Voltaic Dome™ Power Stations By 2000 Program
A Three-World-Powers Competition of Discovery & Sharing
United States - European Commission - Japan

Published In Technical Digest - 9th International Photovoltaic Science and
Engineering Conference - SEAGAIA Convention Complex Miyazaki, Japan
November 11-15, 1996

ABSTRACT

Photovoltaics is a proven technology, today. The Utility PhotoVoltaics Group estimates that if the cost of a complete photovoltaic system fell to $3 per peak watt, a viable market—approximately 9,000 megawatts—would develop. PV modules cost $5 per watt in 1990, down from $500 per watt in 1972.[3] The Headrick Solar-Voltaic Dome(TM) Power Station provides significant benefits as a commercial solar configuration increasing packing density on an acre up to 4.5 times from 60 kWp on the Hesperia field to 262.5 kWp for a 208.7' dome structure. As the building-integrated photovoltaics (BI-PV) industry evolves into a primary energy resource, packing density will become a significant issue in BI-PV design. We will review the technical drawings and specifications of this invention, and the many ways it may be integrated into urban and rural sites providing grid-connected and stand-alone energy for schools, hospitals, and stadiums. We will explore the benefits of a mid-size stand-alone dome power station integrated into hospitals for disaster relief.

Dual Value Costing Formulas for BI-PV

One of the most important break-throughs in PV economics is the substitution of solar walls for traditional wall materials on a building facade or roof. While this may not be as efficient as more sophisticated PV collectors, it represents the most practical application of PV modules because of their durability as a building material, and the cost savings factor in replacing an existing structural wall coupled with real electricity production.

United-Solar has developed a new Standing-Seam Roof that looks just like a regular roof. As BI-PV technology establishes its reliability, aesthetic integration will sell a BI-PV product more rapidly than any other factor.

NOTE: Since this paper was written, I have discovered these batten-seam rooftops are priced the same as regular batten-seam roofs at $50 SF installed. They have a ten-year warranty, and produce 6 W per SF. That is value you can count on. If we can get them out of the science laboratory -
the patent dispute courts and into the marketplace, there is a viable economic product for consumers, today.

PVTEC in Tokyo have begun expanding on the *aesthetics valuation* factor using beautiful PV panels to replace building walls with colorful mosaics that produce energy. BI-PV has several costing factors not just energy. While other energies have a variety of *externality expenses*, BI-PV have a variety of *externality values*.

**BI-PV Externality Value Factoring**

*Building wall replacement factor + aesthetics factor + clean sustainable energy factor + ease of integration into existing industries actor + low maintenance factor = Externality Value Factor.*

**Consumer Laboratory**

The last, and most important issue we need to address in our BI-PV economics study is the *consumer laboratory*. The most critical and self-supporting scientist is the consumer. BI-PV is a ripe technology, today. The tremendous lessons learned in installing over 2,000 PV roofs in Germany could never have been learned in a science laboratory. The BI-PV consumer laboratory will save millions of dollars from being wasted in redundant research while increasing production levels, technology expertise and use of clean energy, today. Computers, automobiles and telecommunications are examples where private industry and research within the consumer laboratory have refined products at a tremendous rate while reducing the costs to the consumer. A new model of car is a delicate balance between industry and consumer testing.

3. **The Headrick Solar-Voltaic Dome(TM) Power Station Pattern Book for Architects and Engineers.**

To accelerate the introduction of this important solar configuration into the mainstream marketplace, we are in the process of compiling a design and construction manual for the Headrick Solar-Voltaic Dome(TM) Power Station. The Solar Development Cooperative recommends these five design sizes:

<table>
<thead>
<tr>
<th>TITLE</th>
<th>BI-PV ARRAY</th>
<th>kWp</th>
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<tbody>
<tr>
<td>12' Gazebo</td>
<td>38 SF</td>
<td>450 Watt peak</td>
</tr>
<tr>
<td>30' Monticello</td>
<td>475 SF</td>
<td>6 kWp</td>
</tr>
<tr>
<td>100' Economy</td>
<td>5,233 SF</td>
<td>65 kWp</td>
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<tr>
<td>208.7' 'Headrick</td>
<td>21,000 SF</td>
<td>262 kWp</td>
</tr>
<tr>
<td>300-400' 'Deluxe</td>
<td>42,000 SF</td>
<td>525 kWp</td>
</tr>
</tbody>
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These five dome solar array models will provide a tremendous opportunity for a variety of clients to utilize the already known and proven benefits of the Headrick Solar-Voltaic Dome(TM) Power Station. Ten designs chosen from our 1998 International BI-PV Design Competition entitled: FROM DOOMSDAY TO DOMESDAY will be included in the Headrick Solar-Voltaic Dome(TM) Power Station Pattern Book for Architects and Engineers. This book will include design drawings as well as summary construction drawings to educate the profession and their clients about the ease of construction, variety of uses and the many design benefits of the Headrick Solar-Voltaic Dome(TM) Power Station.

Richard T. Headrick
LT COL. USAF (Ret.)
5200 Irvine Boulevard, Sp. 24
Irvine, California 92720
(714) 731-9118
November 4, 1996

To the Officials of the
INTERNATIONAL PHOTOVOLTAIC SCIENCE and
ENGINEERING CONFERENCE, Nov. 11-15/1996
Miyazaki, Japan

Gentlemen:

Ms. Eileen Smith has been invited to address your conference as a speaker reporting on our Solar-Voltaic Dome tm. She has our permission to discuss this design with the conference. The material is covered by U.S. and foreign patents issued and applied for.

Thank you for the honor of inviting her for this subject report.

Sincerely,

Richard T. Headrick
Lt. Col. Richard T. Headrick
Inventor.