SWC50-The Century of Solar Celebration Newsletter – June 2021

This month we provide

- A brief overview of solar research and applications in the 1980's; and
- A focus on Israel
- A special announcement about **SWC 2021**

The overview of solar in the 1980's provides some key highlights taken from the booklet:
ISES SWC50 The Century of Solar Stories and Vision Booklet

For more highlights, please refer to the booklet or the ISES Solar Energy Museum – Past, Present and Future

ISES 1980's

Significant events in the history of ISES in the 1980's include:

- In 1980 the ISES Board decided that the SWC would occur every 2 years.
- In 1983 the Achievements through Action Award - in memory of Christopher A. Weeks was established to encourage young professionals in solar. The first award went to went to the Solar Energy Lab University of Madison, USA (Jack Duffie and Bill Beckman)
- In 1985 the 1985 Solar World Congress, Montreal, presented a new congress format which now included posters.
- In 1986 a members' survey indicated the following distribution: engineers (57%), physicists (17%), architects (8%) and chemists (4%) with most working in education and research.
- In 1989, the International Association for Solar Energy Education (IASEE), an ISES working group, was started.
- Numerous country sections were formed during the 1980's.

ISES Presidents in the 1980's

Years	President	Country
1980	W.W.S. Charters	Australia
1981-83	Harry Tabor	UK, Israel
1983-85	Wal R Read	Australia
1985-87	William A. Beckman	USA
1987-89	Corrado Corvi	Italy
1989-91	Doug Lorriman	Canada

What is SWC50 – The Century of Solar?

In 1970 solar research pioneers met at the first International Solar Energy Society (ISES) Conference in Melbourne Australia. ISES commemorated in 2020 this first Solar World Conference with a special 50th Anniversary Virtual Conference, called the Solar World Congress at 50 (SWC50).

During these past 50 years solar energy has grown from being emerging technologies to a vibrant industry. The Century of Solar highlights the transformation in the global energy sector that has taken place since the first Solar World Congress in 1970 and looks forward to the next 50 years when solar energy will be a major cornerstone of the global energy system. While the focus of the Century of Solar is on the evolution of solar energy, the importance of other renewable energy sources working together to reach the 100% renewable energy world goal will be a central theme.

SWC50 - The Century of Solar is about the people: researchers, industry players, policy makers, and leaders of NGOs and Non-profit organizations who have all contributed to make solar energy the fastest growing contributor to new electricity capacity.

SWC50 Programme 2021: August 2021 Webinar on Transforming the Air, Sea and Land Freight Transport Sector.

Conferences and Meetings 1980's

Year	Location	Overview
1981	Brighton UK	Theme: *Solar Technology in the Eighties* 1,700 participants, and 100 displays
1983	Perth Australia	1,000 participants (60 countries), 560 papers and 87 industry exhibitors from 15 countries
1985	Montreal Canada	Intersol 85 1,100 participants
1987	Hamburg Germany	Theme: *Advances in Solar Energy Technology* 1,700 participants (54 countries), 900 accepted papers, large exhibition
1989	Kobe Japan	Theme: *Clean and Safe Energy Forever* 700 participants (54 countries), 450 oral presentations and 150 Posters. Solar car and solar boat display with first Japanese Solar Boat Race being held.

Photovoltaics' 1980's

The price of PV modules continued to drop, and the applications of PV continued to grow through the 1980's with the first large scale grid connected systems being installed and the installation of the first system over 1MW. Solar powered aircrafts are demonstrated, and solar car races started in countries like Australia, Switzerland and Austria. Manufacturers' merge or are bought out and some early ones disappear.

Significant events in the history of PV in the 1980's include:

- In 1980 **ARCO Solar** became the first solar company to produce more than 1 megawatt of photovoltaic modules in one year.
- In 1980 **IEC at University of Delaware**, achieved 10% efficiency for the thin-film solar cell using copper sulphide/cadmium sulphide.
- In 1981 Dr Paul MacCready (founder of AeroVironment in 1971) along with support from other engineers at AeroVironment designed the solar-powered aircraft "Solar Challenger". On July 7th the "SolarChallenger" flew from France to England across the English Channel. The aircraft had over 16,000 solar cells mounted on its wings, which produced 3,000 watts of power.
- In 1982 the first, photovoltaic megawatt-scale power station went on-line in Hisperia, California. It had a 1-megawatt capacity system, developed by **ARCO Solar**, with modules on 108 dual-axis trackers.
- In 1982 Australian Hans Tholstrup (and support driver Larry Perkins) drove a solar-powered car - the QuietAchiever – 4000 Kms between Perth and Sydney in 20 days. Tholstrup was the founder of the "World Solar Challenge" in Australia, considered the world championship of solar car racing.
- In 1985 The **University of South Wales** breaks the 20% efficiency barrier for silicon solar cells under 1-sun conditions.
- In 1985 the first **Tour de Sol,** was held in Switzerland.
- In 1998 the Dye-sensitized solar cell was created by Michael Grätzel with support from Brian O'Regan (chemist). These photoelectrochemical cells work from an organic dye compound inside the cell.

Solar Thermal 1980's

Key points from the IEA SHC data:

- For the 1980's the IEA SHC has data from Australia, Austria, Canada and the USA.
- Austria was installing a few evacuated tube collectors however this represented less than 0.06% of the total installations in 1980 with the highest contribution in the decade being 0.22% in 1988.

Other significant events in the history of Solar Thermal in the 1980's include:

- In 1980 the USA Solar Rating & Certification Corporation (SRCC) was founded as a non-profit by industry associations and a national consortium of U.S. state energy offices and regulatory bodies.
- In 1980 ISO TC180 Solar Energy first met. Standards Australia has maintained the secretariat since that time. 19 standards have been published by ISO TC180 and its subcommittees.
- In 1982 **t**he first-ever large scale ground-mounted Solar district heating system began operating in Torvalla, Sweden. It was a 2,000 m² collector field operated by Östersund Energi between 1982 and 1992.
- From 1982 to 1984, Geoffrey Harding of the University of Sydney and Prof Zhiqiang Yin from Tsinghua University Beijing worked on the development of selective surfaces for evacuated tubes. Prof Yin also worked with Dr Graeme Morrison at the outdoor test facility at UNSW.
- In 1984 Al N/Al solar selective absorbing coating making by single-target magnetron sputtering was completed by Prof. Zhiqiang YIN from Tsinghua University, which created the industrialization of all-glass vacuum tube solar collectors in China.
- In 1988 an agreement between Greece and Germany leads to the Solar Village in Lykovryssi intended for 435 families. Its main goal was to demonstrate the feasibility of energy conservation as well as the utilisation of low temperature solar systems for space heating and heating of domestic hot water.
- The **Oberburger Sonnenhaus** (solarhouse) was built in 1989, it supplies a house with 100% solar energy for heating, hot water and electricity all year round. The system consists of 84 m² solar thermal collectors, PV 48 kW and heat storage of 118 m³.
- In 1989 David Mills and Qi Chu Zhang modelled and created examples of Ge surfaces in the Dept. of Applied Physics at Sydney University Australia and also performed a more general simulation showing that surfaces using two uniform cermet layers of different refractive index could perform as well as Ge. These would be thinner and able to use cheaper materials such as stainless-steel carbide.

CSP 1980's

Significant developments included were:

- In 1980, the first Australian Solar Thermal Power Station was built at White Cliffs. The fourteen 20m^2 dishes made superheated steam to drive a single phase 37KVA alternator to produce power for the town.
- In 1981 the two IEA CSP's installed in Spain begin operation.
- In 1982 Solar One, a 10 MW power tower with thermal energy storage using oil and rocks, supported by US Department of Energy (DOE) and an industry consortium, began operation.
- Between 1984 and 1989 SEGS 2, (30 MW trough plant), SEGS 3, to 7, (each a 30 MW trough plant) and SEGS 8 and 9, (each 80 MW) all begin operating.

Solar Architecture/Buildings 1980's

Significant developments included:

- In 1989 the IEA SHS Cooling Task 13 on Advanced Solar Low Energy Buildings started and finished in 1996 with a final symposium at Eurosun 96. The objective was to advance solar building technologies through the identification, development, and testing of new and innovative concepts which have the potential for eliminating or minimizing the use of purchased energy in residential buildings while maintaining acceptable comfort levels. In the end, eleven of the member countries constructed a total of fourteen experimental buildings.

PV in Developing Countries 1980's

The PV industry is slowly growing along with the interest in providing solar power to unelectrified people around the world. However, individuals begin to investigate how to overcome the need for upfront capital. During this decade Kenya's reputation becomes known globally as one of the active commercial markets for sales of solar home systems and for this reason these highlights show the growth there. Many studies were undertaken about Kenya particularly during the 90s. Multi-lateral and bi-lateral donors' interest in solar projects started to grow.

Other significant developments included:

- Between 1980 and 1989 **G.I.E Solar** (see 2021 SWC50 Newsletter) installed 3300 SHS such that by 1987, 50% of electrified houses in French Polynesia ran on solar power.

- In 1981 **NASA LeRC** built PV systems for vaccine refrigerator power and by 1984 had supplied systems to 30 locations around the globe.
- One of the fastest growing markets for solar home systems was Kenya.
    - In 1982 Ex USA Peace Corps worker Harold Burris establishes **Kidogo Systems**, a solar retail business, in Machakos, Kenya.
    - In 1984 Mark Hankins was a USA Peace Corps teacher at a high school without power and he met with Harold Burris which led to solar being installed on the school and some houses. This convinced Hankins on solar and to this day he is still promoting solar in Kenya.
    - By end of 1989 there were over 10 companies operating in Kenya.
- In 1984, Richard Hansen travelled to the Dominican Republic with a solar photovoltaic panel under his arm. He demonstrated the technology to rural families. This resulted in the first installation of an appropriate solar PV system combined with a micro-credit payment plan. In September 1984, Richard incorporated **Enersol Associates**, **Inc**. a Boston based non-profit organization to introduce solar technology in developing countries through technical assistance for local solar technicians and NGO credit programs.
- In 1986 Pradip Jayewardene, Viren Perera and Lalith Gunaratne started **Power & Sun (Pvt) Limited** in Sri Lanka. At one stage they were assembling solar modules with imported cells. The company changed to Solar Power and Light company which was purchased by Shell Solar in 1999.
- In 1986 the EU commission started the Regional Solar Programme in West Africa. This program installed:
    - 626 PV water pumping systems in nine West African countries
    - 660 community systems installed for lighting and cold storage.
    - Total of 1,257kW of PV were installed by 1996.

For more highlights, please refer to the ISES SWC50 The Century of Solar Stories and Vision Booklet or the ISES Solar Energy Museum – Past, Present and Future.

Focus on Israel

In the 1930s and 1940s Dov Ashbell, Professor of Meteorology at the Hebrew University of Jerusalem (HUJ) and Nathan Robinson, Professor of Physics at the Technion—Israel Institute of Technology in Haifa, published works related to solar energy.

In 1948 the Research Council of Israel (RCI) was established and in 1949 Harry Tabor, an applied physicist with industrial experience from the UK arrived. He was given the "physics and engineering" desk of the RCI, which included the task of setting up a national physical laboratory (NPLI). He received many proposals on how to use the sun and decided to study the literature that was available which led to learning about solar water heaters. This led him to the concept of black surfaces that were not black bodies in the thermodynamic sense, which he called "selective black surfaces". Dr Tabor demonstrated his new collector at the at the First World Symposium on Applied Solar Energy, Arizona (1955).

Harry Tabor with a flat-plate selective-surface steam generator at the "Sun at Work" exhibition at Phoenix in 1955 (Source: The 50 year History of ISES)

The NPLI continued with research in the area of solar energy which included the development of a small organic Rankine cycle (ORC) turbine—with only one moving part, the rotor.

At the 1979 ISES Silver Jubilee Congress in Atlanta, Georgia, an ad-hoc Israeli delegation consisting of Harry Tabor and Gershon Grossman presented to the ISES Board a proposal to hold one of the next ISES congresses in Israel. The presenters were greeted warmly, but were told that only countries with an ISES section could be hosts to an ISES Congress. This information was passed on to the solar community in Israel and, following organizational efforts, the Israeli Section of ISES came to be. The inaugural meeting was held at the Petroleum Institute building in Tel Aviv on December 17, 1979, attended by over 50 solar energy devotees. Harry Tabor was elected chairman and Gershon Grossman as the first secretary of the Section. The Israel Section of ISES had 30 members at its inception.

It was 20 years later before Israel would host a SWC.

ISES Presidents

Harry Tabor was president of ISES in 1981-1983.

ISES Solar World Congresses

The 1999 Solar World Congress was in Jerusalem, Israel with the theme: *Solar is Renewable.*

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Sample of Pioneers Pre-1980

Each month this newsletter will have a sample of people involved with renewable energy prior to 1980. It is impossible to cover the thousands who have contributed to the development of renewable energy prior to 1980 in this monthly newsletter. What is included in each newsletter is just a snapshot of those involved. Those included in the newsletter are either taken from, or will be included in the next edition of the SWC50 celebratory booklet: *The Century of Solar-Stories and Visions.*

Dr. Harry Zvi Tabor

In 1949, David Ben-Gurion, Israel's first Prime Minister, invited Harry to move to Israel to create the National Physical Laboratory (NPLI). While there he invented the 'selective solar surface' and was the 'father' of the solar collector industry in Israel. In 1961, together with Lucien Yehuda Bronicki, he developed the low-temperature Organic Rankine Cycle turbine (the Ormat turbine). This could operate efficiently at the temperature achievable with a flat-plate solar collector and turn a generator for electricity or a water pump. In 1966 a demonstration unit was set up in Mali, but there was no infrastructure for its maintenance. Harry also did a lot of research on solar ponds. He asserted that the Dead Sea would be an ideal 'solar collector'. Harry was one of the founders of ISES. He was a long serving member of the Board and was President of the Society from 1981-83. In 1981 UK-ISES hosted the ISES World Solar Forum in Brighton. This was the occasion when Harry was awarded the Farrington Daniels Award.

Dr. Rudoplh Bloch

Dr Rudolph Bloch was the Director of Research of the Dead Sea Potash Works. During his work he noticed a temperature inversion in the evaporation ponds that he associated with a salinity gradient which stopped convection and lead to higher temperature at the bottom. In 1948 he registered a British Patent for a solar pond acting as a solar collector. Nobody was interested in it and only in 1954 he broached the idea to Harry Tabor who then started a serious research which lead to the construction of a number of ponds culminating with a power station of 5 MW built in 1982 by Ormat, which operated it for 7 years, but was decommissioned when the oil prices collapsed.

Lucien Bronicki

Mr Bronicki stated his research in 1956. In 1964 the solar program at the National Physical Laboratory was terminated and Bronicki received a license for his patent and established Ormat Turbines Ltd. to continue the R&D and commercialize his invention, the Ormat turbine.
In 1966 the first commercial unit was a solar powered ORC power unit of 600W which powered an electric water pump in Mali, Africa. 1970'- lack of interest in small solar units for remote villages forced Ormat to look for other applications: power for unattended telecommunication repeaters where low maintenance requirements of these units now modified to use kerosene or LPG, made them superior to diesel -generator sets. About 3,000 units 200W to 4kW units were sold. In 1979- after the 1973 energy crisis, renewed interest in solar energy led to the development of a 150kW ORC unit powered by a solar pond followed by a 5MW plant, which operated for 7 years. In 1980's the energy prices dropped forcing Ormat to look again for other applications: this time were MW scale ORC systems for electricity production from geothermal heat sources and industrial waste heat. By 2020- Ormat has built more than 500 modules in the power range of 1 to 40 MW, totalling more than 2,000 MW, largest pure ORC plant is the 100 MW Ngatamariki in New Zealand.

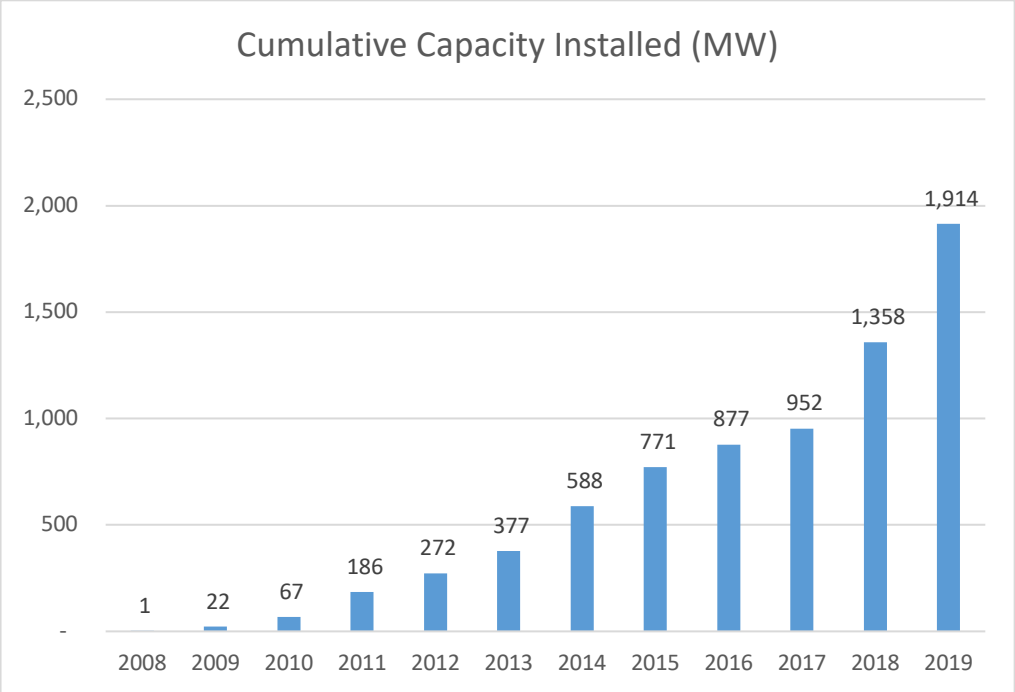
Benjamin Doron

In the early 1950's Benjamin Doron was a assistant to Harry Tabor working on selective surfaces. He designed test equipment, conducted tests, and finally lead the technology transfer to MIROMIT a solar collector company established by Mr. Sobotka. Doron built and tested a vacuum isolated solar collector in 1958 which was industrialized 20 years later by LUZ company and now use 1 thousand MW of solar through power plants as well as Chinese solar water heaters. As assistant to Harry Tabor, Doron built and tested the first lab model solar ponds in 1958. Later in Solmat Ltd and Ormat he was involved in R&D in particular turbidity control. Doron co-authored the U.S.Patents: 4,595,505 (1987) Methods of suppressing growth of algae in solar ponds-

For the current edition of the booklet others from Israel listed in the pioneer's section include:

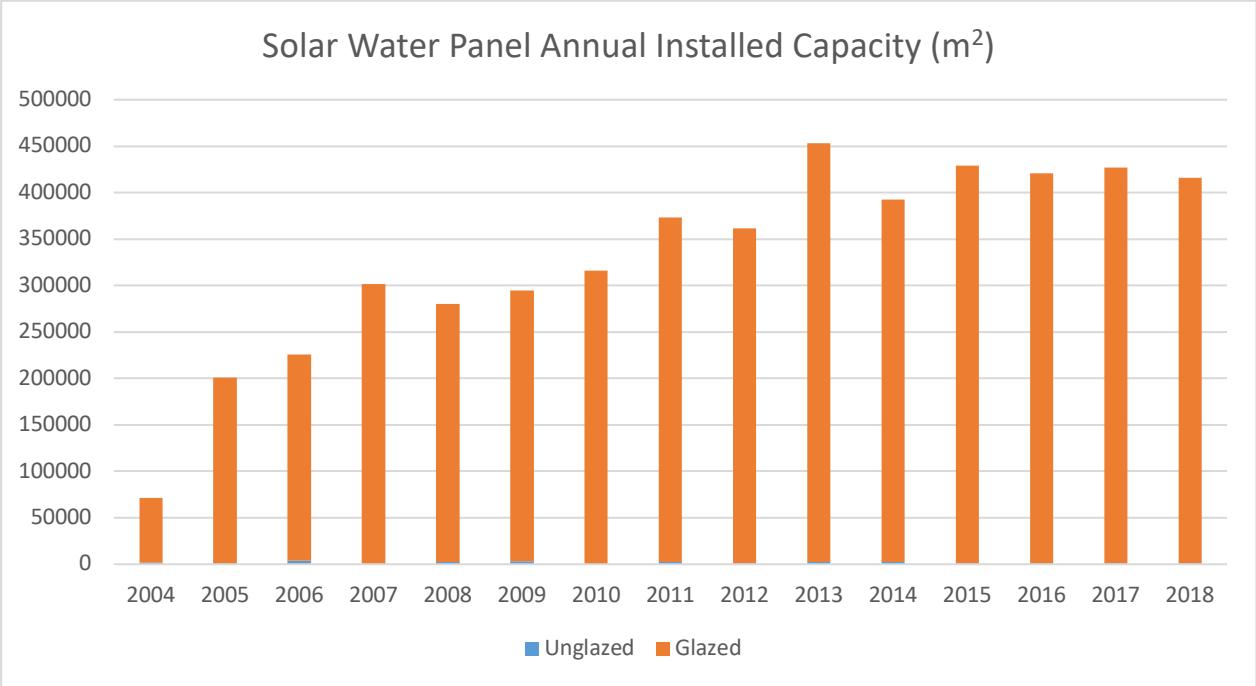
Name	Year Started	Research or Industry
Baruch Givoni	1960	Research
Amnon Yogev	1964	Industry
Gad Assaf	In 1970's	Industry

Growth in Solar
Photovoltaics



Source- IEA PVPS Trends Report 2020

Solar Thermal (Water Collectors)



Source- IEA-SHC Annual Solar Heat Worldwide Reports

Renewable Energy Pioneers

Without the efforts of individual researchers, system designers, system installers, business leaders, policy makers and those within the donor community, the renewable energy industry would not have grown from watts to Gigawatts in the last 50 years. ISES' way of acknowledging the many people was by issuing a call for the submission of Renewable Energy Pioneers to be listed in the celebratory booklet.

ISES will be releasing an updated version of the booklet in December 2021 and therefore **ISES is re-issuing the call for submissions of the names of individuals covering the following two categories**:

1. **Research Pioneers**: Individuals who started their research in 1995 or earlier.
2. **Industry Pioneers**: Individuals who actively started working in or with the renewable energy industry in 1995 or earlier.

Names and information can be submitted here. Individuals can submit on behalf of themselves or on behalf of someone else, in particular for those who might have passed away. (**Note**: If you have previously submitted and are included in the current edition of the booklet, you will be included in the updated edition and do not need to resubmit.)

Partners of SWC50

ISES acknowledges the support provided by the Platinum Partners: GSES from Australia and NREL from USA; Gold Partner: Smart Energy from Turkey.

ISES Solar World Congress 2021

From October 25-29, the ISES Solar World Congress 2021 will take place as an online event and we are looking forward to this first ever virtual Solar World Congress!

Highlight your solar expertise by becoming a SWC 2021 Sponsor!

The ISES Solar World Congresses have been the leading solar congresses for over 50 years - join SWC 2021 and benefit from a truly well connected, divers and enthusiastic solar community from all around the globe!

By joining forces with the International Solar Energy Society, there will be plenty of opportunities for your company/institution to communicate to decision makers, project developers, businesses, researchers and financers of the significant technological advances and commercial successes of solar energy technologies. This engaging and unique setting of the Solar World Congress offers you instrumental reach and networking opportunities on a global level.

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- Strong brand visibility and global promotion campaign before, during and after the congress
- Access to international solar energy experts, including promising young professionals
- Speaking opportunity

Learn more here!