



I-SAEF (Israel Strategic Alternative Energy Foundation)
Empower Israel. Transform the World.

Dear I-SAEF Supporter,

So much has happened since I-SAEF's inception. Who could have known that the modest venture launched in 2008 would go on to have such a significant effect on early-stage alternative energy research conducted at Israel's major universities. With your generous, visionary support, I-SAEF has had a meaningful impact on making the world cleaner, healthier and safer for all people by helping brilliant Israeli scientists discover viable alternatives to fossil fuels. Simultaneously, I-SAEF has helped to stem the "brain drain" of researchers from Israeli institutions, retaining outstanding scientists who so often have been forced to seek positions overseas due to lack of funding at home. I-SAEF has also helped to produce jobs, ensuring that Israel remains the technologically innovative society that merits the label "Start-up Nation."

In 2008, the scientific and financial situation in Israel was very different. There were far fewer opportunities for early-stage alternative energy researchers to pursue their projects primarily due to world economic conditions and Israel's priority to fund security/defense needs. The Israeli government and private philanthropists were reluctant to fund unproven scientific endeavors. There was a major gap in research funding, the infamous "valley of death," a rift preventing bright scientists from proving their concepts and bringing their innovations to market.

How things change. When smart, caring people come together and focus, truly anything is possible.

In 2010, I-SAEF funded two projects. In 2011, four more were added. In 2012, I-SAEF supported eight more game-changing projects, and in 2013, ten highly innovative projects received I-SAEF funding. Each of these 24 research teams got a critical infusion of up to US\$200,000 which goes a lot further than comparable US research costs. I-SAEF assembled a distinguished, independent Advisory Board which was able to select only very consequential early-stage research projects that offered significant advances over existing technologies. I-SAEF's Board included some of the most eminent and accomplished entrepreneurs and researchers in the world, including three Nobel Laureates. Employing best practices from the scientific and business communities, I-SAEF's advisors used a powerful, merit-based process in its grant-making. More than 90 top scientists from 15 countries volunteered to take part in the selection process, providing vitally important peer reviews. Each project was vetted both scientifically and commercially, ensuring that I-SAEF's grants, the contributions of I-SAEF's generous donors, would go only to projects with the potential to have a significant real-world impact once "the valley of death" proof of concept was overcome and the technology was commercialized.

This venture philanthropy prototype proved enormously successful, so much so that three years after I-SAEF's launch the Israeli government started its own Alternative Fuels Initiative patterned on I-SAEF's model. You can learn more about the Initiative by visiting <http://www.i-saef.org/eyal-rosner.html>. Administered by the Israeli Prime Minister's Office, this initiative also focuses on early-stage research with the potential to be commercialized, real-world validation of I-SAEF's prototype and work. The Journal of Energy Security reported on the three research centers supported by this new government initiative. "One center focuses on biofuel and synthetic fuel research, the other on batteries, fuel cells, and energy storage. The centers were granted NIS 60 million and NIS 45 million, respectively. A third research center was founded with a focus on non-food energy crops. Additionally, a new research fund was established to award grants of up to US\$450,000 to researchers in the field of alternative fuels." In total, the Initiative funds 36 research groups working on solar energy and 24 groups working on energy storage. This means there are four times as many alternative energy research groups in Israel today as compared to 2012, a scaling success of tremendous staying power and significance. There can be no doubt I-SAEF has been a major catalyst for alternative energy research in Israel, including spurring this transfer from philanthropic to government funding for this critically important research. Accordingly, I-SAEF's Board of Directors has decided to no longer raise philanthropic funds for new projects, while continuing to fund those projects already underway. To-date, 14 out of 24 I-SAEF projects have been completed, and each of them has been reviewed with its principal scientist and an I-SAEF scientific advisor. Ten projects are continuing. We will update you when they are completed.



Numerous completed I-SAEF-funded research projects merit special mention. Here are four examples:

1. Realizing the Potential of Solar Energy

Professor Avner Rothschild of the Technion – Israel Institute of Technology received US\$199,999.95 from I-SAEF for his project *“Solar Hydrogen Production by Water Splitting Using Ultrathin Iron Oxide Photoelectrons in Tandem with Photovoltaic Cells.”* Professor Rothschild envisioned a more efficient, affordable way to store solar energy in chemical products, in this case, hydrogen. This is a crucial innovation in the large-scale deployment of solar energy, and is considered one of the greatest scientific and technological challenges of this century. I-SAEF’s infusion of funds allowed Professor Rothschild to prove his concept. He has now received 2.15 million euros of follow-up funding from the EU for this game-changing research. Professor Rothschild stated that his I-SAEF grant permitted him to bridge “the valley of death funding gap,” concretely showing the value of his technology. His I-SAEF grant was also pivotal in building his reputation, which later contributed to his winning this major new funding source. As a result, fifteen scientists are now employed on this project, and the future looks a little brighter for Israel, and for people everywhere.

2. Innovative Alternatives to Fossil Fuels

Professor Moti Herskowitz of Ben-Gurion University of the Negev received US\$197,340 from I-SAEF for his project *“Catalytic Process for the Hydrogenation of CO₂ to Liquid Fuels.”* Professor Herskowitz had in mind a highly efficient process for direct conversion of carbon dioxide and hydrogen into fuel via water splitting. This required substantial process innovation and novel catalytic materials from abundant and low-cost raw materials. Professor Herskowitz aimed to develop these improved catalysts and processes so that this new fuel would be commercially viable.

Three short years later, the Times of Israel reports that Professor Herskowitz has discovered “a revolutionary method for producing alternative liquid fuel from two of the most common substances on earth, hydrogen and carbon dioxide. The new process will become the dominant technology by which liquid fuel is produced...ultimately evolving into a technology that requires only carbon dioxide derived from the atmosphere and water.” The Jerusalem Post further quotes Professor Herskowitz, “Why not use zero-cost resources? We could use carbon dioxide, water and energy from the sun and combine them to get real fuels. We’re ready to take off. We have the technology, the technology is proven, we’ve filed patents for it.” Professor Herskowitz further states that “I-SAEF’s donation was extremely important. It came at the right time, and allowed us to move this project forward.” His project will now move forward as part of the Alternative Fuels Initiative run out of the Israeli Prime Minister Office, and encompasses a joint China-Israel cooperation supported by the Ministry of Science.

Start-Up Nation Central Champions Two I-SAEF Projects, Greatly Enhancing Commercialization Potential

The projects kick-started by I-SAEF are themselves contributing to other initiatives. Eugene Kandel, former Chairman of the Israeli National Economic Council at the Prime Minister Office, and trusted I-SAEF supporter, has launched “Start-Up Nation Central,” a not-for-profit organization connecting international business and government leaders with Israeli innovators and technologies that will help them to solve their most pressing challenges. Start-Up Nation Central is the authoritative source on, and the GPS to, the Israeli innovation community, accelerating technological growth with Israeli innovation. The following two I-SAEF’s grantees have joined Start-Up Nation Central, which will showcase their technologies globally.

3. Highly-Efficient Production of a New Clean Fuel

Professor Jacob Karni of the Weizmann Institute of Science imagined using carbon dioxide (a greenhouse gas) as feedstock to generate synthetic fuel. He would use highly concentrated solar energy to power the conversion process. The CO₂ feedstock would be harvested from power plant emissions, preventing the gas from entering the atmosphere, where it would contribute to global warming. Professor Karni’s project *“High-Efficiency Clean Fuel Production from Carbon Dioxide and Water Using Solar Energy at High Temperatures”* received US\$199,904.50 from I-SAEF, a critical infusion that helped him to prove his concept. As a result, he attracted the attention of foreign



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investors, raising US\$14 million to build a prototype and form a for-profit company around his innovation. This technology will remove harmful ozone-depleting gas from the atmosphere, using it to make a synthetic fuel with great utility. Start-Up Nation Central will further promote this innovation globally, to ensure its full exploitation and adoption.

4. Novel Mechanism to Store Energy

Electricity cannot be stored easily on an industrial scale, so it must be used as generated. This is particularly true of renewable energy sources (wind or solar), which generate energy intermittently, and not necessarily at times of greatest need. Professor Yoel Sasson at the Hebrew University of Jerusalem recognized that an innovative storage technology would be extremely useful in taking full advantage of the energy generated from sustainable sources. His project (*"Formate Bicarbonate Cycle for Hydrogen and Energy Storage"*) postulated that the only storable material which is easily and reversibly exchangeable with electrical power on a large scale is hydrogen (conventional batteries are only efficient when used on a small scale). Current mechanisms of energy storage via hydrogen are, however, complex, risky and costly.

Professor Sasson proposed a new hydrogen storage technology that is highly stable, safe, and inexpensive. With his I-SAEF grant of US\$199,525, Professor Sasson designed, built and tested two demonstration units of this new process. This success qualified him to receive US\$200,000 in additional support from the Israel Science Foundation. Subsequently, his technology attracted the attention of a group of entrepreneurs who have established a start-up company to license his intellectual property. The company has secured US\$1,600,000 in additional investment to develop his I-SAEF-funded concept. The new company is located at Hebrew University's High Tech Village in Jerusalem. You can learn more about it here: <http://www.nrgstoredge.com/>. In addition to utility-scale energy storage, the company will also apply this technology to car batteries. Start-Up Nation Central will further promote this technology to investors and commercialization experts around the world, ensuring that this brilliant innovation will bring clean energy to people everywhere.

An Unmitigated Success

Israel now has over 300 alternative energy companies providing jobs, economic security, and of course, real solutions to the global energy challenge. There can be no doubt that I-SAEF's early funding of 24 academic research projects, permitting scientists to bridge the "valley of death" funding gap, has helped to fuel this significant expansion of alternative energy research and commercial activities in the Start-Up Nation. I-SAEF's work has been described as an unqualified success, making Israel stronger and our planet cleaner, healthier and safer. I-SAEF has fulfilled its mission!

Your generosity has played a significant role in this success. On behalf of all the Israeli scientists whose progress was enabled by I-SAEF's grants, we thank you for being one of I-SAEF's major supporters and friends. To be able to assist Israel, to launch this project which is so much in its interest and the world's interest, has been so meaningful to us personally. We never expected such a quick successful "exit strategy". Your trust and support helped make this achievement possible.

With heartfelt thanks,

Galina and Lev Leytes
I-SAEF Co-Founders