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Energy Alliances Conference Reports

STRATEGIC REPORT · 2026

Directed Energy.

The Allied Competitive Edge.

01 DEFEND 02 TRANSMIT 03 ENABLE

MILE ADVISORY · 2026

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EXECUTIVE SUMMARY

The argument in brief

Directed energy is moving from the edge of the defense conversation to the center of the energy one. The same family of technologies that fires a microwave or laser interceptor can, in a different configuration, beam solar power from orbit to a grid on Earth. That dual-use character is not a footnote. It is the strategic point.

As the United States and its allies organize trusted supply chains for the AI age through **Pax Silica** and parallel frameworks, directed energy is emerging as the layer that both secures the battlefield and could one day power the economy. This report places Israel inside that shift. Israel does not yet have a company transmitting power from space, and the report does not pretend otherwise. What Israel has is a dense, operationally proven directed-energy ecosystem, anchored by Iron Beam, the first directed-energy weapon to reach combat use, and extended through defense primes, civilian laser and microwave firms, and a deep research base. Those capabilities are dual-use by nature. They are precisely the enabling technologies that space-based energy transmission will require.

THE STRATEGIC ARGUMENT IN THREE PARTS

01 **The race is already underway.**

The United States, China, Japan, and the European Union are each developing space-based solar power, and the directed-energy weapons market is compounding at roughly 17.6 percent a year. The strategic question is not whether this domain matters, but who leads it.

02 **Israel's contribution is as an enabler, not a principal.**

Israel's edge is in the underlying technology, the lasers, microwaves, optics, and beam control, not in orbital systems. Its role is to make allied programs faster, sharper, and more capable. This is the same enabling-layer position MILE Advisory's Vol. 01 identified in the rare earth supply chain.

03 **The work is operationalization.**

The United States needs a national space-based energy program integrating government agencies, defense primes, national laboratories, universities, and startups. Israel belongs inside it. The instruments exist. The window to embed Israeli capability is open now and will narrow over the next several years as flagship programs move from demonstration toward deployment.

KEY TERMS

A reference for the vocabulary

A short reference for the technical vocabulary used throughout this report.

Directed energy

Technology that generates and transmits concentrated energy, typically electromagnetic radiation or particles, toward a chosen target.

Directed Energy Weapon DEW

A weapon that engages targets with concentrated energy rather than a physical projectile, delivered at or near the speed of light.

Space-Based Solar Power SBSP

Collecting solar energy in orbit and transmitting it to Earth as a microwave or laser beam, for reconversion into grid electricity.

High-Power Microwave HPM

A directed-energy system using microwave energy, offering all-weather, wide-area coverage against multiple targets simultaneously.

Adaptive optics

Systems that correct a beam in real time for atmospheric distortion, preserving its focus over long distances.

In-Situ Resource Utilization ISRU

Extracting and using resources, such as water or metals, at their location in space rather than carrying them from Earth.

01 OPENING

A new frontier for energy

RESEARCHER

Iky Hazan

PUBLICATION

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Directed energy refers to a family of technologies that generate and transmit concentrated energy, typically in the form of electromagnetic radiation or accelerated particles, toward a designated target. Its applications span defense, energy, advanced manufacturing, and scientific research, and the overlap among those fields is substantial. Military systems migrate into civilian use, and civilian innovation strengthens defense capability in return.

Today the development of directed energy, particularly laser and microwave systems, sits at the center of great-power competition. The United States, China, the European Union, and Japan are pursuing civilian, military, and energy programs, and each is competing for leadership. For the United States to lead, it must draw on the capabilities of its allies. Israel is among the most important of them, with a defense and academic ecosystem that has produced advanced research and operational expertise in directed energy.

This report focuses on the energy applications of directed energy, with particular emphasis on space-based energy transmission, a domain that could become a leading source of power within the foreseeable future. It is a companion to MILE Advisory's Energy Alliances 2026 and contributes to the firm's ongoing strategic report series.

METHODOLOGY · SCOPE & APPROACH

The directed-energy yield of the MILE database

This report draws on MILE Advisory's proprietary database of Israeli technology companies in energy, defense-adjacent, and industrial-technology sectors. For this volume, the database was filtered for functional relevance to directed energy and space-based power.

The Israeli companies and institutions named in this report are illustrative examples drawn from that database, not a comprehensive market map. The report identifies a strategic position Israel can occupy as an enabler in the allied directed-energy effort and points to representative capabilities that support it. Commercial decisions remain with allied principals and their counsel.

This research contributes to MILE Advisory's Energy Alliances 2026 (mile.earth). This report draws on research conducted by Iky Hazan as part of MILE Advisory's analyst program. The publisher gratefully acknowledges his contribution.

02 STRATEGIC IMPORTANCE

Why directed energy, why now?

Three forces have converged to move directed energy to the center of strategic policy: its maturity as a defense capability, its dual-use crossover into energy, and the great-power race to lead the field.

DIRECTED ENERGY IN DEFENSE

In the defense context, directed energy is used primarily through directed energy weapons. These systems engage targets with concentrated energy, lasers, microwaves, or particle beams, rather than physical projectiles. They deliver energy at or near the speed of light, with high accuracy, minimal collateral damage, and a low cost per engagement. The most operationally mature systems in deployment today are laser-based and microwave-based.

17.6%

compound annual growth in the global directed-energy weapons market.

Valued at approximately 7.9 billion US dollars in 2025, projected to reach 39.9 billion by 2035. High-energy laser systems account for the largest technology segment at around 44.6 percent, followed by high-power microwave and radio-frequency systems.

Source: Future Market Insights, Directed Energy Market.

The use of directed energy weapons for ballistic-missile interception aligns with the United States administration's Golden Dome initiative, reflected in H.R. 4107, the Executive Order titled “The Iron Dome for America,” and the 2025 National Security Strategy.

Within the field, two paths dominate. **Laser-based systems** are critical against drones, rockets, and mortars, neutralizing targets at the speed of light with high precision and very low cost per interception, though effectiveness is sensitive to dust and humidity. **Microwave-based systems** offer all-weather coverage, engaging multiple aerial threats at once including drone swarms, and can also function as electromagnetic weapons that disable electronic circuits over a wide area without physical destruction.

03 THE DUAL-USE THESIS

One technology, two destinations

The central claim of this report is that directed energy is inherently dual-use, and that this is what makes it strategically valuable rather than merely interesting.

High-energy lasers, microwave beam controls, adaptive optics, and optical power relays form a shared technological foundation. The same components that maintain a coherent beam over distance, compensate for atmospheric distortion, and control how energy propagates are essential both to a directed energy weapon and to a civilian system transmitting power without wires. A component developed for one domain transfers to the other depending on configuration and intent.

THREE STRATEGIC CONSEQUENCES

EXPEDITIONARY

Off-grid power

Transmission without fixed infrastructure, supporting military operations in contested environments and civilian operations in disaster relief or remote industry.

PROTECTIVE

Critical-infrastructure defense

Directed-energy weapons can counter drones and aerial threats rapidly and at low marginal cost, hardening high-value civilian and industrial sites.

INDUSTRIAL

Dual-use companies

A defense firm and an energy firm are, increasingly, working on the same physics. Many defense companies in Israel and the United States can become dual-use companies. That is the opening this report examines.

04 HARVESTING ENERGY FROM SPACE

The allied race

Space-Based Solar Power collects solar energy in orbit using large photovoltaic arrays, converts it to electromagnetic energy, and transmits it to ground stations as a microwave or laser beam, where it is reconverted to grid electricity. Its appeal is continuous, stable generation independent of weather and the day-night cycle. The market, valued at roughly $0.63 billion in 2025, is projected to reach approximately $4.19 billion by 2040, dominated by major aerospace and defense firms including Airbus, Northrop Grumman, Boeing, Thales Alenia Space, and OHB SE.

Source: Mordor Intelligence, Space-Based Solar Power Market Size & Share Analysis, 2025–2040.

The race to develop SBSP has become part of great-power competition, with Japan, China, the United States, and the European Union as the leading actors. Israel does not yet have an SBSP principal of its own; its position is upstream, in the directed-energy technologies on which any SBSP architecture ultimately depends.

> *The country profiles below summarize the leading national programs and Israel's enabling position relative to them.*

NATIONAL PROGRAM · TIER 1

The United States

The U.S. ecosystem spans agencies, national laboratories, startups, and universities. NASA's current assessment is that SBSP remains technically infeasible and cost-prohibitive, with evaluations limited to hypothetical systems around 2050. The startup layer is nonetheless active.

PROGRAMS & ACTORS

- Aetherflux is pursuing laser transmission from orbit; Virtus Solis microwave transmission; Overview Energy infrared laser delivery to ground solar infrastructure; Star Catcher laser beaming to satellites in orbit.
- Virtus Solis depends on SpaceX's Starship, a reusable heavy-lift vehicle, as the enabler for large-scale orbital deployment.
- Caltech's Space Solar Power Project, funded through philanthropic support from Donald Bren, launched the SSPD-1 satellite, which demonstrated wireless power transmission in space in 2023.
- The Air Force Research Laboratory and Northrop Grumman demonstrated solar-to-radio-frequency conversion in 2022 under the SSPIDR program.

NATIONAL PROGRAM · CHINA

A geostationary power station

China is planning a space-based solar power station in geostationary orbit, with implementation led by the China Academy of Space Technology (CAST). An experimental demonstration is targeted around 2028 and a commercial system around 2050.

NATIONAL PROGRAM · JAPAN

The OHISAMA project

Japan is developing the OHISAMA project, led by Japan Space Systems (JSS) together with JAXA and the Ministry of Economy, Trade and Industry. The plan is now for a late-2026 demonstration of microwave power transmission from a low-Earth-orbit satellite to the ground.

NATIONAL PROGRAM · EUROPEAN UNION

ESA's SOLARIS program

The European Union, through the European Space Agency's SOLARIS program, studied feasibility with industry partners, with a long-term scenario envisioning up to 54 satellites by 2070. The program is currently on hold pending further technological maturity.

THE ENABLING LAYER · ISRAEL

Upstream of the principals

No Israeli company currently operates in space-based energy transmission. Israel's position is upstream of that: it is a world leader in directed energy, particularly lasers, a reputation grounded in Iron Beam, one of the world's leading directed energy weapons and the first to enter operational use on the battlefield. The ecosystem is anchored by defense primes and a deep research base, with civilian firms adding depth at the technology layer. The enabling role is already proven: American companies have acquired Israeli directed-energy firms, including Oramir, Ophir Optronics, and Eyal Microwave, and integrated their technology.

THE ECOSYSTEM

Defense: IAI · Rafael Advanced Defense Systems · Elbit Systems. **Civilian lasers and microwaves:** Civan Lasers · MicroKim · ANV Laser Industry · Jet Laser. **Research base:** Technion · Tel Aviv University · Ben-Gurion University · Weizmann Institute · DDR&D (MAFAT).

The Israeli companies and institutions named above are illustrative examples drawn from MILE Advisory's energy and dual-use technology database, not a comprehensive list. See methodology on p. 4.

05 BEYOND SPACE

What else does directed energy unlock?

Space-based power is the most striking application of directed energy, but it is not the only one. The same physics opens questions across fusion, off-grid power, advanced manufacturing, resource extraction, and heat and power, where lasers and millimeter waves show early promise in geothermal drilling. Five worth carrying into the next round of strategic conversation.

01 **Can directed energy unlock fusion at commercial scale?**

Microwaves heat plasma in tokamaks to fusion temperatures. Lasers drive inertial-confinement fusion, with the National Ignition Facility producing net energy gain in 2022. The remaining question is whether either path scales to commercial power generation, and on what timeline.

02 **What does persistent off-grid power look like?**

Laser-based wireless transmission could supply continuous power to remote platforms instead of batteries or fuel, extending endurance and reducing mass. DARPA's POWER program is testing airborne optical relays. The open question is which mission profiles, civilian or military, justify the architecture first.

03 **Where does directed energy meet the critical-minerals supply chain?**

Laser and microwave systems depend on neodymium, erbium, ytterbium, gallium, and germanium. The processing of those inputs sits largely in China, a direct link back to the subject of **Vol. 01**. How the U.S. and its allies secure the upstream of their own directed-energy stack remains an open strategic question.

04 **Can directed energy enable in-situ resource utilization in space?**

Continuous-wave lasers can heat lunar regolith to release materials through ablation. Low-power microwave heating can extract water from lunar and Martian soil. If either technique reaches operational maturity, the economics of long-duration missions change. The question is when, and which agency or company gets there first.

05 **How does directed energy reshape advanced manufacturing?**

Microwave processing heats materials volumetrically, improving uniformity in metals, ceramics, and composites. High-power lasers are already foundational to EUV lithography, wafer dicing, and laser annealing in semiconductor fabrication. The question is which of these moves from supporting role to category-defining capability over the next decade.

06 STRATEGIC OUTLOOK

What could shape the trajectory?

The path from current programs to operational space-based energy is not linear. Two sets of factors will shape it.

TAILWINDS

What could accelerate the field

+ Sustained great-power competition keeps national funding flowing across the U.S., China, Japan, and the EU.
+ Reusable heavy-lift launch capability lowers the cost barrier to orbital deployment.
+ Demonstration milestones, including the SSPD-1 transmission and the AFRL and Northrop Grumman conversion, build investor and government confidence.
+ The dual-use nature of the technology means defense budgets and energy budgets can both underwrite the same advances.

HEADWINDS

What could slow it

– NASA's own assessment holds that SBSP is not yet technically or economically viable, with central timelines pointing to roughly 2050.
– Atmospheric attenuation constrains laser transmission and limits range under adverse conditions.
– Cost-per-kilowatt of orbital generation will need to fall substantially before SBSP competes with terrestrial alternatives, even with reusable launch.

Most tailwinds broaden Israel's relevance; most headwinds shape the timeline rather than the direction. The enabling-layer position is robust across scenarios because it rests on capability that already exists, not on any single program's success.

07 CONCLUSIONS

What an allied approach looks like?

Directed energy is the future of both the defense and the energy sectors, and the moment when energy transmitted from space becomes a significant source of power is not as distant as it once seemed. Three conclusions follow.

THREE STRATEGIC CONCLUSIONS

01

Treat the Israeli ecosystem's relative advantage as a competitive advantage.

Israel's depth in directed energy, particularly lasers, is real and operationally proven. The strategic task is to convert that standing into a defined role in the allied race for space-based energy, and to recognize that many Israeli and American defense companies can become dual-use companies. The overlap between defense and civilian technologies in directed energy is substantial, and that overlap is itself the strategic opening.

02

Position Israel inside the U.S. national program before it forms.

The United States needs a national space-based energy program integrating government agencies, defense and technology companies, national laboratories, universities, and startups. Israel's window is to embed in that program now, while its structure is still being defined. The path runs through close public-private integration, similar to the Japanese and European models.

03

Embed Israeli capability now, while the window is open.

The work is to bring Israeli defense and civilian companies into the program and to leverage their expertise for space-based energy transmission. The instruments exist. Flagship programs are moving from demonstration toward deployment over the next several years, and the cost of late entry rises with each milestone reached. Embedding capability now, in the design phase, is structurally cheaper and more durable than retrofitting it after the fact.

ABOUT MILE ADVISORY

MILE Advisory is a strategic advisory firm working in energy and dual-use technology, with a focus on the US-Israel corridor. We craft strategy and manage its execution, working with governments, investors, and technology companies.

08 SOURCES

References & further reading

Built from the research bibliography supplied for this report. Where a canonical source URL is known, the entry links directly; where the original publisher or DOI was not provided, the entry links to a search anchored to the exact title. Publishers and dates are reproduced as given in the research; complete citation polishing should be done at production sign-off.

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