



EnergyTech – German Israeli Cooperation Opportunities for the Transformation of the Energy Sector

Israel is one of the world's leading ecosystems for ClimateTech startups. In this sector, the focus increasingly lies on EnergyTech, in addition to the traditional strengths in Cyber Security, FinTech and Digitalization. However, on account of the small home market, use cases and support for scaling the technologies are needed. Therefore, Germany, with its political framework for- and social acceptance of renewables, represents an interesting target market for Israelis.

In the shape of the German Israeli Energy Partnership, a political agreement is already in place, which signals the importance of the cooperation and can provide a basis

for collaboration.¹ In this context, the commercialization strengths of German companies on the one hand and the demand-driven scaling potential of the German market on the other hand, offer opportunities for the application of innovative technologies of Israeli startups for a successful energy transition.

Looking at the innovation needs for the energy transition in Germany (including storage technologies, energy efficiency, renewable energy generation, smart grids), there are short- and medium-term opportunities for cooperation. Special potential can be found in the application of technologies from Israeli startups in the fields

of Cyber Security, Digitalization and FinTech, thus ensuring the secure and smart integration of the energy system, as well as its maintenance. In addition, Israeli startups are increasingly working on energy generation and storage technologies. Waste2X technologies, hydrogen generation, storage and transport, and combined heating&cooling approaches are particularly noteworthy.

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Energy Transition in Germany and Israel

Both Germany and Israel have formulated ambitious goals for achieving sustainable energy systems.

The German government is aiming for a climate-neutral energy system by 2045.² In this context, the energy crisis resulting from Russia's attack on Ukraine exacerbates the challenge of achieving a climate neutral energy economy and requires the acceleration of the energy transition.³ The System Development Strategy (SES)¹ is intended to provide the framework for necessary transformation. Furthermore, sector coupling will play an important role.⁴

Experts agree that new technologies are needed to provide secure, clean, and affordable energy.⁵ In particular, the expansion of renewable energies⁶, the development of new storage technologies and increased efficiency in all sectors are essential for success. However, many of the required technologies are still being developed.⁷ Therefore, the relevance of identifying and implementing innovative technologies for the green transformation of energy systems cannot be overstated. In Germany, one challenge lies in the complex structure of the energy sector, which consists of very large companies, as well as many medium-sized, small, and micro enterprises and private households.

Meanwhile, the Israeli energy industry has traditionally been dominated by fossil fuels, such as coal and oil. Due to large gas deposits off the coast of Israel, the share of gas has recently increased. The share of renewable energies in electricity generation was 7% in 2020.⁸ Compared to Germany, where the energy transition has been a hot topic for 22 years, the issue for a long time did not play a role in Israel.

However, this has changed. Today, a significant reduction of CO2 emissions from the energy system is the clear objective of the Israeli government. The expansion of renewable energies (40% of total energy production in 2030) and the production and use of hydrogen will play a decisive role in transforming Israel into a sustainable energy system by 2030.^{9,10,11} As early as 2025, the share of renewable energies is targeted at 20%.¹²

It can thus be stated: Although the conditions in both countries differ, the need for sustainable transformation is equally given.

Digital technologies as a prerequisite for the energy transition

Digitization is a central prerequisite for the energy transition.¹³ It affects all areas of the energy system, from **generation and transportation to trade and consumption**.¹⁴ In addition, it presents challenges but also opportunities with regards to security.¹⁵

Data is increasingly being seen as a new resource for value creation in the energy industry. Intelligent metering systems are needed to collect this data. High data volumes, decentralized applications and evaluation require the expansion of cloud computing and new algorithms.¹⁶ **Artificial intelligence** offers an opportunity for the energy industry to reduce costs, increase system efficiency and optimize decision-making.¹⁷ The application fields of artificial intelligence are diverse and range from **control of consumers, energy management, building control, energy efficiency, smart building, energy market or energy trading, to electricity distribution, energy storage, as well as heat distribution**.¹⁸

In addition, the increasing use of renewable energies and smaller decentralized installations in con-

nection with necessary grid observability, system security and -stability requires **comprehensive real-time information**¹⁹. With regards to energy use and efficiency, **digital twins** of machines are also necessary.²⁰

As a result of increasingly decentralized energy generation, new approaches in **peer-to-peer trading** are also conceivable, made possible by digitization and approaches from the FinTech sector.²¹ Digitization can thus contribute to making the energy system more flexible.²²

An important prerequisite for this is the development of interfaces and standards of digitalization to be able to couple different systems with each other.²³ The use of **blockchain-based technologies** will provide a basis for the unique identification and secure communication of actors, plants, and machines.^{24,25}

At the same time, decentralization and the associated wired and wireless connection of millions of plants will lead to new challenges in ensuring system security at all grid and generation levels.^{26,27} To prevent direct attacks, espionage, sabotage and ransomware, **Cyber Security** will play a central role in the future energy industry.^{28,29} This includes **preventive-, monitoring- and reactive measures**.³⁰ In addition to specific solutions for securing individual data and systems, higher-level, system-wide security concepts are required.³¹

Selected innovation needs in the German energy system

The energy transition will affect almost all economic sectors.¹¹ Nevertheless, this briefing is based on the seven lead markets in the German GreenTech Atlas and focuses on environmentally friendly generation, storage, and distribution of energy as well as energy efficiency.¹¹¹ These have the highest growth potential until 2030, both in Germany and internationally, and will hold significant importance for the German economy.³² The specific technology fields and market segments for applying the necessary technological innovations in the energy sector are listed in **Figure 1**³³.

However, this briefing focuses on five levers of the accelerated energy transition³⁴ - energy efficiency,

renewable energies, storage technologies and hydrogen as an energy carrier.

Renewable energies are indispensable as an energy source for the climate-neutral energy system.^{35,36} This includes wind- and solar energy. Both offer the potential for significant, short-term greenhouse gas reductions.³⁷ The focus is on increasing the efficiency, availability, and control of plants. In the context of photovoltaics, solutions for dual use of land are necessary to meet demand.³⁸

Energy efficiency in all consumption sectors must be achieved through new energy-saving technologies, materials, and energy management systems. This especially concerns the energy use of industry and the building sector.³⁹ Particularly efficient (combined) heating&cooling systems can help reduce greenhouse gas emissions.

Storage technologies are the prerequisite for making the energy system more flexible. The increasing use

of renewable energies leads to fluctuations in energy production. This makes it necessary to be able to store surplus energy and feed it in when production is low, to ensure system and supply security. Depending on the maturity, different types of storage (battery storage, pumped storage, Power2X, compressed air storage) are required for short- and long-term storage.^{40,41}

As energy storage and carriers in the context of sector coupling, **Hydrogen** as well as **Power2X solutions** are important building blocks in the German energy transition.^{42,43,44} Hydrogen can be produced in a climate-neutral and renewable manner and can serve as a raw material for a wide range of synthetic energy carriers. Furthermore, it can enable the decarbonization of non-electrified areas and offer a long-term energy storage option.⁴⁵ This requires the development and expansion of hydrogen production, storage and distribution infrastructure, for which innovations are essential.⁴⁶ Hydrogen and Power2X will create new flexibility options for the spatial and tem-

*Table 1: Differentiation of technology fields and market segments in the selected lead markets.**

Environmentally friendly generation, storage and distribution of energy



RENEWABLE ENERGIES

- Photovoltaics
- Solar thermal
- Solar thermal power plants
- Wind power (onshore)
- Wind power (offshore)
- Geothermal power
- Hydropower

EFFICIENT DISTRIBUTION NETWORKS

- Control technology for networks
- Control technology for plants
- Heating and cooling networks
- Metering systems and consumption measurement
- ICT ("Internet of Energy")

STORAGE TECHNOLOGIES

- Mechanical storage of energy
- Electrochemical storage of energy
- Electronic energy storage
- Thermal energy storage
- Chemical storage
- Power2X Technologies

Energy efficiency



ENERGY-EFFICIENT PRODUCTION PROCESSES

- in metal production
- in basic chemicals
- in vehicle construction
- in mechanical engineering
- in trade/logistics
- in metalworking
- in paper/cardboard production
- in plastics processing
- in food production
- in the processing of stones and earths
- in the production of glass and ceramic products
- waste heat utilization

ENERGY EFFICIENCY OF BUILDINGS

- Thermal insulation
- Building automation
- Passive houses/plus-energy houses
- Efficient heating, air conditioning and ventilation technology
- Combined heat and power plants

ENERGY EFFICIENCY OF DEVICES

- Energy efficiency of household appliances
- Green IT
- Energy efficient lighting
- Energy efficient
- Consumer electronics

CROSS-SECTOR COMPONENTS

- Measurement and control technology
- Process control technology
- Pump systems
- Fans
- Electric drives
- Heat exchangers
- Compressors
- Compressed air and vacuum technology

poral distribution of energy and contribute to sector coupling.^{47,48}

Israeli startups - known strengths and new potentials in the EnergyTech sector

Israeli **startups** can play a special role in the development of new technologies and services in the context of energy transition.^{49,50} The small country in the Middle East is considered a global innovation leader and is known for its startup ecosystem.⁵¹ Traditionally, the Israeli startup ecosystem's strengths are in Cyber Security, IT, FinTech and digitalization.

The increasing focus of private and public players in the startup ecosystem on ClimateTech provides the best conditions for startups. EnergyTech startups represented the second largest group of Israeli startups in 2022 at 18 percent.^{53,54}

In EnergyTech, three innovation communities should also be highlighted, which bring together investors, startups, academics, companies, accelerators, and

public institutions: PLANETech, Ignite the Spark and EnergyCom.^{55,56,57} Through various activities^{VI}, these communities aim to promote exchange among all players and thus create optimal conditions for innovation. Thanks to their close network, they have a very good overview of the EnergyTech ecosystem.

More than 125 startups were already explicitly dealing with the energy-related concepts and technologies in 2022.⁵⁸ An overview of these startups is provided by Start-Up Nation Central's EnergyTech Landscape Map 2022 (see **Figure 1**).⁵⁹ To complement this, PLANETech conducted an analysis of energy companies in 2022.⁶⁰ The largest number of startups can be attributed to the fields of energy generation, infrastructure and energy efficiency with an increasing trend in new areas, especially hydrogen and energy storage.

THERE ARE MORE THAN 100 COMPANIES IN ISRAEL IN THE ENERGYTECH SECTOR

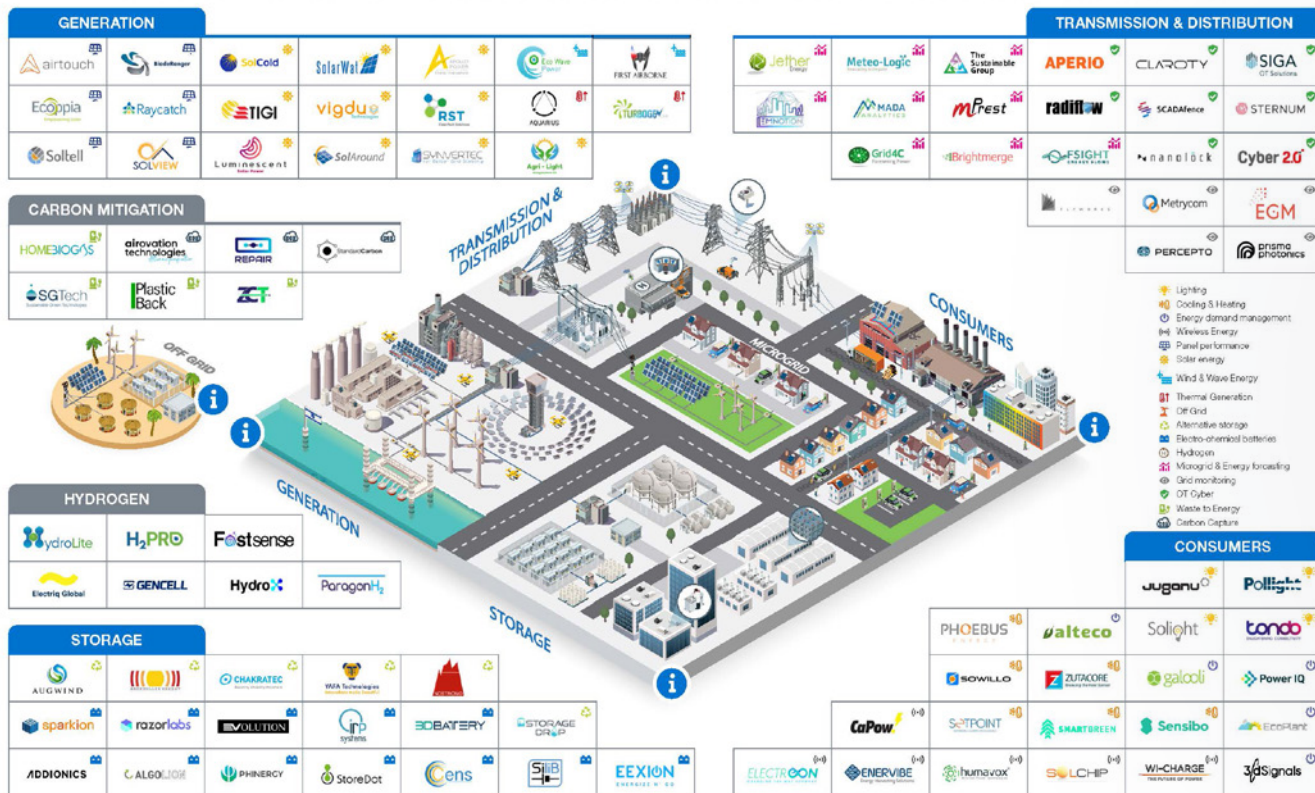


Figure 1: EnergyTech Landscape Map 2022, Start-Up Nation Central⁶¹



Based on the reports^{62,63,64} and the expert interviews conducted, **Table 2** provides an overview and assessment of the different technology fields in Israel:

TABLE 2

Technology field	Definition	Status quo of Israeli Startups
Power Generation and Renewable Energies	Technologies and services primarily related to the generation of energy	<ul style="list-style-type: none"> • Extensive activities in the field of solar energy through new materials, production processes, predictive- and smart maintenance concepts as well as use of robotics in maintenance • Increasing activities and expertise in dual-use application for power generation on primarily other-use land • Increasing number of startups in Waste2Power • Low activities in biomass and wind energy
Power Storage	All forms and scales of storage technology as well as associated management	<ul style="list-style-type: none"> • Rising interest and increasing number of startups • Various approaches in storage in the areas of kinetic, electro-chemical und potential energy storage (air storage, pumped storage) at different levels (utility scale, decentralized, residential), mainly in early stages • Various startups in the field of smart energy management • Extensive research activities of Israeli universities and research institutions with innovation and transfer potential
Hydrogen and alternative Fuels	Hydrogen and other non-fossil fuels	<ul style="list-style-type: none"> • Few but innovative startups in the field of (green) hydrogen (generation, waste2hydrogen, transport, storage, conversion). Israel is not a primary market, but rather a technology supplier • Great interest and increase in activities of startups visible • Extensive research activities of Israeli universities and research institutions with innovation and transfer potential • Various startups in the field of non-fossil fuels (e.g. from plastic waste, waste, enzymes for biodiesel production)
Networks and distribution	Technologies and solutions for the transmission, distribution, and control of energy	<ul style="list-style-type: none"> • Focus on digital application and technologies • Numerous advanced and early-stage startups focused on smart grid management (AI-based prediction and control, sensor- and drone-based grid monitoring) for centralized and decentralized grid management • Many approaches and startups in predictive maintenance of network infrastructure and monitoring of malfunctions. • Digitalization approaches in the context of Industry 4.0 and IoT in connection with energy systems • Cyber Security applications to protect grid infrastructure • FinTech approaches to support future billing processes • Few startups in hardware, primarily in charging technologies in the context of electromobility
Energy efficiency and consumers	Solutions for off-grid and micro-grid applications and energy-efficient consumers	<ul style="list-style-type: none"> • Numerous different topics in the context of energy efficiency improvement (hardware-based, AI, energy management systems, sensor-based concepts). • Highlighting solutions in efficient heating&cooling technologies • Various approaches in control of micro-grids and peer-to-peer energy

In addition, the numerous startups and extensive investments in the areas of Cyber Security, Digitalization and FinTech are worth mentioning.⁶⁵ Many of the technologies and services already developed here, can be adapted and made usable for applications in the clean energy sector. New market opportunities and support for startups in this area, especially in adapting to existing requirements, can lead to a boom in startups in the clean energy sector.

However, Israeli startups face the special challenge of the small home market, which does currently not offer the potential for scaling and applying technologies, and, in addition, a political environment, which has not been favorable to date. Nevertheless, Israel's planned connection to the European power grid by 2026 will provide Israel with the opportunity to trade electricity in the future.⁶⁶ Yet due to the centralized structure of the energy market, the existing grid infrastructure and regulations, there is a lack of use cases for the testing of innovations and technologies, for example in smart grid management.⁶⁷

For this reason, Israeli startups need partners to implement their technologies. The German energy system and the cooperation with German companies therefore offer the opportunity to test the innovations and then jointly scale the implementation in Germany and beyond.

Short- and medium-term potentials in established technology fields and opportunities for joint development

When considering the collaborations, a distinction must be made between short-, medium- and long-term potentials.^{VII}

Considering the identified needs in the context of the energy transition and the existing technologies of Israeli startups (see Table 2), there is **great potential in the short term for cooperation in the fields of Cyber Security, Digitalization and FinTech**, due to the extensive Israeli experience.

Digitization encompasses a broad field of different applications. In addition to digitization, which is fundamentally more advanced in Israel than in Germany, Israeli startups have innovative technologies in areas such as **smart grid management, predictive**

maintenance, AI-based concepts for grid planning, -management and -monitoring, energy management systems and IoT applications. The successful energy transition requires broad digitization. Here, too, Israeli startups can contribute. The Israeli government's AI strategy means that further innovations can be expected in this field.⁶⁸

Cyber Security Solutions from Israeli startups can be used to protect data on the one hand and **defend against attacks** on the other hand, especially in the face of increased interdependencies within the energy market and growing digitization. In addition to the startups already explicitly active in this field, the comprehensive know-how offers potential for new joint developments. Furthermore, **hardware-based monitoring methods** from Israeli startups can contribute to the protection of critical infrastructure.

FinTech Applications are among the established strengths of Israeli startups. In the context of the energy transition, their comprehensive solutions can help digitize **billing in the energy market** and enable **new business models in the context of decentralized energy storage.**

In the medium-term, further innovative solutions can also be expected in the areas of **sustainable energy generation and -storage** through cooperation, new formats, and joint development. Especially in the areas of photovoltaics, including associated **maintenance technologies, Waste2X technologies, hydrogen generation, -storage and -transport as well as combined heating&cooling technologies**, there is great potential, including in ongoing research projects.

Due to increasing activities of Israeli startups in various areas of the clean energy sector, it can also be expected that they will increasingly bring forward new solutions in other areas and that a higher proportion of hardware-based startups will emerge, if market potentials become clear. New suppliers of critical components and concepts could thus replace dependencies on suppliers classified as unreliable, for example in control electronics.

Cooperation between German medium-sized companies and Israeli startups

In Germany, some large companies in the energy sector maintain startup activities (e.g. Energy Baden-Württemberg⁶⁹, Munich Transport and Tariff Association⁷⁰). In Israel, apart from **investments by E.ON**⁷¹, the investment and cooperation platform **Future Energy Ventures**⁷², which is also supported by E.ON and startup programs by **Siemens**⁷³, no explicit cooperation formats of German medium-sized companies are known. At the same time, ENEL, a large Italian energy company, has been very present in the Israeli EnergyTech ecosystem since 2022 and is one of the first points of contact for startups interested in cooperation.⁷⁴ In many areas, the German market is very attractive for Israeli startups due to the political and social framework conditions as well as the given infrastructure, and the interest in cooperation is correspondingly high.

In contrast, many medium-sized companies are not yet aware of the potential of Israeli startups for the sustainable energy transition. This briefing is intended to create an initial **information base** and contribute to **raising awareness**.

A particular challenge for both sides is the search for- and selection of **suitable cooperation partners**.^{75,76} Intermediaries thus play an important role as interfaces.⁷⁷ In particular, the three energy-related Israeli innovation communities, with their overview of the startup ecosystem on the one hand and the **German Israeli Network of Startups & Mittelstand (GINSUM)**⁷⁸, founded in 2020 by ELNET, on the ot-

her hand, can act as contacts for interested German companies and connect them with suitable startups. Within the framework of established formats such as the **Berlin Energy Transition Dialogue Conference (BETD)**, a dedicated session on the topic of Israeli German cooperation could be held, thus providing opportunities for exchange.

Platforms for networking can further serve to systematically promote cooperation and break down barriers. **Joint activities between several medium-sized companies** can be more attractive for startups and at the same time (more) cost-efficient for the companies involved.⁸⁰ Analogous to the cross-sector characteristics of the transformation of the energy system and the technologies required in the process, a cross-sector energy platform of several medium-sized companies under the leadership of a company experienced in cooperation is conceivable.

In addition, the existing activities of the **German Energy Agency GmbH** within the framework of the Future Energy Lab, the **Startup Energy Transition (SET)** platform and the SET Awards for the promotion of (international) startups can serve as a basis for a specific focus on the Israeli startup ecosystem.^{83,84} Additional potentials are offered by the stronger consideration of Israeli startups as consertial partners within Horizon Europe research projects.

The conclusion of the analysis: Despite many differences, the cooperation with the Israeli EnergyTech scene offers great potential for the German (SME-) economy, which should be further tapped.

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List of sources

- I. The **System Development Strategy (SES)** is a cross-sectoral, recurring process aimed at achieving a coherent vision and coordinated energy transition across all sectors of the energy system. It serves as the basis for further plans, such as the grid development plan and municipal heating planning.
 - II. The focus of the analysis is initially primarily on the companies that operate directly in the technology fields under consideration. However, it should be noted that a **broad mass of medium-sized companies is also forced to use new technologies** as a result of the energy transition.
 - III. The topic of sustainable mobility is dealt with in a separate briefing and is therefore not considered here in a dedicated manner.
 - IV. E.g., **Matching Activities, Workshops, Networking Events, Provision of Information**
 - V. For individual technologies or startups, see the specific reports.
 - VI. **Battery technologies are considered specifically in the Sustainable Mobility and Transportation briefing.**
 - VII. An evaluation of the **potential of individual startups or technologies** or the matching of companies and startups is not the subject of the analysis. However, an **overview can be given of the fields in which Israeli startups are particularly active or future research can be expected** and at the same time there are needs on the German side. An individual assessment can only be made by the cooperating companies themselves.
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