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Energy Efficiency in the Construction Sector in the Mediterranean

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Energy Efficiency in the Construction Sector in the Mediterranean

Market Analysis and Capacity Assessment - Israel

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Introduction

The construction sector has traditionally been regarded as one of the main engines of the Israeli economy. However, since 2000, this sector has faced stagnation as a result of the Palestinian uprising (the *Intifada*) in the West Bank and Gaza strip which prevented the main labor force from that area from coming to Israel, and the general economic crises which dominated the early 2000s. The construction market has not recovered even with the new rapid growth of the Israeli economy since 2004.

This situation is indicated in the national macroeconomic trends. The share of the construction sector in the overall activities of the Israeli economy declined significantly. The raw domestic investment of the construction sector in the GDP declined from 13.8% in 1997 to 8.8% in 2003.

The overall building construction completed in 2004 was only 7,254 thousand sq.m., compared to 9,822 thousand sq.m. in 1999, and 13,340 thousand sq.m. in 1997. About 72% of this space was residential, 10% for public buildings, and the rest for industrial, commercial, and agricultural purposes. A total of 34,000 building units were completed in Israel in 2003 – 5 per 1000 residents, compared to 1.7 in Sweden, 6.4 in France, and 13.2 in Ireland (ICBS 2004-6, Ministry of housing and buildings 2006).

The local construction sector is conservative and recoils from using or integrating new technologies in general, and efficient energy technologies in particular. Therefore, despite the availability of advanced efficient energy technologies for buildings in Israel, only a small part of them has been used by the local construction sector. Some of the new technologies developed in Israel are exported, mainly to Europe and North America. Regarding a recent survey by the Ministry of Construction and Housing (Kon 2005), the plumbing share in the Israeli construction sector is the most significant where technological means such as sophisticated industrial pipeline systems have been used (96%). The main use of energy efficiency technologies is in the area of wall coatings (36%).

Since the regulations for energy efficiency in buildings are limited to building insulation and use of solar systems for water heating, and the new standards for “green buildings” are voluntary, there is no necessity for the builders to integrate energy efficiency products except those for solar water heaters and insulation. Moreover, considering the high[1] additional costs of these products and services and the lack of awareness of them by the building owners, there is no significant demand to use more efficient services and products in the buildings. The result is a limited market for efficient energy products and services for buildings.

[1] They are high compared to non-efficient products. Regarding the savings, there is no objective calculation about the savings of every product in every specific house. In addition, the builders want to minimize the costs of the building and don't care about the energy costs that are paid by the buyers.

1. Market Outlook of building and energy efficiency Israel

Energy consumption in buildings is on the rise due to a significant improvement in the standard of living and the influx of immigrants in recent years. Since energy consumption in buildings has become one of the main consumers in the energy market (30%), Israel has been concerned about ways to respond to it. This concern has increased since its signature on the Kyoto protocol on 1998 and its ratification on March 2004.

The growth in energy consumption by the building sector is reflected by the consumption of electricity. In 2004, household consumption of electricity amounted to 13,795 million kWh, a growth of 4.4% from 2003, continuing the 2003 growth of 3.7% from 2002. The forecast for electricity demand in 2025 ranges from a low value of 75,000 million kWh to a medium value of 95,580, and a high value of 170,000 million kWh; compared to 42,678 million kWh in 2001.

Regarding this growth in energy consumption in buildings, the goal of Israeli policy is to encourage competition in the electricity sector and to increase electricity generation by independent (private) power producers from the current 0.8% of the State of Israel's installed generation capacity, to 20% by 2010.

A wide range of laws dealing with environmental issues include regulations dealing specifically with the building sector such as the Planning and Building law and the Licensing of Businesses law, which provide a framework for controlling the use of natural resources and promoting sustainable development.

Israeli policy is based on the principle that efficient use of energy in buildings can moderate this trend in energy consumption. Energy-conscious building design is one of the most effective means of reducing energy consumption. Therefore, encouraging rational use of resources was one of the main goals of Israeli environment policy as defined by the Ministry of the Environment that was established in 1988 (Ministry of Energy and National Infrastructures, 2006).

1.1 Efficient energy technologies

In August 1998, the Israeli government decided to encourage development and implementation of renewable energy technologies. This decision is supported by R&D activities sponsored by the Ministry of Energy and National Infrastructure. The aim of these activities is to promote national policy goals through technological and scientific innovation. The Division of Research and Development of the Chief Scientist’s Office carries out these activities. The Ministry is presently involved in over 60 projects. Other R&D support comes from the Chief Scientists of the Ministry of Industry and Trade.

In 2004, 10.4% of all research projects supported by the Chief Scientists were energy efficient technologies. The average support for the projects was $180,188.

One result of these activities is encouragement of local technological development. So far, Israel has proved its experience in developing efficient energy technologies. For example, the annual income of Ormat Ltd. (an Israeli manufacturer of power stations operated by geothermal energy. http://www.hoovers.com/ormat/--ID__134496--/free-co-factsheet.xhtml) from geothermal energy generation was $75 million in 2004. Israel's technological advantages are based on broad knowledge and development and implementation capabilities.

The main advantages of Israel for technological developments are advanced technologies, market penetrations in developing countries such as India, and Israel's presence in many world markets. Israel has unique commercial agreements with key actors in world trade such as the EU and the United States (Ayalon 2004).

The weaknesses of Israeli energy efficient technological developments are the small local market which prevents emerging technologies from completion within the country – most of the time they need to transfer abroad, and low governmental support for their development, implementation, and marketing.

According to the Israeli Export Institute, there are about 600 companies supplying environmental technologies. Two hundred and ninety-seven companies are officially defined as export companies, with total exports in 2004 of $1 billion; 6.5% of the exports by environmental technology companies is renewable energy technologies. Another 10% of this group of companies belongs to the air quality sector (Ayalon 2004). These companies might be divided into three groups: first, consultant and management companies, second, technology developers and suppliers (technological knowledge), and third, product and system suppliers.

1.2 Legal and technical considerations

The efficient energies and renewable energy markets are influenced by standards, legislation, and technical limitations. For example, regarding the solar energy sector, there are specific standards published by the Standards Institution of Israel (SII) relating to solar collectors and storage tanks for solar systems. Both standards became mandatory (Official Standards) by a proclamation of the Minister of Industry and Trade (MoIT). Therefore, it is forbidden to produce, import, sell, or use solar collectors or storage tanks unless they conform to the Official Standards. In addition, the MoIT has published another order forbidding the production, sale, and use of solar collectors and storage tanks unless they are marked with the Mark of Conformity (Standards Mark) of SII.

Regarding technical considerations, most of the Domestic Hot Water Systems (DHWS) in Israel for small buildings are a thermo-siphon open-loop type, with an electrical backup for cloudy days. The average size of the storage tank is 150 liters and the average size of the collector is 2.5 m^2. Practically all the collectors are coated with a selective coating or black paint. Both the storage tank and the collector are insulated using injected polyurethane. In tall buildings, use is made of collective solar systems where an array of forced closed-loop type collectors are connected to individual storage tanks having heat exchangers and electric backups (Shilton 2003).

2. Product and service market combination[2]

Products		Double glazing	Roof insulation	Solar water heater	Air Conditioning & Ventilation	Shading devices	electric power factor	Efficient lighting	Insulation materials	Household appliances	Office equipment	Management systems	Photovoltaic
Residential	New	2	4	5	4	3	2	3	4	4			
	Existing	1	2	5	3	2	2	3	2	3			
Commercial & administrative	New	3	4	3	4	3	4	4	4		5	4	
	Existing	1	4	3	3	2	4	3	2		4	3	

The numbers indicate maturity of the market (1–5)

Color legend

No change	
Slow increasing	
Fast increasing	

Table 1 Product market combination[3]

[2] Blank column means we do not think there will be any change in this section
[3] Blank column means we do not think there will be any change in this section

Services		ESCO Services	Installation and maintenance	Energy audit	AC & Solar Design (Incl. PV)	Retrofitting	Architectural design services	Awareness campaigns	website portals	Energy efficiency services for the industry
Residential	New		1		4		1	3	2	
	Existing		1		3			1	2	
Commercial & administrative	New		2	1	4		2	4	3	
	Existing	1	2	3	3	3	2	3	3	

The numbers indicate maturity of the market (1–5)

Table 2 Services market combination

3. Trends analysis in the construction sector with regard to energy efficiency and renewable energy

3.1 Market for energy efficiency in buildings

The regulatory framework

The Israeli government has taken several legal steps. One of these is the law of **"**Planning and Building Regulation" (Ayalon 2004) aimed at helping incorporate environmental considerations in earlier stages of the planning and decision-making processes and to incorporate sustainable development principles. The regulation, which was drafted by the Ministry of the Environment in cooperation with the Ministry of the Interior (and in consultation with the National Planning and Building Board), is based on the experience gained in Israel over the past two decades (Ministry of Environment, 2006).

Another important legal step in this framework was taken by a series of standards initiated by the Standards Institution of Israel (SII), one of the most important of which is the thermal isolation standard (1045) for building. The Ministry of Housing and the local municipalities through the local and regional and governmental construction committees enforce the standards.

An additional important standard is the standard on *buildings, which reduce environment impact* (Green Buildings), published in November 2005; this is not mandatory.

The government is enforcing the required building codes systematically. Some changes in the building codes are expected in the area of energy codes for public buildings; however, they are expected to be voluntary standards.

Regarding energy prices, as long as they depend on the international markets, significant changes do not link to local decisions. Minor changes in prices occurred recently as a result of the Israeli decision to reduce its VAT by 1%. Regarding the technological aspect, some emerging technologies are been developed in the area of sophisticated solar collectors for buildings and development of fuel cells for electric equipment. The new collectors are expected to be available during the next few years, while the availability of the fuel cell technology is expected to take at least 10 years (Einav, 2004).

3.1.1 Market needs

The market needs for energy efficiency were a subject of recent studies initiated by the Ministry of Environment (www.sviva.gov.il). In this chapter we used some of these studies in addition to interviews with key actors in the construction sector to define the local market needs of both households and commercial buildings. We considered the significant potential demand as the criterion for this needs analysis.

- Efficient materials for the construction process – development of new materials that can improve the efficiency and flexibility of the construction process and in this way reduce energy consumption, such as advanced cements. These might only have a market potential when promoted with economic incentives.
- Energy efficient materials – development of advanced materials which can improve the energy savings of the buildings, such as insulation or glazing materials. This has a limited market potential based on the demands of the Israeli insulation standard.
- Building control systems which can indicate in real time any change in the building's physical situation and the need for maintenance. These systems might help to reduce the energy investments for refurbishment and rebuild of infrastructures. These might only have market potential when promoted with economic incentives.
- Preparing more integrative computer design tools which will be able to save energy and ensure low costs and energy investments for maintenance. These might only have market potential when promoted with economic incentives.
- Improving the design of the building and the construction process – both need to have more consideration for the local environmental conditions. For example, considering sun conditions is essential for optimization of the building's natural heat and lighting, better insulation materials and glazing. This consideration might lead to use of window with a sophisticated electro-chemical cover. This might only have market potential when promoted with economic incentives.
- Development of intelligent building systems with unique sensors. For example, integrated systems that control energy (such as lighting and air quality), fire alarms, and security systems. These might only have market potential when promoted with economic incentives.
- Other needs relate directly to household building design and construction flexibility: Considering specific sun conditions for heating and natural lighting, using appropriate materials for insulation, double and other sophisticated glazing such as using chemical covering for the glass (anti-sun: low e-coating).

It seems that these technologies might only have a market potential when promoted with economic incentives.

- Improvement in climate control systems has a high potential for implementation in the local market, especially in large commercial and administrative buildings. One of the main advantages of these systems is the ease of installation, not only in new buildings but also in existing buildings. For example, the flexibility of fuzzy logic systems might improve the efficient utilization of energy in buildings. These technologies are profitable already, without subsidies.
- Lighting systems are the second largest (15%) energy consumers (after climate control systems), mainly in commercial buildings. Therefore, any improvement such as using efficient lamps, lighting control by human presence detectors or by photocells, using sophisticated power regulation devices (dimmers), or using efficient optical design of the buildings, would have a significant effect on energy consumption. These technologies are profitable already without subsidies.

3.2 Market for renewable energy in buildings

3.2.1 The regulatory framework

More than 80% of the residential buildings in Israel use domestic hot water systems (DHWS) as the main source of hot water. This widespread use of solar collectors is attributable to two factors:

a. A Regulation published in 1980 compelling the installation of DHWS in every new residential building not higher than 27 m.
b. Persuading the Israeli people that they would save money by using these systems.
c. The comfort of having available hot water all the day.

The use of solar collector is linked to the national regulation since 1980 which enforce every new residential building to install solar collectors. As was mentioned before, the quality of the collectors is controlled by the Standards Institution of Israel (SII) which has published a standard on solar collectors and other standards on storage tanks for solar systems. There is a Governmental decision for a feed in tariff for electricity from PV and other renewable sources. No new legislation is expected.

Regarding the technological aspect, there are some recent developments by Solel Ltd. in the area of electricity generation using solar thermal systems. But the solar systems are still expensive compared to the current systems.

3.3 SWOT analysis for energy efficiency and renewable energies in buildings

Strengths

- Availability of professional quality control of buildings
- The strategic need for Israel to decrease dependence on external sources that has been in place since the 1970s
- Suitable local climate conditions for the use of passive solar energy in buildings
- Wide technological knowledge of energy conservation systems
- Basic standards and regulations, such as the regulation of solar thermal use for water heating and a new building standard for envelope insulation
- Development of industries for production of energy efficient and cost-effective equipment
- Advanced Israeli companies that specialize in building control systems, such as lighting and air conditioning systems.
- Development of professional cadres of architects, engineers, technicians, and operations and maintenance people who specialize in energy conservation in buildings

Weaknesses

- Low priority of implementation of energy efficiency in building construction by the government and by the construction sector due to high prices of the energy efficient systems, lack of awareness, conservativeness, and the existence of other more urgent issues.
- Lack of significant governmental grants for energy conservation in buildings.
- Lack of land for building, which reduces construction flexibility.
- Conflicts of interest between the building construction companies that want to build simple and cheap, and the users in residential or commercial and office buildings, who want to save energy costs.
- There is no special demand for energy efficient buildings and a low supply, creating a sellers market where sellers are able to sell simple and cheap buildings.
- Various economic and technical constraints (such as the costs of the efficient equipment) which do not leave much space for new approaches.
- The conservativeness of the Israeli construction sector that prefers to use traditional, well-known technologies rather than advanced ones.
- Cheap labor force (based on immigrants from Asia and east Europe) does not provide an incentive for investments in new technologies.

- High preliminary costs (about 10%) for energy efficient systems in new building construction and refurbishment.
- Small size of the local market for efficient energy products and services. There are many companies that are active in this area, but most of them produce or supply energy efficient products as only one of their products or services.
- Environmental considerations are not always taken into account in local and national construction planning.

Threats

- Future imbalance between the demand for efficient energy equipment in buildings and the ability of the market to supply this demand. The demand might grow as a result of increased public awareness.
- Different approaches of architects and planners as to the best way to develop an energy efficient building and difficulties in reaching a consensus
- Lack of national strategy for decreasing energy consumption in the construction sector
- High prices of efficient technologies with no national subsides aimed at decreasing them
- No significant demand by the building buyers (residents or businesses) for energy efficiency
- Low relative costs of non efficient energy products, especially electricity, which discourages the use of efficient energy.
- Lack of national support for energy efficient equipment and/or encouraging local companies to base their production on export or to move their manufacturing facilities abroad

Opportunities

- With regard to the forecast of electricity demand and consumption in Israel, the electricity production and supply systems will not be able to meet the demand.
- Sustainable buildings have become fashionable since the beginning of the decade (2000).
- Broad construction sector that can accommodate niche technological systems and new design approaches such as advanced cooling towers for arid areas.
- The increase in world energy prices might lead to similar increases in Israel and encourage adoption of an energy efficiency policy at both local and national levels.

- Urgent need for Israel to solve its local environmental problems, such as the air pollution in the Tel-Aviv and Haifa areas.
- The adoption and confirmation of the Kyoto Protocol by the Israeli government since last March.
- Available technological knowledge from other countries, such as the EU countries, enables learning from European case studies.
- Increase of local pressure from NGOs for adoption of efficient energy approaches by the government and the construction sector.
- Increase in the foreign incentives from the EU and international funds for the use of energy efficiency in buildings. For example, the contribution of the EU LIFE program for third countries which have funded some energy efficient projects in Israel.
  http://www.sviva.gov.il/Enviroment/bin/en.jsp?enPage=BlankPage&enDisplay=view&enDispWhat=Object&enDispWho=News^l1276&enZone=News).

4. Energy efficiency potential in the building sector

The industrial sales volume in 2005 for the companies that are members of the Israeli Manufacturing Association does not provide specific figures regarding the energy efficiency sector. However, the overall sales of electricity and infrastructure products were $3,641 million ($239 million for export) in 2004. The overall sales of construction and infrastructure products (so also building materials) in 2005 were $628.9 million ($15.9 million for export). These figures indicate that the overall market of construction products is not very large.

In the section of construction products, the companies that produce insulation products have a significant part of the overall sales – Ytong $139.1 million and Ashtrum industries $52.8 million.

4.1 General market potential

About 30% of the electricity generated in Israel is consumed by the building sector; 20% of it is consumed by climate systems, mainly air conditioners. In commercial buildings, about 45% of the electricity is consumed by the climate systems and an additional 15% is consumed by lighting systems. Based on recent studies done for the Israeli Ministry of Environment and the Ministry of Energy and National Infrastructure, it is assumed that an energy savings of 30% can be easily achieved in the building sector without a large investment.

Potential of advanced electric and energy exchange systems – efficient equipment for households and offices – there is a significant potential in energy savings through improvement of climate and other electric equipment used for heating (space and water) and cooling systems. Other relevant technologies available in Israel are optimization of energy systems of large consumers, such as cool storage technologies, residual heat utilization, using efficient equipment (refrigerators, printers), use of controlling sensors, and small power supply. Other technologies focused on efficient heat pumping for households and efficient lighting systems (Gersel, Beker and Lavie, 2003).

4.2 First business opportunity: Smart building systems

Smart systems use the building's data for integrating remote systems and controlling the building. These systems might be integrated with other building systems such as security systems or fire alarms. Similar technologies could be used in the preliminary design of the building for simulation of the building function. Recent studies done by the Ministry of Energy and National Infrastructures forecast energy savings of 30% through

the use of these systems. The estimated market potential of this technological area is $20 million/year.

4.3 Second business opportunity: advanced solar energy systems

Israel is located approximately between the latitudes 29°30' N and 34° N where the annual incident solar irradiation is about 2000 kWh/m^2 (Shilton, 2003). The southern part of the country is "blessed" with a continuous summer of practically 360 sunny days, and even the northern part of the country, the rainy and "cold" part, has more than 300 sunny days. These conditions make Israel an ideal place for the development and use of solar energy systems.

The most common use of solar energy is domestic water heating by solar collectors. Other methods of solar exploitation are area photovoltaic cells for rural lighting, generating electric power from saline solar ponds, and the use of parabolic-trough reflectors for the production of industrial process heat.

The use of solar collectors in Israel started in the 6th decade of the 20th century as a result of the pioneering work of Prof. Harry Tabor of Weitzman Institute. Nowadays, more than 80% of the roofs of residential buildings in Israel are covered by solar collectors, saving the country about 600,000 TOE annually and each user, on average, about 2000 kWh which, at current electricity prices, is worth about $165 (Shilton, 2003).

This widespread use of solar collectors is attributable to two factors:

a. The wish of the people to save money by using a free source of energy;

b. A regulation published in 1980 requiring the installation of DHWS in every new residential building not higher than 27 m. The average life time of A DHWS is 10 years, so there is a large potential replacement market.

Israel is a world leader in solar technology and relies heavily on solar energy for water heating, required for most domestic users in the building standards. The growth of solar water heating is mainly in line with population growth. The fact that 75–80% of the solar collector production is aimed at the replacement of old collectors proves that the use of DHWS in Israel is mainly voluntary (Shilton, 2003) .

Distribution and marketing methods – solar system distribution is divided between two sectors: systems installed in new buildings (15% of the market) and the after-sale sector for replacement of existing systems or their components (85% of the market).

In the after-sale sector there are four marketing channels: direct sales by the manufacturer to the end consumers (about 10%), sales through dealers that specialize in selling solar systems (about 50%), sales through installers/plumbers (about 30%), and sales through hardware shops (about 10% – do it your self market segment). By law, the guarantee period for storage tanks and collectors of domestic solar systems is five years. The market segment of solar thermal systems estimated is $50 million /yr.

4.4 Third business opportunity: Air-conditioning systems

There are two options for improving efficiency of existing a/c systems:

- Replacement of existing low efficiency equipment with new high efficiency equipment. The potential installed cooling capacity is above 1,500,000 TR (tons of refrigeration). The potential peak demand savings is 500 MWe and the potential annually energy savings is above 5 billion kWh. The potential investment is approximately is up to $1 billion US. The market segment estimated is 30%.
- Cold storage (ice) for office commercial and public buildings. It is not a common technology in Israel, but it has a business potential. For example, it makes ice or cooling water during off-peak hours (nights) and stores the ice for use during daytime hours. The potential cooling capacity for existing building air conditioning systems is above 500,000 TR. The peak demand savings is estimated to be above 400MWe. Implementation cost potential is greater than $300 million US. However, due to the relatively high cost, the implementation potential is low, unless the cost is subsidized by the public as an alternative to investment in new electrical power stations. The potential in new buildings is high, depending on the motivation of the building's entrepreneurs. The market segment might be 10%.

4.5 Fourth business opportunity: Air-conditioning control systems

- Energy management and control system implementation potential is high for existing and new buildings, mainly in big commercial, institutional, and public buildings. Cost potential for existing buildings is estimated to be up to $500 million US during an implementation period of at least 10 years. For new buildings, the potential is estimated to be $20 million US/year over the next five years. The market segment of these systems in the AC market is over 50%.

4.6 Additional business opportunities for energy efficiency in buildings (this section is based on interview of key actors in energy efficiency in the construction sector. See Appendix 3)

- Thermal insulation for building envelope ($40 million US/yr)
- Climate control (fuzzy logic) and micro-climate systems ($10 million US/yr)
- Efficient lighting systems ($20 million US/yr)
- Passive use of natural light systems (skylight) ($1–2 million US/yr)
- Photovoltaic and related systems ($1 million US/yr)
- Independent electricity generation (micro-turbine generators) ($20 million US/yr, depending on the availability of cheap natural gas)
- Double and other efficient glazing ($20 million US/yr)

- Shading devices (sun screens) ($10 million US/yr)

4.7 List of areas/market niches where new energy efficient and renewable products and services could be successfully launched in the construction sector

- Large public buildings (such as universities): evaluation criteria: large consumption.
- Isolated areas such as Bedouin villages: evaluation criteria: lack of conventional grid and the need to supply efficient energy.
- Energy conservation in arid areas such as installation of PV systems, and use of cooling towers.
- Solar collectors for water heating for old residences, hotels, and medical centers that were not forced to be fitted, by the legislation.
- Solar collectors for high temperature water heating for industrial building use.

5. Areas and niche markets which are promising for cooperation between EU and Israeli businesses

Fifty-four percent of Israeli imports come from the EU; 33% of its exports go to the EU. The overall trade between Israel and the EU in 2005 totaled $27.1 billion: $10.9 billion in exports from Israel, $16.2 billion in imports from the EU.

The Israeli international trade in energy efficient technologies and renewable energies is estimated to be $2–3 billion in 2005.

(http://www.export.gov.il/SubIndex.asp?CategoryID=179).

The relevant niches for Israel–EU cooperation are first in the field of solar energy. These include solar collectors for water heating, mainly for specific high-tech applications, and vacuum tube solar collectors for high temperature water heating, efficient air conditioning systems and dedicated controllers for air conditioning systems with setbacks for energy savings, and advanced materials for building insulation.

5.1 Products that are locally produced and products that are imported

Product name	Locally produced	Imported from
Efficient air conditioning and ventilation systems	X	
Refrigerators	X	US, EU
Photovoltaic and related systems		Spain, Germany, Turkey
Solar water heating systems	X	
Building efficient energy management systems (BMS)	X	EU, US
Efficient lighting systems and HID lamps	X	China, EU
Insulation materials and double-glazing	X	
Shading devices (sun screens)	X	South America, EU
Skylight systems	X	
Computers	x	China , Europe, US, Taiwan

Table 3

5.2 Locally made products that are exported[4]

Technology	Companies	Web site
SWH	Nimrod	http://www.nimrod-solar.com
	Chromagen	http://www.chromagen.co.il
	Solel	www.solel.com
PV	Interdan-Lumitec	www.interdan.com
Windows, curtain walls	Klil	www.klil.co.il
	Mifromal	
Lightning	Metroligh	http://www.metrolight.co.il

5.3 Energy-saving building products manufactured by European manufacturers and imported to Israel

- Siemens (Germany) – photovoltaic cells, energy controllers, lighting devices, and controllers.
- Emation (UK, Germany, US) – building management and control systems.
- Aqua Metro (Switzerland) – energy meters.
- Libert (Italy) – Energy saving air conditioning system.
- TRANE Europe – Energy saving chillers.
- Trend (England) – Building management and control devices and systems.
- Abryl – a worldwide network of associated partnering companies and experienced and professional associates represents Shaarland network. Abryl Projects and Management, Ltd. (Abryl) provides business and trade acceleration services to Israeli and foreign organizations in the private and public sectors.

[4] There is no Israeli company with significant exports in the area of advanced materials for insulation.

6. Local and national initiatives that could function as an energy efficiency and renewable energy information office or helpdesk

Under the current political circumstances, there are almost no regional initiatives in this area, other than a few bilateral specific projects between Israel and Jordan.
On the national level, there are three limited initiatives that could play this role:

- R&D Department at the Ministry of Energy and National Infrastructures – subsidizes some of the main theoretical and practical studies in this area. For example, the department funds the National Solar Energy Center in Sde-Boqer (in the south of the country) and the development of "Thermo-Cool" software for building thermal audit by the Technion (http://www.technion.ac.il/~monica/). The Department concentrates on a wide dissemination of information in this area.
- The Energy Conservation Department at the Ministry of Energy and National Infrastructures – is responsible for supporting energy efficiency projects in buildings, energy marking of electric equipment, standards (efficiencies in buildings, steam boilers, pumps, air conditioners), energy surveys for medium and large energy consumers facilities, training and authorization – through courses at various professional colleges or schools – of energy deputies in medium and large energy consumers facilities, training and authorization of experts for ESCO of retrofitting (contact person Zeev Gross zgross@mni.gov.il).
- The Ministry of the Environment – promotes the concept of Green Buildings and concentrates data about local and international experiences. The Ministry is responsible as well for the implementation of sustainable energy policy in the country and especially the Israeli obligations under the Kyoto Protocol. (http://www.sviva.gov.il/bin/en.jsp?enPage=e_homePage).

NGOs and research institutions

- *The Heschel Center for Environmental Learning and Leadership* was established in 1998 to provide a meeting place where people can develop and implement an alternative environmental, social, and cultural vision for the future of Israel. http://www.heschelcenter.org
- *The Samuel Neaman Institute for Advanced Studies in Science and Technology* is an independent public-policy research institute, established in 1978 to assist in the search for solutions to national problems in science and technology, education, economy and industry, and social development. http://www.neaman.org.il/Neaman/

- *World Energy Council (Israeli committee). WEC* is the foremost multi-energy organization in the world today. WEC has Member Committees in over 90 countries, including most of the largest energy-producing and energy consuming countries, including Israel. The Israeli branch of WEC is led by the IEC (Israeli Electric Cooperative) and Ormat. (http://www.worldenergy.org/wec-geis/news_events/member_news/miec/greetings.asp).
- *Interdisciplinary Center for Technology Analysis and Forecasting (ICTAF)* – The multidisciplinary center taps the expertise of world-class scientists at Tel-Aviv University and other well-known research establishments to create a core body of researchers with unrivaled knowledge in a diverse range of fields in exact sciences and engineering, geography, economics, education, and social sciences, information technology, and communications. Since 2000, ICTAF has led the Israeli branch of the European Organization for Promotion of Energy Technology (OPET) network. OPET members have access to a wealth of information on innovative and "green" energy technologies, resulting from EU and other international energy programs such as OPET buildings. OPET Israel is coordinated by *Asher Vaturi* http://www.ictaf.tau.ac.il.
- *The Jacob Blaustein Institute for Desert Research* was established in Sde-Boqer in 1974 as a result of a recommendation made by the council for higher education in 1972, followed by a decision of the Israeli government in 1973. The Jacob and Hilda Blaustein Foundation made a generous contribution to Ben-Gurion University of the Negev, and the Institute was named The Jacob Blaustein Institute for Desert Research (BIDR). Sixty-five scientists, 60 technical and administrative staff members, and over 100 Israeli and foreign research students constitute a balanced blend for carrying out basic and applied research related in Desert Sciences. Activities cover basic research in environmental physics with applications in desert meteorology and solar energy. http://bidr.bgu.ac.il/bidr/General.aspx?ItemId=3005

7. Local organizations that represent energy efficiency and renewable energies businesses

The Department of Environmental Technologies at the Israel Export & International Cooperation Institute – The Israel Export & International Cooperation Institute is the primary organization facilitating trade opportunities, joint ventures, and strategic alliances between international businesses and Israeli companies.

The environment department of the institute was established to promote Israel's industrial capabilities through business cooperation on all levels – technological, industrial, and commercial – in the field of environment technologies such as water and energy systems (contact person is Mr. Abraham Israeli israeli@export.gov.il).

- Building products industrial union at the Israeli Manufacturing Association. The union includes 12 branches of construction industries (500 enterprises) which represent 27% of Israeli industrial production. (http://www.industry.org.il).
- Energy committee of the Israeli Manufacturing Association. The committee represents the common interests of energy producers – including renewables and saving energy – mainly saving energy costs. It includes 25 members from both energy producers and large industrial consumers (http://www.industry.org.il).
- The union of metal industries, electricity, and infrastructures – The union includes the industries of office and household equipment and solar energy systems (http://www.industry.org.il).
- The association of constructors and builders in Israel – The association promotes the technical professional quality of its members. The technical department of the union is responsible for distribution of efficient technologies professional materials among its members. The association is regarded as one of the most influential in the Israeli economy (http://www.acb.org.il).

8. Recent local and national events[5]

– Launching the new standard for energy efficiency in building, May 22, 2006, Herzliya. The new voluntary standard was prepared by an inter-ministry committee during the last two years. The conference was used to introduce it to architects, planners, and other construction stockholders.

– Rax – The 19th Israel International Exhibition for Electrical Engineering – June 13–15, 2006, Tel-Aviv Fairgrounds. The event included electrical, electronic, and lighting engineers, electronic and industrial technicians, electrical contractors, entrepreneurs, building and institution constructors, and maintenance managers, architects, designers, communications managers, security officers, and general electricians (http://www.stier.co.il/english/fairs/rax/info.htm).

– Sustainable schools conference – June 8 2006, Kefar Saba. The conference summarized a year of activities in schools all over the country and distributed prizes. The Ministries of Education, Culture, and Sports, and the Environment took part in the event (http://www.sviva.gov.il).

– Energy and environment – the annual conference of the Israeli Association of Ecology, Haifa, June 27, 2006 (http://www.neaman.org.il/Neaman).

– The national energy convention – trends, reforms, and business opportunities – May 8–9, 2006 at the Israeli Congress Center in Tel-Aviv www.ecoenergy.co.il/energy2006.

- The annual exhibition for urban renewable energy, July 6–12, 2006 at the exhibition hall of Reading Power Station, Tel-Aviv (http://www.miu.org.il/MIU_v4/docs_about/About_English.html).

– Alternative and Renewable Energy Conference, November 8 2006, at the David Intercontinental Hotel in Tel-Aviv. Contact person: aarbib@mni.gov.il

[5] Some of the events are annual events, so we can expect that they will occur also in 2007 and 2008. Regarding other events, there is no available information.

– Sustainable energy in the built environment, international conference, 1-3 July, 2007, Eilat. Contact person Asher Vaturi asherv@zahav.net.il.

9. Three initiatives of professional networking in Israel that can be involved with other MEDA or EU countries

The New Histadrut – the largest workers' organization in the State of Israel – includes a special department for the construction sector. This organization covers the whole country and has broad cooperation with professional unions in the EU and Mediterranean countries including the Palestinian Authority.

The association of Israeli contractors and builders – this powerful association focuses on the technical and economic promotion of the construction sector in Israel. It initiates technical workshops and other training events and, in our opinion, is more open today for international cooperation with European countries than some years before.

The association of solar industries in Israel – this professional organization focuses on one of the most promising areas for bilateral cooperation with Europe. Some of the members of the organization already have wide experience with European countries and organizations.

10. A concise capacity assessment of relevant service providers and educational facilities

10.1 Israeli education system

Over the years, the Israeli educational system has been the basis for national advanced technological developments. This resource enabled the country to lead in some high technology areas and some of the scientists have earned international prizes, such as Nobel Prizes in chemistry and mathematics.

The educational system is based on five universities: The Hebrew University of Jerusalem, Tel-Aviv University, Bar-Ilan University, Haifa University, and Ben-Gurion University of the Negev (Beer-Sheva). In addition to these universities, there are two technology universities: the Technion, and the Weizmann Institute of Science. Beside the universities which are based on research and qualification activities, there are nearly 30 private and public colleges all over the country. The leading university covering relevant construction and engineering subjects is the Technion. Other universities covering these subjects are Tel-Aviv University and Ben-Gurion University.

Regarding the recent development of the educational system, the number of Israeli higher education students has grown very rapidly from the 1990s. For example, in 2000, 148,500 students studied in the higher education institutions, compared to only 76,000 students in the beginning of the 1990s. The main causes for this growth are the enlargement of the public's interest in getting an academic education and the academization of many of the colleges that had previously been non-academic. This enlargement characterizes not only the number of students and institutions but also the variety of study areas, especially the rapid growth of information science studies.

In 2003, 29,478 students were graduates of the universities; 18,176 students received bachelor's degrees, 9,328 students received master's degrees, and only 999 received PhDs. Regarding technical qualifications relevant for energy efficiency in buildings, 3,155 students graduated in engineering and architecture; only 843 students graduated in the physical sciences in 2003 (ICBS 2006).

Recent surveys of the Israeli labor department (The Ministry of Commerce, Industry and Employment, 2006) reached the conclusion that one of the main shortages in the local employment force is technical qualified workers such as practical engineers and technicians. In recent years, some of the traditional technical high schools were closed and replaced by various informal technical courses. Some of these courses are been

initiated by governmental institutions such as the national employment department which aims to help unemployed people find a job.

Solar water heater installers/double glazing fitters/air conditioner installers/wall and roof insulation fitters, etc. generally receive their training in technical schools such as in Mishlav (http://www.mishlav.co.il), Ort, or Amal school networks. The initiation of some of these courses comes from the Ministry of Social and Labor Affairs in order to provide job qualifications for unemployed persons. Their main problem is a shortage of younger people who would like to qualify in these professional areas. Unlike the German education system where there is professional recognition and respectablestatus for non-academic technical education, in Israel this profession suffers from low status.[6]

So far, the Israeli economic system has succeeded in bridging the gap between the demand and supply of technicians with the large number of technical experts who immigrated to Israel from the former USSR and other east European countries during the 1990s. However, the forecast in employment trends in Israel shows a significant shortage of these experts (such as installers/wall and roof insulation fitters) unless the education system makes the necessary changes.

You might focus on quality control and quality assurance.

10.2 Educational facilities SWOT Analysis

Strengths

- Large national budget
- Deserves high priority by the Israeli public.
- Advanced educational system and educational infrastructures including qualified human resources
- Breeding ground of advanced High-Tech industries for qualification and as a labor market for the graduates.

[6] The workers in these areas generally have much field experience, but not much theoretical knowledge. If you organize a workshop to improve capacity you first need to cooperate with the professional qualification department of the Ministry of Employment and Social Affairs. This workshop will need to be in Hebrew. Finally, in practice, in most of the professions mentioned before, the workers work without official diplomas (except in the air conditioning areas). They get their training by working with other experienced technicians.

- Scientific interconnection between Israel and western countries such as the participation of Israel in FP5, FP6, and probably also in FP7 (the EU subsidizes programs, but the Israeli government pays for its participation)

Weaknesses

- Decrease in the qualifications of educational employees (teachers) as a result of salary erosion
- Decrease in the position (status) and the authority of teachers as educational leaders
- Decentralization of the system, causing loss of control and educational coordination
- Unstable labor market and frequent strikes
- Decline in the results of Israeli pupils in the natural sciences compared to other countries

Opportunities

- Immigration of large numbers of well-educated groups mainly from former the USSR, Argentina, the United States, and Western Europe, which insert new scientific and technological educational approaches.
- The increase of public's attention to the need to improve the educational system.
- Recent globalization trends which enable networking and cooperation with other educational and technological centers around the world.
- New trends in the information society which increase the independence of the Israeli students through use of the Internet and other technological applications.

Threats

- Increasing educational gaps between different social groups in the general society (such as center and periphery, rich and poor).
- Enlargement of privatization in the education sector, which tends to enlarge these gaps.
- Departure of well-qualified workers (instructors) as a result of low salaries and a decline in the image.
- The overall system has not adopted the necessary reforms (such as the Bologna process in Western Europe) which are needed to compete with the updated needs of the information society.

10.3 Rank of the best five educational service providers and their relevant specialization

1. **Amal 1** – a network of educational institutions, engaged in the advancement of comprehensive and technological education for youth and adults. Located throughout Israel, Amal 1's schools can be found in Jewish, Druze, Bedouin, and Arab communities. It aims to provide advanced academic, scientific, and technological education for its students, while endeavoring to instill social and ethical values. Quality education places great demands on today's educators; professionalism, caring, involvement, integrity, initiative, perseverance, innovation, and constant striving for improvement are the cornerstones of Amal's educational endeavors. http://www.amalnet.k12.il/home/amal1/english/

1. **ORT** Israel is the largest center of activity within World ORT, an organization that covers over 60 countries worldwide. In addition to mandatory official curricula and the network's specialized science and technology education, ORT Israel provides a high level of education in a broad range of disciplines. The Ort College Administration encompasses and supervises all activities regarding academic colleges, practical engineering training colleges under the auspices of either the Ministry of Education or Ministry of Labor, diverse certification courses, and other educational programs. http://www.ort.org.il/en/scripts/about.asp

   ORT Braude College offers a wide range of studies and training for careers in the latest technologies. The College's activities are concentrated in four areas:

   a. Training students in engineering technologies, resulting in a Bachelor of Science in Engineering (B.Sc.)
   b. Preparing students for careers in industrial engineering in the public and business sectors; studies from a diverse list of subjects through the College's Continuing Education Department
   c. Services to industry and the community at the College's modern facilities and from its exceptional faculty.

   http://braude.ort.org.il/about.asp

2. **The Israeli Building Center, Ltd**. – offers information services for the construction industry, courses, exhibition and conference organizers, management services, and occupational training. http://www.building.org.il
3. **Ruppin College** – offers services and consulting, financial and marketing information, management services, occupational training, and scientific education to economists, auditors, and accountants.

4. **Shenkar College of Engineering and Design** was founded in 1970, with the goal of serving Israeli industry in all that relates to academic qualifications and R&D services for modern industries.

   Shenkar is an institute of higher education and, like all the public universities in Israel, is supervised and financed by the Israeli Council for Higher Education.

   Shenkar offers degree courses in all the subjects studied. Tuition fees are in line with the fees charged by Israeli universities.

   Shenkar's uniqueness as an academic institution lies in the close ties between the two faculties: the Faculty of Engineering and the Faculty of Design. While both the faculties maintain their own special character, they operate joint projects, designed to expose the students to various disciplines. The goal of the Faculty of Engineering is to provide a generation of engineers and managers who will influence the goals and processes of Israeli industry and business. The college is responsible for wide professional training courses for the Ministry of Labor and the Ministry of Energy and National Infrastructures. For example, it has the authority to train and qualify ESCO companies and Energy Supervisors of Israeli industries.

   http://www.shenkar.ac.il/site/general/about/about_EN.asp

11. Recommendations

1. Based on the structure of the Israeli construction sector, there is a need to focus on niche markets with high technological value.
2. There is a need to initiate specific promotional actions aimed at increasing the public's awareness of the need for the use of energy efficiency in buildings. Other promotional measures should be taken among the professional sectors of architects, building companies, engineers, and planners.
3. Regarding the small size of the local market, regional or international cooperation is essential for its development.
4. Regulatory tools such as the standards for building insulation had a significant impact on the public's use of renewable energy systems. This kind of legal approach should be expanded.
5. As long as the use of energy efficiency and renewable energy systems in buildings are not always cost effective, governmental incentives for the constructors are essential.

11.1 Five business development activities based on the market study

1. Professional training events and workshops for niche sectors
2. Parallel activities between Israeli and EU institutions
3. Establishment of helpdesks and information centers
4. Support conferences, expositions, and fairs professionally and financially
5. Encouragement of industry pools and instruments for the promotion of new business opportunities.

11.2 Five business development activities based on capacity

1. Support conferences, expositions, and fairs professionally and financially.
2. Professional training events and workshops for the Air conditioner sectors.
3. Building an electronic platform for separate professional groups.
4. Publishing a know-how book (with Hebrew version) for contractors.

5 Parallel professional activities between Israeli, MEDA, and EU institutions.

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Appendices

Appendix 1: Energy efficiency services and products in Israel

Services	Company name	Contact	Website
ESCO Services	Smart Energy Ltd.	info@smart-save.co.il	http://smart-save.co.il/Site/Index.asp
	Nidan control systems	ofer@nidan.co.il	http://www.nidan.co.il/
	Melta Ltd.	sale@melta.co.il	http://www.melta.co.il
	Gadir Engineering Ltd.	nir@gadir.co.il	http://gadir.co.il
	Dalkia Israel		www.sei.ie/getFile.asp?FC_ID=1153&docID=227
	Universe Electronics	malki@gsd-univ.com	http://www.smuniverse.co.il/profile_en.html
	Radion	elect@radion.co.il	
Installation and maintenance of efficient energy equipment	Danon		http://www.danon.co.il/index.files%5Cair_condition.htm
	Control Applications Ltd.	cal@ddc.co.il	http://www.ddc.co.il
	Hotelo	h@hotelo.com	
	Shovalim Ltd.	andregol@inter.net.il	http://www.shouvalim.com
	Metrolight	info@metrolight.co.il	http://www.metrolight.co.il
	Melta Ltd.	sale@melta.co.il	http://www.melta.co.il
Energy audit for building	Gadir Engineering Ltd.	nir@gadir.co.il	http://gadir.co.il
	EMC	sales@emcil.co.il	http://www.emcil.co.il/emcil/index.html
	ROMTEC	yaron@yaron-control.co.il	http://www.yaron-control.co.il
	EnConSol	enconsol@zahav.net.il	http://www.enconsol.co.il
	Isotop Ltd.	sales@Isotop.co.il	http://www.isotop.co.il

Design and engineering of systems (AC or Solar)	Nidan Control Systems Ltd.	ofer@nidan.co.il	http://www.nidan.co.il
	Electra	ramig@electra.co.il	http://www.electra-trade.co.il
	EnConSol	enconsol@zahav.net.il	http://www.enconsol.co.il
	Smart Energy Ltd.	info@smart-save.co.il	http://smart-save.co.il/Site/Index.asp
	Hotelo	h@hotelo.com	
	Gadir Engineering Ltd.	nir@gadir.co.il	http://gadir.co.il
	Nowarski Engineering	nowarski@netvision.net.il	http://www.nowa-tech.com/
	Solarit Ltd.		http://www.solar.hci.co.il
Design services of energy efficiency in buildings (architects)	LAHAV-RIG	ir_misrd@netvision.net.il	http://www.and.co.il/galleries/lahavrigg/index.php?fr=and
	ABT	micha_b@abt.co.il	http://%20www.abt.co.il
	Yissum	all@yissumconsult.co.il	http://www.yissumplan.com
	Yona Yehiam	office@arch-y-r.co.il	http://www.and.co.il/galleries/ygg-arch/index.php?fr=and
	Yodfat	info@yodfatengineers.com	http://www.yodfatengineers.com
	Content	info@contec.co.il	http://www.contec.co.il
	Gertner Architects	s@gertner-arch.com	
Retrofitting of existing buildings with insulation, double glazing, etc.	Smart Energy Ltd.	efal@013.net	http://smart-save.co.il/Site/Index.asp
	RDT Equipment & Systems (1993) Ltd.	tadir@rdt.co.il	http://www.rdtest.co.il/SiteFiles/1/8/2589.asp
	Technorit	uri@frp.co.il	http://www.itum-net.co.il/www/directory_page.asp?id=225
	Universe Electronics	malki@gad-univ.com	http://www.smuniverse.co.il

Energy efficiency awareness campaigns	The Israeli Center for Construction	info@neaman.org.il	http://www.building.org.il
	The regional municipality of Eilat	moetza-matnas7@moetza.ardom.co.il	http://www.eilot.org.
	ICTAF	sharany@post.tau.ac.il	www.ICTAF.tau.ac.il
	SNI (Technion)		http://www.neaman.org.il/
	ASSIF-Strategies Ltd.	info@assifstrategies.com	http://www.assifstrategies.com
Other relevant services			
Energy efficiency services for the industry	Maryon	info@mayron.biz	http://www.mayron.biz
	EnConSol	enconsol@zahav.net.il	http://www.enconsol.co.il/IndexH.htm
	Nidan control systems	ofer@nidan.co.il	http://www.nidan.co.il/
	Gadir Engineering Ltd.	nir@gadir.co.il	http://gadir.co.il
	Universe Electronics	malki@gsd-univ.com	http://www.smuniverse.co.il/profile_en.html
	Boiler & Piping Industrial energy(1989) Ltd.	Tel: +972-8-859-8111	
Energy efficiency portals	Planners' portal	pittovi@netvision.net.il	http://plannersnet.ios.st/Front/Tools/homepage.asp
	Climaton	efal@013.net	http://www.climaton.co.il
	Archijob	pirsum@archijob.co.il	http://www.archijob.co.il

Products			
Solar water heating systems			
	Solel	marketing@solel.com	http://www.solel.com
	Chromagen Ltd.	chromagen@cromagen.co.il	http://www.chromagen.biz
	Nimrod Ltd.	nmrod@netvision.net.il	
	Rand Ltd.	rand@rand.co.il	http://www.rand.co.il
	Esh-Dar	pk-refr@zahav.net.il	http://www.esh-ar.co.il/fprofile.html
	Orhateva	orhateva@walla.com	http://www.orhateva.co.il
	Amkor Ltd.	Tel: +972-8-865-1444	http://www.amcor-solar.co.il
Air conditioning and ventilation systems	Tadiran Ltd.		http://tadiran-appl.co.il
	TRM		http://www.whircool.co.il
	MAAYAN	info_center@bezeqint.net	http://www.danon.co.il/index.files%5Cair_condition.htm
	Electra	rikia@electra.co.il	http://www.electra-consumer.com
	Tornado Ltd.	Tel: +972-9-764-0140	http://www.tornado-top.co.il
	CH.M.B	bargal2@netvision.net.il	http://www.mazganim.co.il/Page.asp?page=183
Shading devices (sun screens)	Orgon	holis@holis.co.il	http://www.orgon.co.il/home.htm
	Kairi	urik1@zahav.net.il	http://www.kairi.co.il
	Burda	erez5555@zahav.net.il	http://www.burda.co.il
	Domus		www.domus.co.il
	Astrom Ltd.	mgt@ashtrom.co.il	http://www.ashtrom.co.il/english/index.aspx
Insulation materials and double-glazing	Ytong	iris@ytong.co.il	http://www.ytong.co.il/tech/whitefront.html
	Bitum Ltd.	amosh@bitum.co.il	http://www.bitum.co.il/site/index.asp
	Phoenicia Ltd.	gil_k@pgw.co.il	http://www.phoenicia.co.il/aboutus.html
	Golmat	info@golmat.co.il	www.golmat.co.il

Efficient lighting systems	Metrolight Ltd.	info@metrolight.co.il	http://www.metrolight.co.il
	Universe Electronics	malki@gad-univ.com	http://www.smuniverse.co.il
	Designbylight	info@designbylight.co.il	http://www.designbylight.co.il
	Skylight Ltd.	skylite@skylite.co.il	http://www.skylite.co.il
	Solatube	sales@solatube.co.il	www.solatube.co.il
	malki@gsd-univ.com	http://www.smuniverse.co.il/ profile_en.html	Universe Electronics
	Elco	sales@elco.ind.com	www.elco-ind.com
	General Engineering		WWW.General-Eng.COM
	IMD	Tel: +972-8-921-1151	http://www.imd.co.il/
Equipment for electric power factor improvement	Sustainer Ltd.	sustainer@sustainer.co.il	http://www.sustainer.co.il
	Topower Ltd.		http://www.topower.co.il
	Sustainer	sustainer@sustainer.co.il	http://www.sustainer.co.il/en/
	Thermostyler	michael.teller@gmail.com	http://www.thermostyler.com
Building efficient energy management systems (BMS)	Ardantech	ofirab@ardan-pic.co.il	http://www.ardantech.co.il/act/a.htm
	Bynetsoft	info@bynetsoft.co.il	http://www.bynetsoft.co.il
	Danshir		http://www.ib2b.co.il/textrev.asp?id=6888
	EMC	sales@emcil.co.il	http://www.emcil.co.il/emcil/index.html
	Contel	contel@contel.co.il	http://www.contel.co.il/
	Bimar	tec@tec.co.il	http://www.tec.co.il/
	Hotelo	h@hotelo.com	
	Danmar		www.danmar.co.il
	Afcon Ltd	info@afcon.co.il	http://www.afcon.co.il/english.htm
	Ebeat	info@bynetsoft.co.il	http://www.ebeat.co.il/

Energy efficient household appliances	Quick-heat Ltd.	nonyo@quick-heat.co.il	http://www.quick-heat.co.il/profile.htm
	Amcorgroup Ltd.	amcoril@amcorgroup.com	http://www.amcorgroup.com/new/index.htm
	UNIBATT	UNIBATT@ZAHAV.NET.IL	http://www.unibatt.com
	Harmonology	support@harmonology.co.il	http://harmonology.co.il
	Gur technologies	info@air-conditioner-cleaners.com	http://www.air-conditioner-cleaners.com
	Termosiv	THERMOSIV@BEZEQINT.NET	http://www.thermosiv.com
	Electra	rikia@electra.co.il	http://www.electra-consumer.com
Energy efficient office equipments	Powerpaper	INFO@POWERPAPER.COM	http://www.powerpaper.com
	TRM	Tel: +972+3-532-8784	http://www.whircool.co.il
	Ipcomp	shlomi@ipcomp.co.il	http://www.ipcomp.co.il
	Intel		http://www.intel.co.il
Photovoltaic and related systems	Millennium Ltd.	info@millenniumsolar.com	http://www.millenniumsolar.com
	SolarPower Israel	info@solarpower.co.il	http://www.solarpower.co.il
	Interdan Ltd.	info@interdan.com	http://www.interdan.com
	Rand Ltd	rand@rand.co.il	http://www.rand.co.il

Appendix 2: Israeli Export companies in the areas of renewable energy and efficient energy in the building sector

1. Chromagen is a global leader in the field of thermal solar energy systems, with over 40 years' experience. Located in more than 35 countries, Chromagen is known for its ability to provide cost-effective and environmentally friendly solutions to energy requirements. Chromagen's systems are designed to supply hot water both for domestic use in family homes and for more complex centralized installations in hotels, hospitals, apartment buildings, and industrial plants. Each system can be custom-tailored to the specific requirements of its users, ensuring optimal efficiency and reliability backed by Chromagen's expertise. A wide range of solar collectors and storage tanks, together with advanced design capabilities, state-of-the-art manufacturing methods, and an extensive marketing network, enable Chromagen to provide high quality products that comply with a broad range of conditions and standards worldwide (Web site**:** http://www.chromagen.co.il/).

2. Interdan-Lumitec, Ltd. – manufacturing, marketing, and installation of solar (photovoltaic) power systems for buildings, communications, irrigation, and other applications; solar lighting and signs; inverters and battery chargers; 220V and 110V energy-saving electric signs and sign lighting systems (Web Site**:** www.interdan.com).

3. Klil Industries, Ltd. designs, develops, manufactures, markets, and supports aluminum systems. Klil Industries designs and produces dies, extrudes aluminum, completes the surface treatment of aluminum extrusions with dry and wet paints as well as anodizing and developing aluminum systems. Klil Industries has many years of experience in the design and extrusion of profiles for windows, doors, and curtain wall systems, including thermally broken systems, rolling shutters, shop fronts, and balustrades. In addition to its own systems, Klil designs and exports aluminum extrusions and aluminum-machined extrusions that are tailored to customer specifications. Klil's well-trained professional staff manages the technical support and training center. Klil Industries is ranked among the leading 100 industrial companies in Israel. Klil has managed to maintain and increase its market share in Europe and Eastern European Countries for over twenty years. Klil Industries has formed many foreign liaisons and has entered into knowledge-sharing

agreements with leading European companies. Klil is the only Israeli extruder operating under ISO 9001 and the only Israeli company in its field that

uses a quality assurance system compatible with the ISO 9001 standard (Web site**:** www.klil.co.il).

4. Mifromal provides complete systems for windows, doors, and curtain walls, and industrial systems (such as lifts, motors, gas systems, electronics), greenhouses, etc., applicable for all types of buildings and designs, with special attention to the finish-look and its integral involvement with the entire project and its environment, as well as for its functionality, easy and friendly for the end user, and for the fabricator who is assembling and installing the systems. For over 40 years, the company has been supplying coated profiles for shower and bath cabinets in Israel and Europe. The company specializes in coating the profiles with the best quality materials and the ultimate solution in terms of performance and durability for: 1. powdered coated technology backed by a worldwide 15-year guarantee and 2. duranar pvdf (Teflon) technology backed by a worldwide 25-year guarantee.

5. Metrolight is a technology-driven company recognized as an innovator and leader in Electronic Ballast technology for HID lamps. Combining the talents and experience of power electronics and embedded-microprocessor engineers with in-depth understanding of HID lamp technology, Metrolight creates innovative Electronic Ballasts which set new standards of performance and reliability. Metrolight offers the world's widest range of electronic Ballasts for HID lamps: Metal Halide, High Pressure Sodium (HPS), and Xenon, in power ratings from 20 to 7,000 Watts (Web site**:** http://www.metrolight.co.il).

5. **Nimrod Industries, Ltd.** is Israel's leading manufacturer of solar and electric water heaters. It is the only Israeli company in the field that manufactures all of the components – tank, collectors, and pipes – under one roof. The company manufactures solar and electric water heaters as well as water heaters with heat exchangers. Nimrod's water heaters come in variety of sizes, from 30 to 300 liters, and can be installed in a vertical or horizontal position or suspended in the air (Web site: http://www.nimrod-solar.com).

7. Ormat designs, produces, builds, owns, and operates systems for power generation from geothermal resources, recovered waste heat, solar, and biomass. With 800 MW installed worldwide, modular Ormat® Energy Converter plants of 200kW to over 130MW, to date have saved

7 million tons of fuel and have avoided the emission of 17.5 tons of CO_2 (Web Site**:** www.ormat.com).

8. Solel Solar Systems, Ltd. is a world leader in solar thermal central power generation. Solel produces solar thermal collectors and systems for industrial, commercial, and residential applications. It produces large scale solar collectors for the industrial market that provide hot water at 100^{o}C and an innovative hot water system for the residential market. Its technology is behind the nine solar power plants in California that have been successfully producing 354 MW of solar power for 20 years. Its core competencies are in solar engineering and coating technologies (Web Site**:** www.solel.com).

Appendix 3: List of interviewees

1. Mr. Natan Hilu, The Association of Israeli Contractors and Builders.
2. Mr. Abraham Arviv, Ministry of Energy and National Infrastructures.
3. Dr. Ofer Efal, Smart Energy LTD .
4. Mr. Avraham Israeli, Israeli Export Institute.