Green Collar Jobs: The Alternative Energy Industry and Labor Markets

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Abstract

At the turn of the second decade of the 21st century, the world is facing a major challenge in the field of energy. While demand is increasing at an exponential rate, energy supply is lagging behind, due to limited output from depleted and exhausted natural resources. Adding to that, the need to reduce greenhouse gas emissions from the burning of fossil puts even greater pressure on energy markets to provide substitutes and solutions. A coming energy crisis now seems inevitable.

The impact of such a crisis will vary between nations and geographical regions. While having a milder effect on countries rich in natural resources, ramifications for other countries, including Israel, might be severe. Energy shortages as well as scarcity of food and basic commodities could destabilize the social structures as well as the economies of these countries.

Coping with the crisis and the growing demand for energy will require conservation policies as well as achieving greater efficiency in the use of energy resources. On the supply side, much effort is put into the development of applicable technologies for energy production from renewable, sustainable sources. The energy crisis is indeed an enormous and complex global challenge, but it also provides opportunities for economic development and growth, especially through investments in science, technology and human capital as well as in the evolvement of new modern industries and expansion of labor markets.

For many years now, Israel has been a world leader in alternative energy research and development, cooperating with major research centers in the U.S. and Europe. Israeli companies have constructed some of the world's largest solar power stations, some which have been operating for more than two decades. Other companies are engaged in similar projects in Europe. Ormat, one of the world's biggest geothermal energy producers, is also based in Israel.

However, the alternative energy market is still in its initial stages, and the total energy produced from renewable resources worldwide is relatively minor. Since the demand for energy is bound to continue and grow, so will the demand for renewable energies. As new technologies mature, the need for the production, installation, integration and maintenance of facilities based on using these technologies will also increase.

Greater cooperation between the E.U. and Israel could help transform Europe's energy market, providing the need for cleaner energy, while at the same time, creating new export markets for industries in Israel.

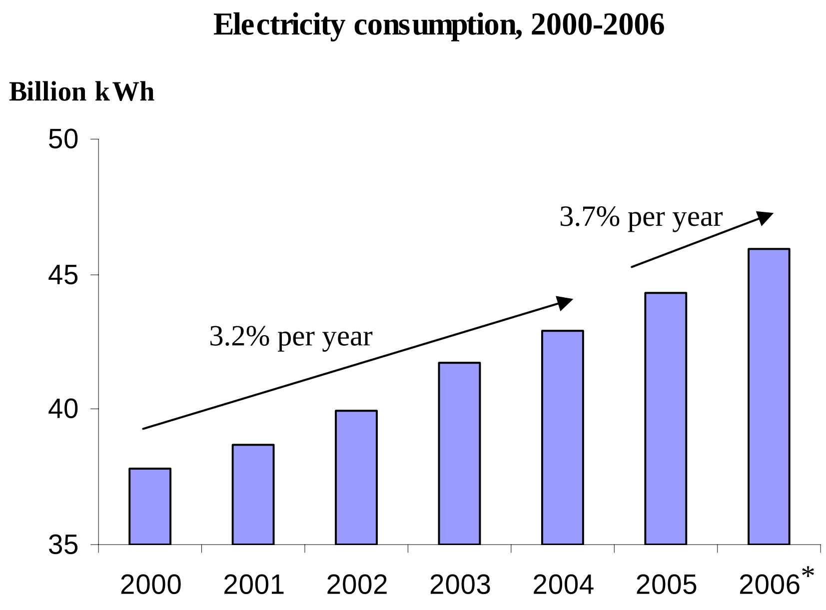
This chapter provides a survey of the situation in the energy market and its possible vectors of development, while demonstrating the possibilities for enhancing cooperation between Israel and the EU.

The Energy Crisis

The global energy crisis has long been an established fact. Oil prices are sky-high and there is no sign of their decline in the foreseeable future. The International Energy Agency estimates that oil prices will continue to rise in the coming years, a result of expanding demand and limited supply (IEA 2008). This situation may cause significant instability and frequent crises in the energy market, which will become more susceptible to sudden shocks. For Israel, which imports some 99% of the fuels used for transportation and the production of electricity and is an "electrical island" as it cannot connect to the electricity grid of its neighboring countries, this volatility in the international market may be even more dangerous than in other countries.

The rise in fuel prices is occurring at a time of an unprecedented jump in energy consumption in Israel. In the past two decades energy consumption per capita in Israel expanded by 44%, whereas in the EU per capita consumption rose by only 15% (Mor 2006). Between 1996 and 2006 there was a 62% increase in the total demand for electricity in Israel, led by a 98% increase in the public and commercial sectors (IEC 2006). As electricity cannot be stored (except for special facilities which can store small amounts of energy, such as pumped storage), and because Israel cannot connect to the electricity grids of neighboring countries for geopolitical reasons, it must rely on autonomous production. However, production capacity did not expand together with the growth in electricity demand, resulting in difficulties for Israel Electric in coping with demand peaks, especially in times of extreme weather such as unusually hot days in summer or very cold days in winter.

The rise in quality of life and the lack of a clear policy for encouraging energy efficiency brought about, according to non-official data, a 6% to 8% growth in demand for electricity, 3 to 4 times the rate of population growth. In 2006, record demand caused widespread blackouts throughout the country. The Public Utility Authority – Electricity, which is responsible for electricity prices and demand management policy, forecasts that such crises may repeat themselves in the summers of 2009 and 2010. Israel Electric production capability is currently 12,000 megawatt (MW), while the Ministry of National Infrastructure forecasts that demand will double by 2020.



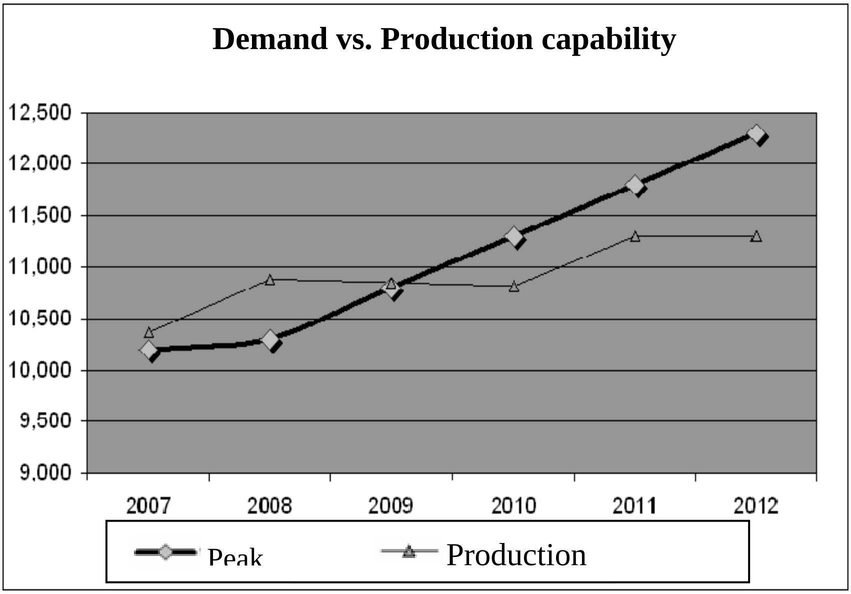
* Not including electricity for desalination and effects of Second Lebanon War

Graph no. 1: Electricity consumption in Israel, 2000-2006. Source: Israel Electric Corp.

Israel's electrical system is also burdened by its water management policy. Pumping water from the Sea of Galilee to the National Water Carrier alone consumes about 4% of the total electricity consumption.

The increase in use of desalination facilities, which are significant energy consumers, in order to enlarge the water supply, also weighs heavily on the electricity supply. For example, some two thirds of the output of a new 80 MW power plant in Ashkelon is reserved for a close-by desalination plant.

The development plan of Israel's electricity producers, which are expected to provide for the growing demand, includes the building of a coal power plant in Ashkelon, as well as a number of natural gas based plants. However, in light of expanding demand, it is improbable that the plan will be able to provide an adequate response to future needs. In addition, the coming years are to be characterized by a shift to electricity production using natural gas. Yet the supply of natural gas available to Israel at the moment (from a gas well near Ashkelon and by purchasing gas from Egypt) is limited, and its provision in the future is not ensured.



Graph no. 2: Production capacity in Israel versus peak demand. Source: Israel Electric Corp.

New options for the labor market

Even as the energy crisis is unfolding, the global labor market is also undergoing profound changes. The transfer of traditional industries to China, India and East Asian countries, together with the rise in life expectancy and lengthening retirement years, reduce the number of jobs in the Western countries, and may cause increasing unemployment in Europe and North America. Since Israel is a relatively small, export-oriented market, these changes are a real challenge for the Israeli labor market. The growing competition for markets from developing countries challenges the Israeli economy to discover additional development trajectories and to develop new export industries, which will utilize Israel's relative advantages in technology and science while creating more jobs.

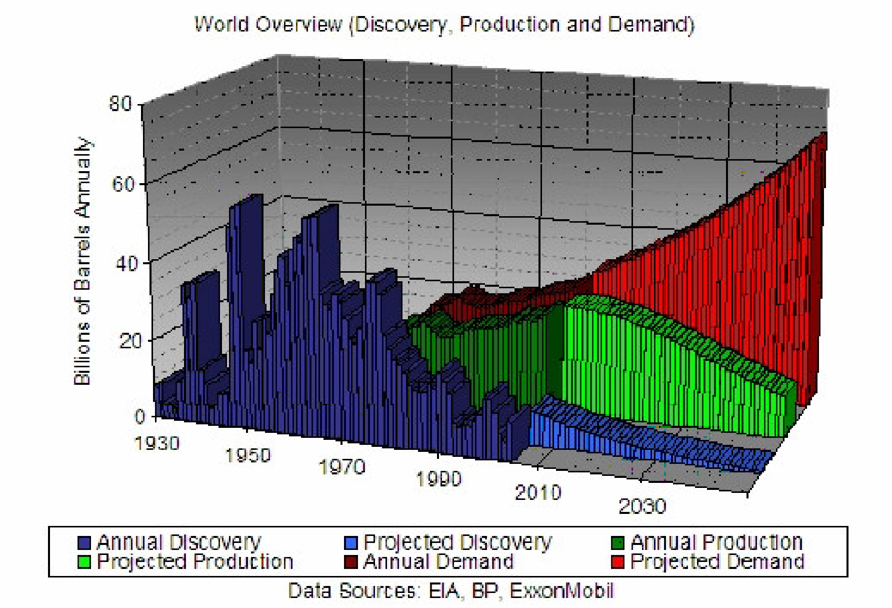
Many studies investigating the Israeli labor market examine it using parameters such as the size of the workforce, workforce participation rates, unemployment rates, disparities between wage levels and work conditions in different sectors. However, macro-economic questions such as the economy's future development in light of global competition do not always receive the attention they deserve. It is hard to know what the future of Israel's labor market will be, given the continuing presence of global competition.

About half of Israel's industrial workforce is presently employed in "traditional" industries, which are increasingly in competition with East Asian and other countries (Brodet 2008). The rapid rise in the standard of living in countries such as China and India has improved the education level and quality of the workforce, leading even hi-tec companies to transfer some of their manufacturing processes to these countries. The Israeli economy still enjoys a relative advantage over the Far Eastern countries in its professional manpower and technological infrastructure. These advantages are observable, for example, in the industries of advanced plastics, generic drugs (Teva), medical instruments and designated electronic equipment, aviation, arms, water and agriculture, and especially the computer and communications industry (ibid.). However, in the past years the local hi-tec has undergone modifications which opened it to competition from developing countries, following its gradual shift to services and technical support with limited technological development, and the future of the "engine" of the Israeli economy is unclear.

In order to survive under the conditions of global competition with the developing countries, Israel must invest in its human resources. Cutbacks in governmental support for higher education lead many scientists to leave Israel ("brain drain"), making human capital a veritable export sector. The future of Israeli economy must be based on technological competition, such as development and production of bio-technology, nano-technology and composite materials. The field of energy, and especially the development and application of technologies for the production of renewable energy and energy efficiency, may also be an important path for developing the Israeli labor market.

Technological solutions for the energy crisis

Most of the energy in the world today is produced from fossil fuels, especially petroleum, coal and natural gas, which are non-renewable. Using these fuels as the main energy source for transportation and electricity production has negative environmental effects such as air pollution and emission of greenhouse gases, contributing to climate change. The International Energy Agency's official forecasts are that present global petroleum reserves can provide for humanity's needs for another thirty years at least, a period which will be utilized for the development of new energy-producing technologies (IEA 2007). However, the high marginal cost of tapping and refining these reserves, together with the sharp increase in energy demand (for example from China and India), may create a severe petroleum shortage already in the next decade. Other evidence shows that the production of petroleum cannot be significantly increased beyond the present levels, and therefore the continual rise in demand will widen the gap between supply and demand. This will result in shortages and price hikes, as demonstrated in the next graph, complied from the data of the energy companies themselves.



Graph No. 3: The rise in demand for petroleum (red) versus the decline in supply (green) and the discovery of new petroleum reserves (blue). Source: BP, Exxon Mobile, Energy Information Administration.

Furthermore, increased use of these fuels contributes greatly to the greenhouse effect. The expected petroleum shortage and the need to find alternatives for it because of global warming underline the necessity to develop alternative energy sources. We should bear in mind that most of the new technologies for energy production (solar energy, wind energy, hydrogen cells etc.) are still in experimental stages and are not yet suited for commercial mass production. Chances are slim that these technologies would be ready sufficiently early and in the required amounts in order to provide a solution for the dearth in existing energy sources. Other alternative technologies which already exist, such as biological fuels based on producing energy from organic materials and hydroelectric energy based on exploiting water flowing through dams and waterfalls, are socially and environmentally problematic, and they are not a sustainable alternative. To sum up, there is no available, widely applicable solution to the global energy crisis today. Therefore, it is imperative to promote an agenda focusing on energy conservation and efficiency, through the development of engineering solutions, improving the efficiency of energy consumption in the commercial and service sectors, and changing wasteful household lifestyles. The International

Energy Agency lists 17 different technologies designed to improve the efficiency of energy use, create alternative energy sources and decrease greenhouse gases emissions (IEA 2008).

Energy efficiency

Solutions for the energy crisis are being sought on two levels: greater efficiency in energy use and the development of alternative, renewable and sustainable energy sources. These solutions complement each other, as they bring down demand while expanding the supply of clean energy.

The field of energy efficiency is therefore the most cost-effective and important course of action for coping with the energy crisis, as it makes use of existing means, which can be speedily implemented. Energy efficiency is a generic term, implying any process that reduces energy consumption, including efficiency in utilization, conservation, economization and reduction of its use.

Although this field may seem, at first glance, less attractive for investment, it has great technological and economic potential, and it may contribute to creating new jobs. Investment in this field has significant environmental and economic advantages. Through the reduction of energy consumption per capita, electricity demand falls as compared to supply, thereby economizing on resources needed for expanding supply such as additional production facilities, reducing the environmental pollution they create. Actually, economization through energy efficiency can be thought of as building a "virtual," environmentally-friendly power plant.

National energy efficiency policies make use of general economization incentive policies, such as differential rates which reward reductions in electricity use. Moreover, energy efficiency can be increased using complementing technological means which are adapted to the energy usage profile of different sectors: households, industry, offices, commercial buildings and public institutions.

For example, the main components of energy consumption in office buildings are heating in winter and air-conditioning in summer (up to half of energy consumption), lighting and computers. This usage profile can be made more efficient by installing regulators which adjust room temperature optimally in terms of air conditioner utilization, and sophisticated space detectors that shut down the air conditioning, heating, computing and lighting systems when the room is empty. Other technological techniques are systems which adjust the electrical capacity of the building according to actual usage, returning surplus electricity to the national grid.

Much energy efficiency can be achieved by green building of new structures, and by investing in the retrofitting of existing ones. New office buildings currently built in Israel make use of large expanses of dark glass as external walls. This is energetically inefficient as heat from direct solar radiation penetrates through the glass walls and cannot escape; at the same time, artificial lighting is used for internal rooms. Significant energy savings can be achieved in this sector through designs which make maximal use of natural sunlight throughout the day, while shading windows and other openings in order to prevent direct summer sunlight from entering the building. Thermal insulation can be used in the building’s surface so as to conserve internal heat or cold (according to the season).

Improving energy efficiency in large commercial and public buildings (such as food retail chains), may take a number of months and requires continuous supervision also after it is completed. The process includes a number of stages:

1. A detailed survey which examines all energy use aspects of the structure, i.e., analysis of energy consumption distribution among functions, location of the primary energy consumption systems (lighting, air conditioning) and assessment of their usage profiles.
2. Installation of regulators and switchboards for automatic shutdown of lighting, air conditioners and computers when not in use.
3. Changing work environments in order to improve resource utilization efficiency. For example, transferring employees to smaller offices so as to avoid air conditioning or lighting of large central spaces at times when most employees aren’t present.
4. Improving the efficiency of the building’s lighting by changing light fixtures to efficient light bulbs, adapting them to the size and usage of the room by changing their location and number, re-planning rooms in order to allow natural light to enter the room through open windows.
5. Upgrading air conditioning systems so as to allow selective cooling of rooms, as opposed to large systems which cool the

whole building. In addition, installing devices for maintaining suitable room temperature, including thermal insulation.

6. Planning computer systems and server rooms so as to cut electricity consumption, for example by automatic shutdown at night.

It should be noted that in the long run, investment in energy efficiency pays for itself through the direct savings in energy expenses, which can reach up to 20%. After the investment is returned, the owner of the building will start profiting from it. A study conducted by the U.S. Environmental Protection Agency demonstrates that for every dollar invested in improving energy efficiency in a commercial building, the property's value is enhanced by two to three dollars. In order to encourage investment in energy efficiency projects, the government must assist entrepreneurs through economic incentives and low-priced loans.

Furthermore, a broad national policy for energy efficiency improvement has great potential for increasing employment. These processes require a large number of professional workers of various fields of expertise: planning and architecture, building, electrical engineering, civil engineering, air conditioning engineering, energy experts to lead the process and training facilities for the workers. In addition, there will also be a need to develop and produce technologies and products for improving energy efficiency such as regulators, switchboards, thermal insulation and the like.

The current business model for implementing energy efficiency is known as ESCO (Energy Services Company). These companies, first set up in the U.S. in the 70's, advise factories and large firms and implement energy efficiency processes. The companies are usually paid by distributing the savings on energy expenses created by the efficiency process. In Israel there are twenty such companies on paper, but in practice, only one is active. This is the result of a lack of professional manpower, and the reluctance of organizations to commit themselves to long term investments.

Renewable energy

Research in the field of renewable energy attempts to identify alternatives to existing energy sources that are based on fossil fuels, due to the heavy pollution the latter's production and use entail.

Renewable energy is usually produced by the utilization of renewable and sustainable resources: solar, wind, wave, tide, and geo-thermal power. Alternative renewable energy sources which are not sustainable are hydro-electrical energy (rivers and waterfalls) and energy from organic fuels. Global warming and the climate crisis, which require the reduction of greenhouse gases emission, together with the rise in fuel prices, have led to a significant growth in the alternative energy field. This growth is evident in research and development as well as in the development of the renewable energy industry and its use to produce electricity.

However, there are still considerable challenges in transforming renewable energy into a widely-available and low-priced energy source. Apart from the scientific problems, such as the physical feasibility of increasing the efficiency of systems producing renewable energy, there are complex engineering problems in commercializing these technologies. Furthermore, the choice of a suitable technology for investment raises many economic and environmental questions, as the renewable energy production may also have negative environmental effects. For instance, using large tracts of open land for solar energy stations, the negative ecological implications of building dams on rivers or the scenic disturbance and harm to migrating birds resulting from wind turbines.

Following is a brief exposition of the main technologies known today in the renewable energy field, which are currently in use or in development, and an estimation of the growth prospects of every field as well as its job-creating potential.

Solar-thermal energy

This technology is based on the absorption of solar energy through a field of mirrors, which reflect the sun’s rays in order to heat oil or air activating electricity-producing turbines, or in order to heat water in tubes. This is a well-known technology, which has already been in use for many years: solar collectors cover the roofs of Israeli houses since the 60’s, and the largest operating power plants using renewable energy, built some 20 years ago in Arizona, U.S., by the Israeli LUZ (today Sollel), produce electricity using this technology.

In 2006, the European solar-thermal market grew by 44% (EurObserv'ER Barometer 2007). The installed production capacity (i.e., the maximal amount of energy that can be produced from existing facilities) came to 14 gigawatt (GW) at the end of 2006, half of it in Germany. For comparison, the maximal production capacity of Israel Electric is presently about 12 GW. According to the data of the German Solar Energy Industries Association, some 6500 new employees joined the industry in 2006, coming to a total of 19,000 workers. In Austria the industry employed 6,500 workers at the end of 2006, and in Spain and Greece, 3,000 each.

Photo-voltaic (PV) solar energy

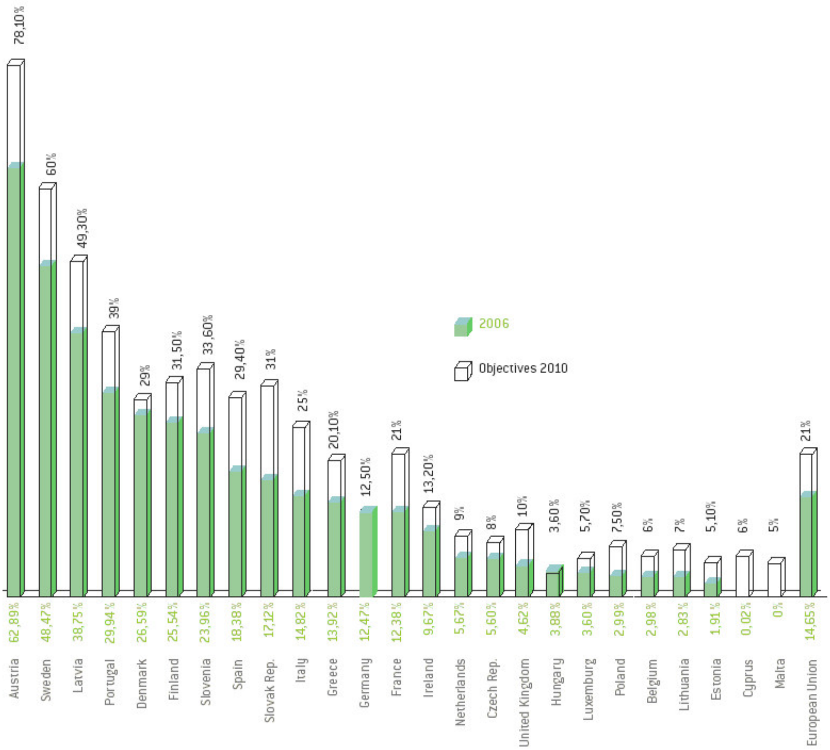
This technology is based on photo-voltaic cells made of silicon, which react to sunlight, producing electricity. Its use is usually dispersed, i.e., in small units installed on buildings or lampposts, but there are also large power plants based on this technology. In the past two years, this technology has become more widespread as a result of the fall in the price of its components and government subsidies in a number of European countries, chiefly Germany and Spain.

In 2006, the global PV market grew by some 35% (European Photovoltaic Technology Platform 2007). The installed capacity of photo voltaic cells in Europe came to 3 GW in that year (EurObserv'ER 2007). As of 2006, 35,000 workers are employed in Germany alone in the photo-voltaic industry (ibid.). There are estimations that the manufacture, installation and maintenance of a 1 MW photo-voltaic unit, creates employment for 50 workers during its lifetime.

Wind energy

Wind energy is produced using a rotor which is turned by the wind, driving an electricity-producing turbine. Wind turbines are placed in open spaces with a suitable wind regime, or on floating rigs in sea. Small turbines which can be placed on houses or on tall office buildings with a suitable wind regime are currently entering the market.

Global use of wind energy has grown in 2007 by some 25%; global installed capacity from wind is about 100 MW, about half of it in Europe (EurObserv'ER 2007). In fact, this is the most widespread alternative energy technology in use. There is significant growth in the use of wind energy in the U.S., where there is currently an order backlog of some 500 MW; in China, where 3 GW were installed in the past two years; and in India, with 1700 MW installed in 2007 (ibid.). In total, €10 billion were invested in 2007 in the wind energy industry. In Germany alone, some 75,000 people were employed in the wind energy industry, with 8,000 new jobs added in 2007. In Denmark, one of the five leading European states in wind energy use, some 21,000 workers were employed in the industry in 2007. Significant growth is expected in the wind industry in the coming years as well, with the products of the next two years in most of the large plants already sold.



Graph no. 4: Renewable energy as percentage of total electricity production in EU countries in 2006, contrasted with policy objectives (including hydroelectric and geothermic energy). (EurObserv'ER Barometer 2007).

Green collar jobs

The term “green collar” (borrowing from the traditional “blue collar” and “white collar”) relates to jobs and occupations created as a result of the growing awareness of the important of conservation and the need to cope with problems in this field. The term was coined in 1976 by Prof. Patrick Heffernan in a hearing about the labor market before the U.S. Congress Joint Economic Committee, but it came into general use only in the past years. It was propagated mainly by large American organizations such as the Blue Green Alliance and the Apollo Alliance, which promote the expansion of government and private investments in the environmental industry, and especially in the renewable energy industry, in order to create thousands of jobs. The term is also used by the Presidential candidates in the current election campaign, with Democrat candidate Barack Obama declaring that he intends to allocate federal funds for the creation of 5 million new jobs in renewable energy.

Although this is an industry with a significant technological component, one of the essential characteristics of the green collar industry is that it is a vertical industry, in which a large variety of workers are needed throughout the planning and executing processes: research and development, applied engineering, management, production, installation and maintenance. The various sectors and occupations in which environmental industry workers are needed include fields such as engineering, planning, consultancy, finance, education and architecture, as well as manual labor occupations such as manufacturing, installation, operation and maintenance of solar energy systems. In addition, training facilities will have to be set up in order to train the skilled manpower needed for the industry, providing even more jobs.

Another aspect of green collar jobs is that they are stable and long-term, as on top of the expanding demand for environmental products and systems, many projects require ongoing operation and maintenance which create permanent employment, e.g., cleaning dust from the mirrors of solar power plants. For Israel, investment in the renewable energy industry has a huge potential for strengthening the local labor market and for creating new workplaces, as it is a developing, export-oriented industry, with high global growth rates. The probable peripheral location of solar power plants and plants for producing electricity from wind energy can contribute to the creation of a large number of jobs in wide geographic distribution.

Studies estimate that for every energy production job in the traditional energy industry, four new jobs are created in the renewable energy market. The American Apollo project aims to create 3 million new jobs in renewable energy in the U.S., in ten years. Another study conducted in Berkeley University estimates, that by 2020 the renewable energy industry will create some 240,000 jobs in the U.S., as opposed to only 75,000 in the fossil fuels industry (Apollo Alliance 2004).

This is a sustainable field, i.e., employment in the industry is stable and provides employment security, with good wages, in a growing sector. Israel has a significant relative advantage in the sector, and a proven performance ability that can be devoted to the global challenge of the struggle against the energy and climate crises. Green collar jobs provide employment to a wide variety of sectors, in companies which are part of the industry, in factories and public buildings in which ongoing maintenance is needed, and in the local community.

A significant obstacle to the development of the industry in Israel is the lack of professional manpower, mainly in engineering. Therefore, a framework should be established for professional instruction and retraining, both for new employees and for old hands, some of them from the conventional energy industry. The transfer to the renewable energy industry will also help workers to change from the services and commerce sector to the productive industry for export. According to an estimate published by the Samuel Neaman Institute, an additional 50,000 jobs can be created in Israel in the environmental sector by 2015, and some 175,000 can be created by 2025, most of them in renewable energy (Goren and Ayalon 2004).

Nevertheless, Israel’s governmental renewable energy R&D budget is miniscule. According to a government decision of August 2008, the government will invest only some $200 million in the field in the next five years. The EU, in contrast, allocated some €4.2 billion for environmental technologies research in its seventh program (2007-2013), some €2.3 billion of them in renewable energy. The Samuel Neaman Institute estimates that governmental investment of about NIS 1 billion will create 10,000 new jobs in the environmental industry (ibid.).

Summary

The energy crisis and the climate crisis provide a significant opportunity for Israel for developing the renewable energy industry, in which it has relative advantages. It is an export-oriented industry with high growth rates and increasing global demand which can contribute to the expansion of Israel’s labor market and create high-quality, stable jobs. In order to realize this potential, the Israeli government must significantly expand the investment in research and development as well as its support to the industry and assistance to entrepreneurs, not only in the renewable energy field but also in energy efficiency. Investment in the promotion of this sector on the national level will be an important boost to industry, in training manpower, creating experimental projects and proving Israel's technological abilities in the global market.

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