Energy Efficiency and Jobs –a case Study of Israel

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OVERVIEW

For many years, Israel had few domestic conventional energy resources. The discovery of large gas reserves in the Mediterranean and the exploration of said reserves has changed the picture. Israel developed from a country which meets its fossil fuel needs fully from imports to a country considering gas exports in the near future. Electricity generation plants today run increasingly on natural gas as opposed to coal several years ago.

However, the new natural gas findings are not limitless with a volume of approximately 900 billion cubic meters. Electricity demand is growing and will continue to grow in the future, driven mainly by three factors.

- Population growth: Israel's population is still growing with high fertility rates;
- Increasing degree of being equipped with electrical devices: Rising living standards of social groups, which are thus far underequipped with electric appliances parts and changing climatic conditions due to climate change lead to the projection of increasing percentages of households being equipped with e.g., air-conditioners. Israel already experiences increased temperatures and frequency of heat waves.
- Additionally, temperature peaks during the summer days requires more electricity for cooling office spaces, but also hospitals, schools and universities.

Increasing energy efficiency can be regarded as a source of energy. As such, it is among the least environmentally harmful sources of energy and the least expensive. Reducing electricity consumption saves primary energy inputs, decreases a country's energy dependence and hence a country's dependence from imported fuels, if it not self sufficient. Acknowledging this, the Ministry of National Infrastructures, Energy and Water Resources in Israel has developed the NEEP, the National Energy Efficiency Program. This program aims at reducing electricity consumption between the years 2010-2020, and it states: "this will save the construction of power plants with an overall capacity of 3,400 Megawatts, and will allow us to meet the government's efficiency objectives. In economic terms, this means the saving of approximately U.S$ 4.25 billion." (NEEP 2010). Today, in 2015, as half of the time horizon of the program has passed, it is time to evaluate the economic impacts of the past five years and estimate the upcoming development. While the energy savings are stated clearly in the NEEP, economic effects in terms of jobs and value added are not included. Therefore, this contribution focuses on estimating employment from energy efficiency according to the NEEP, considering additional investment in energy efficiency triggered by the measures described in the NEEP.

MODELING ECONOMIC EFFECTS OF MORE EFFICIENCY

Additional investment in energy efficiency, as any other investment, leads to additional demand for certain goods and services. Energy savings free budgest and trigger further economic effects. Figure 1 gives an overview of the economic effects of increased energy efficiency. Investment may change relative prices, as the cost for investors are recovered through unit costs or, in the case of buildings, higher apartment rents. Investment in energy efficiency could also crowd out alternative investment purposes, which might have led to larger economic benefits. Energy savings reduce energy imports, lower individual energy expenditures and free budget for non-energy expenditures. The reduction of imports improves the trade balace. Lower energy demand, however, has negative effects on industries, whose main source of income is energy supply. Higher demand for non-energy products increases production of these goods. If they are produced domestically, this increases employment in the respective country, otherwise it leads to more imports and

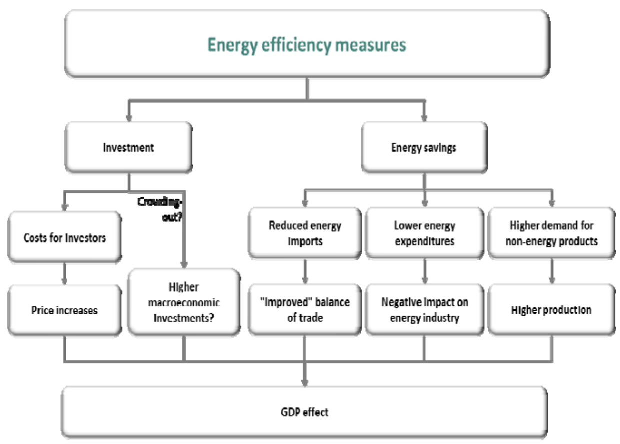

Figure 1: Economic effects of increased energy efficiency
Source: GWS, own graph

more jobs abroad.

To quantify economic effects of increased efficiency, we follow suggestions by OECD/IEA. OECD and IEA have issued a comprehensive volume on the economic effects of energy efficiency (OECD/IEA, 2014). The chapter on macro-economic effects states: "(....) economy-wide effects occur at national, regional and international level in relation to impacts that result from energy efficiency policies. (...) In general, the macroeconomic impacts of energy efficiency are the product of two types of effects associated with energy efficiency measures:

- investment effects being the results derived from increased investment in energy efficiency goods and services
- energy demand or cost reduction effects, which comprise the effects arising from the energy demand reduction (or reduced costs) associated with actually realizing an improvement in energy efficiency.

OECD/IEA (2014) then gives an overview of the type of models being used to capture the economic effects of additional energy efficiency. They list models based on different approaches, but most include the use of input-output-tables to model the impact of efficiency measures on the level of industries and economic sectors. This is in accordance with the literature on measuring employment effects of renewable energy increases (for an overview and methodological recommendations on RE see IEA-RETD 2013).

The approach applied in the following is also based upon IO-theory. Employment from additional investment in energy efficiency is estimated as direct employment (investment* labor intensity of the respective sector) and indirect employment from the Leontief approach (see below) using input-output–tables. This allows to take a deeper look into the economic structure of Israel and the interlinkages of production between different sectors. Thus, the approach not only yields estimates for direct employment from additional investment, but takes into account local value chains and indirect employment through the provision of inputs. The more a country is industrialized – and integrated, the more relevant this aspect. A simple model can be derived from these ideas, being based upon statistical data including input output data, employment data, national accounts and projection on GDP growth and population development.

The results of this modeling exercise cannot simulate all effects in Figure 1, because price adjustments are not included. However, it can give a first round estimate to investment effects and effects from energy saving. Further, the difference between impacts from different policy measure targeting different sectors can be identified. For a full assessment, price mechanisms have to be included in the analysis.

The inputs to domestic production and services are obtained from Israel's input-output tables, provided by the Central Bureau of Statistics. Input-output tables provide information on the inter-industrial linkages of production in an economy and thus allow for the calculation of indirect employment. The underlying idea is that additional production in one sector triggers production in all sectors which produce intermediary input for this production. The effect perpetuates through the economy. Solar water heaters produced in Israel, for instance, are built with inputs from other industries (tank: metal fabrication and coating, glass: cover, electrical devices: cables) which partly are produced in the country, too. Solar water heater expansion therefore leads to additional employment in these industries. Additional effects come from installation, wholesale and planning, plus the inputs to these services. We developed a simple macro driven IO- model for Israel (e3.isr) to estimate and forecast future employment.

For the ex-post analysis, capacities installed in the past are observable. Future installations are taken according to the NEEP. Investment, i.e., the costs of new equipment or of the improvement of buildings, the share of imports and domestically produced goods and the costs of sales were estimated with the help of experts from Israel. Our thanks goes in particular to Rachel Zaken and Edi Bet-Hazavdi from the Division for Resources Infrastructure Management, Ministry of Energy and Water Resources in Israel.

The COP21 negotiations and their globally welcomed results lead to the definition of a second scenario, called the Post Paris Scenario, because the Government of Israel has pledged additional support and funds for measures which exceed the scope of the NE. However, since the use of the funds is not yet as detailed as the NEEP, the Post Paris Scenario should be read more as a sensitivity.

RESULTS

Annual investment in measures to increase the efficient use of electricity in households, public administration, buildings, industry, trade, agriculture and the water sector on average amounts to 1.4 billion NIS. The amount increases over time. Almost 2/3 of the investment goes to new energy efficient buildings, residential and commercial. The remaining third is spent on efficient appliances in the private, commercial, industrial and public sector. A large share of these appliances are imported so that the economic impact of efficient appliances comes from installation and wholesale of the equipment. Most appliances such as fridges or stoves do not need operation and maintenance from an expert, thus employment effects in O&M are also low.

The other important driver of economic effects is the additional budget from energy savings. Without detailed data on the use of this additional budget, we assume that part of it is spent according to the historic consumption pattern in the households' case. Industry and public domain use the savings to refinance the investment in energy efficiency.

With these assumptions the measures from NEEP and cross sectional activities lead to a plus of 5,645 people in the year 2020. The additional employment rises with increasing investment along the time path, and increasing returns from energy savings. The impact on economic sectors reflects the heavy focus on buildings: the largest effect is in the construction sector.

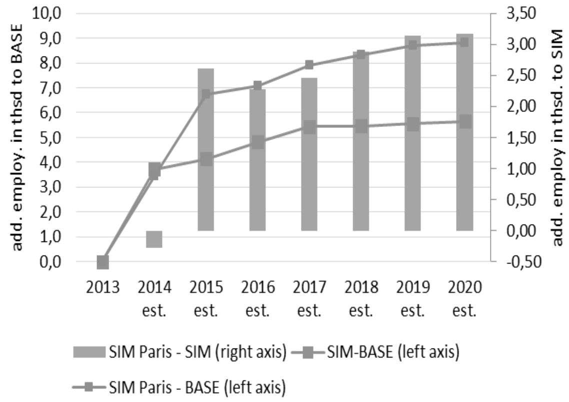

Figure 2: Employment from additional efficiency, two simulations compared to base and to each other.
Source: Own calculation.

The Post Paris scenario assumes additional investment in energy efficiency, but mainly targeting industry, local authorities, commercial and public purposes. For energy efficient household appliances, a new regulation is planned and this will lead to a slower deployment of the efficient appliances than before. Monetary support has led to early replacements in the NEEP scenario. Without further data, we assume that the additional funds and support are distributed in the same pattern as before – without the support of household appliances. The Post Paris Scenario leads to additional employment of almost 3,200 people, so that the overall employment from increased efficiency and energy savings reaches 8.8 thousand jobs. Additional employment is found in the construction sector, wholesale and trade as well as all entertainment, sports and cultural activities. The construction sector is involved in several activities: energy efficient buildings, installation of appliances and improvement of energy efficiency in hotels, local authorities, public and commercial buildings. Wholesale and trade is gaining from two drivers: firstly, all appliances have to be imported/ sold and traded and secondly, the additional budgets are spent on consumptive uses. The latter three sectors are good examples of this: additional household budget are spent on cultural or sporting events and entertainment.

CONCLUSIONS

The effects compare well to the literature. For Germany, effects from efficiency increase were estimated to be around 200,000 persons (Pehnt et al. 2012), but additional investment amounted to more than 20 billion Euro per year at the peak. Tunisia, on the other hand, has an efficiency component in its Solar Plan. The Solar Plan creates 6,000 additional jobs, from roughly 1 billion Tunisian Dinar (around 400 million Euro) investment. This, however includes renewables as well. The Tunisian labor productivity is much lower than labor productivity in Israel, therefore employment effects from roughly the same amount (1.3 billion NIS convert into roughly 300 million Euro) are relatively low.

At least two conclusions can be drawn from this exercise and the international comparison: Firstly, producing energy efficiency equipment tailored to the special needs of Israel could lead to more job opportunities in the respective industries. As long as most equipment is imported, effects on the labor market are low. Secondly, given the challenge of increasing energy demand, the effort of the energy efficiency plan is not ambitious enough. Energy security is not about resources and reserves alone. It also is about infrastructure, investment in additional capacities and enhancing the grid. Especially at peak times this can be a costly challenge and energy efficiency the less costly option.

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