

# NATIONAL ENERGY EFFICIENCY ACTION PLAN

Electricity Consumption Reduction 2016-2030



**Ministry of Energy**  
[www.energy.gov.il](http://www.energy.gov.il)

This paper was drafted by the Ministry of Energy in consideration of the Guidelines of the European Directive Instructions on writing a national energy efficiency action plan (Guidance for Energy Efficiency Action Plans under Directive 2012/27/EU) and based on drafts of the Ministry of Finance<sup>1</sup> recommendations, the inter-ministerial steering committee for formulating a national target of greenhouse gasses (GHG) mitigation<sup>2</sup>, the Ministry of Environmental Protection and the data of the Ministry of Energy.

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<sup>1</sup> Developing the Field of Energy Efficiency in Israel, January 2015, draft.

<sup>2</sup> Assessment of GHG Emission Reduction Potential and Recommended National Target for Israel, The Ministry of Environmental Protection, 2015

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## SUMMARY

### BACKGROUND

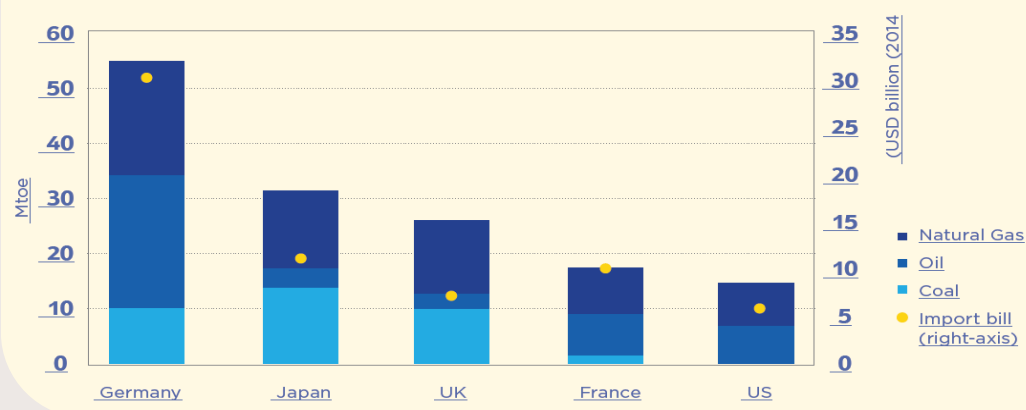
Israel has a high standard of living, and its electricity sector is characterized by a steady increase in demand for electricity, yet presently its ability to generate electricity from renewable sources of energy is limited. For this reason, the focus should be on reducing the demand for electricity in general and promoting energy efficiency in particular. Energy efficiency is the fastest and cheapest way to establish energy security, cope with environmental challenges and avoid market expenditure. Around the world, energy efficiency is considered a virtual energy source since it saves the need to increase electricity generation while providing the necessary energy. Energy efficiency is achieved by reducing energy wasting (correct use) and through consumption management, using energy efficient appliances and planning new building (as well as refurbishing existing ones) based on energy conservation principles.

Over the past four decades, there is a steady and ongoing improvement in the energy efficiency field, that is one of the most significant changes to the global energy system, yet its far-reaching impacts go mostly unnoticed. Energy consumption per capita in the global organization International Energy Agency (IEA) countries in 2015 have dropped to levels not seen since the 1980s, yet the income per capita is at its highest level, and the access to energy services is continually expanding<sup>3</sup>. Technological improvements and energy efficiency investments over the last 25 years are the primary reason for this uncoupling of energy consumption from economic growth. As demonstrated in the graph below these investments saved the energy consumers USD 5.7 trillion, while enjoying much higher levels of energy services. The benefits of improving energy efficiency extend well beyond financial savings alone.

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<sup>3</sup>Energy Efficiency Market Report 2015, Market Trends and Medium-Term Prospects.  
<http://www.gita.org.in/Attachments/Reports/MediumTermEnergyefficiencyMarketReport2015.pdf>

Financial saving by avoiding imports of fuels and natural gas due to efficiency investments in IEA countries, 1990-2015



Source: Energy Efficiency Market Report 2015, Market Trends and Medium-Term Prospects.  
<http://www.qita.org.in/Attachments/Reports/MediumTermEnergyefficiencyMarketReport2015.pdf>

The Energy Efficiency Market Report 2015 (EEMR) that reviewed the energy efficiency benefits for the consumers, the industry, and the government has found that:

1. The energy intensity of countries belonging to the Organization for Economic Co-operation and Development (OECD) improved by 2.3% in 2014. The energy consumption is now as it was in the year 2000, while the GDP has expanded by USD 8.5 trillion - an increase of 26%. This suggests that these countries have successfully decoupled economic growth from energy consumption growth. The primary contributor to this success is energy efficiency.
2. The improvement in the energy security in IEA countries corresponds to the improvement in energy efficiency. In 2014 alone, at least 2,209 TWh were avoided, respectively followed by a discontinuation of IEA countries' fuel imports. Preventing the need for natural gas and fuels was reflected in USD 80 billion in savings.
3. Energy efficiency improvements in IEA countries since 1990 have avoided a cumulative 10.2 billion tonnes of CO<sub>2</sub> emissions, helping to make the global 2-degree warming goal of the Paris Agreement more achievable.
4. With the support of a suitable policy, the energy efficiency market in the IEA countries is expected to grow. Energy efficiency has a potential of mitigating at least 40% of the GHG emissions necessary to limit the global temperature to 2 degrees Celsius less by 2050.

Israel, much like other developed countries understands the many benefits of energy efficiency and acknowledges its responsibility to reduce electricity demand and improve efficiency. For that reason, it has committed to achieving a national target of reducing the electricity consumption by at least 17% by 2030, as opposed to that year's projected electricity consumption in the Business As Usual (BAU) scenario. To achieve this, the Ministry was tasked in Government Resolution 1403 (dated 10 April

2016) - National Plan for Implementation of the GHG Reduction Targets and Energy Efficiency - with writing a national plan for long-term energy efficiency improvement.

## **WORK METHOD:**

This paper is based on an integration of published and accessible professional papers, data from the Central Bureau of Statistics, data from qualified government officials in conjunction with the professional work of experts in their field from the Ministry of Energy, and professional opinion reports from officials from the private and non-profit sectors as listed in the literature section.

## **THE MAIN FINDINGS:**

In 2014, Israel's energy intensity (TOE/ NIS millions of GDP) improved by 7.5%<sup>4</sup> compared to the OECD countries, whose improvement average was 2.3%<sup>5</sup>. A review of the total final consumption per capita (TOE per capita) shows a 2.7% improvement in that year, while the total primary energy supply (TPES) to the market has increased by TOE 1098 thousand, which indicates a positive progress toward decoupling Israel's economic growth from its energy consumption growth. Still, it is necessary to put a significant effort in energy efficiency plans in order to reduce the energy consumption in absolute terms and not just relatively.

In the BAU Scenario, Israel's electricity consumption is expected to grow by about 71% by 2030 compared to 2014, and reach an economic consumption of 96 TWh. In order to meet the national target of reducing electricity consumption (Government Resolution 542), it is necessary to reduce 17% of the electricity consumption of the BAU scenario in 2030, i.e., to reduce the consumption to 80 TWh in 2030.

Implementing the non-horizontal<sup>6</sup> energy efficiency measures specified in this plan generate a reduction potential of TWh 10.8 in electricity consumption, putting it at 85.1 TWh. Note that about 70% of these reduction measures were found to be very economical to the market. In order to reduce an additional five TWh, it is necessary to implement the horizontal reduction measures as well. The horizontal efficiency measures are specified on page 82 of this brochure and implementing them will allow an even more profound reduction than the one set as the national target.

Implementing the energy efficiency measures specified in this plan contribute to the stability of the electricity sector and save a lot of money to the market, significantly mitigating GHG emissions in Israel and allowing Israel to meet the national target of mitigating emissions to a rate of 7.7 tonnes of GHG per capita in 2030, since the electricity sector is the dominant source of GHG emissions in Israel (52.5% of the total amount of GHG emissions in 2030<sup>7</sup>).

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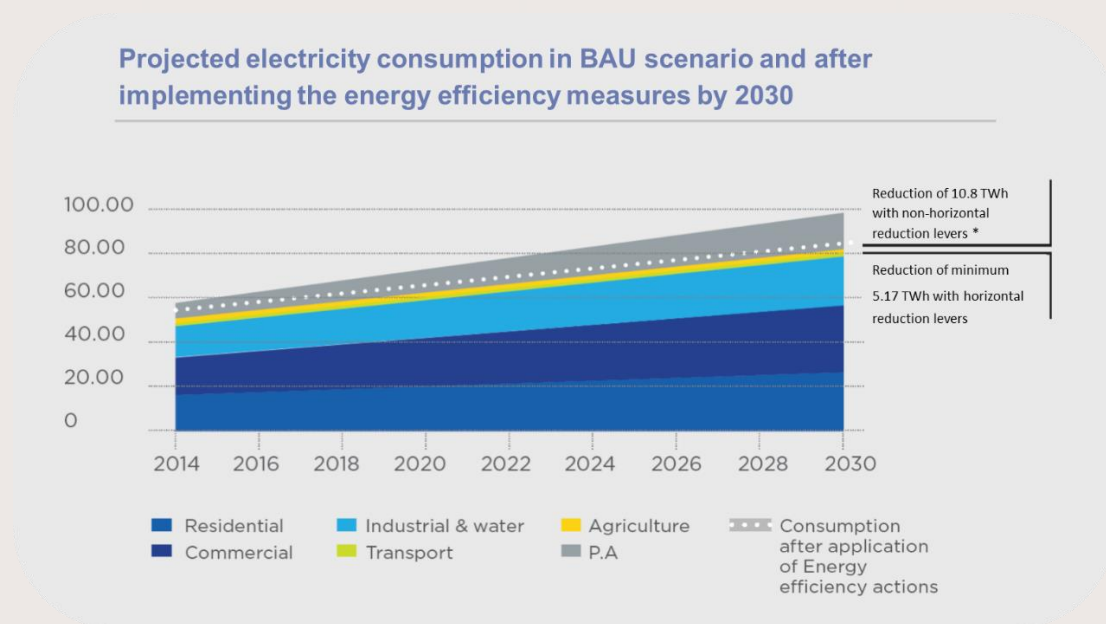
<sup>4</sup> Initial Energy Consumption, Ratio between Energy and Final Energy Consumption per Capita, Fig. 21.2, published on 14.9.16

<sup>5</sup> EEMR report (Energy Efficiency Market Report 2015)

<sup>6</sup> Horizontal Measures specified in p. 84 of this plan

<sup>7</sup> Assessment of GHG Emission Reduction Potential and Recommended National Target for Israel, the Ministry of Environmental Protection, September 2015, Fig. 37 p. 152.

In the graph below are the total electricity consumption in the different sectors by 2030 and the projected reduction in electricity consumption upon using the energy efficiency measures specified in this plan.



\* Data processed by the Ministry of Energy from Assessment of GHG Emission Reduction Potential and Recommended National Target for Israel, The Ministry of Environmental Protection, 2015, Fig. 37 p. 163.

In order to meet the electricity reduction target of reducing 17% by 2030 compared to the BAU scenario, it is necessary to implement the efficiency measures (by priority) listed in this plan and summarized in the following tables:

## Priority scale of Efficiency Measures and Recommended Policy Tools for the Residential Sector

| Priority Scale | Efficiency Measure                                                                                      | Central Premises                                                                                                                                                                                                                   | Implementation Potential for 2030                                                                         | Economic Feasibility (NIS/MWh) | Recommended Policy Tool                                                                                                       | Net Cost to the Market by 2030* | Savings Potential for 2030   |
|----------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------|
| 1              | Technologies for preventing accumulation of lime scale in sun-heated boilers                            | * Lifespan: 15 years<br>* 15% saving in energy consumption for heating water, as of the fifth year<br>* Implementation potential: 90%                                                                                              | 90%                                                                                                       | -3774                          | 1. Raising consumers awareness<br>2. Soft loan ***                                                                            | NIS 155.5 million               | NIS 8.9 million<br>132.4 GWh |
| 2              | Awareness: raising public awareness to electricity reduction                                            | Up to 10% saving from domestic energy consumption                                                                                                                                                                                  | -                                                                                                         | -1815                          | 1. Obligating the electricity supplier to efficiency which will lead to efficiency also in end-users<br>2. Campaigns          | NIS 283.2 million               | NIS 323.7 million<br>493 GWh |
| 3              | Improvement of efficiency of white electrical appliances: refrigerators, washers and dryers, dishwasher | * Lifespan: about 15 years. Appliances replacing rate in the market is about 7% a year.                                                                                                                                            | * Replacing 90% of the appliances to appliances in the most energy efficiency category.                   | -901                           | 1. Further obligating to place energy labels<br>2. Updating minimum efficiency regulations for appliances<br>3. Soft loan *** | NIS 135.7 million               | NIS 273.3 million<br>480 GWh |
| 4              | Air conditioning: improving A/C efficiency                                                              | * An average consumption was calculated of about 1118 KWh annual consumption per unit.<br>* Additional cost for replacing one unit: NIS 500 per A/C unit, NIS 1000 per mini-central A/C unit and NIS 300 per standard split units. | * Replacing 90% of the appliances to appliances in the most energy efficiency category.                   | -852                           | 4. Further obligating to place energy labels<br>5. Updating minimum efficiency regulations for appliances<br>6. Soft loan *** | NIS 117 million                 | NIS 289 million<br>441 GWh   |
| 5              | Lighting: economic lamps                                                                                | * Lighting consumes about 10% of the domestic electricity consumption<br>* Lifespan: halogen, incandescent – 10 years; CFL – 8 years; LED – 40 years.                                                                              | * Halogen and incandescent – will be replaced with CFL lamps<br>* 5% halogen lamps, 5% incandescent lamps | -1527                          | 7. Further obligating to place energy labels<br>8. Updating minimum efficiency regulations                                    | NIS 95 million                  | NIS 103 million<br>20.5 GWh  |

|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  |                |           |                                                        |
|---|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------|-----------|--------------------------------------------------------|
|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  | for appliances |           |                                                        |
|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  | 9.             | Soft loan | ***                                                    |
| 6 | Heating system: replacing radiators and diesel based systems with A/Cs | Lifespan: radiators – 25 years; diesel systems – 30 years; A/Cs – 10 years.<br><br>* Coefficient of Performance: A/C – 3.5; radiator – 1; diesel system – 0.65.<br><br>Market status: 72% of the residential units are heated using A/Cs, 20% heated with radiators and about 7.6% heated with diesel. | * Replacing 50% of the diesel-based systems and 80% of the radiators with energy efficient A/Cs. | -298           | 1.        | Further obligating to place energy labels              |
|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  |                | 2.        | Updating minimum efficiency regulations for appliances |
|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  |                | 3.        | Soft loan                                              |
|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  | ***            |           |                                                        |
|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  | NIS 16 million |           |                                                        |
|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  | NIS 87 million |           |                                                        |
|   |                                                                        |                                                                                                                                                                                                                                                                                                        |                                                                                                  | 151 GWh        |           |                                                        |

\* Cost of efficiency minus electricity consumption savings (in NIS) \*\* Smart Meters – electricity meters that display the consumption in real-time and smart meters that allow remote control of appliances and information on energy wasting appliances (through a computer or an App). \*\*\*

Soft loan: a bank loan in relatively lenient terms compared to other loans on the market -may provide low-interest rates, extended return time, etc. The Ministry of Energy will inspect the feasibility of this tool opposite the banking system. Updating the minimum efficiency regulations to the electrical appliances – noting the standards customary in developed countries.

## Priority Scale of Efficiency Measures and Recommended Policy Tools for the Industrial Sector

| Priority Scale | Efficiency Measure                                                                                                                                                                                             | Central Premises                                                                                               | Implementation Potential for 2030                                  | Economic Feasibility (NIS/MWh) | Recommended Policy Tool                                                                           | Net Cost to the Market by 2030* | Savings Potential for 2030   |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------|------------------------------|
| 1              | Energy Management System (EMS)                                                                                                                                                                                 | * Lifespan: 15 years (experts evaluation)<br>* Average energy saving of 8% for each site                       | 75% of the industrial sites                                        | -1039                          | 1. Preferred ranking as part of tenders for granting energy efficiency grants<br>2. Giving grants | NIS 570 million                 | NIS 638 million<br>974 GWh   |
| 2              | Use of chillers <sup>8</sup>                                                                                                                                                                                   | * Lifespan: 15 years (experts evaluation)<br>* 17% saving for air condensation                                 | Replacing 90% of the chillers                                      | -1916                          | 1. Soft loan<br>2. Giving grants                                                                  | NIS 580.4 million               | NIS 638 million<br>973 GWh   |
| 3              | Use of speed regulators in motors                                                                                                                                                                              | *Lifespan: 15 years (experts evaluation)<br>*Use of speed regulators will lead to a 30% energy saving          | 90% of the compatible motors                                       | -1824                          | 1. Soft loan<br>2. Giving grants                                                                  | NIS 384 million                 | NIS 443 million<br>676 GWh   |
| 4              | Use of geothermal heat pumps (GSHP)                                                                                                                                                                            | * Lifespan: 20 years (experts evaluation)<br>*Integrated Part Load Value=9                                     | Replacing 5% of the chillers with water condensation               | 2482 -                         | 1. Soft loan<br>2. Giving grants                                                                  | NIS 16.9 million                | NIS 14.3 million<br>GWh 21.9 |
| 5              | Use of speed regulators for air compressors smaller than 30 wK                                                                                                                                                 | *Lifespan: 20 years (experts evaluation)<br>* Use of speed regulators will lead to 30% energy saving           | 90% of the compatible compressors                                  | -1883                          | 1. Soft loan<br>2. Giving grants                                                                  | NIS 9.5 million                 | NIS 10.6 million<br>GWh 16.2 |
| 6              | ** Use of a Combined Heat and Power system (CHP), powered by natural gas to generate energy in the distribution network and conduction network where a direct benefit to the electricity sector is identified. | * Lifespan: 20 years (experts evaluation)<br>Efficiency assessment (electrical and thermal) – 70% <sup>9</sup> | Additional 300 eMW in smaller CHP facilities (Ministry of Economy) | - 4,179                        | 1. Soft loan***<br>2. Giving grants                                                               | NIS 643.5 million               | NIS 948 million<br>TWh 1.9   |

<sup>8</sup> As part of encouraging the replacing of chillers, the topic of chiller's efficient use of water will also be considered.

<sup>9</sup> As assessed by the Electricity Authority establishing cogeneration facilities is not expected to minimize the electricity reduction in the market, the facilities' efficiency is expected to be lower than 70% which cannot prove savings to the market. Nurit Gal, Deputy Director-General of Regulation and the Electricity Sector, the Electricity Authority. 12.11.17

\* The cost of efficiency minus electricity consumption savings (in NIS) \*\* there is a wide range of projects, so projects should be evaluated on a case-by-case basis. \*\*\* Soft loan: a loan in relatively lenient terms compared to other loans in the market, may provide low-interest rates, extended return time, etc. Awarding grants under the relevant enacted Government Resolutions and from the Ministry of Energy's budget. \*\*\*\* - additional financial steps will be assessed such as taxes.

### Priority scale of Efficiency Measures and Recommended Policy Tools for the Public-Commercial Sector

| Priority Scale | Efficiency Measure                                                                           | Central Premises                                                                                                                                                  | Implementation Potential for 2030                                | Economic Feasibility (NIS/MWh) | Recommended Policy Tool                                                                                                                                                                                                    | Net Cost to the Market by 2030* | Reduction Potential for 2030 (GWh) |
|----------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------------|
| 1              | Improving the efficiency of white electrical appliances (A/C not included)                   | * Lifespan: 15 years (experts evaluation)                                                                                                                         | Replacing 90% of the appliances to the most efficient appliances | -873                           | 1. Soft loan (loan with low interests) or<br>2. Giving grants<br>3. Regulation – minimum energy efficiency                                                                                                                 | NIS 12.1 million                | NIS 25.2 million<br>44.2 GWh       |
| 2              | Improving the insulation of walls and roofs by the Insulations Requirements in Standard 5281 | *Lifespan: 50 years (experts evaluation)<br>* 14% savings in the energy consumption of climate systems (calculation of weighted average of different sub-sectors) | 4% of the existing structures<br>55% of the new structures       | -384                           | 1. Existing structures – soft loan (loan with low interests)<br>2. New buildings – required under Standard 5281 subject to cost-effectiveness<br>3. Energy ranking to building/office subject to cost-effectiveness review | NIS 61.1 million                | NIS 20.5 million<br>280.3 GWh      |
| 3              | Glazing under Standard 5281                                                                  | *Lifespan: 20 years (experts evaluation)<br>* 3% saving in energy consumption                                                                                     | 6% of existing structures<br>55% of new structures               | -225                           | 1. Existing structures – soft loan (loan with low interests)<br>2. New buildings – required by Standard 5281 subject to cost-effectiveness<br>3. Energy ranking to building/office                                         | NIS 8.8 million                 | 4.61NIS million<br>68.5 GWh        |

|   |                                                                                  |                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                  |      | subject to cost-effectiveness review                                                                                                                                                                                    |                   |                                |
|---|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------|
| 4 | Climate systems <sup>10</sup><br>(includes speed regulations and cooling towers) | <ul style="list-style-type: none"> <li>* Speed regulator lifespan 10 years</li> <li>* Chiller lifespan: 15 years</li> <li>*Speed regulator yields a 15 % saving (expert evaluation)</li> <li>* Cooling towers yield 15% saving (Study by the Ministry of Environmental Protection)</li> <li>* Efficient chillers yield a 15% saving (expert evaluation)</li> </ul> | <ul style="list-style-type: none"> <li>* Speed regulators – 40% of the climate system motors lack regulators (which will meet 30% of all motors in the market)</li> <li>* Cooling towers – will replace 10% of the chillers</li> <li>*Chillers – 100%</li> </ul> | -703 | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 692.1 million | NIS 1155 million<br>1.76 TWh   |
| 5 | Use of geothermal heat pumps (GSHP)                                              | <ul style="list-style-type: none"> <li>Lifespan: 20 years (experts evaluation)</li> <li>* 40% savings in energy consumption</li> </ul>                                                                                                                                                                                                                             | 10% commercial electricity consumption for climate control system                                                                                                                                                                                                | -942 | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 264.1 million | NIS 329.2 million<br>502.3 GWh |
| 6 | Solar shading: solar shading and reflective coating                              | <ul style="list-style-type: none"> <li>* Lifespan: 30 years</li> <li>Solar shading – 8% savings in energy consumption for climate control</li> <li>* Reflective coatings – 6% savings in energy consumption for climate control</li> </ul>                                                                                                                         | <ul style="list-style-type: none"> <li>Solar shading – 5% of the buildings</li> <li>Reflective coatings – 10% of the buildings</li> </ul>                                                                                                                        | -960 | 1. Existing structures – soft loan (loan with low interests)<br>2. New buildings – required by Standard 5281 subject to cost-effectiveness<br>3. Energy ranking to building/office subject to cost-effectiveness review | NIS 57 million    | 61.412NIS million<br>105.9 GWh |
| 7 | Utilization of residual heat/cold in the Mechanical Ventilation Systems (MVHR)   | <ul style="list-style-type: none"> <li>*Lifespan: 30 years (experts evaluation)</li> <li>* 5% energy consumption saving (experts evaluation)</li> </ul>                                                                                                                                                                                                            | 20% of the electricity consumption for climate control in the commercial sector (experts evaluation)                                                                                                                                                             | -815 | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 85.1 million  | 122.6NIS million<br>187.1 GWh  |
| 8 | Auto lights and HVAC controls                                                    | <ul style="list-style-type: none"> <li>Lifespan: 20 years (experts evaluation)</li> <li>* 10% energy consumption saving (based on expert evaluation 10% of the time)</li> </ul>                                                                                                                                                                                    | 90% of office buildings (experts evaluation)                                                                                                                                                                                                                     | -873 | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 101.8 million | NIS 136.8 million<br>208.8 GWh |

<sup>10</sup> As part of moves to encourage replacing chillers, the matter of efficiency of chillers' use of water will also be considered.

|    |                                                               |                                                                                                                                                   |                                                 |      |                                                               |                   |                                 |
|----|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|------|---------------------------------------------------------------|-------------------|---------------------------------|
|    |                                                               | the systems are active without human presence)                                                                                                    |                                                 |      |                                                               |                   |                                 |
| 9  | Economic lamps (transitioning to fluorescent lamp 5T and LED) | *Lifespan LED lamps – 40 years in use<br>* Lifespan of 5T lamps - 8 years in use                                                                  | Replacing all lamps with LED (250 lumens/ watt) | -908 | 1. Soft loan (loan with low interests) or<br>2. Giving grants | NIS 313.5 million | NIS 319 million<br>GWh604.5     |
| 10 | Street lights                                                 | * Lifespan of LED lamp: 40 years when used<br>* 50% energy saving per lamp compared to reference technology-<br>High-pressure sodium/metal halide | Replacing all lamps with LED (250 lumens/ watt) | -969 | 1. Soft loan (loan with low interests) or<br>2. Giving grants | NIS 22.4 million  | NIS 329.43 million<br>573.2 GWh |

\* The cost of efficiency minus electricity consumption savings (in NIS)

\*\* Assessing the requirement under Standard 5281 shall include among other things an evaluation of cost-effectiveness with the relevant government officials, in conjunction with the business sector. Noting the impact on the residential construction costs.

Giving grants under the relevant enacted Government Resolutions.

### Priority scale of Efficiency Measures and Recommended Policy Tools for the Water Sector:

| Priority Scale | Efficiency Measure                                       | Central Premises                                                                                                         | Implementation Potential for 2030           | Economic Feasibility (NIS/MWh) | Recommended Policy Tool                                       | Net Cost to the Market by 2030* | פוטנציאל הפחתה לשנת (GWh) 2030 |
|----------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------|---------------------------------------------------------------|---------------------------------|--------------------------------|
| 1              | Improving the efficiency of water pumps                  | Lifespan: 11 years (experts evaluations)<br>* Average efficiency of existing and new pumps: 66.5 and 73.4% respectively. | 90% of the water pumps                      | - 1978                         | 1. Soft loan (loan with low interests) or<br>2. Giving grants | NIS 115.2 million               | NIS 122.6 million<br>187.1 GWh |
| 2              | Reduction of water loss with pressure management systems | * Lifespan: 15 years (experts evaluation)                                                                                | Lowering the leakage percent from 12% to 8% | - 663                          | 1. Soft loan (loan with low interests) or<br>2. Giving grants | NIS 18.2 million                | NIS 57.6 million<br>88 GWh     |

\* The cost of efficiency minus electricity consumption savings (in NIS)

Furthermore, in order to meet the target of the energy efficiency policy of at least 17% by 2030 compared to the BAU scenario, alongside the mentioned measures, horizontal plans to reduce energy consumption in the market should also be promoted.

## HORIZONTAL RECOMMENDATIONS:

Many of the obstacles in promoting energy efficiency, impact all sectors. These obstacles include:

- High initial costs of capital
- Lack of knowledge and awareness
- Exposure to risk
- Difficulty to quantify external efficiency

In order to accelerate the energy efficiency rate, it is important to encourage strategic plans for energy efficiency at the local level (bottom up) and update them regularly. In addition, status evaluations and enforcement are critical for identifying gaps and achieving the goals of the strategic plan for energy efficiency at the national level. It is suggested that these actions be carried out by the Energy Efficiency Division of the Ministry of Energy in coordination and conjunction with the relevant bodies.

### Necessary Actions:

1. Collecting data and defining measurements: to collect detailed data on the market's energy consumption in real time, thus allow developing and updating strategic policy plans. The measuring form will be based on defined and approved measurements. The plan's efficiency will be regularly monitored by a national system of Measurement, Reporting, and Verification (MRV) of GHG emissions mitigation which is being established by the Ministry of Environmental Protection. Note it is necessary to set up the MRV system in order to monitor the implementation of the national targets pursuant the international agreements of GHG emissions mitigation.
2. –
3. Strategy and action plans: by analyzing energy consumption patterns, markets, and new technologies, the government should formulate and regularly update strategies and action plans to encourage and improve the energy efficiency of the market. These plans will include identifying obstacles that prevent the implementation of financial investments and attempt to remove, minimize or overcome them. Furthermore, each sector should prioritize the actions most efficient to it. Targets and clear schedules and approved methods of evaluation should be defined.
4. Private investment in the Energy Efficiency Field: the government should facilitate private investments in the energy efficiency field by supporting the development of technological ability (R&D), establishing standards for measurement and verification protocols. These steps should include: spreading knowledge and providing reliable technical support to all sectors through a designated website; education and training programs to ensure all sectors have access to well-trained staffs on demand; developing measurement and verification protocols to ensure methodological consistency and overcome feelings of uncertainty; develop funding mechanisms to facilitate the execution of energy efficiency projects.
5. Enforcement and evaluation of policy and the measures to achieve it: the policy and the measures used to achieve it are to be evaluated and updated by the government for all sectors periodically (once every five years) by the

following principles:

The policy and effectiveness of the plan are to be monitored and evaluated during and after its implementation, under Section 2. Each year, the government is to be presented with an annual report containing results and conclusions by which future decisions will be made. The identities of the bodies that fail to meet their legal requirements are to be published with transparency to the public on an annual basis.

### Structures:

All sectors have a considerable potential of energy efficiency in the field of structures. An IEA evaluation suggests the field's annual savings potential (by 2030) will be equivalent to the current annual electricity consumption of the United States and Japan combined<sup>11</sup>, i.e., about 1% of the total electricity consumption of all OECD countries in 2015. The electricity consumption based on the reduction measures listed in this plan (reduction measures related only to the structure itself and not to its designation) shall yield a reduction of 7.5 TWh by 2030. This as well presents challenges to surmount in order to reach the full savings potential. Obstacles such as lack of awareness and knowledge in the energy efficiency field, lack of qualified personnel that is familiar with the innovations in the field, the 'renter-landlord problem', difficulty to implement conventional measures to measure savings, followed by an inability to calculate cost-effectiveness for the long term, and a relatively high initial investment of capital.

### **Necessary Actions:**

1. Standard of minimum structure efficiency: the government must see to it that all new buildings, and buildings that are being refurbished, be constructed in accordance with the Minimum Energy Performance Standard (MEPS) which is designed to minimize the structure's energy consumption and lower the energy costs over the structure's lifespan. It is necessary to use a holistic approach that includes the envelope of the building and the equipment installed in it. In addition, it is necessary to ensure enforcement on a regular basis. The Ministry of Energy suggests adopting Israeli Standard 5281 or the American Standard LEED. This should be subject to cost-effectiveness evaluation with the relevant government entities, in conjunction with the business sector. Noting the impact it has on residential construction costs.
2. Zero-Energy Building (ZEB): encourage construction of buildings with nearly zero energy consumption and striving to make these buildings available in the market by assimilating a cost-effective financial analysis that is based on an analysis of the structure's lifecycle and not just its cost. This could be carried out by making a plan to increase the number of zero-energy buildings and implementing it in the market in the near decade.

The policy should include:

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<sup>11</sup> OECD/IEA, 2011 ,  
[http://www.iea.org/publications/freepublications/publication/25recom\\_2011.pdf](http://www.iea.org/publications/freepublications/publication/25recom_2011.pdf) ,25 Energy Efficiency Recommendations

- A. Clear goals for a market share of buildings that consume nearly zero energy (zero-energy buildings) by 2030, in reference to new construction that is based on joint professional work of the Ministry of Energy with the Ministry of Construction and Housing, focusing on residential buildings.
  - B. Zero-energy buildings should be seen as a Bench Mark for the future standard of new buildings' construction.
- 3. Energy labels for structures: to pursue an evaluation of energy performance in new structures (includes commercial, public, industrial, buildings and apartments) and later in existing structures, to evaluate energy performances and display them in an energy label in a clear manner that provides information on the structure's energy consumption to its owners, potential buyers and renters. Provided that this matter is reviewed by evaluating cost-effectiveness, noting its impact on the business sector in the short term.
- 4. Implementing technologies to improve energy efficiency in structures:  
There are standards on the minimum energy efficiency of building's heating and cooling systems, boilers and more, to improve the overall energy performance of new and existing buildings.

It is necessary to implement a policy package that includes:

- A. Updating the standards of minimum performances of technologies in the field of structures as they continue to improve.
- B. Continue to train qualified professionals in the field, both at the basic level and in seminars, since the energy efficiency field continually improves as well as the technology. Also, the field of measurement and verification of energy efficiency savings is in constant flux making it essential to provide such information to all professionals in the field.

#### Appliances:

In order to improve the energy efficiency in this field, it is recommended to:

- A. Israel has advanced standards in the field. Requiring the display of energy labels on appliances should be further enforced, and standards that prohibit the import of appliances with a low rated efficiency level are to be further drafted and updated. The standard should also be upgraded every few years, so it may conform to the technology, noting the common standards in developed countries.
- B. Allocate resources to monitor and verify electricity consumption and through enforcement to ensure the appliances' standards are met.
- C. Measurement protocols for appliances and equipment: to ensure that the products evaluation standards and measurement protocols are regularly updated. It is necessary to promote the development and use of international protocols in order to form international comparison ability for traded technology performances.
- D. Policy on market shifts for appliances and equipment: it should be aspired to accelerate the implementation of cutting edge and energy efficient technologies in the market through incentives. These steps include:

- i. Monetary incentives (for projects with high economic feasibility at the market level)
- ii. Acquisition plans and energy audits, ensuring energy-effective products are available in the market.
- iii. Continue the international collaboration to establish a coordinated policy that will facilitate the increase in demand and appliances and equipment trade.

#### Lighting:

Lighting constitutes almost 20% of the global electricity consumption, about 40% of the local authorities' electricity consumption and major energy consumers in the industry sector. In order to improve this sector's electricity consumption, it is recommended to:

1. Gradually prohibit the use of inefficient lighting: the regulations Israel put in place in the field of lighting are advanced in comparison to rest of the world. These regulations should continue to be enforced and regularly updated based on new technological developments.
2. It is necessary to continue to support the development, implementation and regular updates of minimum efficiency regulations and measuring protocols on a global scale to allow comparing the performances of tradable products.
3. Electricity saving lighting systems: promoting implementation and lighting management systems to bolster the use of natural light and lighting systems standards. Additional measures include information and guidance for architects, constructors, building owners and managers.

#### Industry:

Most of the potential in this sector can be applied by using policy tools for promoting use and optimization of equipment and energy saving industrial systems, and improving efficiency in general through energy management systems.

In order to achieve energy savings in the industry sector, it is recommended to:

1. Energy management: demand that primary energy consumers meet the 50001ISO standard or an equivalent energy management protocol approved by the regulator and issue a periodical report on their efforts, and encourage small-to-medium consumers to do the same.

The energy management measures must include:

- i. Identifying and evaluating energy savings potential via energy audits, measuring and documenting the energy consumption.
- ii. Obligating consumers that are defined as primary energy consumers (as defined by the regulator) to implement the results of the energy audits.
- iii. Publish the energy savings potential audit and the actions taken towards its implementation (for major consumers).

2. Industrial equipment – Israel has advanced regulations that require a minimum efficiency threshold for industrial equipment without a technological barrier. The additional actions specified in this paper should be implemented:
  - i. Offering incentives for the implementation of more efficient technologies.
  - ii. Bolstering the monitoring and enforcement of all energy consumers in the market duly required performing and implementing an energy audit.
3. Professional service – encourages forming an active energy efficiency market in the private sector:
  - i. Consultation and technical support by uploading professional content to an accessible website and publishing professional material and data about professional training courses and workshops.
  - ii. Incentivizing professional training.
  - iii. Integrating systems of protocols for measurement and verification as a result of uniform energy efficiency actions in the market.
  - iv. Publishing high-quality professional material and relevant information on proven experience for energy efficiency suitable to all industry sub-sectors based on their nature, which includes performance comparisons (Benchmarking) of small companies to enable making relevant international comparisons.
4. Complementary policy: support removing efficient technology-oriented subsidiaries (in a moderate and long-term process) and shift the incentives to "avoided KWh", and guaranteeing funding ability by:
  - i. Writing a long-term work plan to subsidize "avoided KWh" (such as white certificates), taking into consideration external costs when evaluating energy efficiency projects.
  - ii. Assessing the need for additional monetary incentives, with emphasis on encouraging investments in energy-saving industrial equipment, and cultivating private funding for this form of investment.
5. Encouraging competition in the electricity market and introducing "new players." It is required to create an environment that enables objective and transparent competition that is run professionally and with equality. For that purpose, a long-term master plan for the energy market should be designed.

## CONCLUSION:

Based on the electricity consumption projected for 2030, Israel's electricity consumption in the BAU scenario will be 96 TWh. To meet the target of reducing electricity consumption by 17%, electricity consumption in 2030 should be 79.9 TWh.

Implementing the reduction measures described in the aforementioned tables (non-horizontal) will reduce the electricity consumption by 2030 to about 86.4 TWh in the following manner: in the residential sector by 2.15 TWh, in the industrial sector by 4.1 TWh, in the commercial- public sector by 4.3 TWh, and in the water sector by 0.27 TWh. The reduced consumption obtained by these measures accumulates to 10.82 TWh, and the financial cost to the market is estimated at NIS 24.3 billion, while the benefit to the market is estimated at NIS 79.9 billion. Therefore, savings over the

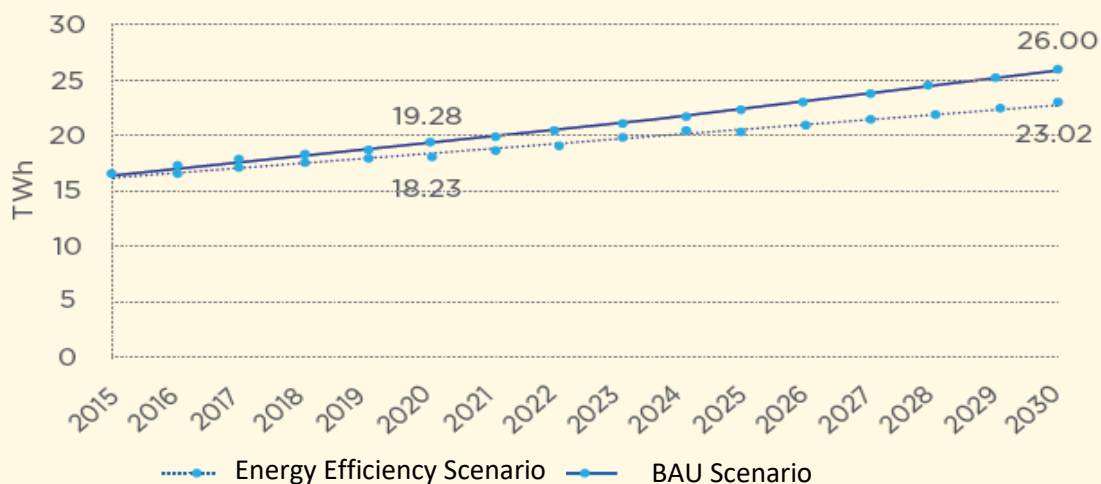
lifespan of the reduction measures are estimated at a net market value of capitalized NIS 56 billion in 2015.

Fulfilling the energy efficiency potential by implementing all the horizontal recommendations is expected to fall below the 5.5 TWh required to meet the target, reaching an overall reduction of 20% compared to the BAU scenario, making Israel's overall electricity consumption 79.2 TWh in 2030.

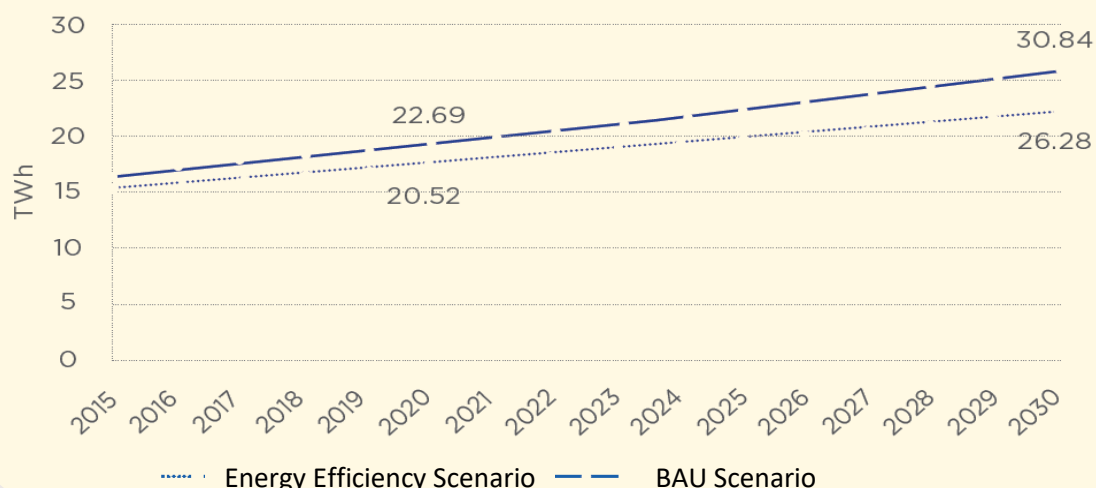
The following graphs display the final target and interim targets by which the national target will be achieved (without the horizontal measures specified in this paper).

### Electricity Consumption in BAU Scenario and Consumption Abatement via Energy Efficiency Scenario (TWh)

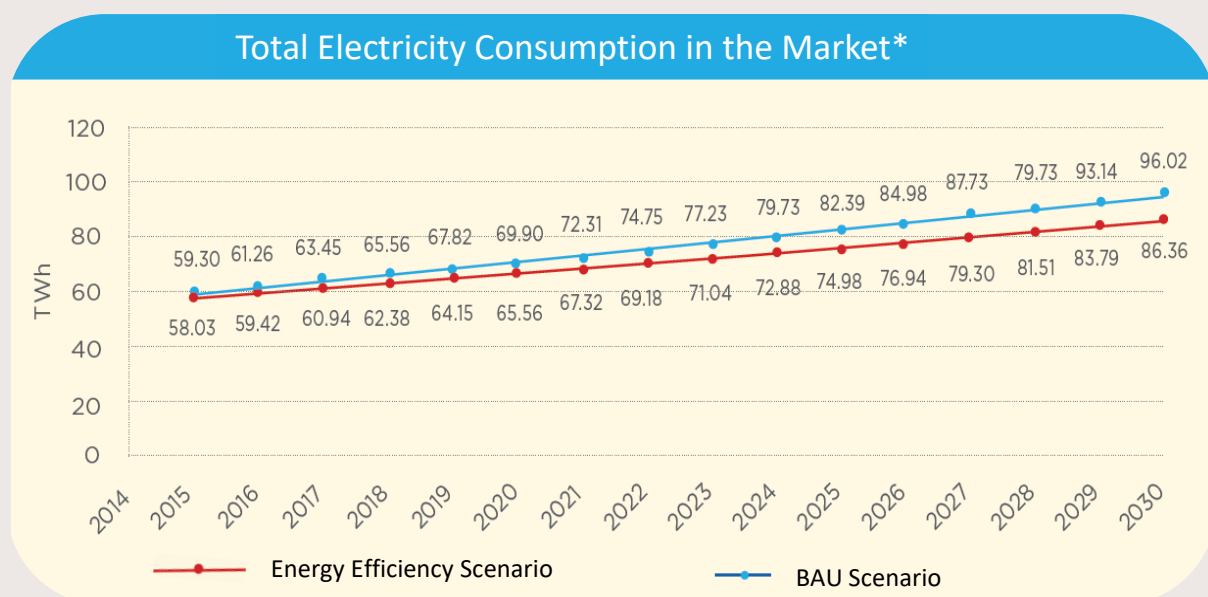
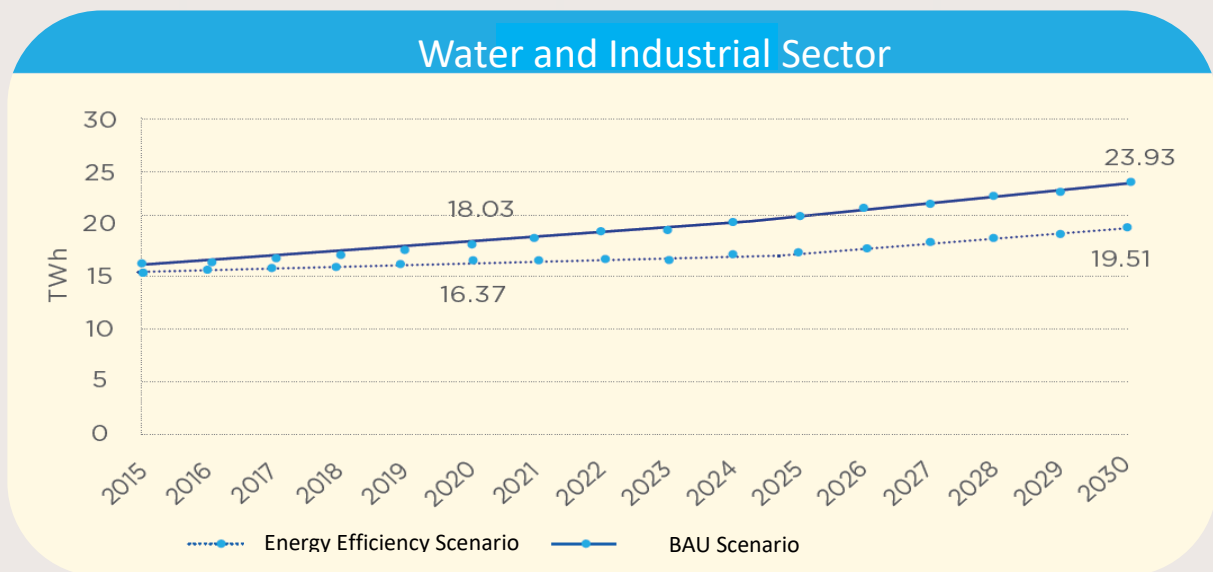
#### Residential Sector



#### Commercial - Public Sector



## Electricity Consumption in the BAU Scenario and Consumption Abatement via Energy Efficiency Scenario (TWh)



\* The electricity consumption in the energy efficiency scenario does not include reduction that stems from the horizontal measures specified in this paper.

## Status of Actions Necessary to Meet the Energy Efficiency Targets and Interim Targets:

In order to meet the target of 17% energy efficiency, the Ministry of Energy has prepared a list of tasks for the coming years. This list is the first step in a long way toward achieving the target, while each year the measures will be reviewed and the level of success established to allow a re-examination of the measures taken. Below is the status of the actions required to meet the target.

| Sector      | Type of Measure                                                    | Description of Measure                                                                                                                         | Managing Entity                                                                                                                      | Date of Measure Formulation                                                   | Status                                                                                                                                                                                                                         |
|-------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Residential | Raising awareness                                                  | Smart meters                                                                                                                                   | Ministry of Energy, Energy Conservation Division                                                                                     | Second half of 2018                                                           | These days the electricity-saving potential in Israel is being assessed by installing smart meters in the electrical grid by the Electricity Authority, and if the project proves feasible, it will be used.                   |
| Residential | Implementing more efficient technology through economic mechanisms | Reviewing the possibility to take a soft loan from banks for energy efficiency projects in the residential sector (based on KWh saved)         | Ministry of Energy in conjunction with the Ministry of Economy, the Ministry of Environmental Protection and the Ministry of Finance | The possibility of establishing such a mechanism will be reviewed by 31.12.18 | The Economy Division in the Ministry of Energy will review the possibility to offer a soft loan mechanism in conjunction with the Ministry of Economy                                                                          |
| Residential | Change of regulations                                              | Continue to require placing energy labels on electricity products and updating minimum efficiency regulations for electrical appliances import | The Ministry of Energy                                                                                                               | Ongoing                                                                       | Completed professional writing of 9 regulations for electricity products' import (based on Government Resolution 2118 from 22.10.2014). The regulations will be submitted to the Economy Committee by the second half of 2018. |

| Sector                                  | Type of Measure                                                                                                                                | Description of Measure                                                                                                                                                                       | Managing Entity                                                                                                                                                                           | Date of Measure Formulation (planned)                                                            | Status                                                                                                                                                                                                                                                     |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Industrial                              | Implementing more efficient technology with high electrical efficiency and implementing smart energy management systems by economic mechanisms | Grant program encompassing NIS 300 million. The grants are given based on a competition of saved KWh and GHG mitigation.                                                                     | The Ministry of Energy, Ministry of Finance, Ministry of Environmental Protection and the Ministry of Economy                                                                             | 01.09.2016                                                                                       | The first round has ended, grants totaling NIS 74 million were given to 90 projects. At the beginning of 2018, another round of grants will begin.                                                                                                         |
| Industrial                              | Implementing more efficient technology with high electrical efficiency and implementing smart energy management systems by economic mechanisms | Guarantees program encompassing NIS 500 million. Will include a mechanism of favoring Israeli technologies.                                                                                  | The Accountant General in the Ministry of Finance, the Ministry of Energy, Budgets Division in the Ministry of Finance, Ministry of Environmental Protection and the Ministry of Economy. | Publishing a tender in the first quarter of 2018                                                 | Tenders committee was established to elect a financial entity which will offer the designated loans, assembled from the relevant ministries.                                                                                                               |
| Industrial – Commercial – Public Sector | Education                                                                                                                                      | The Ministry supports national conventions for promoting awareness of energy efficiency                                                                                                      | The Ministry of Energy                                                                                                                                                                    | On a regular basis                                                                               | The Ministry supports about 5 central conventions for energy efficiency a year                                                                                                                                                                             |
| Industrial – Commercial – Public Sector | Training and authorizing energy officials                                                                                                      | Training of energy officials in all sectors. The officials are in charge of energy consumption, energy consumption reduction projects, and filling out an annual on-line consumption report. | The Ministry of Energy                                                                                                                                                                    | On a regular basis by the Resources Regulations (Monitoring Energy Consumption Efficiency), 1993 | Each year about 10 energy officials training courses take place under Ministry supervision. In 2017 a designated course for energy officials in government ministries and auxiliary units took place, as well as a designated course for local authorities |

| Sector               | Type of Measure                                                                                                                                                                                        | Description of Measure                                                                                                   | Managing Entity                                                                                                                                                                                   | Date of Measure Formulation (planned)            | Status                                                                                                                                                               |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Public-Commercial    | Installing energy efficient electrical appliances and energy efficient lighting<br>Improving buildings' insulation<br>Installing smart energy management systems<br>Using geothermal heat pumps(GSHP)  | Grant program encompassing NIS 300 million. The grants are given based on a competition of saved KWh and GHG mitigation. | The Ministry of Energy, the Ministry of Finance, the Ministry of Environmental Protection and the Ministry of Economy                                                                             | 01.09.2016                                       | The first round has ended, grants totaling NIS 74 million were given to 90 projects. At the beginning of 2018, another round of grants will begin.                   |
| Public-Commercial    | Installing energy efficient electrical appliances and energy efficient lighting<br>Improving buildings' insulation<br>Installing smart energy management systems<br>Using geothermal heat pumps (GSHP) | Guarantees program encompassing NIS 500 million. Will include a mechanism of favoring Israeli technologies.              | The Accountant General in the Ministry of Finance, the Ministry of Energy, the Budget Division in the Ministry of Finance, the Ministry of Environmental Protection and the Ministry of Economy   | Publishing a tender in the first quarter of 2018 | Tenders committee was established to elect a financial entity which will offer the designated loans, assembled from the relevant ministries.                         |
| Public-Commercial    | Improving buildings' insulation                                                                                                                                                                        | Grant program encompassing NIS 300 million. The grants are given based on a competition of saved KWh and GHG mitigation. | The Ministry of Energy, the Ministry of Finance, the Ministry of Environmental Protection and the Ministry of Economy                                                                             | 01.09.2016                                       | The first round has ended, grants in a total of NIS 74 million were given to 90 projects. At the beginning of 2018, another round of grants will begin.              |
| Public-Commercial    | Improving buildings' insulation                                                                                                                                                                        | Guarantees program encompassing NIS 500 million. Will include a mechanism of favoring Israeli technologies.              | The Accountant General in the Ministry of Finance, the Budget Division in the Ministry of Finance, the Ministry of Energy, the Ministry of Environmental Protection and the Ministry of Economy . | Will be published in the first quarter of 2018   | Tenders committee was established to elect a financial entity which will offer the designated loans, assembled from the relevant ministries.                         |
| Public               | Raising awareness                                                                                                                                                                                      | Joint project with the Federation of Local Authorities                                                                   | The Ministry of Energy in conjunction with the Federation of Local Authorities                                                                                                                    | By the end of 2018                               | Mapping authorities' energy consumption, providing professional consultation, holding seminars, and establishing an information center, as part of the joint project |
| Public – Authorities | Education at schools                                                                                                                                                                                   | Installing smart systems for energy management at schools                                                                | The Ministry of Energy                                                                                                                                                                            | By the end of 2019                               | Throughout 2017, tenders were published for technology companies and local authorities, and throughout 2018 monitoring                                               |

|               |                      |                                                                                                                                                                                                                |                                                                                               |                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                      |                                                                                                                                                                                                                |                                                                                               |                                                                     | and control devices will be installed in the dozens of schools selected.                                                                                                                                                                                                                                                                                                                       |
| Public        | Education at schools | An education program on energy saving and renewable energies to 1 <sup>st</sup> - 8 <sup>th</sup> grades which will include written material, models for visualization and an educational website              | The Ministry of Energy in conjunction with the Ministry of Education                          | The implementation process of the education program started in 2012 | The program was implemented in 900 schools across Israel, the models kit has been implemented in 600 schools so far, and these days a new educational website is being developed in which the lessons learned from the program will be implemented.                                                                                                                                            |
| Public        | Raising awareness    | Reviewing the establishment of a auditors' pool to perform energy audits in the Government Ministries in order to assess the energy efficiency potential in the government sector, and provide recommendations | The Ministry of Energy in conjunction with the Accountant General and the Ministry of Finance | By the end of 2018                                                  | Throughout 2018 a tender will be published on establishing an auditors' pool. The pool will be used by all government ministries and auxiliary units and encourage the Ministries and units to take energy audits                                                                                                                                                                              |
| Public Sector | Transparency         | Publishing the electricity consumption data of all government ministries and auxiliary units.                                                                                                                  | The Ministry of Energy                                                                        | Based on Government Resolution 1403                                 | In 2017, a course for energy officials in government ministries and auxiliary units was held. In it, the Ministries' representatives were trained among other things to fill out an energy consumption report. The electricity consumption report of ministries and units whose representatives participated in the course are displayed on the website. In 2018, another course will be held. |

| Sector     | Type of Measure                                                                   | Description of Measure                                                                                                                                                                                                                                           | Managing Entity                                                                                                                                                                                 | Date of Measure Formulation (planned)                   | Status                                                                                                                                                                                                                                                      |
|------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water      | Improving the efficiency of water pumps and measures to reduce water loss         | Grant program encompassing NIS 300 million. The grants are given based on a competition of saved KWh and GHG mitigation.                                                                                                                                         | The Ministry of Energy, the Ministry of Finance, the Ministry of Environmental Protection and the Ministry of Economy                                                                           | 01.09.2016                                              | The first round has ended, grants in a total of NIS 74 million were given to 90 projects. At the beginning of 2018, another round of grants will begin                                                                                                      |
| Water      | Improving the efficiency of water pumps and measures to reduce water loss         | Guarantees program encompassing NIS 500 million. Will include a mechanism of favoring Israeli technologies.                                                                                                                                                      | The Accountant General in the Ministry of Finance, the Budget Division in the Ministry of Finance, the Ministry of Energy, the Ministry of Environmental Protection and the Ministry of Economy | A tender will be published in the first quarter of 2018 | Tenders committee was established to elect a financial entity which will offer the designated loans, assembled from the relevant ministries.                                                                                                                |
| Horizontal | Information management and measurements of success                                | Collecting data and defining measurements, strategy and action plan                                                                                                                                                                                              | The Ministry of Energy                                                                                                                                                                          | Ongoing                                                 | The national plan that includes these findings will be submitted to the government in July 2017. The plan was published for public review and updated based on the comments.                                                                                |
| Horizontal | Removing barriers regarding private investments in the field of energy efficiency | Encouraging ESCO companies via a recommended shelf contract, an inventory of certified companies, auditors, and commonly accepted uniform means of measurement. In addition, enable integration as borrowers from a guarantees fund by virtue of Resolution 1403 | The Ministry of Energy                                                                                                                                                                          | Ongoing                                                 | There is already an inventory of ESCO companies and other position holders in the field of energy efficiency. Presently a designated plan for this sector is being formulated.                                                                              |
| Horizontal | Changing the legislation                                                          | Enforcing electricity consumption reporting, and performing energy audits on consumers required to do so by law.                                                                                                                                                 | The PM Office in conjunction with the Ministry of Energy, the Ministry of Justice and the Ministry of Finance.                                                                                  | 30.6.18                                                 | After a final round of drafts, just before submitting the memorandum of law. The change will allow, in addition to the administrative capacity to impose fines on consumers that do not meet the requirements of the law, the ability to serve indictments. |

| Sector     | Type of Measure                                                                                                                                            | Description of Measure                                                                                                           | Managing Entity                                                                                                                                       | Date of Measure Formulation                                                                                                      | Status                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Horizontal | Subject to a review of cost-effectiveness, an obligation will be made to rank the energy of new residential buildings and offices by Israeli Standard 5282 | Formulating mandatory energy ranking regulations for new residential buildings and offices based on international methodologies. | Ministry of Energy in conjunction with the Ministry of Environmental Protection, the Ministry of Construction and Housing and the Ministry of Finance | 30.9.16                                                                                                                          | The Ministry of Energy in conjunction with the Green Building Council has reviewed the measures required to rank the energy of buildings. An action plan was drafted, and it will be published by 31.12.18. Afterwards, the option of implementing energy rankings in all buildings in Israel will be reviewed. If it is decided to make ranking mandatory, applicability will be examined.                                     |
| Horizontal | Zero-energy building                                                                                                                                       | Subject to a cost-effectiveness review, a plan to integrate zero-energy building will be formulated                              | The Ministry of Energy, the Ministry of Construction and Housing and the Ministry of Environmental Protection                                         | The guide for zero energy building – by the end of 2017. The action plan in accordance with recommendations – by the end of 2019 | Presently, a guide to zero-energy building is being written in conjunction with the Green Building Council. If its execution is deemed mandatory, the action plan in accordance with recommendations will be formulated by 31.12.2019.                                                                                                                                                                                          |
| Horizontal | Negawatt mechanism – for generating non-produced electricity                                                                                               | Mechanism of tariffs to encourage energy efficiency                                                                              | The Electricity Authority in conjunction with the Ministry of Energy                                                                                  | A professional position on the implementation of the Negawatt mechanism in Israel will be established by 31.12.18                | The Electricity Authority acts in coordination with the Ministry of Energy to implement regularization which will encourage reducing consumption. A legislation amendment that allows granting licenses for operation and setting tariffs to regulate operations was published for hearing. Among the other mechanisms, the feasibility of the Negawatt mechanism will also be reviewed opposite other possible mechanisms. The |

|            |                     |                                                                                                             |                                                                                                                 |          |                                                                                                                                                                                     |
|------------|---------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |                     |                                                                                                             |                                                                                                                 |          | Electricity Authority will promote the preferred mechanism through regulation                                                                                                       |
| Horizontal | Economic mechanisms | Review of the accelerated depreciation taxation policy for energy efficient products that save electricity. | The Ministry of Finance in conjunction with the Ministry of Energy and the Ministry of Environmental Protection | 31.12.18 | The Tax Authority in conjunction with the Ministry of Environmental Protection and the Ministry of Energy reviews a list of products for which to provide accelerated depreciation. |
| Horizontal | Raising awareness   | Campaigns to raise awareness of technological and financial energy efficiency tools                         | The Ministry of Energy, Energy Conservation Division, and the Spokesperson Office                               | 31.12.18 | Presently, the most effective communications media per sector is being reviewed. Simultaneously, we are renewing the website which will be the basis for future campaigns           |

An RIA assessment will be performed for each step of efficiency under Government Resolution 2118 on Reducing the Regulatory Burden from 22 Oct 2014.

## ENERGY EFFICIENCY IN THE ISRAELI MARKET: REVIEW, REGULATIONS, AND TRENDS

### GENERAL BACKGROUND

The energy industry is responsible for satisfying the energy needs of the population and the entire market for the short and long-term, with the reliability, availability, and efficiency the modern economy requires while maintaining a proper balance between social, environmental and economic costs.

In recent years, the energy demand is increasing due to, among other things, population growth, a higher standard of living and economic growth. Increasing use of energy involves investing financial resources, utilizing land resources that are of limited supply and even intensify the climate crisis. A trend of energy efficiency has been developing worldwide displaying the intelligent use of energy resources, production, and economic benefits while using less energy and preserving the modern lifestyle. Many experts around the world agree there is an immediate need for fundamental change on how we generate and consume energy and a change must take place in the coming years to avoid the alarming effects of the climate crisis<sup>12</sup>. The scope of the challenge requires a comprehensive change in the manner by which we generate, distribute and consume energy while maintaining economic growth.

Israel, much like other developed countries, has acknowledged its responsibility to decrease the energy demand and be more efficient in its consumption. The state has regulated this, among other things, in the Energy Sources Law, 1989, in regulations made by virtue of it, and in five main government resolutions made in 2008-2016: Resolution 3261 from 13 March 2008 on "Formulating Steps toward Energy Efficiency – Reducing Electricity Consumption"; Resolution no. 4095 from 18 September 2008 on "Steps Toward Energy Efficiency – Reducing Electricity Consumption"; Resolution no. 2508 from 28 November 2010 on "Formulating a National Plan for Reducing GHG Emissions in Israel"; Government Resolution no. 542 from 20 September 2015 on "Reducing GHG Emissions and Increasing the Efficiency of the National Energy Consumption" and Government Resolution no. 1403 from 10 April 2016 on "National Plan for Implementation of the GHG Emissions Reduction Targets and for Energy Efficiency", the State of Israel committed to meet the national target of reducing the electricity consumption by at least 17% by 2030 compared to the projected electricity consumption of that year according to the BAU scenario (that is, without policy changes in the field).

Aside from the environmental and health considerations, Israel has other incentives to invest resources and make its energy consumption in the market more efficient. Israel is a geopolitical island, and therefore, the stability of its energy sector is highly essential strategically and in aspects of security. Energy conservation efforts will further Israel's goal of achieving energetic security and financial stability. Energy savings is known as the 'fifth type of fuel' that can help supply the growing demand

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<sup>12</sup> The inter-governmental panel for climate change, chapter 1, special report renewable energies, May 2011

for energy, and whose sole byproducts are financial savings and a cutback on the ecological footprint. Also, Israel has a high potential to enter the global market and develop a local market for energy efficiency technologies and additional services. In recent years, the market for energy efficiency and conservation technologies has been growing, and it will allow boosting Israel status in the international arena and among the OECD countries.

The Energy Conservation Division at the Ministry of Energy is in charge of making the energy use in the market more efficient ensuring it is used in the best way.

Based on previous papers, the "National Plan for Energy Efficiency – Reducing the Electricity Consumption 2016-2030" has been formulated.

## STATUS REPORT – ELECTRICITY CONSUMPTION IN ISRAEL

The lion's share of Israel's energy sector is directed at generating electricity. In 2002 to 2015, Israel's electricity consumption climbed from about 40 GWh to about 58, which is an average annual growth of 2.97%. The table below concentrates Israel's electricity consumption data and its shifts in 2002-2015 as they appear in the reports of Israel Electric and the data of the Central Bureau of Statistics.

**Israel's Electricity Consumption in 2002 to 2015 by sector. The data is in millions of KWh. The colors show low (green), moderate (yellow) and high (red) electricity consumption within a particular consumers' sector.**

| Total  | East Jerusalem<br>+ PNA | Water<br>Pumping | Industria | Agricultur | Commercial<br>-Public | Residential | Year  |
|--------|-------------------------|------------------|-----------|------------|-----------------------|-------------|-------|
| 39,928 | 2,300                   | 2,242            | 9,432     | 1,621      | 11,586                | 12,747      | 2002  |
| 41,721 | 2,454                   | 2,501            | 9,728     | 1,674      | 11,999                | 13,365      | 2003  |
| 42,932 | 2,598                   | 2,728            | 9,880     | 1,701      | 12,508                | 13,517      | 2004  |
| 44,309 | 2,863                   | 2,708            | 10,237    | 1,699      | 13,083                | 13,719      | 2005  |
| 46,175 | 3,097                   | 2,838            | 10,387    | 1,755      | 13,785                | 14,313      | 2006  |
| 49,323 | 3,457                   | 3,021            | 11,178    | 1,852      | 14,766                | 15,049      | 2007  |
| 50,160 | 3,666                   | 2,749            | 11,218    | 1,827      | 15,499                | 15,201      | 2008  |
| 48,948 | 3,783                   | 2,404            | 10,329    | 1,690      | 15,625                | 15,117      | 2009  |
| 51,979 | 3,966                   | 3,029            | 10,647    | 1,614      | 17,132                | 15,591      | 2010  |
| 53,069 | 4,225                   | 3,015            | 10,987    | 1,731      | 17,202                | 15,909      | 2011  |
| 57,085 | 4,547                   | 3,175            | 11,849    | 1,837      | 18,433                | 17,244      | 2012  |
| 56,794 | 4,675                   | 3,109            | 13,182    | 1,935      | 17,753                | 15,662      | 2013  |
| 56,162 | 4,844                   | 2,404            | 15,211    | 1,769      | 15,953                | 15,981      | 2014  |
| 57,801 | -                       | -                | -         | -          | -                     | -           | *2015 |

High Consumption
Low Consumption

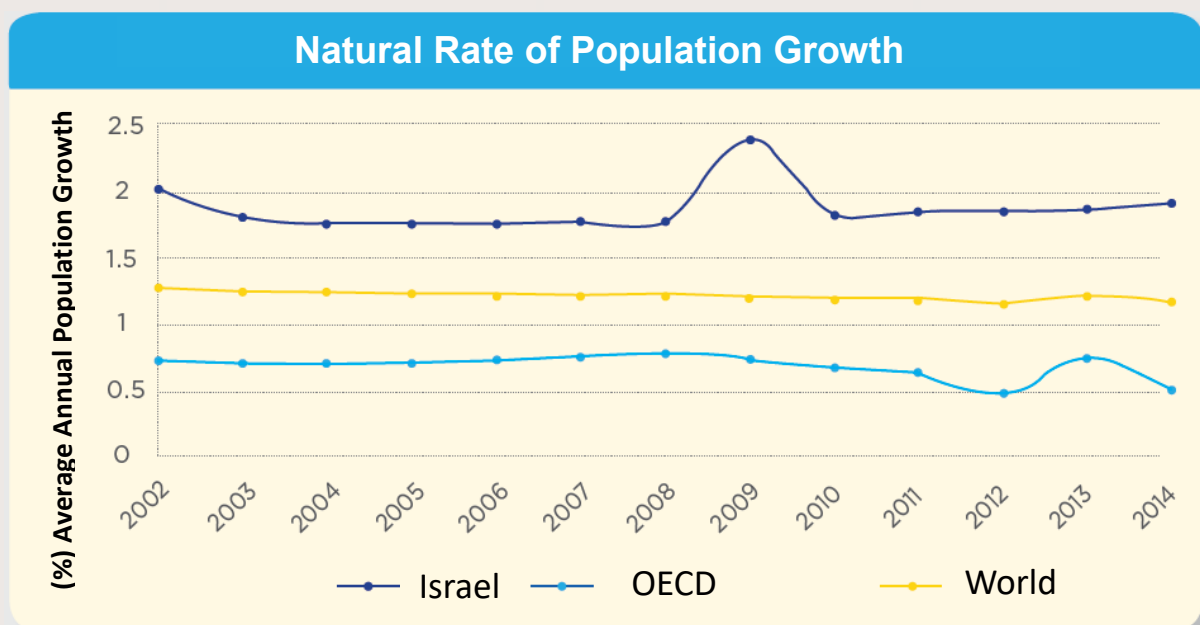
**Source:** Israel Electric, statistics report 2011, table 20A; Israel Electric Corporation – Periodical Report for 2014, Table 10.2, p.72; Israel Electric Corporation – Periodical Report for 2015, Table 10.2, p. 75

\* The data for 2015 is estimated by the Ministry of Energy

As demonstrated in the above table, in the decade of 2002-2012, Israel's total consumption doubled times 1.5. From 2013, the energy consumption data include electricity consumption from Independent Power Producers (IPP). Israel's electricity production is on a rise although it fluctuates throughout the period. The average annual increase rate is 2.92% and cannot be explained by Israel's natural population growth which is 1.9%, even though it is higher than the demonstrated global average

(1.9%) and the European Union's average (0.5)<sup>13</sup>. We still do not have the updated electricity consumption data for 2015, so we estimated it by adding the average annual growth rate (2.92%) to the consumption total of 2014.

**Natural Rate of Population Growth.** The data is presented using an annual average growth percentage.



Source: The World Bank (World Development Indicators) updated to 02/05/2016

\*Following 2008's combined census a new method for census calculation was introduced, so in 2009 the overall growth is not a result of summing the growth components. From: a review of Israel's demographics in 2011, press release, the Central Bureau of Statistics.

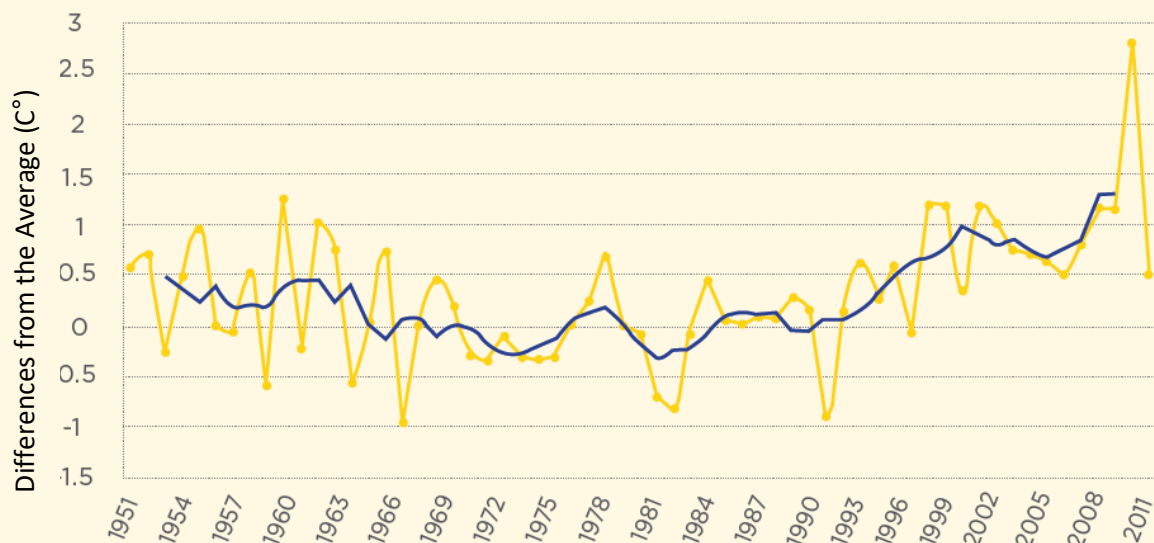
## Energy Consumption and Israel's Climate Change

The growing energy rate in the Israeli market can be partially explained by the global climate crisis which also affects Israel's weather. The Climate Changes in Israel Report<sup>14</sup> details the climate changes emphasizing the existence of a general correlation between the average temperature of our region and the global temperature. However, the difference between the temperatures of the 2000s and those of the 1950s is not as high as indicated in the world graph. An analysis of the data series shows there was a noticeable rise in temperature during the 1990s and a leveling in the 2000s on a higher average than that of the 1950s. Another notable difference is that while in the 1950s alongside the hot years there were also cold years; from 1993 to 2011 there has not been a year that was colder than the multiannual average, save 1997.

<sup>13</sup> Based on the World Bank Data (Indicators World Development, updated to 02/05/2016). <http://data.worldbank.org/indicator/SP.POP.GROW/countries/1W-OE-IL?display=graph>

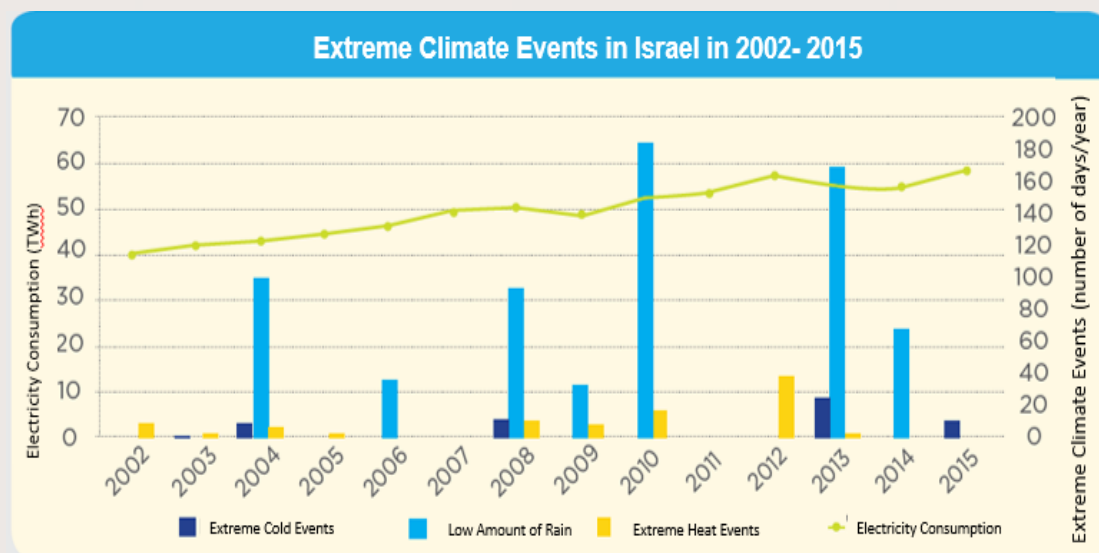
<sup>14</sup> Report on Climate Changes in Israel, findings of the meteorological service, March 2015, Fig. 3 p.5

**The Difference between Israel's Average Daily Temperatures on an Annual Basis, and the Multiannual Average (1961-1990). The Green Line Symbolizes the Difference from the Average and on it a Five-Year Average (Black)**



Comparing the years in which Israel's energy consumption was high with years with many extreme weather events we find a positive correlation. When reviewing the water pumping sector, the highest energy consumption was measured in 2010-2013. During this period, two of the years (2011,2013) measured the longest period of small amount of rain along with extreme heat events. This data corresponds to the energy consumption data in the agricultural sector.

#### Extreme Climate Events in Israel in 2002- 2015

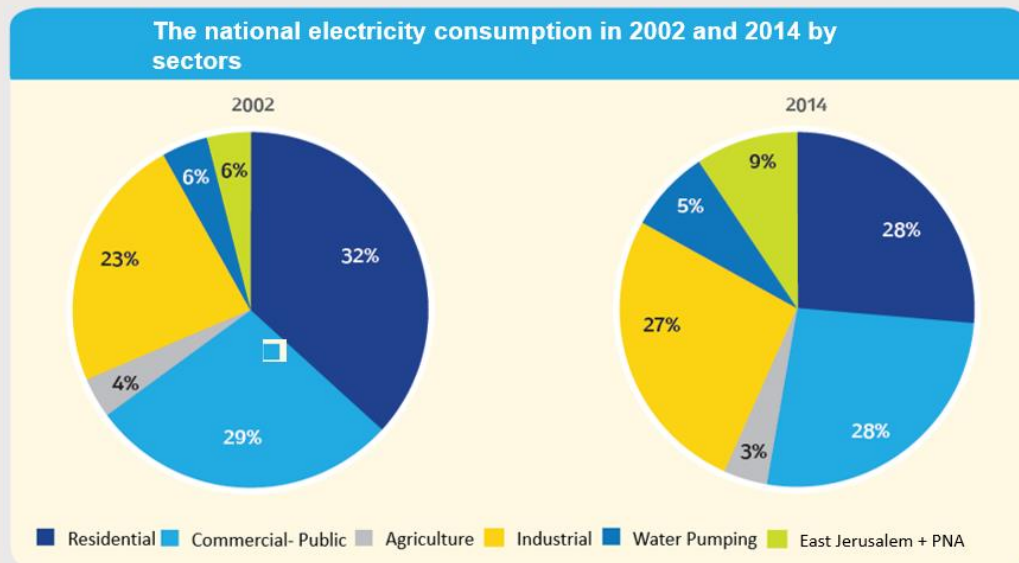


\* Ministry of Energy Data Analysis from original data taken of the meteorological service report "Review of Extreme Weather Events in Israel" Version 0001,07072015

## TRENDS OF CHANGE IN ENERGY CONSUMPTION IN ISRAEL BY SECTORS

It is safe to say that in the past decade the national energy distribution to the different sectors (in percentages) has remained practically the same. Despite the increasing absolute energy consumption, the significant change, in fact, was measured by an increase in the energy consumption in the industry sector, at the expense of the residential sector's share of consumption.

**The national electricity consumption in 2002 and 2014 by sectors. The data is demonstrated in percentages from the overall electricity consumption.**



## THE PROJECTED ELECTRICITY CONSUMPTION IN ISRAEL FOR 2030 WITHOUT ENERGY EFFICIENCY ACTIONS

The projected electricity consumption in Israel by 2030 was checked using two different models: (1) the Long-range Energy Alternatives Planning system (LEAP)<sup>15</sup>,

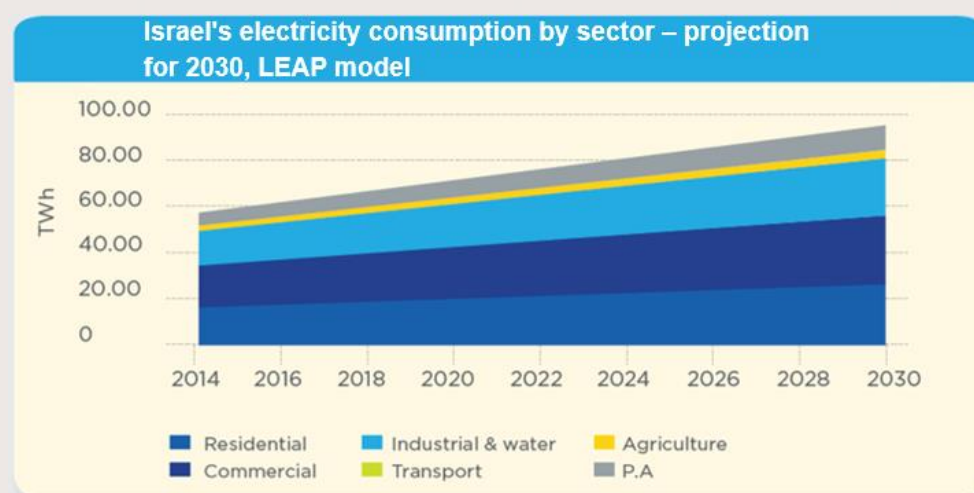
<sup>15</sup> The model was planned and executed by a joint team of expert consultants of the Ministry of Environmental Protection, a member of Eco traders Ltd. and member of Environment & Ricardo Energy, for the inter-ministerial steering committee to formulate a national target for GHG emissions mitigation.

which is used by 80 governments around the world to manage and monitor the energy consumption, use of fuels and emissions; performing energy predictions, fuel and emissions; analyzing different scenarios and (2) econometric models by METRIXND (hereinafter: Itron Models) that include complex variables of end-uses.

The energy consumption projection in the BAU scenario refers to an increase in the energy consumption bound to occur without a policy or government actions on top of the existing one by 2015 based on the Guidance for National Energy Efficiency Action Plans.

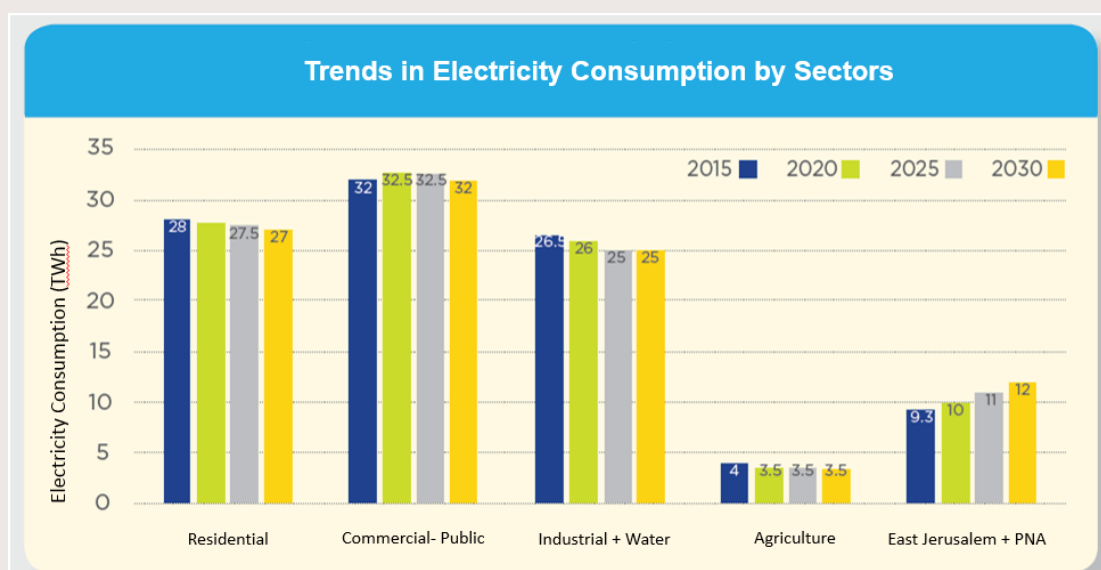
In accordance with the BAU scenario projection in the LEAP model (see below), by 2030 the national electricity consumption will increase by 62% compared to 2015 and reach a total consumption of 96 TWh. According to this scenario, the consumption ratios between the different sectors will remain similar over the next 15 years. In 2030 the national energy consumption is expected to distribute as follows: the commercial-public sector will constitute about 32% of the total national consumption, the next notable sector is the residential sector which is 27% and following it is the industry and water sectors which are 25% together.

#### Israel's electricity consumption by sector – projection for 2030, LEAP model



**Source:** "Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel," the Ministry of Environmental Protection, September 2015, diagram 37 p.152.

**Trends in Electricity Consumption by Sectors – projection for 2030**  
The data is given as the percentages of the total national consumption for 2015, 2020, 2025 and 2030.



\* Data processing by the Ministry of Energy from the "Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel," the Ministry of Environmental Protection, September 2015, table 96 p.152.

The energy consumption projection in 2030 in BAU scenario in the LEAP model is similar to the energy consumption in the BAU scenario in Itron Models (96 TWh compared to 94 TWh respectively). Based on the BAU scenario projection, in the Itron models in 2030, the national electricity consumption will increase by 45% compared to 2015 and reach a total consumption of 94 TWh. Based on this scenario 2030's important sectors are the commercial-public and industrial sectors together which are about 57% of the total national consumption, followed by the residential sector which is 30% of the national electricity consumption.

## Legislation and Regulation in the Energy Efficiency Field

### 1. LAWS

- i. Energy Sources Law, 1989\* - the purpose of this law is to allow regulation of the consumption of energy sources, their allocation based on the various needs of the market, and using them efficiently and with frugality.
- ii. Energy Sources Law (Amended), 2011, the amendment was put in place to require the government to work according to a regulated plan with targets and efficiency measurements; apply the regulations by virtue of the law on the government ministries that were exempt from it in the original law; and generate economic mechanisms to encourage efficiency.

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## 2. REGULATIONS

### A. Affectivity/ Energy Efficiency

- i. Energy Sources Regulations (assessment of energy efficiency in pumping facilities) -2004
- ii. Energy Sources Regulations (Assessment of Combustion Efficiency in Liquid Fuel or Gas Fired Heaters) -2004
- iii. Energy Sources Regulations (Maximum Electric Output in Standby Mode for Domestic and Office Electric Appliances), 2011
- iv. Energy Sources Regulations (Maximum Electric Output for a Television Receiver), 2011
- v. Energy Sources Regulations (Energy Efficiency and Energy Information of Cooling Appliances) (temporary order)– 2007
- vi. Energy Sources Regulations (Energy Efficiency and Energy Information of Cooling Appliances), 2004
- vii. Energy Sources Regulations (Minimum Energy Efficiency for an Electric lamp for indoor lighting of buildings)-2011
- viii. Energy Sources Regulations (Energy Efficiency, Energy Markings and Energy Rates in Air conditioners), 2004
- ix. Energy Sources Regulations (Minimum Efficiency Indicator of Florescent Lamp Burden)- 2009
- x. Energy Sources Regulations (Energy Sources Regulations (energy Efficiency of Electric Induction Motors) 2004
- xi. Energy Sources Regulations (Energy Marking of Electric Heaters), 1993
- xii. Energy Source Regulations (Maximum Energy Consumption for Domestic Electrical Appliance), 2009
- xiii. Energy Sources Regulations (Improving Combustion Efficiency in Fuel Fired Steam Boilers)-2004
- xiv. Energy Sources Regulations (Minimum Energy Efficiency for Electric Lamp for Indoor Lighting in Buildings) (Fluorescent Lamps), 2012
- xv. Energy Sources Regulations (Minimum Energy Efficiency and Periodical Measurement of Water Cooling System)-2013
- xvi. Energy Resources Regulations (Minimum Energy Efficiency for New Water Cooling System) – 2013.
- xvii. Energy Sources Regulations (Maximum Electric Output in Active Standby Mode of Numeric Channels Converter for Receiving Television Broadcasts) - 2015

### B. Energy Audits

- i. Energy Sources Regulations (Conducting an Audit to Detect Energy Conservation Potential) 1993

### C. Monitoring and Reporting Energy Consumption

- i. Energy Sources Regulations (Monitoring Energy Consumption Efficiency) 1993
- ii. Administrative Offenses Regulations (Administrative Fine – Energy Sources), 2004

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### 3. GOVERNMENT RESOLUTIONS

- i. Resolution no. 3261, Formulating Steps For Energy Efficiency – minimizing the electricity consumption, 13 March 2008 – the resolution set an objective by which Israel's Electricity Consumption will decrease by a rate of 20% compared to the projected consumption in 2020, according to the reference year 2006.
- ii. Resolution no. 4095, Steps Toward Energy Efficiency Reduction Of Electricity Consumption, 10 September 2008 – the resolutions set an objective by which Israel's electricity consumption will decrease by a rate of 20% compared to the projected consumption in 2020.
- iii. Resolution no. 2508, Formulating a National Plan For Reducing GHG Emissions In Israel, 28 November 2010 – it was decided to meet the target Israel committed to in the Copenhagen Committee in December 2009 to reduce 20% of the GHG emissions expected to be emitted by 2020 according to the BAU scenario.
- iv. Resolution no. 542 and sequential resolution 1403, Formulating a National Plan To Implement The Target of Reducing GHG Emissions and Energy Efficiency, 10 April 2016 – the resolution includes a series of steps the Ministry needs to take to meet the national target of mitigating emissions and reducing electricity consumption by at least 17% by 2030 compared to that year's expected electricity consumption based on the BAU scenario, and meeting the commitment the Israeli government made in the Paris Committee (2015).

### THE PLAN OF THE MINISTRY OF ENERGY FOR ENERGY EFFICIENCY 2010

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#### BACKGROUND

In July 2010, the Ministry of the National Infrastructures, Energy and Water published "the National Plan for Energy Efficiency: Reduction of Electricity Consumption 2010-2020". This plan was not submitted for government approval and was not made official and binding.

The purpose of the plan was to make the electricity consumption of the market more efficient and avoid electricity expenditure to the point of eliminating the need for another power plant. A delay in establishing power plants due to the efforts to save electricity is called "Establishing a Virtual Power Plant," which means, fewer plants thanks to avoided energy consumption. According to the plan, the size of the plants which will be avoided by 2020 is 3,400 MW, the monetary saving achieved from the virtual plant was estimated at USD 4.25 billion (NIS 16.5 Billion<sup>16</sup>).

The plan exhibited a series of steps that will gradually reduce Israel's electricity consumption, until achieving the target of reducing 20% of the consumption projected

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<sup>16</sup> In accordance with the representative rate for 1 July 2010, the Israel Bank Website, entry date 18.5.16  
<http://www.boi.org.il/he/Markets/ExchangeRates/Pages/Default.aspx>

in 2020.

Based on the plan, the majority of the efficiency will be achieved in the residential sector, 47.2% of the overall savings in 2020; the efficiency in the commercial public sector will be responsible for 22.3% of the overall savings; efficiency in the industrial sector will be responsible for 17.2% of the overall savings; and efficiency in the local authorities sector will be responsible for 7.3% of the overall savings. The projected avoided electricity consumption in the plan is in the amount of 16.3 billion KWh in 2020 and a reduction in electricity purchasing costs in a sum of NIS 35 Billion in 2011-2020 (capitalized for 2008). Below are the steps that were suggested to achieve this efficiency<sup>17</sup>:

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#### **RESIDENTIAL SECTOR:**

1. Updating various regulations for electrical appliances. Amending the regulations on the maximum electricity consumption of refrigerators, air conditioners, dryers, and dishwashers. Changing the energy rating of appliances, and establishing seven ranks of efficiency from A to G. Changing the regulations of washing machines to allow the machines to tap into the hot water faucet.
2. Standby Mode Regulations<sup>18</sup>. These regulations were meant to reduce the consumption of appliances in standby mode. Based on the plan's data, consumption in standby mode was about 5% of the overall domestic consumption and 3% of the overall commercial public consumption. The new regulations the Ministry have formulated are meant to reduce the standby consumption mode by 80% using a technological change, which will not raise the price of the products.
3. Offering incentives to replace energy-wasting appliances. This section addresses low-income households which are unable to purchase new and energy saving appliances to replace the old, energy-wasting appliances they have. The main criteria that were suggested in order to replace appliances in this framework were: annual energy savings to the household and to some low-income households that have this type of appliance. The selected appliances were: refrigerators and air conditioners.
4. Replacing lamps with energy saving lamps. The efficiency potential in this field reaches about 70% of all households and can save up to 90% of the electricity consumption for lighting.
5. Advertisement campaigns. Their goal is to encourage behavioral changes among consumers, which manifests in the way the appliances are used. Assessments indicate that through better use it is possible to save 15%. However, the plan relied on a work assumption of 10% savings due to education programs, as a precaution.

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<sup>17</sup> The actions summary was taken as is from: Energy Efficiency: Follow up of Government Resolutions implementations for efficiency in the Electricity Sector" the Knesset, Information and Research Center, November 2014. It was submitted to the sub-committee of the Economy Committee for the Promotion of Green Energy.

<sup>18</sup> This regulation appears under the Residential Sector, but it also applies to the Commercial- Public Sector and the local authorities.

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## THE COMMERCIAL PUBLIC SECTOR

The primary consumption of electricity in this sector is in climate systems: space cooling and heating constitute about 60% of the total consumption, 30% of the consumption is dedicated to lighting, and 10% for other uses. The primary types of facilities in this sector are malls, hotels, nursing homes and nursing institutes, hospitals, boarding schools and welfare institutions, higher education institutes, government offices, Israel's security forces and other commercial branches.

The primary recommendations for this sector are:

1. Promoting regulations for energy efficient chillers.
2. Granting accelerated depreciation for installing energy efficient systems.
3. Reinforcing incentive plans for the different sectors based on their characteristics.

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## INDUSTRY SECTOR

The primary electricity consumers in this sector are production systems (30%), chillers (30%) and air compressors and pneumatic systems (15%). The rest of the consumption is distributed among the lighting systems, cooling towers, and other systems.

The main recommendations:

1. Offering incentives to encourage acquisition of new and more efficient manufacturing technologies.
2. Amending the regulations for chillers that serve massive cooling systems to require they maintain a minimum threshold of efficiency, support changing or upgrading old chillers, education and guidance in the industrial sector.
3. Offering incentives for upgrading air compression systems and pneumatic systems.
4. Offering tax benefits and efficiency incentives for changing and upgrading lighting systems and installing energy saving and management systems.

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## LOCAL AUTHORITIES SECTOR

As part of the plan, the consumption of the local authorities sector was evaluated at approximately 5% of the total national consumption. The lion's share (45%) of the electricity consumption in the authorities is for street lights, and lights in public spaces, about 40% is dedicated to buildings' climate control systems (air-conditioning and heating), about 10% of the electricity consumption is dedicated to indoor lighting and additional 10% for other needs.

In order to reduce the electricity consumption in the local authorities, it was recommended:

1. To offer incentives to the authorities to upgrade lighting systems, air-conditioning systems and provide thermal treatment to rooftops.
2. To give securities to authorities with a low socioeconomic rating so that they may start the efficiency processes.

3. To appoint energy officials in the authorities and require them to submit consumption reports.
4. To conduct administrative enforcement in local authorities for lack of efficiency. This enforcement shall manifest, among other things, in imposing fines.

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## IMPLEMENTATION AND RECOMMENDATIONS

In 2011-2020, the Ministry of Energy received a budget of NIS 269 million for residential sector efficiency<sup>19</sup>. The energy efficiency budget in the industry and commercial sectors has been transferred to the Ministry of Environmental Defense (NIS 114 million) and the Ministry of Industry, Trade and Labor (NIS 40 million) under government resolutions to mitigate GHG emissions and air pollution. Projects for energy efficiency in the residential sector were carried out throughout 2011-2014 and based on the calculations of the Ministry of Energy<sup>20</sup> the electricity saving that was achieved due to 2011-2015 savings is 630 million KWh which is a reduction of about 457 thousand tonnes of CO<sub>2</sub>. Most actions consisted of replacing energy-wasting appliances in the residential sector.

### Electricity Savings (millions of KWh) Following Efficiency Actions in the Residential Sector 2011-2015

| Electricity Savings (millions of KWh) Following Efficiency Actions in the Residential Sector 2011-2015 |                      |
|--------------------------------------------------------------------------------------------------------|----------------------|
| Annual saving (Millions of KWh)                                                                        | Electrical Appliance |
| 133                                                                                                    | Refrigerators        |
| 49                                                                                                     | Air conditioners     |
| 4.4                                                                                                    | Sun-heated boilers   |
| 80                                                                                                     | Lamps*               |
| 186.4                                                                                                  | Total                |

\* The saving presented in the lamp project is valid for 2012-2013 because afterward-new regulations were put in place regarding lamps.

In addition to replacing appliances in the residential sector, the Ministry of Energy acted in 2011-2015 to replace energy wasting technologies with new energy-

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<sup>19</sup> Government Resolution no. 2508 from 28.11.2010

<sup>20</sup> Based on data from the Ministry of Energy, the Director of the Field of Statistics and Performance Research, the Division of Energy Conservation at the Ministry of National Infrastructures, Energy and Water.

saving technologies in the commercial-public and industrial sectors. These projects<sup>21</sup> yielded an annual saving of about 183 million KWh.

### **Electricity Savings (millions of KWh) due to Efficiency Actions of the Ministry in the Commercial – Public and Industrial Sectors in 2011-2015**

| <b>Electricity Savings (millions of KWh) Following Efficiency Actions in the Commercial – Public and Industrial Sectors ,2011-2015</b> |                                                               |                                          |                                        |                               |
|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------|----------------------------------------|-------------------------------|
| <b>Number of Projects Performed in Practice</b>                                                                                        | <b>Grant from the Ministry with 18% VAT (millions of NIS)</b> | <b>Cost of Project (millions of NIS)</b> | <b>Annual Saving (millions of KWh)</b> | <b>Project Inception year</b> |
| 15                                                                                                                                     | 5.01                                                          | 27.85                                    | 17.88                                  | 2011                          |
| 85                                                                                                                                     | 12.86                                                         | 83.61                                    | 51.31                                  | 2012                          |
| 14                                                                                                                                     | 1.64                                                          | 6.65                                     | 3.59                                   | 2013                          |
| 176                                                                                                                                    | 26.8                                                          | 127.37                                   | 65.11                                  | 2014                          |
| 110                                                                                                                                    | 15.23                                                         | 96.33                                    | 45.16                                  | 2015                          |
| 430                                                                                                                                    | 61.57                                                         | 341.82                                   | 183.05                                 | Total                         |

### **RECOMMENDATIONS IN THE STATE COMPTROLLER REPORT<sup>22</sup>**

Several main recommendations were given in the State Comptroller Report (October 2014):

1. For the government to approve a national energy efficiency plan by 2020 as deemed by the Energy Sources Law.
2. To regulate the monitoring and enforcement of regulations by virtue of the Energy Sources Law and finish certifying the division's supervisors. It was also recommended that the Ministry create a complete database on the energy consumption of the bodies to which the provisions of the law apply.
3. Energy efficiency in government bodies: the government bodies will formulate an efficiency plan and efficiency targets, the government bodies will be instructed to act to implement the plan, to obtain information of the actions the government bodies assume and to use the authorities vested by virtue of the law if needed. It was also recommended, that the Accountant General's Division set a clear timetable for the implementation of the energy efficiency project in government buildings.

<sup>21</sup> Based on data from the Ministry of Energy, the Director of the Field of Statistics and Performance Research, the Division of Energy Conservation at the Ministry of National Infrastructures, Energy and Water.

<sup>22</sup> The State Comptroller, Annual Report 54 A, the Ministry of National Infrastructures, Energy and Water: promotion of energy saving, October 2014, p. 315-343

## ENERGY EFFICIENCY POTENTIAL IN THE ISRAELI MARKET

### GENERAL

On 29 September 2015, Israel committed, in Resolution 542, to contribute to the global effort to achieve the targets of the UN's Framework Convention on Climate Change under Resolutions 19.CP/1 and 20.CP/1.

Based on the work of the inter-ministerial committee on examining the potential of emissions mitigation, the Ministry of Environmental Protection, the Ministry of Finance and the Ministry of National Infrastructures, Energy and Water submitted a joint document that defines Israel's target and was approved by the Israeli Government<sup>23</sup>.

Below are the targets of the Israeli Government as they were defined:

1. Energy Efficiency – a reduction of 17% in the total national electricity consumption compared to the projected consumption in 2030 without assuming additional energy efficiency actions.
2. Renewable energy – 17% of the national electricity consumption will be provided through renewable energy in 2030.
3. Public transport – transition of 20% due to use of public transport instead of private vehicles.

The national plan for energy efficiency 2016-2030 is aimed at achieving the first goal – reducing 17% of the national electricity consumption compared to the projected consumption in 2030, without additional energy efficiency steps.

The plan specifies the steps each sector is required to take, defines priorities and demonstrates the actions the Ministry of National Infrastructures will lead, and recommendations for future actions required to boost the energy efficiency trend in the Israeli economy.

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<sup>23</sup> Israel's Intended Nationally Determined Contribution (INDC), 29 September 2015

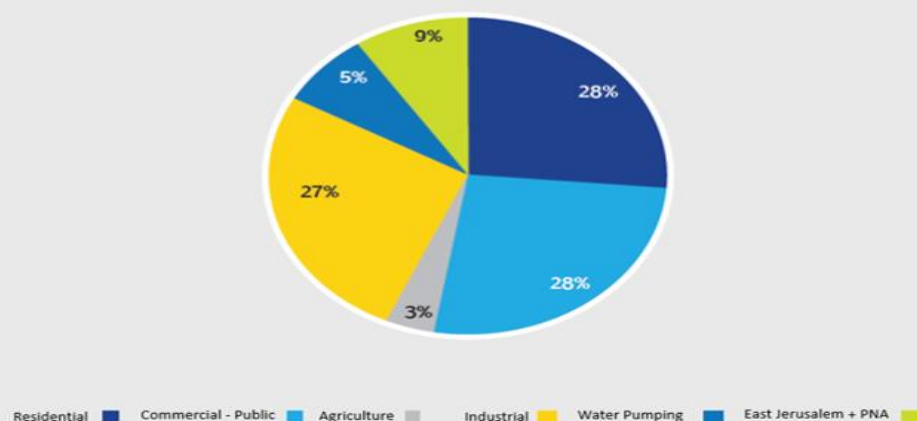
## ENERGY EFFICIENCY IN STRUCTURES IN THE RESIDENTIAL SECTOR

### RESIDENTIAL SECTOR

#### GENERAL

The residential sector's electricity consumption in 2014 was 28% of the total national electricity consumption at about 15,981million KWh<sup>24</sup>. The electricity consumption in the residential sector comprises about a third of the national electricity consumption for over a decade, consistently, which makes it a significant consumer sector.

#### National Electricity Consumption in 2014 by sector (measured in percentage)

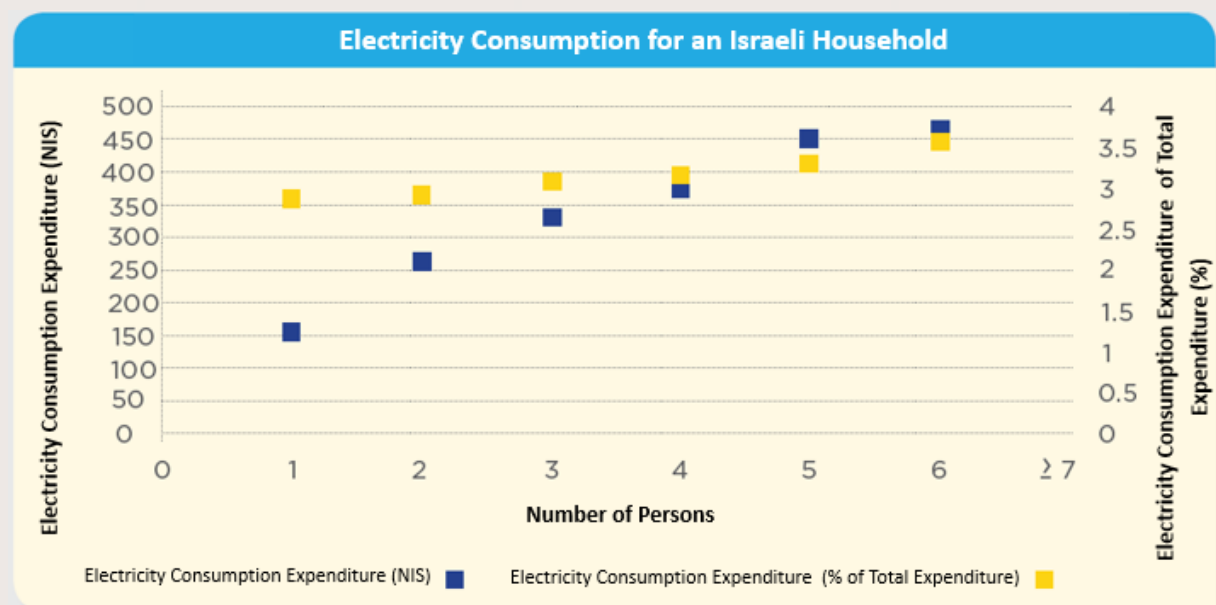


<sup>24</sup> Israel Electric Corporation – periodical report for 2015, table 2,10, p.75

Electricity consumption in residential buildings is mostly affected by a number of elements that are mostly in agreement with each other and affect one another:

1. Household size (number of persons, structure perimeter)
2. Climate Zones
3. Socioeconomic status
4. Number of appliances
5. Appliances' energy efficiency
6. Consumers behavior
7. Policy (laws and regulations)

### Electricity Consumption for an Israeli Household, Divided by Number of Persons<sup>25</sup>



<sup>25</sup> Processing data by the Ministry of Energy from "Data on Electricity Consumption in Households by Household size and Income", May 2012, the Knesset Research and Information Center, letter to Knesset Member Amnon Cohen.

As demonstrated, there is a positive correlation between the number of persons per household and the electricity expenditure. As the number of persons per family grows, the daily expenses on electricity grow as well (NIS) and so does the overall expenses of the household (%). The relative part of electricity in the daily expenses of a household of 6 persons and more is higher by a quarter (25%) than the relative expense of a household with only one person.

One of the most important and useful measurements in the field of energy is a measurement named "Energy Intensity," and it expresses the relation between the energy consumption and the demand for energy services. For example, in order to compare energy efficiency between countries, it is necessary to show the relation between the country's energy consumption and its GNP. In fact, the higher the energy intensity, the more wasteful the energy consumption, since more energy is invested for each GNP unit. To reflect energy efficiency in structures in the residential sector, the 'Number of Housing Units' measurement was chosen as the measurement that represents the 'Demand for Energy Services' since the number of housing units in the market and the main electrical appliances (refrigerators, washing machines, dryers and air-conditioners) has a high correlation.

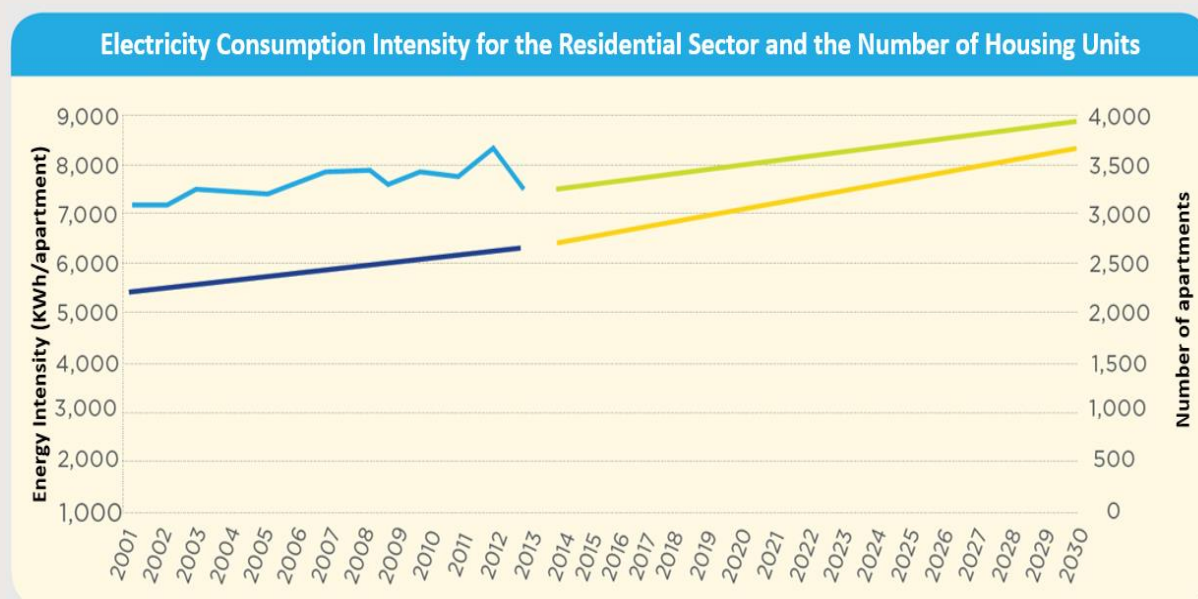
## The Ownership Rate of Main Electrical Appliances in the Residential Sector for 2014

| The Ownership Rate of Main Electrical Appliances in the Residential Sector for 2014 |       |       |       |       |       |                   |                                             |
|-------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------------------|---------------------------------------------|
| Number of Persons per Household                                                     |       |       |       |       |       |                   |                                             |
| 6+                                                                                  | 5     | 4     | 3     | 2     | 1     | Total             |                                             |
| 275.9                                                                               | 318.2 | 388.9 | 367.7 |       | 438.8 | 2,371.6           | Households in the Population (in thousands) |
|                                                                                     |       |       |       |       |       | Total percentages |                                             |
| 99.9                                                                                | 100.0 | 100.0 | 99.8  | 100.0 | 99.6  | 99.9              | Refrigerator                                |
| 42.5                                                                                | 24.0  | 22.4  | 22.2  | 22.1  | 9.4   | 24.4              | Deep freeze                                 |
| 37.4                                                                                | 27.1  | 31.4  | 35.3  | 39.7  | 38.7  | 35.5              | Cooking and Baking Ovens                    |
| 66.0                                                                                | 73.6  | 69.7  | 63.4  | 56.0  | 38.0  | 59.6              | Oven for Baking Only                        |
| 68.6                                                                                | 76.1  | 70.8  | 67.8  | 60.9  | 56.9  | 65.8              | Cooking Stove                               |
| 80.1                                                                                | 86.6  | 89.5  | 90.6  | 86.5  | 76.8  | 85.1              | Microwave                                   |
| 33.9                                                                                | 52.9  | 52.1  | 42.5  | 39.4  | 20.3  | 39.5              | Dishwasher                                  |
| 32.3                                                                                | 47.3  | 44.5  | 40.5  | 29.2  | 16.8  | 34.0              | Water filter                                |
| 99.0                                                                                | 99.3  | 99.1  | 98.0  | 96.3  | 84.3  | 95.5              | Washing machine                             |
| 53.3                                                                                | 57.4  | 54.1  | 43.3  | 31.4  | 19.9  | 40.9              | Dryer                                       |
| 83.1                                                                                | 89.5  | 91.7  | 88.9  | 88.0  | 78.5  | 86.6              | A/C                                         |
| 59.0                                                                                | 70.6  | 67.7  | 67.7  | 62.9  | 44.6  | 61.6              | Vacuum cleaner                              |
| 69.6                                                                                | 91.4  | 92.2  | 92.2  | 93.2  | 88.1  | 89.0              | Television                                  |
| 38.5                                                                                | 66.5  | 65.4  | 63.4  | 58.9  | 33.6  | 54.6              | 2 television sets or more                   |
| 34.3                                                                                | 49.0  | 50.0  | 43.5  | 37.5  | 28.3  | 40.0              | DVD system                                  |
| 23.9                                                                                | 15.9  | 14.4  | 12.1  | 9.9   | 11.8  | 13.8              | Digital converter box                       |
| 80.7                                                                                | 93.4  | 90.6  | 89.5  | 76.7  | 63.6  | 81.3              | Computer                                    |
| 34.8                                                                                | 52.5  | 47.9  | 42.6  | 29.8  | 13.0  | 35.3              | 2 computers or more                         |
| 42.0                                                                                | 57.8  | 59.1  | 35.7  | 26.3  | 16.6  | 36.2              | Tablet                                      |
| 15.5                                                                                | 31.1  | 21.4  | 10.1  | 5.8   | 3.4   | 13.1              | Video game console                          |
| 98.0                                                                                | 99.3  | 99.6  | 99.0  | 96.1  | 87.1  | 96.1              | At least 1 mobile phone                     |
| 93.6                                                                                | 96.3  | 97.0  | 92.2  | 78.5  | 5.0   | 74.2              | At least 2 mobile phone                     |

Source: Table 15 – ownership of Durable Goods by Number of Persons per Household, Central Bureau of Statistics, entered: 27 November 2016

The below graph demonstrates the projected energy efficiency by 2030, which was evaluated based on the average annual change measured between 2001 and 2011, which is 1.1%.

### Electricity Consumption Intensity for the Residential Sector and the Number of Housing Units<sup>26</sup>



Raising awareness by using smart meters and educational campaigns: the European directive document of energy efficiency assumes the consumers will change their behavior from an energy wasting behavior to an energy conserving behavior and that this change will lead to an ongoing and long-lasting energy savings<sup>27</sup>.

Examination of the EEA report - Achieving energy efficiency through behavior change: What does it take? Reveals that behavior change among households will lead to a reduction in electricity consumption of 5-20% per reduction measure, this projection puts the Israeli projection in a more conservative and moderate light.

<sup>26</sup> Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel, the Ministry of Environmental Protection, September 2015, chart 2, p.51

<sup>27</sup> Commission Staff Working Paper, Impact Assessment accompanying the document Directive of the European Parliament and of the Council on energy efficiency and amending and subsequently repealing Directives 2004/8/EC and 2006/32/EC, Brussels, 22.6.2011, SEC(2011) 779 final. See [http://ec.europa.eu/energy/efficiency/eed/doc/2011\\_directive/sec\\_2011\\_0779\\_impact\\_assessment.pdf](http://ec.europa.eu/energy/efficiency/eed/doc/2011_directive/sec_2011_0779_impact_assessment.pdf).

## Policy for Changing Consumers' Behavior based on the European Directive

**Table 1.1** Energy policies with specific references to changing consumer behaviour and/or smart meter roll-out

| Energy policy                                   | References to consumer behaviour change and/or smart meter roll-out                                 |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Directive 2005/89/EC on security of supply      | Encourages the adoption of real-time demand management                                              |
| Directive 2006/32/EC on end-use energy services | Encourages the introduction of smart meters                                                         |
| Third liberalisation package (*)                | Requires transparency in energy billing information and encourages the introduction of smart meters |

Note: (\*) The third liberalisation package entered into force in September 2009 and includes a number of directives and regulations. For details, see the European Commission website: [http://ec.europa.eu/energy/gas\\_electricity/legislation/legislation\\_en.htm](http://ec.europa.eu/energy/gas_electricity/legislation/legislation_en.htm)

Source: Achieving Energy Efficiency through Behavior Change: What Does it Take? EEA Technical Report 5/2013, p.6.

## Potential Energy Saving Due to Behavior Change – EU

**Table ES.1** Potential energy savings due to measures targeting behaviour

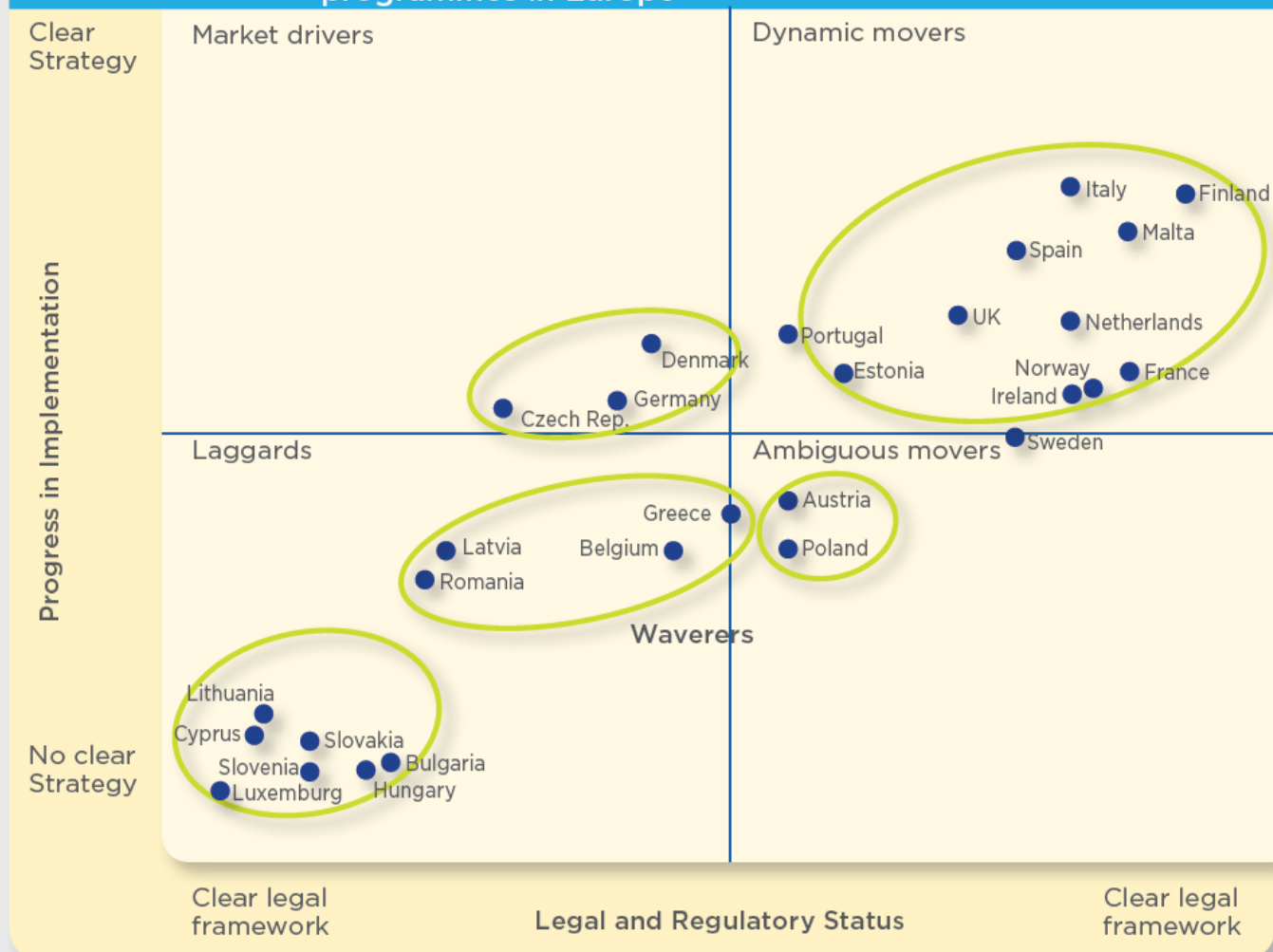
| Intervention                                 | Range of energy savings |
|----------------------------------------------|-------------------------|
| Feedback                                     | 5-15%                   |
| Direct feedback (including smart meters)     | 5-15%                   |
| Indirect feedback (e.g. enhanced billing)    | 2-10%                   |
| Feedback and target setting                  | 5-15%                   |
| Energy audits                                | 5-20%                   |
| Community-based initiatives                  | 5-20%                   |
| Combination interventions (of more than one) | 5-20%                   |

Source: Achieving Energy Efficiency through Behavior Change: What Does it Take? EEA report, 2013

Europe has many plans designed to "raise awareness" which include installing smart meters and monitoring consumers' behavior change and electricity savings. The following graph details the legal status of the plans in the different countries opposite their level of implementation as of 2013. As demonstrated, 75% (21 of 28) of the reviewed countries are in a relatively advanced process of implementation and half (12 of 28) have a clear political indication and implementation of the processes in the market.

## Implementation of Smart Metering Programs in Europe, 2013

**Figure 2.3** Progress to date of implementation of smart-metering programmes in Europe

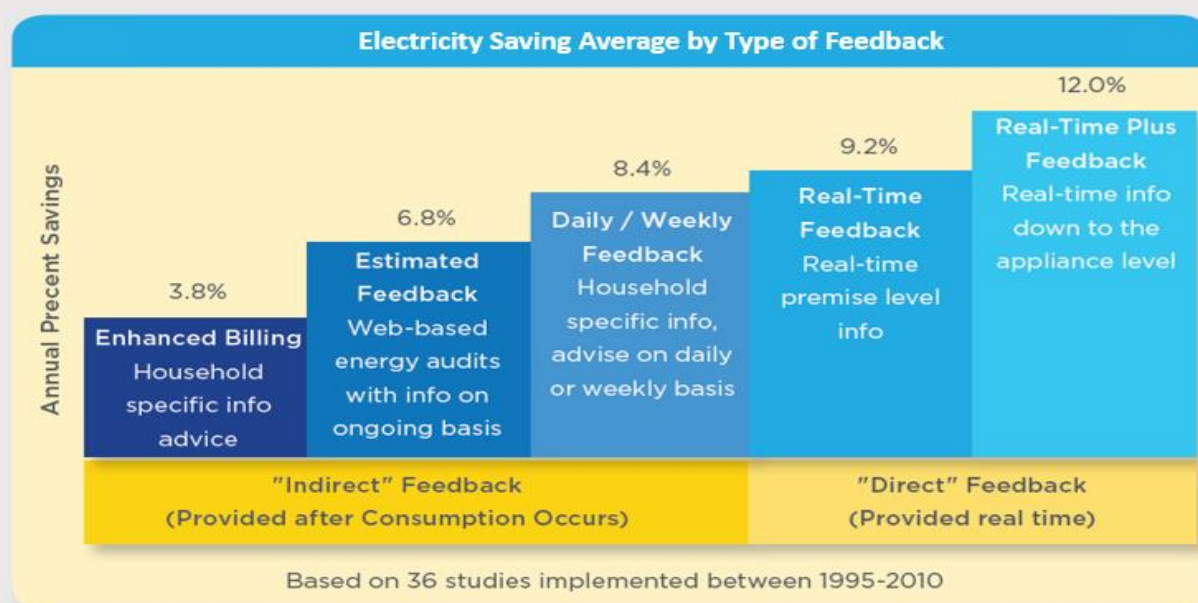


36 studies conducted in the US in 1995-2010 showed that the savings average due to smart metering programs and raising awareness through the electricity bill proved savings of 3.8-12%. Also, the Federal Energy Regulatory Commission surveyed the use of advanced measurement tools. According to the survey, 66% of the companies that use smart meters do this to improve their customer service, 53% to detect power outages and line losses, 42% to improve the quality of the provided electricity, 39% for properties management, and only 19% for demand management<sup>28</sup>. Conversely, in different countries such as Victoria Australia, Italy and others it was found that the avoided electricity demand was insignificant and the maximum benefit from smart metering is credited to saving costs on meter readers. In most cases in these countries, the actual cost surmounts the planning, and the actual benefits are lower.

<sup>28</sup> Ehrhardt-Martinez, Karen; Donnelly, Kat A. and John A. 'Skip' Laitner. 2010. 'Advanced Metering Initiatives and Residential Feedback Programs: A Meta- Review for Household Electricity-Saving Opportunities', Washington, D.C.: American Council for an Energy-Efficient Economy.

In light of these conflicting conclusions, the Electricity Authority currently reviews the benefits of this project.

### Electricity Saving Average by Type of Feedback<sup>29</sup>



### White Appliances:

In 2011-2014 the Ministry of Energy carried out four projects to replace old refrigerators with new energy-efficient refrigerators bearing energy rank B, two for a population defined as entitled and two for the general population. As part of these projects, a total of about 126,000 refrigerators were replaced. In 2012-2014 there were two projects to replace inefficient air conditioners, in which about 33,000 inefficient air conditioners were replaced, and in 2013 a project to replace electric boilers with sun-heated boilers was initiated, and 3,452 boilers were replaced. The below table specifies the costs to the Ministry of Energy and the market and the savings generated from each project.

<sup>29</sup>Advanced Metering Initiatives and residential feedback programs: A Meta-Review for Household Electricity-Saving Opportunities, June 2010, p. iii

## Cost and Savings from Projects to Replace Refrigerators and Air-conditioners

| Cost and Savings from Projects to Replace Refrigerators and Air-conditioners |                                               |                                               |                                           |                                             |              |
|------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-------------------------------------------|---------------------------------------------|--------------|
| Production Market-<br>saving for 8 years<br>(millions NIS)                   | Household<br>Annual savings<br>(millions NIS) | Household<br>Annual savings<br>(millions KWh) | consumers<br>Total Cost<br>(NIS millions) | Ministerial<br>Total Cost<br>(NIS millions) | Projects     |
| 290                                                                          | 84                                            | 133                                           | 313                                       | 152                                         | Refrigerator |
| 104                                                                          | 30                                            | 47                                            | 115                                       | 48                                          | A/C          |
| 394                                                                          | 114                                           | 180                                           | 428                                       | 200                                         | Total        |

As demonstrated, the total investment to the market summed up to NIS 628 million (the total cost to the Ministry and the consumers) and the return for the investments is NIS 1306 million (the total saving of households and market-savings in electricity generation, for eight years). Meaning, for every shekel invested in the market, 2 shekels were avoided.

## International Comparison of the Residential Sector Policy<sup>30</sup>

| International Comparison of the Residential Sector Policy |                               |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
|-----------------------------------------------------------|-------------------------------|--------------------------------|--------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------|-----------------|---------------------------|-----------------|----------------------|
|                                                           | Subsidies<br>for<br>buildings | Soft<br>loans for<br>buildings | Tax credit for energy<br>efficient equipment<br>or investment for<br>household |                      | Tax reduction for energy efficient<br>equipment or investment |                 |                           |                 |                      |
|                                                           | Existing<br>dwelling          | Existing<br>dwelling           | Appliances                                                                     | Existing<br>dwelling | Appliances                                                    | Lamps           | Solar<br>water<br>heaters | New<br>dwelling | Existing<br>dwelling |
| Algeria                                                   | S                             |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Argentina                                                 |                               |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Austria                                                   | S                             | SL                             |                                                                                | TC                   |                                                               |                 |                           | TRE             | TRE                  |
| Benin                                                     |                               |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Botswana                                                  |                               |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Brazil                                                    |                               | SL                             |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Colombia                                                  |                               | SL                             |                                                                                |                      | TRE<br>(IT,VAT)                                               | TRE<br>(IT,VAT) | TRE<br>(IT,VAT)           |                 |                      |
| Croatia                                                   | S                             |                                |                                                                                |                      |                                                               |                 |                           |                 | TRE (VATL)           |
| Cyprus                                                    | S                             |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Czech Republic                                            | S                             | SL                             |                                                                                |                      |                                                               |                 |                           |                 | TRE (VATL)           |
| Denmark                                                   |                               |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Ecuador                                                   |                               |                                |                                                                                |                      |                                                               |                 | IT                        |                 |                      |
| El Salvador                                               |                               |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Estonia                                                   | S                             | SL                             |                                                                                | TC                   |                                                               |                 |                           |                 |                      |
| Finland                                                   | S                             |                                |                                                                                | TC                   |                                                               |                 |                           |                 |                      |
| France                                                    |                               | SL                             | TC                                                                             | TC                   |                                                               |                 | TRE                       | TRE             | TRE                  |
| Germany                                                   | S                             | SL                             |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Ghana                                                     |                               |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |
| Indonesia                                                 |                               |                                |                                                                                |                      |                                                               |                 |                           |                 |                      |

S: Subsidies; VATL: Value Added Tax on Labour Force; TI: Tax on inefficient appliances; EA: Energy audit; subsidies;  
 TC: Tax credit; TRE: Tax reduction; IT: Import tax for energy efficient equipment; M: Mandatory; SL: Soft-loans;  
 PT: Purchase tax, including value added tax; V: Voluntary; MEQ: Energy Savings Quotas; MCR: Mandatory energy  
 consumption reporting; P: Planned; MEA: Mandatory energy audits; MSP: Mandatory energy savings plans; Y: Yes; N: No;  
 AT: Annual registration tax for cars; MEM: Mandatory energy managers

<sup>30</sup> World energy council. Updated for December 2015, entry: 13/07/16.  
<https://www.worldenergy.org/data/energy-efficiency-policies-and-measures/>

## International Comparison of the Residential Sector Policy

|                         | Subsidies<br>for<br>buildings | Soft<br>loans for<br>buildings | Tax credit for energy<br>efficient equipment<br>or investment for<br>household |                      | Tax reduction for energy efficient<br>equipment or investment |             |                           |                 |                      |
|-------------------------|-------------------------------|--------------------------------|--------------------------------------------------------------------------------|----------------------|---------------------------------------------------------------|-------------|---------------------------|-----------------|----------------------|
|                         | Existing<br>dwelling          | Existing<br>dwelling           | Appliances                                                                     | Existing<br>dwelling | Appliances                                                    | Lamps       | Solar<br>water<br>heaters | New<br>dwelling | Existing<br>dwelling |
| Israel                  |                               |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Italy                   | S                             |                                | TC                                                                             | TC                   | TRE                                                           | TRE         | TRE                       | TRE             | TRE                  |
| Japan                   | S                             | SL                             | TC                                                                             | TC                   | PT                                                            | PT          |                           |                 | TRE (VATL)           |
| Kenya                   | S                             |                                |                                                                                |                      | IT                                                            | IT          | IT                        |                 |                      |
| Latvia                  | S                             |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Lebanon                 |                               | SL                             |                                                                                |                      |                                                               |             |                           |                 |                      |
| Lithuania               | S                             |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Malta                   | S                             | SL                             |                                                                                |                      |                                                               |             |                           |                 |                      |
| Mexico                  |                               |                                |                                                                                | TC                   | TRE                                                           | TRE         | TRE                       |                 |                      |
| Nepal                   | S                             |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Nigeria                 |                               |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Netherlands             |                               | SL                             |                                                                                | TC                   |                                                               |             |                           |                 |                      |
| Pakistan                |                               |                                |                                                                                |                      |                                                               | TRE<br>(IT) |                           |                 |                      |
| Philippines             |                               |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Poland                  |                               | SL                             |                                                                                |                      |                                                               |             |                           |                 |                      |
| Portugal                | S                             |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Republic of<br>Korea    |                               |                                | TC                                                                             |                      | TRE<br>(PT)                                                   |             |                           |                 |                      |
| Romania                 | S                             |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Serbia                  | S                             | SL                             |                                                                                | TC                   |                                                               |             |                           | TRE             | TRE                  |
| Singapore               |                               |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Slovakia                |                               |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Slovenia                | S                             | SL                             |                                                                                |                      |                                                               |             |                           |                 |                      |
| South Africa            |                               |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Spain                   | S                             | SL                             |                                                                                |                      |                                                               |             | TRE (IT)                  |                 |                      |
| Sri Lanka               |                               |                                | TC                                                                             |                      |                                                               | IT          |                           |                 |                      |
| Swaziland               |                               |                                |                                                                                |                      |                                                               |             |                           |                 |                      |
| Sweden                  | S                             |                                |                                                                                | TC                   |                                                               |             |                           | TRE             |                      |
| Switzerland             | S                             |                                |                                                                                | TC                   |                                                               |             |                           |                 |                      |
| Thailand                |                               |                                | TC                                                                             |                      |                                                               | TRE         |                           |                 |                      |
| Tunisia                 | S                             |                                | TC                                                                             |                      | IT                                                            | IT          | IT                        | IT              |                      |
| United Arab<br>Emirates |                               |                                |                                                                                |                      |                                                               |             |                           |                 |                      |

## International Comparison of the Residential Sector Policy

|               | Subsidies for buildings | Soft loans for buildings | Tax credit for energy efficient equipment or investment for household |                   | Tax reduction for energy efficient equipment or investment |       |                     |              |                   |
|---------------|-------------------------|--------------------------|-----------------------------------------------------------------------|-------------------|------------------------------------------------------------|-------|---------------------|--------------|-------------------|
|               | Existing dwelling       | Existing dwelling        | Appliances                                                            | Existing dwelling | Appliances                                                 | Lamps | Solar water heaters | New dwelling | Existing dwelling |
| United states | S                       | SL                       | TC                                                                    | TC                | TRE                                                        | TRE   | TRE                 | TRE          |                   |
| Uruguay       |                         | SL                       |                                                                       |                   |                                                            | IT    | TRE (IT, VAT)       |              |                   |
| Vietnam       |                         |                          |                                                                       |                   |                                                            |       |                     |              |                   |

|                |               | Subsidies for energy audits | Subsidies / soft loans for energy efficient equipment in households |                  |       |                     |             |                  |
|----------------|---------------|-----------------------------|---------------------------------------------------------------------|------------------|-------|---------------------|-------------|------------------|
|                |               | Households                  | Refrigerators                                                       | Air conditioning | Lamps | Solar water heaters | Wood stoves | Other Appliances |
| Algeria        | Africa        |                             |                                                                     |                  | S     | S                   |             |                  |
| Argentina      | Latin America |                             |                                                                     |                  | S     |                     |             |                  |
| Austria        | Europe        | EA                          | S                                                                   | S                | S     | S,SL                | S,SL        | S                |
| Benin          | Africa        |                             |                                                                     |                  | S     |                     |             |                  |
| Botswana       | Africa        |                             |                                                                     |                  |       |                     |             |                  |
| Brazil         | Latin America |                             | S                                                                   | S                | S     | S                   |             | S                |
| Colombia       | Latin America |                             | SL                                                                  | SL               | SL    | SL                  | SL          | SL               |
| Croatia        | Europe        |                             | S                                                                   |                  | S     | S                   | S           | S                |
| Cyprus         | Europe        |                             | S                                                                   | S                | S     | S                   | S           | S                |
| Czech Republic | Europe        |                             |                                                                     |                  |       |                     |             |                  |
| Denmark        | Europe        |                             |                                                                     |                  |       |                     |             |                  |
| Ecuador        | Latin America |                             |                                                                     |                  |       |                     |             | S                |
| El salvador    | Latin America |                             |                                                                     |                  |       |                     |             |                  |
| Estonia        | Europe        | EA                          |                                                                     |                  |       |                     |             |                  |
| Finland        | Europe        | EA                          |                                                                     |                  |       | S                   | S           |                  |

| Subsidies for energy audits |               | Subsidies / soft loans for energy efficient equipment in households |               |                  |       |                     |             |                  |
|-----------------------------|---------------|---------------------------------------------------------------------|---------------|------------------|-------|---------------------|-------------|------------------|
|                             |               | Households                                                          | Refrigerators | Air conditioning | Lamps | Solar water heaters | Wood stoves | Other Appliances |
| France                      | Europe        | S                                                                   | S             |                  |       | S                   |             |                  |
| Germany                     | Europe        | S                                                                   | S             |                  | S,SL  | S,SL                | S           |                  |
| Ghana                       | Africa        |                                                                     | S             |                  | S     |                     |             |                  |
| Indonesia                   | Asia non-OECD |                                                                     |               |                  |       |                     |             |                  |
| Israel                      | Middle-East   | EA                                                                  | S             | S                | S     |                     |             |                  |
| Italy                       | Europe        |                                                                     | S             | S                | S     | S                   | S           | S                |
| Japan                       | Asia OECD     | EA                                                                  |               |                  | S     | S                   |             |                  |
| Kenya                       | Africa        | S                                                                   | S             | S                | S     | S                   | S           | S                |
| Latvia                      | Europe        | EA                                                                  |               |                  |       |                     |             |                  |
| Lebanon                     | Middle-East   |                                                                     | SL            | SL               | S,SL  | S,SL                | SL          | SL               |
| Lithuania                   | Europe        |                                                                     |               |                  |       | S                   |             |                  |
| Malta                       | Europe        | EA                                                                  | SL            | SL               |       | S                   |             | SL               |
| Mexico                      | Latin America |                                                                     | SL            | SL               | S,SL  | SL                  | S           | SL               |
| Nepal                       | Asia non-OECD |                                                                     |               |                  |       |                     |             |                  |
| Netherlands                 | Europe        |                                                                     |               |                  |       | S                   |             |                  |
| Nigeria                     | Africa        |                                                                     |               |                  | S     |                     |             |                  |
| Pakistan                    | Asia non-OECD | EA                                                                  |               |                  |       |                     |             |                  |
| Philippines                 | Asia non-OECD |                                                                     |               |                  | S     |                     |             |                  |
| Poland                      | Europe        |                                                                     |               |                  |       | S                   |             |                  |
| Portugal                    | Europe        | EA                                                                  | S             |                  | S     | S                   |             |                  |
| Republic of Korea           | Asia non-OECD |                                                                     | S             |                  | S     |                     |             | S                |
| Romania                     | Europe        |                                                                     |               |                  |       | S                   |             |                  |
| Serbia                      | Europe        | EA                                                                  |               |                  |       |                     |             |                  |
| Singapore                   | Asia non-OECD |                                                                     |               |                  |       |                     |             |                  |
| Slovakia                    | Europe        |                                                                     |               |                  |       | S                   | S           |                  |
| Slovenia                    | Europe        |                                                                     | SL            | SL               |       | S,SL                | S           |                  |
| South Africa                | Europe        |                                                                     |               |                  | S     | S                   |             |                  |
| Spain                       | Europe        |                                                                     | S             | S                | S     | S                   |             | S                |
| Sri lanka                   | Asia non-OECD |                                                                     |               |                  |       |                     |             |                  |
| Swaziland                   | Africa        |                                                                     |               |                  |       |                     |             |                  |
| Sweden                      | Europe        |                                                                     |               |                  |       | S                   |             |                  |
| Switzerland                 | Europe        |                                                                     | S             |                  |       | S                   | S           |                  |

S: Subsidies; VATL: Value Added Tax on Labour Force; TI: Tax on inefficient appliances; EA: Energy audit; subsidies; TC: Tax credit; TRE: Tax reduction; IT: Import tax for energy efficient equipment; M: Mandatory; SL: Soft-loans; PT: Purchase tax, including value added tax; V: Voluntary; MEQ: Energy Savings Quotas; MCR: Mandatory energy consumption reporting; P: Planned; MEA: Mandatory energy audits; MSP: Mandatory energy savings plans; Y: Yes; N: No; AT: Annual registration tax for cars; MEM: Mandatory energy managers

| Minimum Energy Performance Standards (MEPS) for appliances in households |                              |                  |                              |              |                     | MEPS for existing buildings | MEPS for new buildings | Other regulatory instruments | Incandescent lamps phase-out | Mandatory training for professionals                       |
|--------------------------------------------------------------------------|------------------------------|------------------|------------------------------|--------------|---------------------|-----------------------------|------------------------|------------------------------|------------------------------|------------------------------------------------------------|
|                                                                          | Refrigerators                | Washing Machines | Air conditioning             | Lamps        | Solar water heaters | Existing dwelling           | new dwelling           | Household                    | Banishment                   | Mandatory training for professionals                       |
| Denmark                                                                  | M(1999)                      | M                | M(P)                         | M            |                     | M(2010)                     | M(2010)                |                              | Y                            |                                                            |
| Ecuador                                                                  | M(M,2009)                    | M(M,2013)        | M(M,2013)                    | M(M,2013)    | M(M,2014)           | M(M,2011)                   | M(M,2011)              |                              | Y                            | N                                                          |
| El Salvador                                                              | M(M,2010)                    | M(V,2013)        | M(P,2016)                    | M(M,2010)    |                     |                             |                        |                              |                              | N                                                          |
| Estonia                                                                  | M(2004)                      | M                | M(P)                         | M(2004)      |                     |                             | M(2007)                |                              | Y                            | Y (Energy auditors)                                        |
| Finland                                                                  | M(2000,2010)                 | M(2011)          | M(P,2013)                    | M(2002,2009) |                     | M(2012)                     | M(2012)                |                              | Y                            | Y (Energy auditors)                                        |
| France                                                                   | M(1998,1966)                 | M()              | M(P)                         | M            |                     | M(M,2007)                   | M(2013)                | MEA                          | Y                            | N                                                          |
| Germany                                                                  | M(1998)                      | M                | M(M)                         | M            |                     | M(2012,2002)                | M(2014,2002)           | IMEA                         | Y                            | Consultants)                                               |
| Ghana                                                                    | M(M,2009)                    |                  | M(2006)                      | M(2006)      |                     |                             | M(P)                   |                              | Y                            | N                                                          |
| Indonesia                                                                | M()                          | M()              | M(M,2016)                    | M(2009,2015) | M(P)                | M(V)                        | M()                    |                              |                              | and building which consumes energy over 6000 TOE/year      |
| Israel                                                                   | M(1986)                      | M                | M                            | M            | M                   |                             | M                      | MEA                          | Y                            |                                                            |
| Italy                                                                    | M(2005)                      | M(1998)          | M(M)                         | M(2008)      |                     | M(2011)                     | M(2013)                |                              | Y                            | N                                                          |
| Japan                                                                    | M(M,2006)                    |                  | M(M,2008)                    | M(M,2009)    |                     | M(2008)                     | M(V,2009)              |                              | Y                            | N                                                          |
| Kenya                                                                    | M(P, Short term (2015-2019)) |                  | M(P, Short term (2015-2019)) |              | M                   |                             |                        | MEQ                          | N                            | Y (Energy managers, energy auditors & energy officers)     |
| Latvia                                                                   | M                            | M                | M(P)                         | M(2002)      |                     | M(2001)                     | M(2001)                |                              | Y                            | N                                                          |
| Lebanon                                                                  | M(V,2007)                    | M(P,2017)        | M(V,2008)                    | M(V,2007)    | M(V,2008)           |                             | M(P,2017)              | MEA                          | Y                            | N                                                          |
| Lithuania                                                                | M(2008)                      | M(2008)          | M(P)                         | M(2008)      |                     |                             | M(M,2020)              | MEA                          | Y                            |                                                            |
| Malta                                                                    | M(2009)                      | M(M)             | M(M)                         |              |                     | M(M,2006)                   | M(2006)                | OR                           | Y                            | Y (PV & SWH installers, energy auditors & energy managers) |
| Mexico                                                                   | M(M,1995)                    | M(2010)          | M(M,1995)                    | M(M,1998)    | M(V,2005)           |                             | M(M,2011)              |                              | Y                            | N (Energy efficiency & energy management systems)          |
| Nepal                                                                    |                              |                  |                              |              |                     |                             |                        |                              |                              |                                                            |
|                                                                          |                              |                  |                              |              |                     |                             |                        |                              |                              | ExpertListEng.aspx                                         |

S: Subsidies; VATL: Value Added Tax on Labour Force; TI: Tax on inefficient appliances; EA: Energy audit; subsidies; TC: Tax credit; TRE: Tax reduction; IT: Import tax for energy efficient equipment; M: Mandatory; SL: Soft-loans; PT: Purchase tax, including value added tax; V: Voluntary; MEQ: Energy Savings Quotas; MCR: Mandatory energy consumption reporting; P: Planned; MEA: Mandatory energy audits; MSP: Mandatory energy savings plans; Y: Yes; N: No; AT: Annual registration tax for cars; MEM: Mandatory energy managers

| Minimum Energy Performance Standards (MEPS) for appliances in households |               |                  |                  |                |                     |                   |               |           |                              |                                                                                    |
|--------------------------------------------------------------------------|---------------|------------------|------------------|----------------|---------------------|-------------------|---------------|-----------|------------------------------|------------------------------------------------------------------------------------|
|                                                                          | Refrigerators | Washing Machines | Air conditioning | Lamps          | Solar water heaters | Existing dwelling | new dwelling  | Household | Incandescent lamps phase-out | Mandatory training for professionals                                               |
| Netherlands                                                              |               |                  |                  |                |                     | M(2012)           | M(2012)       |           | Y                            |                                                                                    |
| Nigeria                                                                  | MS            | MS(P,)           | MS               | S(2003,201)    | MS(P,)              | M(V,2012)         | M(V)          | Planned   | N                            | N                                                                                  |
| Pakistan                                                                 | MS(P)         | MS(P)            | MS(P)            | MS(V)          | MS(P)               |                   | M(V)          |           | Y                            |                                                                                    |
| Philippines                                                              | MS(P)         | MS(P)            | MS(2002,2002)    | MS(2002)       |                     | M(M,2015)         | M(2005)       |           |                              |                                                                                    |
| Poland                                                                   | MS(2003)      | MS               | MS(P)            | MS(2005)       |                     | M(2002)           | M(2008)       | MEA       | Y                            | Y (Auditor)                                                                        |
| Portugal                                                                 |               |                  |                  |                |                     | M(M,2013)         | M(M,2013)     | OR        | Y                            | N                                                                                  |
| Republic of Korea                                                        | MS(2010)      | MS(2006)         | MS(2010)         | MS(2003)       | MS(2011)            |                   | M(2008)       |           |                              |                                                                                    |
| Romania                                                                  | MS(1997,2001) | MS(2001)         | MS(M,2011)       | MS(2001)       |                     |                   | M(M)          | MEA       | Y                            | Energy auditors in industry & energy manager)                                      |
| Serbia                                                                   | MS(P)         | MS(P)            | MS(P)            | MS(P)          | MS(P)               | M(M)              | M             | OR        | Y                            | Y (Energy saving managers & energy saving advisors)                                |
| Singapore                                                                | MS(M,2011)    |                  | MS(M,2011)       | S(M,July 2015) |                     |                   | M(2008)       |           | N                            | N                                                                                  |
| Slovakia                                                                 | MS            | MS               | MS(M)            | MS             | MS(V)               | M(M,1975)         | M(M,1975)     | MCR       | Y                            | Y (Energy managers)                                                                |
| Slovenia                                                                 | MS(2001)      | MS               | MS(M)            | MS             |                     | M (2010,2014)     | M (2010,2014) |           | Y                            | Y (Course to get licence)                                                          |
| South Africa                                                             | MS(P)         | MS(P)            | MS(P)            | MS (V,2010)    | MS(P)               | M(V,2011)         | M(M,2011)     |           | Y                            | Y (Measurement & verification (M&V). In process energy managers & energy auditors) |
| Spain                                                                    | M(V,2007)     | MS(1996)         | MS(M,2011)       | MS(2007)       |                     |                   | M (2007,2006) |           | Y                            | N                                                                                  |
| Sri Lanka                                                                |               |                  | MS(M,2010)       |                |                     |                   | M(V,2015)     |           |                              |                                                                                    |
| Swaziland                                                                | MS(P)         | MS(P)            | MS(P)            | MS(P)          | MS(P)               | M(V)              | M(P)          |           | N                            | N                                                                                  |
| Sweden                                                                   | MS(1999)      | MS               | MS(P)            | MS(2001)       |                     | M(2012)           | M(2012)       | MEA       | Y                            | N                                                                                  |
| Switzerland                                                              | MS(2003)      | MS(2003)         |                  | MS(2003)       |                     | M(2009)           | M(2009)       |           | Y                            | Y                                                                                  |
| Thailand                                                                 | MS(2006)      | MS(P)            | MS(2005)         | MS(V)          |                     |                   | M(M,2009)     |           |                              | N                                                                                  |

S: Subsidies; VATL: Value Added Tax on Labour Force; TI: Tax on inefficient appliances; EA: Energy audit; subsidies; TC: Tax credit; TRE: Tax reduction; IT: Import tax for energy efficient equipment; M: Mandatory; SL: Soft-loans; PT: Purchase tax, including value added tax; V: Voluntary; MEQ: Energy Savings Quotas; MCR: Mandatory energy consumption reporting; P: Planned; MEA: Mandatory energy audits; MSP: Mandatory energy savings plans; Y: Yes; N: No; AT: Annual registration tax for cars; MEM: Mandatory energy managers

| Minimum Energy Performance Standards (MEPS) for appliances in households |                |                  |                  |               |                     | MEPS for existing buildings | MEPS for new buildings | Other regulatory instruments | Incandescent lamps phase-out | Mandatory training for professionals             |
|--------------------------------------------------------------------------|----------------|------------------|------------------|---------------|---------------------|-----------------------------|------------------------|------------------------------|------------------------------|--------------------------------------------------|
|                                                                          | Refrigerators  | Washing Machines | Air conditioning | Lamps         | Solar water heaters | Existing dwelling           | new dwelling           | Household                    | Banishment                   | Mandatory training for professionals             |
| Tunisia                                                                  | MS(2004,2006)  |                  | MS(2009,2010)    | MS( )         | MS(2005)            |                             | M(2009, 2009)          | OR                           | Y                            | Y (Audit offices, installers companies (CES VP)) |
| United Arab Emirates                                                     | MS(M,)         | MS(M,)           | MS(2011)         | MS(V,)        |                     |                             | M(M,2003)              |                              | Y                            |                                                  |
| United States                                                            | MS(2001)       | MS(2007)         | MS(2007)         | MS(2006)      | MS(2004)            |                             | M(V,2010)              |                              | Y                            |                                                  |
| Uruguay                                                                  |                |                  |                  |               |                     |                             | M(M)                   |                              | Y                            | N                                                |
| Vietnam                                                                  | MS(2007, 2015) | MS(2015)         | MS(2015)         | S(1999, 2015) |                     | MS(2005)                    | M(2005, 2013)          |                              | Y                            | Y (Energy managers)                              |

S: Subsidies; VATL: Value Added Tax on Labour Force; TI: Tax on inefficient appliances; EA: Energy audit; subsidies; TC: Tax credit; TRE: Tax reduction; IT: Import tax for energy efficient equipment; M: Mandatory; SL: Soft-loans; PT: Purchase tax, including value added tax; V: Voluntary; MEQ: Energy Savings Quotas; MCR: Mandatory energy consumption reporting; P: Planned; MEA: Mandatory energy audits; MSP: Mandatory energy savings plans; Y: Yes; N: No; AT: Annual registration tax for cars; MEM: Mandatory energy managers

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## **NATIONAL TOOLS RECOMMENDED FOR ENCOURAGING AND IMPLEMENTING THE EFFICIENCY MEASURES IN THE RESIDENTIAL SECTOR**

Different political tools can be used to implement the efficiency measures in the market. Each political tool has advantages and drawbacks, for example, dependency in the tool itself, and the sector in which the efficiency measure will be implemented. This paper will later specify the policy tools most suitable for each of the efficiency measures by evaluating the different mechanisms implemented in other countries.

The policy tools for the encouragement of energy efficiency in the residential sector divide into several categories:

1. Financial policy tools:
  - A. Participating in projects for energy efficiency (subsidizing energy and refurbishment audit as part of time-limited designated projects).
  - B. Soft loans
2. Physical policy tools:
  - A. Tax allowance
  - B. Tax reduction
  - C. Accelerated depreciation
3. Regulatory policy tools:
  - A. Energy labels
  - B. Minimum Energy Performance Standards (MEPS)

A review of the financial policy tools in the residential sector shows that 43% of the reviewed countries subsidize projects of energy efficiency in residential buildings. This mainly involves financial aid for energy audits to existing buildings and structure refurbishment following the audit. The extent of the possible funding for this type of project varies between countries and in all of them the projects are designated, time-limited, and budget-limited. However, only 32% of the reviewed countries have chosen to provide soft loans, i.e., a loan whose interest rates are lower than in conventional bank loans with longer amortization schedules (in some cases up to 50 years). It can be seen that when the grants of the soft loan are for energy efficient appliances such as refrigerators, air conditioners, sun-heated boilers, heaters, and others, 24.5-55% of the countries offer grants or soft loans. Brazil in comparison requires electricity suppliers to invest a portion (60%) of the profits (net) in energy efficiency in low-income households, mostly by replacing their appliances with more efficient ones.

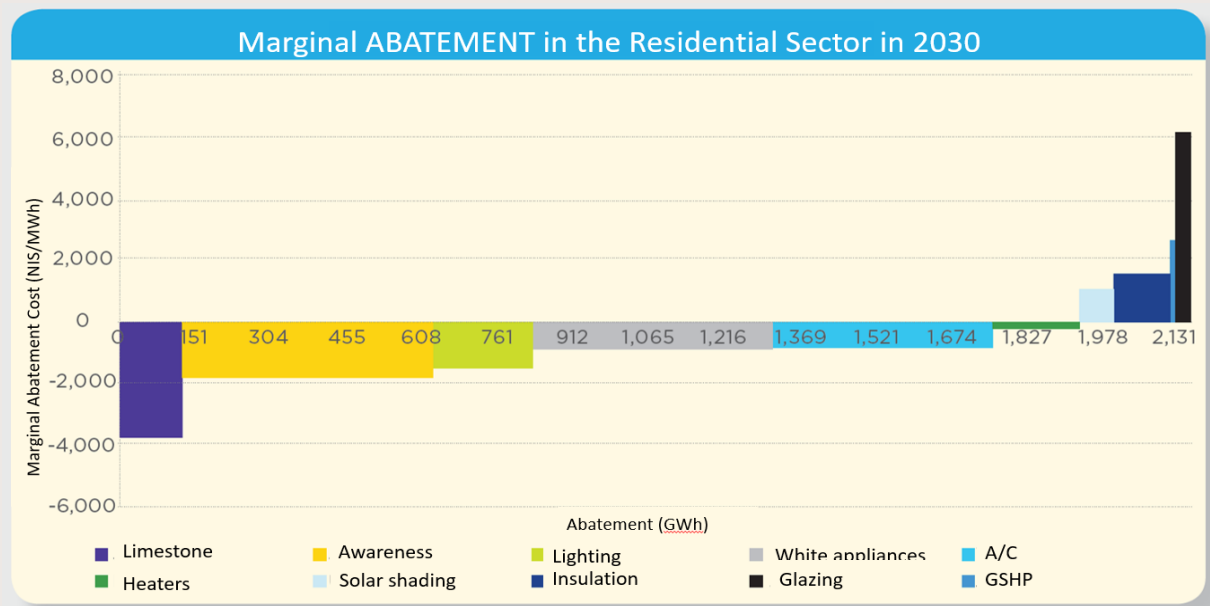
Upon review of the physical policy tools, only 7-13% of the reviewed countries pursue this course of action since it requires inconvenient follow up mechanisms which are less suitable to the residential sector.

As opposed to physical policy tools, 51-90.5% of the reviewed countries use regulatory tools while in 83-90.5% of the countries have standards for minimum energy performance in household appliances (MEPS). 51% of the countries have minimum energy performance standards from existing buildings, and 92% of the countries have minimum energy performance standards to new buildings, while 34% of the reviewed countries must have a license for auditing energy in structures. This

statistical analysis shows a preference for using regulatory policy tools in this sector instead of others.

**EFFICIENCY MEASURES IN THE RESIDENTIAL SECTOR**

**MARGINAL ABATEMENT IN THE RESIDENTIAL SECTOR IN 2030**



Data analysis of the Ministry of Energy from "Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel," September 2015, the Ministry of Environmental Protection, Chart 5 p. 51.

## Priorities Scale of Efficiency Measures in the Residential Sector<sup>31</sup>

| Priority Scale | Efficiency Measure                                                                                      | Central Premises                                                                                                                                                                                                                  | Implementation Potential for 2030                                                       | Economic Feasibility (NIS/MWh) | Recommended Policy Tool                                                                                                          | Net Cost to the Market *by 2030 | Savings Potential for 2030   |
|----------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------------------------------|
| 1              | Technology for preventing accumulation of lime scale in sun-heated boilers                              | * Lifespan: 15 years<br>* 15% saving in energy consumption for heating water, as of the fifth year<br>* Implementation potential: 90%                                                                                             | 90%                                                                                     | -3774                          | 3. Raising consumers awareness<br>4. Soft loan ***                                                                               | NIS 155.5 million               | NIS 8.9 million<br>132.4 GWh |
| 2              | Awareness: raising public awareness to electricity reduction                                            | Up to 10% saving from domestic energy consumption                                                                                                                                                                                 | -                                                                                       | -1815                          | 3. Obligating the electricity supplier to efficiency which will lead to efficiency also in end-users<br>4. Campaigns             | NIS 283.2 million               | NIS 323.7 million<br>493 GWh |
| 3              | Improvement of efficiency of white electrical appliances: refrigerators, washers and dryers, dishwasher | * Lifespan: about 15 years. Appliances replacing rate in the market is about 7% a year.                                                                                                                                           | * Replacing 90% of the appliances to appliances in the most energy efficiency category. | -901                           | 10. Further obligating to place energy labels<br>11. Updating minimum efficiency regulations for appliances<br>12. Soft loan *** | NIS 135.7 million               | NIS 273.3 million<br>480 GWh |
| 4              | Air conditioning: improving A/C efficiency                                                              | * An average consumption was calculated of about 1118 KWh annual consumption per unit.<br>* Additional cost of replacing one unit: NIS 500 per A/C unit, NIS 1000 per mini-central A/C unit and NIS 300 per standard split units. | * Replacing 90% of the appliances to appliances in the most energy efficiency category. | -852                           | 13. Further obligating to place energy labels<br>14. Updating minimum efficiency regulations for appliances<br>15. Soft loan *** | NIS 117 million                 | NIS 289 million<br>441 GWh   |
| 5              | Lighting: economical lamp                                                                               | * Lighting consumes about 10% of the domestic                                                                                                                                                                                     | * Halogen and incandescent – will be replaced with CFL lamps                            | -1527                          | 16. Further obligating to place energy labels                                                                                    | NIS 95 million                  | NIS 103 million<br>20.5 GWh  |

<sup>31</sup> Data analysis of the Ministry of Energy from "Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel," the Ministry of Environmental Protection, September 2015, Chart 1 p. 44. Figures with decimal marks were rounded.

|   |                                                                              |                                                                                                                                                                                                                                                                                                        |                                                                                                  |                                                            |                                                                                                                               |                |                           |
|---|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------|
|   | electricity consumption                                                      | * 5% halogen lamps, 5% incandescent lamps                                                                                                                                                                                                                                                              |                                                                                                  | 17. Updating minimum efficiency regulations for appliances |                                                                                                                               |                |                           |
|   | * Lifespan: halogen, incandescent – 10 years; CFL – 8 years; LED – 40 years. |                                                                                                                                                                                                                                                                                                        |                                                                                                  | 18. Soft loan ***                                          |                                                                                                                               |                |                           |
| 6 | Heating system: replacing radiators and diesel based systems for A/Cs        | Lifespan: radiators – 25 years; diesel systems – 30 years; A/Cs – 10 years.<br><br>* Coefficient of Performance: A/C – 3.5; radiator – 1; diesel system – 0.65.<br><br>Market status: 72% of the residential units are heated using A/Cs, 20% heated with radiators and about 7.6% heated with diesel. | * Replacing 50% of the diesel-based systems and 80% of the radiators with energy efficient A/Cs. | -298                                                       | 4. Further obligating to place energy labels<br>5. Updating minimum efficiency regulations for appliances<br>6. Soft loan *** | NIS 16 million | NIS 87 million<br>151 GWh |

## RESULTS AND RECOMMENDATIONS – THE RESIDENTIAL SECTOR

As can be concluded from the marginal abatement graph and the efficiency measures priority scale, the maximum potential for saving energy is a saving of 3.02 TWh in 2030. This saving is 3.1% of the total electricity consumption in the market and 11.5% of the total residential electricity consumption in the BAU scenario. This saving includes the efficiency measures that were found highly profitable to the market (90%), and the measures that are feasible energy-wise and in terms of external costs<sup>32</sup> (decrease in morbidity from air pollution, the costs of constructing another power plant to meet peak demands, costs due to air pollution per generated KWh<sup>33</sup>, etc.) yet are not profitable in net financial calculation (10%).

In using all the efficiency measures that were found profitable to the market (without calculating external costs) the potential savings in 2030 is 1.932TWh. This saving is 2.3% of the total electricity consumption of the market and 7.43% of the total residential electricity consumption in the BAU scenario.

<sup>32</sup> Development of the Energy Efficiency Field in Israel, January 2015, p.31-32, for the Ministry of Finance

<sup>33</sup> Development of the Energy Efficiency Field in Israel, January 2015, p.61, for the Ministry of Finance

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## INDUSTRY SECTOR

### GENERAL

The Industry Sector is a third of the global total final consumption. The real potential for energy efficiency in the industrial sector on the global level is 26% annually from the energy consumption for this sector (IEA, 2009a; UNIDO, 2011). Different plans and measures were implemented worldwide in an effort to make the energy consumption in the industry sector more efficient. On the one hand, this sector stretches on a large number of sub-sectors with a different consumption profile. Therefore, the policy to improve the energy efficiency of the industry must be planned in a way that allows flexibility. On the other hand, actions taken to improve the energy efficiency in the Industry Sector are defined as having very high cost-effectiveness ratio in reference to similar actions in other sectors while the intended benefits are productivity, GHG mitigation, energy consumption reduction and energy security<sup>34</sup>. A significant advantage to energy efficiency promotion in the Industry Sector rather than all other sectors is that this sector is comprised of a relatively small number of "players" when compared to other sectors.

In Israel, the electricity consumption of the Industry Sector in 2014 was 27% of the total electricity consumption of the market at 15,211 million KWh - which is a third of the electricity consumption in the market, consistently, for over a decade.

Based on the LEAP model used by the inter-ministerial staff for the BAU scenario, the electricity consumption in the industrial sector is expected to grow by 62% from 2014 and reach 19.1 TWh by 2030<sup>35</sup>. As the Ministry of Energy sees it, this projection is quite conservative since the database did not include data on Independent Power Producers (IPP) which makes the electricity consumption in the industry in 2013-2014 higher than the one used to calculate the model. The Ministry of Energy estimates the electricity consumption of the industry in 2030 would reach 21TWh<sup>36</sup>.

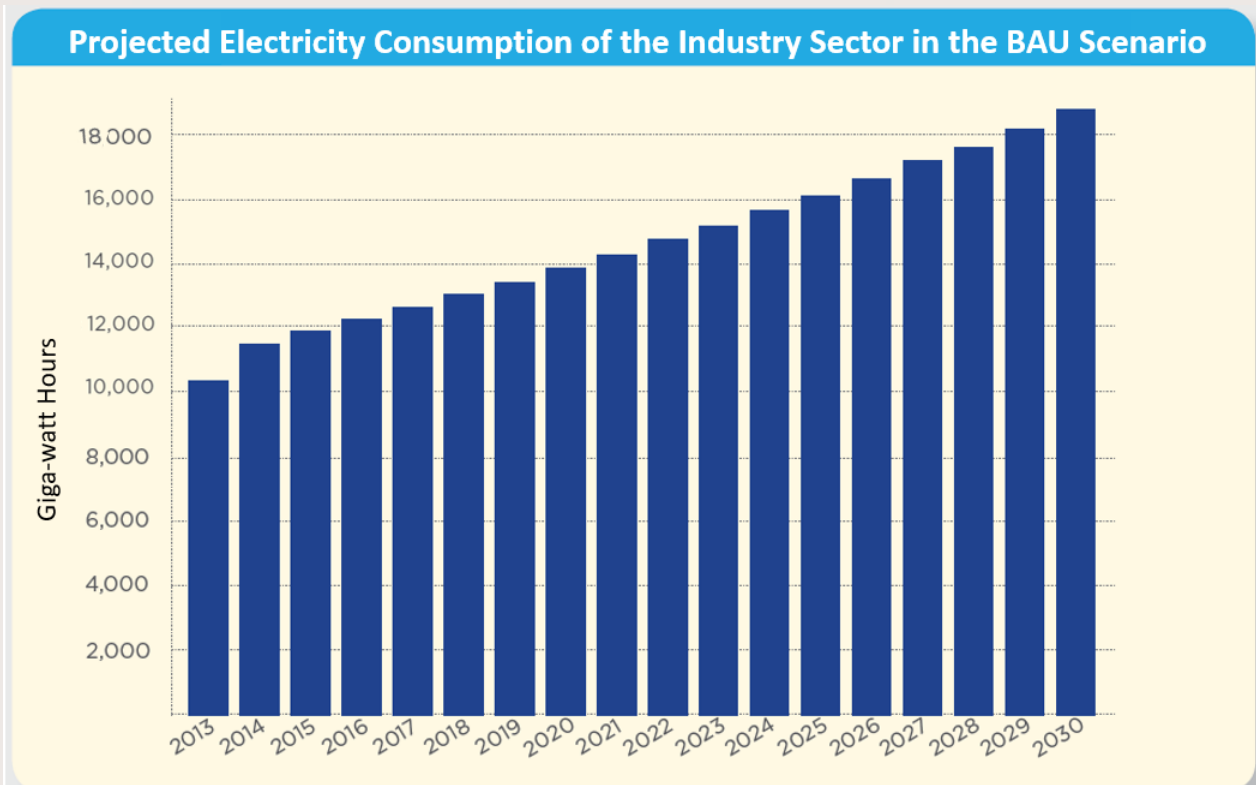
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<sup>34</sup> International Energy Agency; Energy management programs for industry, 2012

<sup>35</sup> Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel, the Ministry of Environmental Protection, September 2015, chart 10, p.65

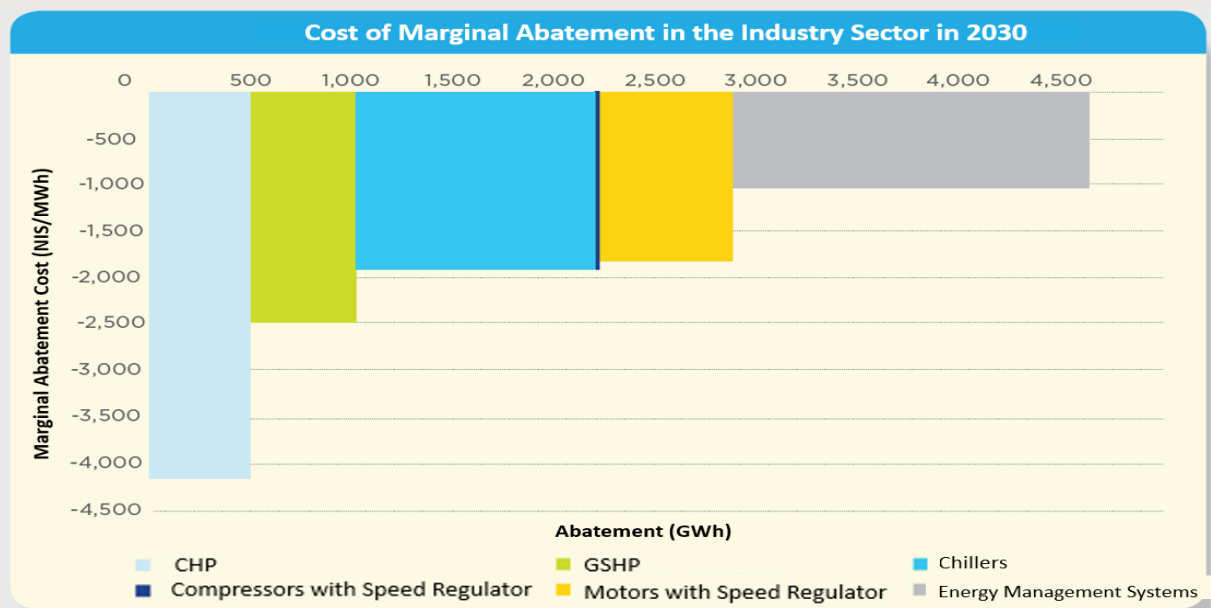
<sup>36</sup> Assessment based on trend of growth in electricity consumption by Graph 13 and consumption data from 2013-2014 that include IPPs from table 1.

**The Projected Electricity Consumption of the Industry Sector in the BAU Scenario**



Source: "Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel" the Ministry of Environmental Protection, September 2015, Chart 10 p. 65.

## The Cost of Marginal Abatement in the Industry Sector in 2030



Data analysis of the Ministry of Energy from "Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel," September 2015, the Ministry of Environmental Protection, Chart 11 p. 66.

## Priorities Scale of Efficiency Measures in the Industry Sector<sup>37</sup>

| Priority Scale | Efficiency Measure                                                                                                                                                                                             | Central Premises                                                                                                 | Implementation Potential for 2030                                  | Economic Feasibility (NIS/MWh) | Recommended Policy Tool                                                                           | Net Cost to the Market by 2030* | Savings Potential for 2030   |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------|------------------------------|
| 1              | Energy Management System (EMS)                                                                                                                                                                                 | * Lifespan: 15 years (experts' evaluation)<br>* Average energy saving of 8% for each site                        | 75% of the industrial sites                                        | -1039                          | 1. Preferred ranking as part of tenders for granting energy efficiency grants<br>2. Giving grants | NIS 570 million                 | NIS 638 million<br>974 GWh   |
| 2              | Use of chillers <sup>38</sup>                                                                                                                                                                                  | * Lifespan: 15 years (experts' evaluation)<br>* 17% saving for air condensation                                  | Replacing 90% of the chillers                                      | -1916                          | 1. Soft loan<br>2. Giving grants                                                                  | NIS 580.4 million               | NIS 638 million<br>973 GWh   |
| 3              | Use of speed regulators in motors                                                                                                                                                                              | *Lifespan: 15 years (experts' evaluation)<br>*Use of speed regulators will lead to a 30% energy saving           | 90% of the compatible motors                                       | -1824                          | 1. Soft loan<br>2. Giving grants                                                                  | NIS 384 million                 | NIS 443 million<br>676 GWh   |
| 4              | Use of geothermal heat pumps (GSHP)                                                                                                                                                                            | * Lifespan: 20 years (experts' evaluation)<br>*Integrated Part Load Value=9                                      | Replacing 5% of the chillers with water condensation               | 2483 -                         | 1. Soft loan<br>2. Giving grants                                                                  | NIS 16.9 million                | NIS 14.3 million<br>GWh 21.9 |
| 5              | Use of speed regulators for air compressors smaller than 30 wK                                                                                                                                                 | *Lifespan: 20 years (experts' evaluation)<br>* Use of speed regulators will lead to 30% energy saving            | 90% of the compatible compressors                                  | -1883                          | 1. Soft loan<br>2. Giving grants                                                                  | NIS 9.5 million                 | NIS 10.6 million<br>GWh 16.2 |
| 6              | ** Use of a Combined Heat and Power system (CHP), powered by natural gas to generate energy in the distribution network and conduction network where a direct benefit to the electricity sector is identified. | * Lifespan: 20 years (experts' evaluation)<br>Efficiency assessment (electrical and thermal) – 70% <sup>39</sup> | Additional 300 eMW in smaller CHP facilities (Ministry of Economy) | - 4,179                        | 1. Soft loan***<br>2. Giving grants                                                               | NIS 643.5 million               | NIS 948 million<br>TWh 1.9   |

<sup>37</sup> Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel, the Ministry of Environmental Protection, September 2015, Table 18, p.61. Figures with decimal marks were rounded.

<sup>38</sup> As part of encouraging the replacing of chillers, the topic of chiller's efficient use of water will also be considered.

<sup>39</sup> The Electricity Authority assesses that establishing cogeneration facilities is not expected to minimize electricity reduction in the market, the facilities' efficiency is expected to be lower than 70% which cannot prove savings to the market. Nurit Gal, Deputy Director-General of Regulation and the Electricity Sector, the Electricity Authority. 12.11.17

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## RESULTS AND RECOMMENDATIONS – THE INDUSTRY SECTOR

As can be concluded from the marginal abatement graph and the efficiency measures priority scale, the maximum potential for saving energy is of 3.02 TWh in 2030. This saving is 4.27% of the total electricity consumption in the market and 21% or 19% of the total industry electricity consumption in the BAU scenario based on the assessment of the Ministry of Environmental Protection<sup>40</sup> and the Ministry of Energy respectfully. All the measures that were reviewed were found profitable.

Although the reduction measures in the Industry Sector were found profitable, there are certain structured challenges for the implementation of the projects<sup>41</sup>.

### Challenge: Funding Sources for Energy Efficiency Projects

- Relatively small transactions – hundreds of thousands of NIS/ several million
- Lack of external funding source
- Business development first – for major consumers the energy topic is usually negligible
- Temporary consumers negatively affected – usually small and medium business, the investor is not the beneficiary of the savings
- Electricity distributors (unlicensed) – have no interest in becoming more efficient, the investor is not the beneficiary of the savings

### Challenge: Knowledge, Awareness and Public Trust in the Field

- No security – the savings' cash flow is non-tangible
- Operative inertia – why replace a system that works?
- Lack of knowledge and awareness
- Mistrust in the field

These challenges hold back Israel's energy efficiency market from moving forward. Therefore, it is necessary to allocate resources to remove these holdbacks. The Ministry of Energy has held meetings on the topic, and the following solutions were suggested:

### Solution: Funding Sources for Energy Efficiency Projects

- Forming a government mechanism of Government Loans Fund by virtue of Resolution 1403, whose goal is establishing a safety net for the bank loans that efficiency companies or businesses take in order to carry out energy efficiency projects.

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<sup>40</sup> Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel, the Ministry of Environmental Protection, September 2015, p. 65.

<sup>41</sup> Energy Efficiency in Israel – Mapping Core Obstacles and Solutions, July 2016. Presentation by Eitan Parnass, Director General of the Green Energy Association of Israel.

- Establishing a government mechanism to offer grants for energy efficiency projects.
- Publishing a recommended uniform contract for working with energy service companies (ESCO). The contract will refer to the way energy efficiency is to be measured following the efficiency, the manner the payments are to be calculated and other conditions.

Solution: Knowledge, Awareness and Public Trust in the Field

- Creating a list of energy services companies (audits, installation, and service) after the government or anyone acting on its behalf will review the quality, service and credibility of the companies (the methodology by which a candidate company is chosen will be decided before the list is published). The list will be published in the Ministry of Energy's official website. It is suggested to separate the energy auditors and the companies implementing the audit by signing the relevant companies on a contract to avoid a conflict of interests. Presently, the Ministry of Energy provides a list of energy auditors as a public service.
- Publishing a recommended uniform contract for working with energy services companies. The contract will refer to the way energy efficiency is to be measured as a result of efficiency actions, the manner the payments are to be calculated and other conditions.
- Publishing "success stories" on the Ministry of Energy's official website. Publishing energy efficiency projects which have saved electricity and money will reduce mistrust in this market.
- Grants for energy audits by consumers not legally bound to perform it.
- Constructing knowledge and skill – initiating promotion and development of professional designated courses to key members of the industry. Initiating and publishing professional conventions.
- Publishing a Ministry of Energy approved uniform protocol (one or more) for energy efficiency measurements due to efficiency actions.
- Continue to update and publish a uniform format for energy efficiency audits on behalf of the Ministry of Energy.
- Regularly updating the professional material published on the Ministry of Energy's official website.

## International Comparison of the Industry Sector Policy<sup>42</sup>

|                |               | Subsidies for energy audits | Subsidies in Industry |                 | Accelerate depreciation | Labels for Industrial electric motors | MEPS for Industrial electric motors | Other regulatory Instruments |
|----------------|---------------|-----------------------------|-----------------------|-----------------|-------------------------|---------------------------------------|-------------------------------------|------------------------------|
|                |               |                             | Industry              | Electric notors |                         |                                       |                                     |                              |
| Algeria        | Africa        | EA                          | S                     |                 |                         | LB(P)                                 |                                     | MEA,MCR                      |
| Argentina      | Latin America |                             |                       |                 |                         | LB(V,2010)                            | MS(P)                               |                              |
| Austria        | Europe        | EA                          | S                     |                 |                         | LB(M,2011)                            | MS(2011)                            | OR                           |
| Brazil         | Latin America | S                           |                       |                 |                         | LB(M)                                 | MS(M,2002)                          | MSP,MSP                      |
| Colombia       | Latin America |                             | S(175%)               | S(16%)          |                         | LB(P)                                 | MS(P)                               |                              |
| Croatia        | Europe        | S                           | S(40-80)              | S(40-80)        |                         |                                       |                                     |                              |
| Cyprus         | Europe        |                             |                       |                 |                         |                                       | MS(2011)                            | IMCR, MEA                    |
| Czech Republic | Europe        |                             |                       |                 |                         |                                       | LB(M)                               | MS                           |
| Denmark        | Europe        |                             |                       |                 |                         |                                       | MS(2011)                            | MEM,MCR MSP                  |
| Ecuador        | Latin America |                             |                       |                 |                         | LB(P,2015)                            | MS(P,2015)                          |                              |
| El Salvador    | Latin America | S(100)                      | S(40%)                |                 |                         |                                       | MS(M,2010)                          |                              |
| Estonia        | Europe        |                             |                       |                 |                         | LB(M)                                 | MS                                  | MCR, MEA                     |
| Finland        | Europe        | EA                          | S(15-25)              |                 |                         | LB(M)                                 | MS(2011)                            | MEA                          |
| France         | Europe        | EA                          |                       |                 | AD                      | LB(M)                                 | MS                                  | MEM                          |
| Germany        | Europe        | S                           | S                     |                 |                         | LB(M,2011)                            | MS                                  | MEA                          |
| Ghana          | Africa        | EA                          |                       |                 |                         |                                       |                                     |                              |
| Indonesia      | Asia non-OECD |                             |                       |                 |                         |                                       | MS                                  | MEA,MEM MSP,MCR              |
| Israel         | Middle-East   | EA                          | S                     | S               |                         |                                       | MS                                  | MEA,MEM MCR                  |
| Italy          | Europe        |                             |                       |                 |                         | LB(M)                                 | MS                                  |                              |
| Japan          | Asia OECD     | EA                          | S                     |                 | AD                      | LB(M,2015)                            |                                     | MEA,MEM MCR,MSP              |
| Kenya          | Africa        | S                           | S                     | S(0)            |                         |                                       | MS(P)                               | MEQ,MEM MEA                  |
| Latvia         | Europe        |                             | S                     |                 |                         | LB(M)                                 | MS                                  | OR                           |
| Lebanon        | Middle-East   |                             |                       |                 |                         |                                       |                                     |                              |
| Lithuania      | Europe        |                             |                       |                 |                         | LB(M)                                 | MS                                  |                              |
| Malta          | Europe        |                             |                       |                 |                         | LB(M,2009)                            |                                     | MEA                          |
| Mexico         | Latin America |                             | S                     |                 |                         | LB(M)                                 | MS(M,1995)                          | MCR                          |
| Nepal          | Asia non-OECD | S                           |                       |                 |                         |                                       |                                     |                              |
| Nigeria        | Africa        |                             |                       |                 |                         |                                       | MS(P)                               | Planned                      |

<sup>42</sup> World energy council <https://www.worldenergy.org/data/energy-efficiency-policies-and-measures> updated December 2015, entered: 13/07/16

|                      |                  | Subsidies<br>for energy<br>audits | Subsidies In Industry |                    | Accelerate<br>depreciation | Labels for<br>Industrial<br>electric motors | MEPS for<br>Industrial<br>electric motors | Other<br>regulatory<br>instruments |
|----------------------|------------------|-----------------------------------|-----------------------|--------------------|----------------------------|---------------------------------------------|-------------------------------------------|------------------------------------|
|                      |                  |                                   | Industry              | Electric<br>motors |                            |                                             |                                           |                                    |
| Pakistan             | Asia<br>non-OECD | EA                                |                       |                    |                            |                                             | MS(P)                                     | MEA                                |
| Philippines          | Asia<br>non-OECD | EA                                |                       |                    |                            |                                             |                                           | MCR                                |
| Poland               | Europe           | S                                 |                       |                    |                            | LB(M)                                       | MS                                        | MEM,MSP                            |
| Portugal             | Europe           | S                                 | S                     | S                  |                            | LB()                                        | MS(2011)                                  | MCR, MEM,<br>MSP, MEA              |
| Republic of<br>Korea | Asia OECD        | EA                                |                       |                    |                            | LB(M)                                       | MS(2010)                                  | MCR, MSP,<br>MEA                   |
| Romania              | Europe           |                                   | S                     |                    |                            | LB(M,2011)                                  | MS(2011)                                  | MEA, MEM,<br>MSP, MCR              |
| Serbia               | Europe           | EA                                |                       |                    |                            |                                             |                                           | MCR                                |
| Singapore            | Asia<br>non-OECD |                                   | S                     |                    | AD                         |                                             |                                           | MEM, MCR,<br>MSP                   |
| Slovakia             | Europe           |                                   |                       |                    |                            |                                             | MS                                        | MCR, MEA,<br>, MEM                 |
| Slovenia             | Europe           |                                   |                       |                    |                            |                                             | MS                                        | MEA                                |
| South Africa         | Africa           | EA                                | S                     |                    | AD                         |                                             | MS(V,2011)                                | MSP,MEQ                            |
| Spain                | Europe           |                                   |                       |                    |                            |                                             | MS                                        |                                    |
| Sri Lanka            | Asia<br>non-OECD |                                   |                       |                    |                            | LB(P)                                       | MS(P,2011)                                | MEA, MEM,<br>MCR, MSP              |
| Swaziland            | Africa           | S                                 | S                     |                    |                            | LB(P)                                       | MS(P)                                     |                                    |
| Sweden               | Europe           |                                   |                       |                    |                            | LB(M)                                       | MS                                        |                                    |
| Switzerland          | Europe           |                                   |                       |                    |                            |                                             | MS(P)                                     |                                    |
| Thailand             | Asia<br>non-OECD |                                   | S                     | S                  |                            |                                             | MS(2007)                                  | MCR, MEM,<br>MSP                   |
| Tunisia              | Africa           | S                                 |                       |                    |                            |                                             |                                           | MEA, MCR                           |
| United States        | North<br>America | EA                                |                       |                    |                            |                                             | MS(2007)                                  |                                    |
| Uruguay              | Latin America    | EA                                | S                     |                    |                            |                                             |                                           |                                    |
| Vietnam              | Asia<br>non-OECD | EA                                |                       |                    |                            | LB(M,2013)                                  | MS(2015)                                  | MEA, MEM,<br>MCR, MSP              |

S: Subsidies; EA: Energy audit; M: Mandatory; MEQ: Energy Savings Quotas; MCR: Mandatory energy consumption reporting; P: Planned; MEA: Mandatory energy audits; MSP: Mandatory energy savings plans; MEM: Mandatory energy managers

|                | Mandatory training for professionals |                                                   | Existence of Energy Service Company (ESCO) |                                                |
|----------------|--------------------------------------|---------------------------------------------------|--------------------------------------------|------------------------------------------------|
|                | Mandatory training for professionals | Type of professionals concerned                   | Turnover                                   | Financial incentive                            |
| Algeria        | Y                                    | For Auditor's agreement                           |                                            |                                                |
| Argentina      | N                                    |                                                   |                                            |                                                |
| Austria        |                                      |                                                   | € 15,000,000                               |                                                |
| Brazil         | N                                    |                                                   | Y                                          | Soft loans to ESCOS                            |
| Colombia       | N                                    |                                                   | \$ 5,000,000                               | No financial incentives                        |
| Croatia        | N                                    | Engineers                                         | \$ 10,000,000                              |                                                |
| Cyprus         | Y                                    | Energy Auditors                                   | € 2,000,000                                |                                                |
| Czech Republic | Y                                    | Energy experts                                    | € 0                                        |                                                |
| Denmark        |                                      |                                                   | € 8-25 Million                             |                                                |
| Ecuador        | Y                                    | Industrial Engineering or related field           |                                            |                                                |
| El Salvador    | N                                    |                                                   |                                            |                                                |
| Estonia        | N                                    |                                                   |                                            |                                                |
| Finland        | Y                                    | Energy Auditors                                   | Y                                          | Y                                              |
| France         | N                                    |                                                   | € 4-5 Billion                              | N/A                                            |
| Germany        | Y                                    | Energy managers, energy consultants               | € 1.7-2.4 Billion                          |                                                |
| Ghana          | Y                                    | Decision makers                                   |                                            |                                                |
| Indonesia      |                                      | Energy manager for industry which consumes        |                                            |                                                |
| Israel         | Y                                    | Energy Auditors excluded                          | Y                                          | Y                                              |
| Italy          | Y                                    | Energy manager                                    | N/A                                        |                                                |
| Japan          | N                                    |                                                   | On                                         |                                                |
| Kenya          | Y                                    | Energy managers, energy auditors, energy officers |                                            | Numerous incentives as the ESCO's do not exist |
| Latvia         | N                                    |                                                   | € 1-5 Million                              |                                                |
| Lebanon        |                                      |                                                   | \$ 500,000                                 |                                                |
| Lithuania      |                                      |                                                   |                                            |                                                |
| Malta          | Y                                    | Energy Auditors and Energy Managers               |                                            |                                                |
| Mexico         | N                                    | Systems                                           |                                            |                                                |
| Nepal          |                                      |                                                   |                                            |                                                |

EA; audits energy Mandatory: MEA; MEM: Mandatory energy managers; MEQ: Energy Savings Quotas; MSP: Mandatory energy savings plans; MCR: Mandatory energy consumption reporting; P: Planned, No: N; Y: yes

|                   | Mandatory training for professionals |                                                                          | Existence of Energy Service Company (ESCO) | Financial Incentive                            |
|-------------------|--------------------------------------|--------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------|
|                   | Mandatory training for professionals | Type of professionals concerned                                          | Turnover                                   |                                                |
| Nigeria           | N                                    |                                                                          | available                                  |                                                |
| Pakistan          |                                      |                                                                          |                                            |                                                |
| Philippines       |                                      |                                                                          |                                            |                                                |
| Poland            | N                                    |                                                                          |                                            |                                                |
| Portugal          | N                                    |                                                                          | € 30,000,000                               |                                                |
| Republic of Korea |                                      |                                                                          | \$ 112,000,000                             |                                                |
| Romania           | Y                                    | Energy Auditors and Energy Managers                                      | € 50,000,000                               | NO                                             |
| Serbia            | N                                    | Energy saving managers and Energy saving                                 |                                            |                                                |
| Singapore         | Y                                    | Energy Managers                                                          |                                            |                                                |
| Slovakia          | Y                                    | Energy Managers                                                          | € 10-12 Million                            |                                                |
| Slovenia          | N                                    |                                                                          | Y                                          |                                                |
| South Africa      | Y                                    | Energy Managers and Energy Auditors                                      | Y                                          | Various funding mechanisms                     |
| Spain             | N                                    |                                                                          | Unknown                                    |                                                |
| Sri Lanka         |                                      |                                                                          |                                            |                                                |
| Swaziland         | Y                                    | Engineers, business owners                                               |                                            | none                                           |
| Sweden            | N                                    |                                                                          | € 60-80 Million                            |                                                |
| Switzerland       | N                                    |                                                                          | € 170-350 Million                          |                                                |
| Thailand          | Y                                    | PREs = Person Responsible for Energy; Senior PREs = Higher level of PREs | \$ 87,000,000                              |                                                |
| Tunisia           | Y                                    | Audit officers, installers companies                                     |                                            |                                                |
| United States     |                                      |                                                                          | \$ 5,100,000                               |                                                |
| Uruguay           | N                                    |                                                                          | Y                                          | as "ESCO A" can apply for income tax reduction |
| Vietnam           | Y                                    | Energy Managers                                                          |                                            |                                                |

EA; audits energy Mandatory: MEA; MEM: Mandatory energy managers; MEQ: Energy Savings Quotas; MSP: Mandatory energy savings plans; MCR: Mandatory energy consumption reporting; P: Planned, No: N; Y: yes

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## **RECOMMENDED POLITICAL TOOLS TO ENCOURAGE AND IMPLEMENT EFFICIENCY MEASURES IN THE INDUSTRY SECTOR**

Different political tools can be used to implement the efficiency measures in the market. Each political tool has advantages and drawbacks, for example, dependency on the tool itself, and the sector in which the efficiency measure will be implemented. This paper will later specify the policy tools most suitable for each of the efficiency measures by evaluating the different mechanisms implemented in other countries.

The policy tools for encouraging energy efficiency in the industry sector divide into several categories:

1. Financial Policy Tools:
  - A. Grants
  - B. Soft loans
2. Physical Policy Tools:
  - A. Accelerated depreciation
3. Regulatory Policy Tools:
  - A. Energy labels
  - B. Minimum Efficiency Performance Standard (MEPS)

A review of the financial policy tools in the Industry Sector shows that 49% of the reviewed countries subsidize energy audits and 37% subsidize technological efficiency (such as replacing motors). A review of the physical policy tools shows that only 4 of the reviewed countries pursue this course. In comparison, 96% of the reviewed countries use regulatory tools: 55% of the countries (27 of 49) require putting energy labels on industrial motors, 75% of the countries (37 of 49 countries including Israel) have set a mandatory minimum efficiency threshold (MEPS) and 67% of the reviewed countries (33 of 49 countries, including Israel) require appointing an energy manager and/or carry out energy efficiency potential audit and/or an energy efficiency plan and/or an electricity consumption report. Furthermore, 51% of the reviewed countries (20 of 39 countries, including Israel) require a license or professional training (conditioned by passing a final exam).

### **ESCO companies:**

The business model of ESCO companies relies on the ability to purchase energy efficiency as a product in one-step (one-stop-shop). Entering into a contract with them usually includes funding, efficiency potential audit, technology and maintenance for a predetermined long period in a performance-based contract. This attachment model with clients allows clients that do not have self-funding to carry out energy efficiency projects. However, alongside the apparent advantages of this model, focusing on the financial gain creates market limitation when some of the ESCO companies ask to reduce the risk they are taking and thus focus on implementing technologies whose return time is short and the financial profit large<sup>43</sup>. If the ESCO

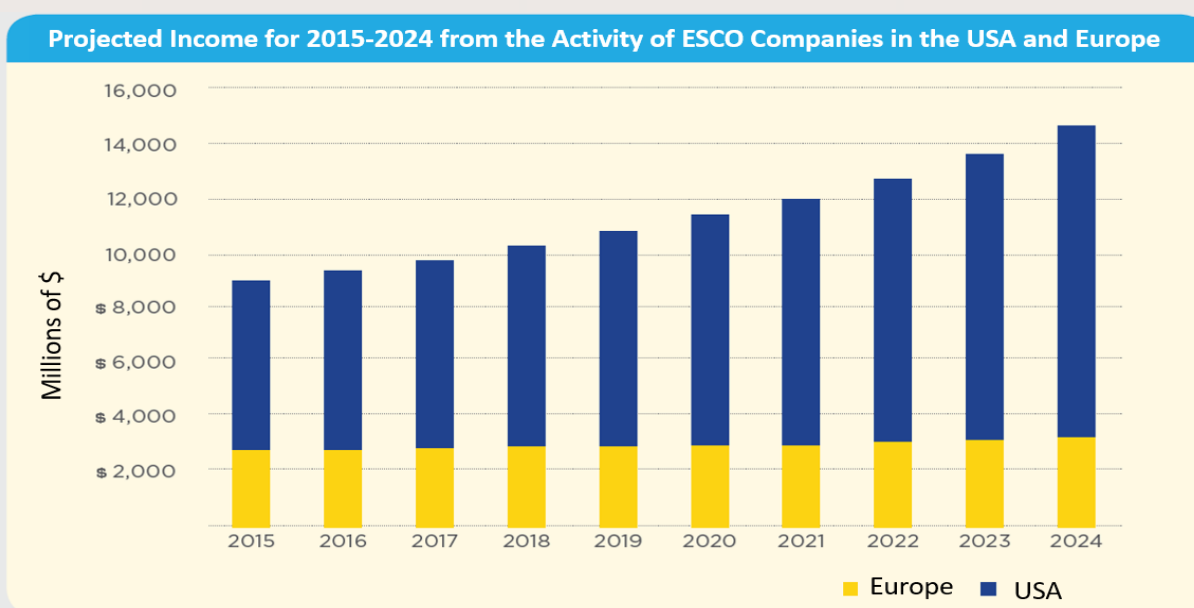
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<sup>43</sup>MEDIUM TERM ENERGY EFFICIENCY MARKET REPORT 2015 IEA p. 86

company mainly chooses economic steps for the short term (ROI = 2-4 years) the facility will not implement any energy efficiency potential.

In accordance with the Energy Service Company's Market Overview Report (the graph below) the ESCO market in the USA is estimated at USD 6.3 billion and is expected to grow to USD 11.5 billion in 2024 (7% annual increase). Similarly, the European ESCO market is expected to grow from USD 2.7 billion in 2015 to USD 3.1 billion in 2024 (a 1.7% annual increase)<sup>44</sup>.

### National Projected Income for 2015-2024 from the Activity of ESCO Companies in the USA and Europe



Based on a report of the European Union 2013<sup>45</sup>, the ESCO market in Israel is estimated at USD 1-1.5 billion. Presently, 43 companies are registered in the Ministry of Energy's list (private companies that employ an average of 50 employees), that some are not active or do not provide full energy efficiency services as is expected of an ESCO model (correct to the time this report was written). Most clients arrive from the industry and commercial –public sectors.

<sup>44</sup> Research Report, 2015. P.4 Executive Summary

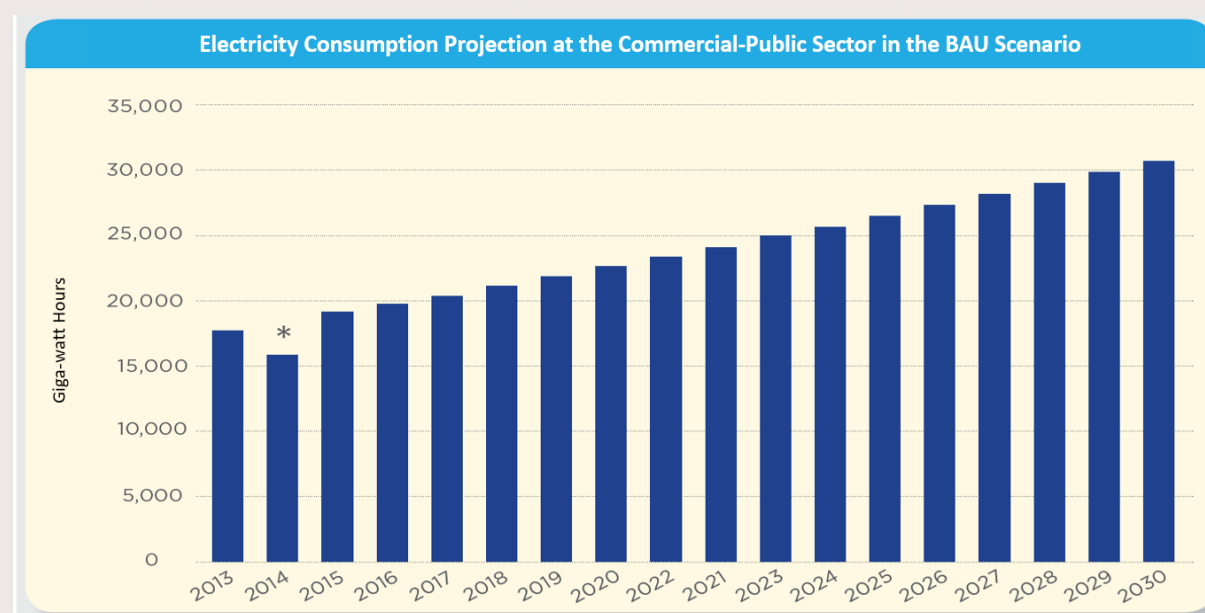
<sup>45</sup> B, Kiss-Boza., C, Cahil., T, Serrenho., P, Bertoldi. N, Labanca., S, Panev Commission European, 2013 countries European-non for report market ESCO ,26989 EUR Report, Transport and Energy for Institute Centre Research Joint Ispra, 2014, p. 127.

## COMMERCIAL- PUBLIC SECTOR

### GENERAL

The electricity consumption of the commercial- public sector in 2014 was 28% of the total electricity consumption in the market and was at 15,953 million KWh<sup>46</sup> which has been a third of the electricity consumption in the market, consistently over a decade. In the BAU scenario, the electricity consumption is expected to grow by 97% from 15.9TWh in 2014 to about 30.8TWh in 2030.

### Electricity Consumption Projection at the Commercial-Public Sector in the BAU Scenario



\*In 2014 relatively smaller electricity consumption, compared to previous years, was measured. Data processed by the Ministry of Energy from "Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel" the Ministry of Environmental Protection, September 2015, Chart 3 p. 50.

The commercial bodies and public bodies are subject to existing general regulations on energy topics regarding energy audits and the appointing an energy manager, yet this sector faces other unique challenges such as the renter-landlord problem. The problem is that the owner of the property has no incentive to use energy efficiently, on the contrary – the higher the maintenance costs of the property, the higher his profit, since the contract between him and the renter of the property is often a Cost (+) contract. Another known problem in the public sector is that the return investment time for energy efficiency in the local authorities is over five years. This presents a challenge for two reasons: 1. The mayors of the local authorities have no incentive to initiate projects of that scale since during their time in office the residents will only feel the inconvenience of replacing/upgrading the infrastructures and the saving will be felt only when the next elected official is in office. 2. The funding obstacle – powerful authorities can receive funding for long periods of time while weak

<sup>46</sup> Israel Electric Corporation – Periodical Report for 2015, Table 2,10, p.75.

authorities are limited to shorter periods, thus, in fact, they are unable to perform energy efficiency.

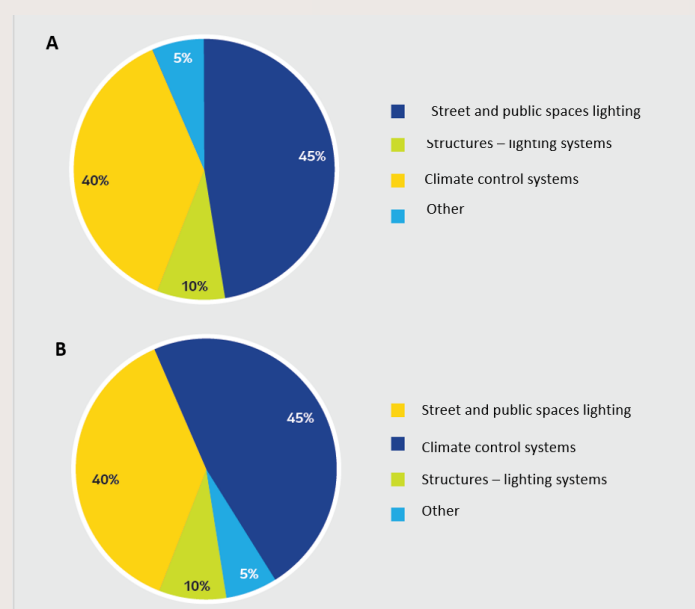
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### STREET LIGHTS IN LOCAL AUTHORITIES:

The annual expenditure of local authorities on electricity consumption is about NIS 1.2 billion a year<sup>47</sup> while the electricity consumption in this sector in 2015 was 107.5 million KWh<sup>48</sup>.

The rate of the annual increase in electricity consumption in the local authorities is estimated at 6% and is bound to be about 7% of the total consumption of the market in 2020<sup>49</sup>. Streetlights constitute between 50% <sup>50</sup>(Graph A) and 55% (Graph B) of the electricity consumption in the Authority, which makes it the leading candidate for energy efficiency projects in local authorities.

### Segmentation of the Electricity Consumption in the Local Authorities



Source: Graph A: the national plan for energy efficiency, the Ministry of National Infrastructure, Energy and Water, July 2010.

Graph B: Guide to energy efficiency in indoor and outdoor lighting in local authorities, January 2014.

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<sup>47</sup> Energy chapter in Tag Hasviva program, Federation of Local Authority, December 2010.

<sup>48</sup> Board 22, Market Consumption – by sectors – 2015. Entered: 09.08.2016  
<http://pua.gov.il/Publications/PressReleases/Pages/menahelmarachet.aspx>

<sup>49</sup> The National Plan for Energy Efficiency, the Ministry of National Infrastructures, Energy and Water, July 2010.

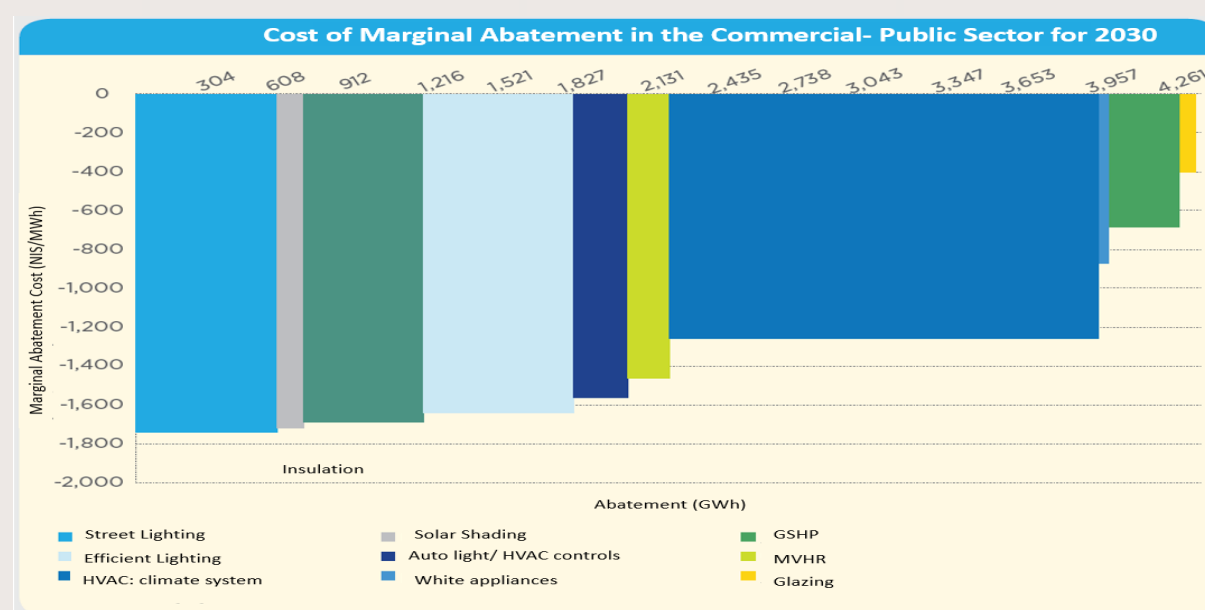
<sup>50</sup> Stage A Report of the Tag Hasviva program, based on an analysis of 57 local authorities

The efficiency process is structured on an initial mapping of the light consumers in the Authority, receiving a clear image of the distribution of lamps in the Authority, their characteristics and the energy consumption of indoor and outdoor lamps by separating buildings from central units. This mapping allows the decision makers to detect savings opportunities and provides them with the basic knowledge they need in order to adopt efficiency targets and form a practical work plan.

The mentioned challenges come as an addition to the general challenges of the market (knowledge and awareness, public trust, etc.) yet investing in this sector holds the solution to the public trust issue in the field of energy efficiency. The efficiency of public institutes (with emphasis on government offices) shows the general public an example and direction. From discussions with private companies in the energy efficiency field and with local authorities it was found that they observe the actions of the government, examine the way it enters into contracts with equipment/ service providers and other entities in the field, learn from it and follow suit. In addition, energy efficiency projects the government initiates are naturally extensive, so these investments will increase the local market and jumpstart investments from the private sector as well.

## EFFICIENCY MEASURES IN THE COMMERCIAL- PUBLIC SECTOR

### Cost of Marginal Abatement in the Commercial- Public Sector for 2030



Data processed by the Ministry of Energy from "Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel" the Ministry of Environmental Protection, September 2015, Chart 6 p. 52.

## RESULTS AND RECOMMENDATIONS, THE COMMERCIAL-PUBLIC SECTOR

As can be concluded from the marginal abatement cost graph and the efficiency measures priority scale, the maximum potential for saving energy will be 4.3 TWh in 2030. This saving is 4.45% of the total electricity consumption in the market and 14% of the total electricity consumption of the commercial-public sector in the BAU scenario. All the measures that were reviewed were found profitable. The commercial- public sector is a very important sector, especially its public part. This sector consists of the government and the local authorities' auxiliary units. This is a binding position where the whole equals more than the sum of its parts – energy efficiency in the public sector not only saves money, electricity and mitigates pollution; it also outlines the way by which the other sectors act. Israel's energy efficiency market holds much potential, yet it is still very new, so it is recommended that the government and its auxiliary units will not only act to remove obstacles in this field but also invest and show an example by its units.

### International comparison in the commercial-public sector policy<sup>51</sup>

|                |               | Subsidies<br>for buildings |                    | Soft loans<br>for buildings |                    | MEPS                                       |                                                 | Voluntary agreement<br>(reducing energy<br>consumption) |                         |
|----------------|---------------|----------------------------|--------------------|-----------------------------|--------------------|--------------------------------------------|-------------------------------------------------|---------------------------------------------------------|-------------------------|
|                |               | Existing<br>commercial     | Existing<br>public | Existing<br>commercial      | Existing<br>public | New<br>buildings<br>& Public<br>Commercial | Existing<br>buildings<br>& Public<br>Commercial | Public<br>buildings                                     | Commercial<br>buildings |
| Algeria        | Africa        | S                          | S                  |                             |                    | MS(2005)                                   |                                                 |                                                         |                         |
| Argentina      | Latin America |                            |                    |                             |                    | MS(V)                                      |                                                 |                                                         |                         |
| Austria        | Europe        | S                          | S                  | SL                          | SL                 | MS(M,1995)                                 | MS(M,2013)                                      |                                                         |                         |
| Benin          | Africa        |                            |                    |                             |                    | MS(P)                                      |                                                 |                                                         |                         |
| Botswana       | Africa        |                            |                    |                             |                    | MS(P)                                      | MS(P)                                           |                                                         |                         |
| Brazil         | Latin America |                            |                    | SL                          | SL                 |                                            |                                                 |                                                         |                         |
| Colombia       | Latin America |                            |                    | SL                          | SL                 | MS(V)                                      |                                                 |                                                         |                         |
| Croatia        | Europe        | S                          | S                  |                             |                    | MS(2008)                                   | MS(M)                                           | Y                                                       |                         |
| Cyprus         | Europe        | S                          |                    |                             |                    | MS(M,2007)                                 | MS(M,2007)                                      |                                                         |                         |
| Czech Republic | Europe        | S                          | S                  |                             |                    | MS(2007)                                   | MS(2001)                                        |                                                         |                         |
| Denmark        | Europe        | S                          |                    |                             |                    | MS(2010)                                   | MS(2010)                                        |                                                         |                         |
| Ecuador        | Latin America |                            |                    |                             |                    | MS(M,2011)                                 | MS(M,2011)                                      | N                                                       | N                       |
| El Salvador    | Latin America |                            |                    |                             |                    | MS(P,2017)                                 | MS(P,2017)                                      |                                                         |                         |
| Estonia        | Europe        |                            |                    |                             |                    | MS(2007)                                   |                                                 |                                                         |                         |
| Finland        | Europe        | S                          | S                  |                             |                    | MS(2012)                                   | MS(2012)                                        | Y                                                       | Y                       |
| France         | Europe        | S                          | S                  | SL                          | SL                 | MS(2012)                                   | MS(M,2007)                                      | Y                                                       |                         |
| Germany        | Europe        | S                          | S                  | SL                          | SL                 | MS<br>(2014,2002)                          | MS<br>(2012,2002)                               | N                                                       | N                       |
| Ghana          | Africa        | S                          | S                  |                             |                    | MS(P)                                      |                                                 |                                                         |                         |

<sup>51</sup>World energy council. <https://www.worldenergy.org/data/energy-efficiency-policies-and-measures> updated December 2015, entered: 13/07/16

|                      |                  | Subsidies<br>for buildings |                    | Soft loans<br>for buildings |                    | MEPS                                       |                                                 | Voluntary agreement<br>(reducing energy<br>consumption) |                         |
|----------------------|------------------|----------------------------|--------------------|-----------------------------|--------------------|--------------------------------------------|-------------------------------------------------|---------------------------------------------------------|-------------------------|
|                      |                  | Existing<br>commercial     | Existing<br>public | Existing<br>commercial      | Existing<br>public | New<br>buildings<br>& Public<br>Commercial | Existing<br>buildings<br>& Public<br>Commercial | Public<br>buildings                                     | Commercial<br>buildings |
| Indonesia            | Asia<br>non-OECD |                            |                    |                             |                    |                                            | MS(V)                                           | Y                                                       | Y                       |
| Israel               | Middle-East      | S                          | S                  | SL                          | SL                 | MS                                         |                                                 |                                                         |                         |
| Italy                | Europe           | S                          | S                  |                             |                    | MS(2013)                                   | MS(2011)                                        | Y                                                       | Y                       |
| Japan                | Asia OECD        | S                          | S                  | SL                          | SL                 | MS(V,2009)                                 | MS(2008)                                        |                                                         | Y                       |
| Kenya                | Africa           | S                          | S                  |                             |                    |                                            |                                                 |                                                         | Y                       |
| Latvia               | Europe           |                            | S                  |                             |                    | MS(2001)                                   | MS(2001)                                        |                                                         |                         |
| Lebanon              | Middle-East      |                            |                    | SL                          | SL                 | MS(P,2017)                                 |                                                 | Y                                                       | Y                       |
| Lithuania            | Europe           | S                          | S                  |                             |                    | MS(M)                                      |                                                 |                                                         |                         |
| Malta                | Europe           |                            |                    | SL                          | SL                 | MS(2006)                                   | MS(M,2006)                                      |                                                         |                         |
| Mexico               | Latin America    |                            |                    |                             |                    | MS(M,2001)                                 |                                                 | N                                                       | N                       |
| Nepal                | Asia<br>non-OECD |                            |                    |                             |                    |                                            |                                                 |                                                         |                         |
| Netherlands          | Europe           |                            |                    |                             |                    | MS(2012)                                   | MS(2012)                                        | Y                                                       |                         |
| Nigeria              | Africa           |                            |                    |                             |                    |                                            | MS(P)                                           | N                                                       | N                       |
| Pakistan             | Asia<br>non-OECD |                            |                    |                             |                    | MS(P)                                      |                                                 |                                                         |                         |
| Philippines          | Asia<br>non-OECD |                            |                    |                             |                    | MS(2005)                                   | MS(M,2015)                                      |                                                         | Y                       |
| Poland               | Europe           |                            |                    | SL                          | SL                 | MS(2008)                                   | MS(2002)                                        |                                                         |                         |
| Portugal             | Europe           | S                          | S                  |                             |                    | MS(M,2013)                                 | MS(M,2013)                                      |                                                         |                         |
| Republic of<br>Korea | Asia OECD        |                            |                    |                             |                    | MS(2008)                                   |                                                 |                                                         | Y                       |
| Romania              | Europe           |                            |                    |                             |                    |                                            |                                                 |                                                         |                         |
| Serbia               | Europe           | S                          | S                  | SL                          | SL                 | MS(M)                                      | MS(M)                                           | Y                                                       | Y                       |
| Singapore            | Asia<br>non-OECD | S                          |                    |                             |                    | MS(2008)                                   | MS(M,2014)                                      | Y                                                       |                         |
| Slovakia             | Europe           | S                          | S                  | SL                          | SL                 | MS(M,1975)                                 | MS(M,1975)                                      |                                                         |                         |
| Slovenia             | Europe           | S                          | S                  |                             |                    | MS<br>(2010,2014)                          | MS<br>(2010,2014)                               |                                                         |                         |
| South Africa         | Africa           | S                          | S                  | SL                          | SL                 | MS(M,2011)                                 | MS(M,2011)                                      | Y                                                       | Y                       |
| Spain                | Europe           | S                          | S                  | SL                          | SL                 | MS<br>(2007,2006)                          | MS(2006)                                        | N                                                       | N                       |
| Sri Lanka            | Asia<br>non-OECD |                            |                    |                             |                    | MS(V,2008)                                 |                                                 |                                                         |                         |
| Swaziland            | Africa           |                            |                    |                             |                    | MS(P)                                      | MS(P)                                           | N                                                       | N                       |
| Sweden               | Europe           |                            |                    |                             |                    | MS(2012)                                   | MS(2012)                                        |                                                         |                         |

|                         |                  | Subsidies<br>for buildings |                    | Soft loans<br>for buildings |                    | MEPS                                       |                                                 | Voluntary agreement<br>(reducing energy<br>consumption) |                         |
|-------------------------|------------------|----------------------------|--------------------|-----------------------------|--------------------|--------------------------------------------|-------------------------------------------------|---------------------------------------------------------|-------------------------|
|                         |                  | Existing<br>commercial     | Existing<br>public | Existing<br>commercial      | Existing<br>public | New<br>buildings<br>& Public<br>Commercial | Existing<br>buildings<br>& Public<br>Commercial | Public<br>buildings                                     | Commercial<br>buildings |
| Switzerland             | Europe           | S                          | S                  |                             |                    | MS(2009)                                   | MS(2009)                                        |                                                         |                         |
| Thailand                | Asia<br>non-OECD | S                          | S                  |                             |                    | MS(2009)                                   | MS(2009)                                        |                                                         | Y                       |
| Tunisia                 | Africa           | S                          |                    |                             |                    | MS<br>(2010,2008)                          |                                                 | Y                                                       | Y                       |
| United Arab<br>Emirates |                  |                            |                    |                             |                    | MS(M,2008)                                 |                                                 |                                                         |                         |
| United States           | North<br>America |                            |                    |                             |                    | MS(V)                                      |                                                 |                                                         |                         |
| Uruguay                 | Latin America    | S                          | S                  | SL                          | SL                 |                                            |                                                 | Y                                                       |                         |
| Vietnam                 | Asia<br>non-OECD | S                          |                    |                             |                    | MS(2005)                                   | MS(2005)                                        |                                                         |                         |

## RECOMMENDED POLITICAL TOOLS TO ENCOURAGE AND IMPLEMENT EFFICIENCY MEASURES IN THE COMMERCIAL PUBLIC SECTOR

Different political tools can be used to implement the efficiency measures in the market. Each political tool has advantages and drawbacks, for example, dependency on the tool itself, and the sector in which the efficiency measure will be implemented. This paper will later specify the policy tools most suitable for each of the efficiency measures by evaluating the different mechanisms implemented in other countries.

The policy tools for encouraging energy efficiency in the commercial-public sector divide into several categories:

1. Financial Policy Tools:
  - A. Energy efficiency grants
  - B. Soft loans
2. Regulatory Policy Tools:
  - C. Energy labels
  - D. Minimum Efficiency Performance Standard (MEPS)

According to a report by the World Energy Council updated December 2015, 55% of the countries use financial policy tools: 43% (23/53) of the reviewed countries subsidize energy efficiency in buildings in the commercial public sector and 26% (14/53) grant soft loans (low interest). None of the reviewed countries use physical tools to encourage energy efficiency. Regarding regulatory policy tools, 88% (47/53) of the countries established an energy efficiency minimum to new buildings and 60% (32/53) to existing buildings in broad topics such as insulation, electricity consumption, building code for energy consumption and alike.

## Priority Scale of the Efficiency Measures and Policy Tools Recommended to the Commercial- Public Sector

| Priority Scale | Efficiency Measure                                                                           | Recommended Policy Tool                                                                                                                                                                                                 | Net Cost to the Market<br>by 2030* | Electricity Savings             |
|----------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------|
| 1              | Climate systems <sup>52</sup> (includes speed regulations and cooling towers)                | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 692.1 million                  | NIS 1155 million<br>1.76 TWh    |
| 2              | Economic lamps (transitioning to fluorescent lamp 5T and LED)                                | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 313.5 million                  | NIS 319 million<br>GWh604.5     |
| 3              | Street lights                                                                                | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 22.4 million                   | NIS 329.43 million<br>GWh 573.2 |
| 4              | Use of geothermal heat pumps (GSHP)                                                          | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 264.1 million                  | NIS 329.2 million<br>GWh 502.3  |
| 5              | Improving the insulation of walls and roofs by the Insulations Requirements in Standard 5281 | 1. Existing structures – soft loan (loan with low interests)<br>2. New buildings – required by Standard 5281 subject to cost-effectiveness<br>3. Energy ranking to building/office subject to cost-effectiveness review | NIS 61.1 million                   | NIS 20.5 million<br>GWh280.3    |
| 6              | Auto lights and HVAC controls                                                                | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 101.8 million                  | NIS 136.8 million<br>GWh 208.8  |
| 7              | Utilization of residual heat/ cold in the Mechanical Ventilation Systems (MVHR)              | 1. Soft loan (loan with low interests) or<br>2. Giving grants                                                                                                                                                           | NIS 85.1 million                   | NIS 122.6 million<br>GWh187.1   |
| 8              | Solar shading: solar shading and reflective coating                                          | 1. Existing structures – soft loan (loan with low interests)<br>2. New buildings – required by Standard 5281 subject to cost-effectiveness<br>3. Energy ranking to building/office subject to cost-effectiveness review | NIS 57 million                     | NIS 61.412 million<br>GWh105.9  |
| 9              | Glazing under Standard 5281                                                                  | 1. Existing structures – soft loan (loan with low interests)<br>2. New buildings – required by Standard 5281 subject to cost-effectiveness                                                                              | NIS 8.8 million                    | NIS 4.61 million<br>GWh68.5     |

<sup>52</sup> As part of encouraging the replacing of chillers, the topic of chiller's efficient use of water will also be considered.

|    |                                                                           |                                                               |                  |                             |
|----|---------------------------------------------------------------------------|---------------------------------------------------------------|------------------|-----------------------------|
|    | 3. Energy ranking to building/office subject to cost-effectiveness review |                                                               |                  |                             |
| 10 | Improving the efficiency of white electrical appliances (without A/Cs)    | 1. Giving grants<br>2. Regulation – minimum energy efficiency | NIS 12.1 million | NIS 25.2 million<br>GWh44.2 |

\* Cost of efficiency minus electricity savings (NIS)

The above table summarizes the efficiency measures that proved profitable to the market by order of priority from an electricity saving measure that is highly efficient (1) to a measure with low efficiency (10).

## ENERGY EFFICIENCY IN THE WATER SECTOR

The water and the energy sectors are tightly connected. Production, treatment, and water distribution, both natural and "artificial" (seawater and brackish desalinated water), collecting and treating sewage water, transferring and reclaiming sewage effluents, need energy. At the same time, most processes related to the production of fuels and generation of energy use water. This connection between water and energy have recently gained international attention as well as a professional nickname - the "Water-Energy Nexus" (Nexus = integrated system). While in the past the energy and the water systems were perceived as separate, many countries have started to integrate the planning of the two systems.

California is the first state to embrace political plans of energy efficiency in the water sector yet they are focused on the water conduction problem, and the offered solutions limit the quantity of the transferred water or encourage water cycle<sup>53</sup>.

In Spain, the Spanish Institute for Diversification and Energy Conservation has initiated research on evaluating the energy consumption of seawater desalination and drinking water treatment, and the possible role of new technologies in abating these energy consumptions<sup>54</sup>. Australia has several university research programs that focus on the connection between climate, energy, and water, and integrating the water and energy sectors<sup>54</sup> planning policy. In China, the national development council stopped plans for the construction of Coal Liquefaction plants since they require a massive amount of water and might aggravate the country's water shortage and quality problems<sup>54</sup>.

In the United States, nine states have enacted laws that acknowledge the energy-water connection<sup>54</sup>. Simultaneously, the Federal Bureau of Energy has established a Water Energy Technology Team whose goal is to form R&D programs referring to these relationships. In addition, "The Energy and Water Research Integration Act" was formulated to force the American Ministry of Energy to include water consumption consideration in its R&D plans of fuels production and energy generating<sup>54</sup>.

In Israel, in May 2013, a "Final Report – The Interface between Water and Energy Globally and in Israel, Mapping the Scope of Consumption, Methods and Technology for Making the Interface more Efficient, and Formulating Recommendation to Focus the Activity of the Ministry of Energy and Water in this Field" was issued. It presented measures to improve the energy consumption and energy saving. The water consumption projection for 2030, for the inter-ministerial committee<sup>55</sup>, was based on the Master Plan for the Water Sector, August 2012 (2,765 MCM) which is not very different from the current water projection<sup>57</sup> (2,704 MCM)<sup>57</sup>. The specific energy

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<sup>53</sup> Water and Energy Nexus: A Literature Review, August 2013.

file:///C:/Users/hanit/Desktop/Water-Energy\_Lit\_Review\_2013.pdf

<sup>54</sup> Final Report – "The Interface between Water and Energy Globally and in Israel, Mapping the Scope of Consumption, Methods and Technology for Making the Interface more Efficient, and Formulating Recommendation to Focus the Activity of the Ministry of Energy and Water in this Field", 2013

<sup>55</sup> The Inter-Ministerial Steering Committee for the Formulation of a National Target for GHG Emission Reduction.

consumption data (KWh/ CBM) for desalination of seawater and brackish water for which the model was used is similar to the data in the Ministry of Energy<sup>56</sup>.

#### THE WATER CONSUMPTION IN THE ISRAELI MARKET FOR 2017-2030<sup>57</sup>

| Year | Residence                  |                                           |                   | Industry              | Agriculture     |                   | Regional | Water to nature | Commercial - Public | Total Consumption |              |
|------|----------------------------|-------------------------------------------|-------------------|-----------------------|-----------------|-------------------|----------|-----------------|---------------------|-------------------|--------------|
|      | Population million persons | Consumption per capita, CBM/ person/ year | Total consumption | Potable Briny (Total) | Potable Briny   | Brackish* (Total) |          |                 |                     | Potable           | Of all types |
| 2017 | 8.5                        | 90                                        | 767               | 29 93 (121)           | 187 472 (1,175) | 516               | 137      | 34              | 0                   | 1,547             | 2,234        |
| 2020 | 8.7                        | 90                                        | 786               | 29 94 (122)           | 182 503 (1,198) | 514               | 145      | 45              | 5                   | 1,589             | 2,302        |
| 2030 | 10.1                       | 90                                        | 911               | 29 96 (125)           | 181 582 (1,270) | 507               | 217      | 50              | 131                 | 1,912             | 2,704        |

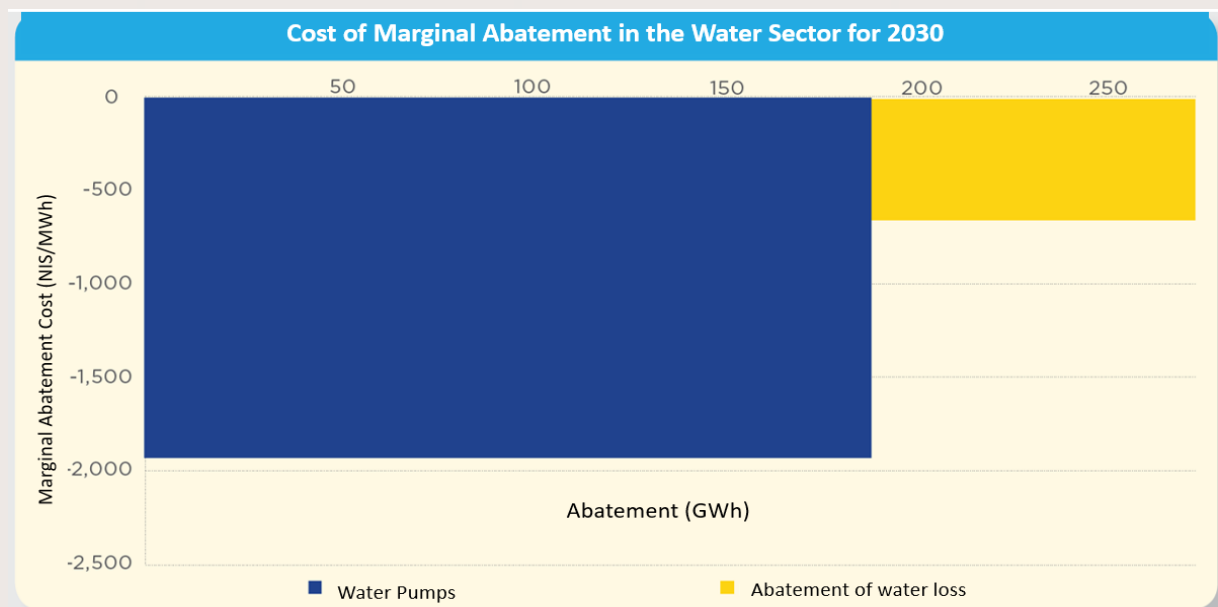
\*Brackish water include the Dan Region Wastewater Treatment Plant (Shafdan): Includes additional scenarios (other than diversity in natural supply) which are reviewed as part of the plan: rate of population growth, consumption per capita, supply to the Palestinian National Authority, climate changes, decrease in agriculture, decrease in coastline supply, losing the west bank mountain aquifer, addition to nature. Consumption of potable water domestically, by the industry and in agriculture includes consumption depreciation in agriculture as well as bolstering Brackish Water Plants and the Shafdan with potable water, regional consumption and supply to the Palestinian National Authority, Gaza and the Kingdom of Jordan.

<sup>56</sup> Final Report – “The Interface between Water and Energy Globally and in Israel, Mapping the Scope of Consumption, Methods and Technology for Making the Interface more Efficient, and Formulating Recommendation to Focus the Activity of the Ministry of Energy and Water in this Field”

<sup>57</sup>The August 2016 Water Authority projection will be approved along with the long-term master plan for the water sector (update in progress).

## EFFICIENCY MEASURES IN THE WATER SECTOR

### Marginal Abatement Cost in the Water Sector in 2030



Data processed by the Ministry of Energy from the data of the inter-ministerial steering committee to formulate a national target to mitigate GHG. Chart 11 p. 66.

## Priority Scale of the Efficiency Measures in the Water Sector<sup>58</sup>

\*Cost of efficiency minus electricity savings (NIS)

| Priority Scale | Efficiency Measure                                       | Central Premises                                                                                                             | Implementation Potential for 2030           | Economic Feasibility (NIS/MWh) | Recommended Policy Tool                                                                                                                                                                                                                  | Net Cost to the Market by 2030* | Abatement Potential for 2030   |
|----------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------------|
| 1              | Improving the efficiency of the water pumps              | Lifespan: 11 years (experts evaluations)<br><br>* Average efficiency of existing and new pumps: 66.5 and 73.4% respectively. | 90% of the water pumps                      | - 1978                         | 1. Minimum efficiency regulations <sup>59</sup> (by virtue of the energy sources law in conjunction with the Ministry of Finance and the Water Authority)*<br><br>2. Giving grants (grants fund by virtue of Government Resolution 1403) | NIS 115.2 million               | NIS 122.6 million<br>187.1 GWh |
| 2              | Reduction of water loss with pressure management systems | * Lifespan: 15 years (experts evaluation)                                                                                    | Lowering the leakage percent from 12% to 8% | - 663                          | Giving grants (grants fund by virtue of Government Resolution 1403)                                                                                                                                                                      | NIS 18.2 million                | NIS 57.6 million<br>87.9 GWh   |

\* Regulations of Minimum Efficiency in the Water Sector made in coordination with the Ministry of Finance and the Water Authority in light of possible influence on existing and future franchise agreements with desalination plants.

## RESULTS AND RECOMMENDATIONS – THE WATER SECTOR

The savings rate achieved as a result of the water sector efficiency is not high at 275 GWh, which is about 0.3% of the total projected electricity demand in the Master Plan of 2030. Yet, the cost of carrying out an efficiency plan is lower than the energy cost saved based on the projected electricity prices, and therefore it is economically justified to carry out an efficiency plan in the water sector.

<sup>58</sup> Data analysis from “Assessment Of Greenhouse Gas Emission Reduction Potential And Recommended National Target For Israel”, Ministry of Environmental Protection, September 2015, Table 18 page 63. Figures with decimal marks were rounded.

<sup>59</sup> Regulations of Minimum Efficiency in the Water Sector made in coordination with the Ministry of Finance and the Water Authority in light of possible influence on existing and future franchise agreements with desalination plants.

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## HORIZONTAL EFFICIENCY MEASURES:

### Challenges often seen in the Local Authorities Sector:

Gaps in Knowledge and Awareness: a process of efficiency in the local authorities is complicated, and managing it in a structured and organized manner is imperative for its success. Often, the position holders in the local authorities are unaware of the energy efficiency and financial potential hidden in the energy efficiency plans. Even when awareness of the energy efficiency field does exist there are gaps in knowledge on how to push the process forward, that is – who is authorized to prepare and manage the energy efficiency plan at the local authority level, what an energy audit is meant to include and what to consider when choosing an auditor.

Budget and funding: one of the central barriers when carrying out an energy efficiency project in local authorities is that of the budget. In projects that involve replacing outdoor lighting, it is common to assume an investment return period of about 6 to 7 years. In indoor lighting projects, it is common to assume an investment return period of about 2 to 3 years. Local authorities with a low socioeconomic level find it difficult to raise the budget needed for financing the project.

### Solutions and Recommendations:

Budget and funding: initial investment in energy efficiency projects is a significant challenge to authorities with low socioeconomic ranking, while by calculating cost-effectiveness the local authority could save a lot of money over the years after improving the efficiency of street lighting and indoor lighting. And yet, the investment return period might be long, making it difficult for the authority to receive credit and locate sources of funding for these sorts of projects.

There are several funding options:

1. Funding by ESCO companies – these companies are in fact suppliers of energy services specializing in all services required to implement an energy efficiency project which includes doing energy audits, preplanning the efficiency project, funding, installing, monitoring and providing training for efficiency and economical use of the installed equipment. Attachment with an ESCO Company is through a performance contract. There are three types of performance contracts<sup>60</sup>:
  - Guaranteed Saving: based on this funding model, the authority bears the costs of the project. The energy service company guarantees savings which will be achieved in a predetermined time span and provides security in case it is not achieved. The performance of the equipment and the energy consumption are monitored throughout the project to ensure the equipment meets the requirements of the technical specification defined by the tender.

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<sup>60</sup> Guide to Efficient Energy-Use in Interior and Exterior Lighting for Local Authorities, January 2014.

- Shared Saving: based on this funding model, the ESCO Company bears the cost of the initial investment, and the authority pays it based on the level of saving actually achieved. An attachment with the ESCO Company usually extends over a long time, between 3 to 10 years. In this method as well, the system performance is continuously monitored and stored throughout the period of attachment. Promoting the efficiency project based on this contract saves the authority the need to find sponsors for the project, to enter into contracts with technical advisors for equipment installation and it does not expose itself to the risks such a project may entail. On the other hand, throughout the attachment period, the authority does not enjoy or only partially enjoy the financial saving this project's implementation produces in its first years. Also, the contract should bind the saving measurement form with an agreed saving measurement protocol.
  - The method of setting the price (Chauffage). In this method, ESCO Company manages the energy systems in full, and the client (local authority) buys the energy services from ESCO at a preset price. This method makes the need for operating the lighting systems redundant and the price known in advance. The authority must supervise the performances of ESCO Company to ensure the provided service is of the desired quality and that it meets the terms of the contract.
2. Independent funding (using the budget of the council): the council has at its disposal its regular budget, an extraordinary budget, and summer renovation budget. Using an unutilized surplus of the budget is the simplest and cheapest funding option. If the budget cannot be utilized it is possible to take a loan. This course of action does not fit all types of efficiency projects since they are often considered high-risk projects and the investors demand a high return for their investment, so much so, that the financing channel from banks and private clients may become blocked. Local banks give loans to local authorities for carrying out an energy saving project. This is a simple and relatively quick procedure that provides up to 100% of the necessary funding. The drawback is that the financing costs become added to the authority's loan burden. To overcome this drawback Dexia Bank Israel created a Public Funding Project in which the loan is provided to a Project Company, and the Authority provides a guarantee for the project's undertakings. The guarantee will only be used if the Project Company reaches a shortage in cash.
  3. Government Grants: the Ministry of National Infrastructures, Energy, and Water, the Ministry of the Environmental Protection in conjunction with the Ministry of Economy and Finance allocate budgets for grants of energy efficiency implementation projects. It is recommended that the authority prepare an energy efficiency plan for the entire authority and be ready to offer itself for government grants on energy efficiency projects. Furthermore, based on Government Resolution 1403, Israel will create a mechanism for offering state guarantees at the extent of NIS 500 million for a ten-year period. Its purpose will be giving loans for investing in energy efficiency and GHG

emissions mitigation and establishing a 4-year-grant program of NIS 300 million.

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### **ENERGY LABEL FOR STRUCTURES (ENERGY CONSERVING CONSTRUCTION)**

Over the past decade, the energy ranking label changed the consumers' preferences in the field of electrical appliances. Nowadays, most consumers prefer to purchase appliances with a ranking of A or B. The higher the ranking, the more efficient is the appliance's energy consumption. The price of an average property is estimated at NIS 2.1 million<sup>57</sup>, after the property is bought the highest maintenance expenses are on climate control. These expenses are not taken into account when the apartment is purchased because there is no information on this topic in the Real Estate market. Making it mandatory to present an energy label will divulge to the purchasers the structure's energy consumption. Aspects such as the building's energy consumption receive a small amount of attention, if any, from the building engineers who focus on the planning and economic aspects. The architectural design of a structure that deliberately makes energy use efficient can help to significantly reduce the electricity consumption used for lighting, cooling and heating the structure and the various operative systems. Common measures used for planning and implementing energy saving construction includes an improved insulation of the structure's walls, doors, and windowpanes and taking advantage of the structure's direction to utilize the natural light and for heating purposes in the winter, as well as using shading to prevent overheating in the summer. It is vital to encourage energy aware planning from the initial steps of the planning process, and there is a clear need to require presenting the energy label to ensure the standards in the field of buildings energy consumption are fulfilled.

The countries of the European Union have regulations for binding energy labels since 2002<sup>53-55</sup>, for example in Portugal, Austria, Sweden, Finland, Estonia, Hungary, Latvia, Lithuania, Malta, Slovenia, Slovakia, Poland, Czech Republic, Cyprus, Bulgaria, Croatia, Belgium, Luxemburg, Ireland, Denmark, Italy (2009), Germany (2009), Holland (2008), France (2008), Britain (2007), Greece<sup>61</sup> (2011) and Spain (2008). Structures in Europe are responsible for about 40% of the electricity consumption. For the sake of comparison, Israel's electricity consumption by structures constitutes over 60% of the total consumption of the market. Under the European Directive regarding the energy performance of structures<sup>62</sup>, all the members of the Union are required to improve regulation and present methods of energy inspections of structures so they could be labeled with an energy label. According to the directive, the energy label of the structure is to be issued during its planning, selling or renting. In Japan, a labeling mechanism<sup>63</sup> (TGLSC) was developed in 2005 for labeling condominiums, with a requirement that energy ranking is published in favor of the potential buyers. The directive applies to the private and

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<sup>61</sup> The Greek Income Tax Authority does not validate the sale or purchase documents of an asset if the structure's energy label is not presented.

<sup>62</sup> Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings. <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV:I27042>

<sup>63</sup> Tokyo Green Labeling System for Condominiums

public sectors for all type of structures<sup>64</sup>. In Australia, property sellers are required to provide information on the energy efficiency of their apartments using an energy label (EER<sup>65</sup>) since 1999. The label includes recommendations for energy improvements. Presently, the obligation to report has made the energy consumption a significant criterion in choosing a property<sup>66</sup>.

According to Israeli Standard 5282: ranking buildings by energy needs - residential buildings, offices (under preparation- parts of hotels, hospitals, and hotels). Its purpose, as is the purpose of regulation in general, is to correct market failures by increasing activity in a particular field, overseeing it and directing it toward creating a behavior and activity that promotes the interest of the general public. The requirements of a standard are mostly minimum requirements used when the market does not uphold these requirements on its own. Standard 5282 was drafted at the request of the Ministry of National Infrastructures, Energy, and Water and it is a voluntary standard meant to give a professional and efficient response to the lack of awareness prevailing in the field of construction, and there is no demand for a minimum requirement. Ranking the apartments in the Standard reflects the envelope elements and structure's characteristics level of planning, based on the climate zone in which it is located. Since 2011, the reference building of Standard 5282 is a structure that conforms to Standard 1045 and several other parameters. Each building that ranks above a structure that conforms to 1045 is considered energy efficient. Nowadays, a revision of Standard 5282 has been completed. In accordance with one of the changes in the revision, a building that receives a rank of C in 5282 Residential meets the requirements of Standard 1045.

In accordance with Government Resolution 1403 from 10 April 2016, a review should be made of all the measures required to formulate regulations that will determine the energy ranking requirement of new residential buildings and offices based on Israeli Standard 5282.

This kind of step is expected to influence the Real Estate market on the short and long terms – a rise in buying high-ranked apartments. It should be noted that the level of energy efficiency improves between ranks by at least 20%<sup>67</sup> (as well as the financial savings for the consumer). Each rank increase expresses an increase in the energy efficiency of the residential unit and it manifests in the improvement of 10%-40% (based on climate zone). Energy labels will inform the buyers of the structure's energy consumption and affect the consumer's judgment during the buy. Often, the price of the buy is determined by the market based on the meeting between supply and demand. The inclusion of an energy ranking that proves "energy saving" performance will give the property priority and affect the demand for the apartment. The energy label is a mechanism that will allow the consumer to compare different

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<sup>64</sup> Which "Greenness" is valued? Evidence from green condominiums in Tokyo, 2011.; [http://nilskok.typepad.com/files/paper-yoshida\\_sugiura.pdf](http://nilskok.typepad.com/files/paper-yoshida_sugiura.pdf)

<sup>65</sup> Energy Efficiency Rating.

<sup>66</sup> Energy Efficiency Rating and House Price in the ACT; <http://www.nathers.gov.au/about/publications/pubs/eer-house-price-act.pdf>

<sup>67</sup> Position Paper 5282 – Assessing the Inclusion of a Requirement to Present Energy Labels in the Israel Sales Law (Apartments), February 2014. The Energy Conservation and Efficiency Division at the Ministry of National Infrastructure, Energy and Water Resources.

apartments and integrate this information into their purchase considerations. Reference to it can be found in studies<sup>6869</sup> that reviewed the effect energy labels have on the property's price of sale or price of rent. While in Britain, no positive correlation was found between the property's energy efficiency and its price – a one-rank improvement is reflected in 4% drop in the price of the property, in Austria, one-rank increase reflected in an 8% rise in the Real Estate Market designed for sale and 4.4% in the renting market. In Belgium it was found that there is a distinct positive correlation between the property's energy efficiency and its selling price or renting price – the influence of the energy efficiency is estimated at about 4.3% above the average price. The influence over the renting prices was small but clear, about 3.2% above average. In France, a positive correlation was found between the selling price and the energy efficiency, in Marseille a price that is about 4.3% higher and in the city about 3.2% higher. In Ireland, the influence of the energy efficiency is reflected by an increase in price by 2.8% above the market average of apartments for sale, while in the apartments for rent the estimated influence is about 1.4%.

It is likely to assume that in the short term, the contractor's desire to meet the changing demands of the market, might increase the cost of construction slightly. Nonetheless, it is important to remember that the planned life-span of residential buildings constructed in Israel is at least 50 years. Thus, a one-time investment will return itself within a reasonable time. From the above, we conclude without a doubt that requiring an energy label will lead to significant energy savings in the market in general and in the residential sector in particular.

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## **NEGAWATT<sup>70</sup> (WHITE CERTIFICATES)**

In the past, energy efficiency was nicknamed "the fifth fuel" as it provides the means to meet the growing demand for energy - just like coal, gas, petroleum or uranium. However, while burning fossil fuels contribute to global warming by emitting GHG and nuclear reactors are hazardous, the only side effect energy efficiency has is financial savings.

The Negawatt mechanism<sup>71</sup> is extensively implemented throughout Europe and the United States. In accordance with the mechanism, the electricity distributor or provider (hereinafter: the obligated entity) is given a defined target, and he is free to achieve it at the lowest cost (by actions he initiates, or through a tender for purchasing "savings" ["certificates"] measured in Hour-Negawatts). The obligated entity claims the extra costs of the plan from his clients (the consumers). Below is a comparison between incentive programs in the different countries:

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<sup>68</sup> "Thermal Performance of Buildings and the Development of Guidelines for Energy Conscious Design". The study was performed by the Technion and the Center for Architectural Research and Development, March 2002.

<sup>69</sup> Energy performance certificates in buildings and their impact on transaction price and rents in selected EU countries. European Commission, April 2013

<sup>70</sup> Tariff Mechanisms for Efficient Energy-Use – Methodology Paper, 2015

<sup>71</sup> Also referred to as Energy Savings Certificate (ESC), Energy Efficiency Credit (EEC), white tag

| Country | Start of Plan Implementation | Who is liable? (Supplier/ Distributor)          | Number of obligated entities | Annual investment (the obligated entities) |
|---------|------------------------------|-------------------------------------------------|------------------------------|--------------------------------------------|
| France  | 2006                         | Suppliers (all energy sectors)                  | 2,454                        | Euro 460 million                           |
| Britain | 1994                         | Suppliers (electricity, gas)                    | 6                            | Euro 1510 million                          |
| Italy   | 2005                         | Distributors (electricity, gas)                 | 66                           | Euro 696 million                           |
| Poland  | 2013                         | Suppliers (electricity, gas, heat)              | 200                          | Euro 472 million                           |
| Austria | 2014                         | Major suppliers/ consumers (all energy sectors) | N/A (a very large number)    | Euro 312 million                           |
| Denmark | 2006                         | Distributors (electricity, gas, heat)           | 501                          | Euro 149 million                           |

In most cases, the use of white certificates, which are tradable certificates, is integrated with efficiency requirements for achieving energy savings – predefined. Under such a system, producers, suppliers or distributors of electricity are required to strive toward energy efficiency for the end-user, which is in line with their commitment to the annual energy savings predefined by the law. If the energy producers/ distributors do not meet the energy consumption target, they are required to pay a fine<sup>72</sup>. The certificates (white certificates) are issued and given to manufacturers whenever a certain quantity of energy savings is measured and verified – the producers/ distributors can use the certificates as they see fit (to reach their target or sell to other entities that are unable to reach their targets). The ability to trade the certificates ensures total energy savings are achieved at a minimum cost, while the certificates themselves guarantee the total energy saving target is gained. According to the report of the Electricity Authority from 2015<sup>73</sup>, 154 (an overwhelming majority) of Kibbutzim and four Druze settlements are in the process of receiving an electricity distributor license.

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<sup>72</sup> [White Certificates: concept and market experiences](#), Euro White Cert project brochure.

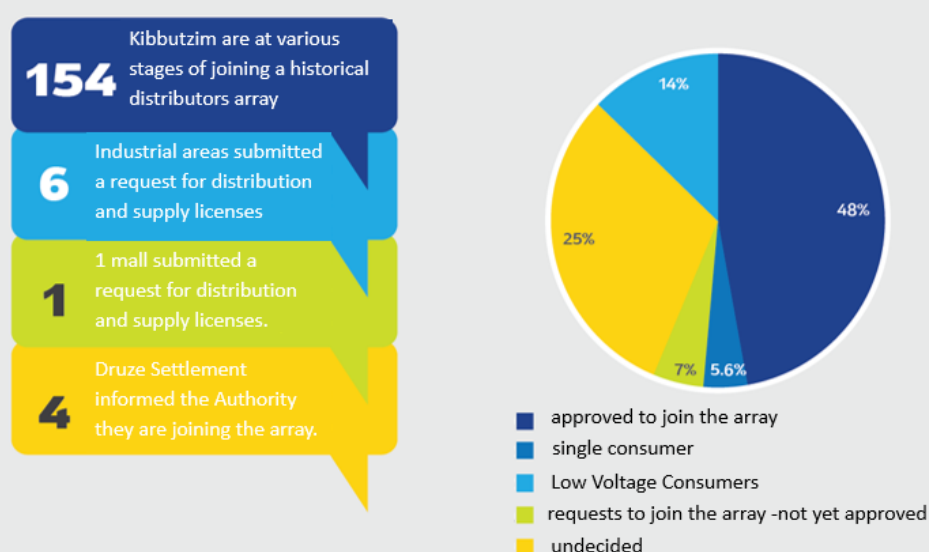
<sup>73</sup> Electricity Sector Status Report for 2015

[http://pua.gov.il/publications/pressreleases/documents/doch\\_reslut\\_2015.pdf](http://pua.gov.il/publications/pressreleases/documents/doch_reslut_2015.pdf)

## Segmentation of the Electricity Consumption in the Local Authorities

| Distribution of Historical Electricity Distributors by alternatives |                                                          |
|---------------------------------------------------------------------|----------------------------------------------------------|
| No. of Settlements                                                  | Alternative                                              |
| 40                                                                  | Low Voltage consumers                                    |
| 16                                                                  | Single Consumer Alternative (potential)                  |
| 20                                                                  | Submitted requests to join the array                     |
| 137                                                                 | Alternative to joining the historical distributors array |
| 72                                                                  | Undecided                                                |
| 285                                                                 | Total                                                    |

### Distribution of Historical Electricity Distributors by alternatives:

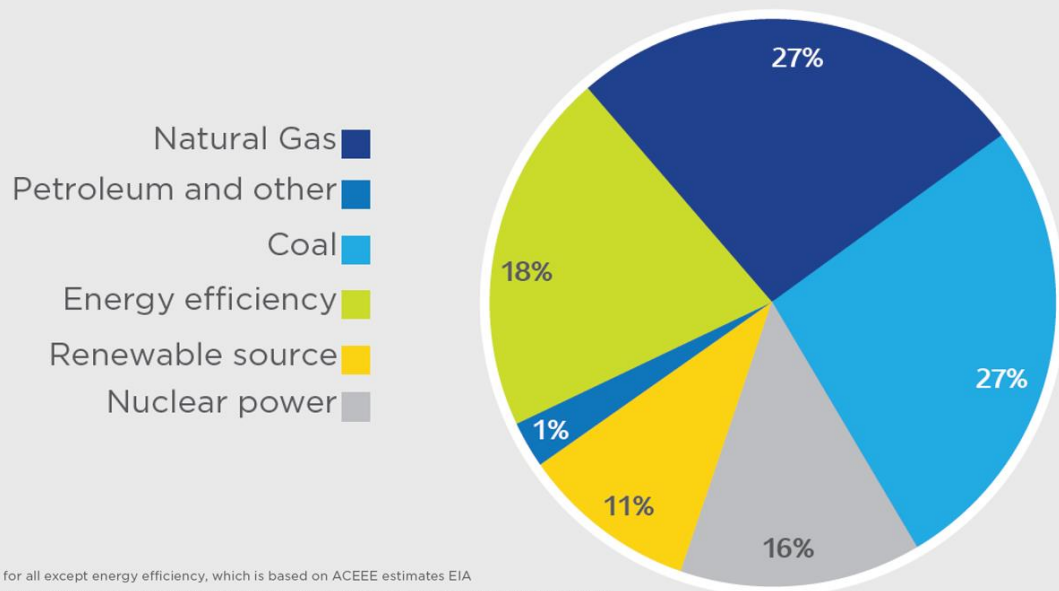


Source: Electricity Sector Status Report for 2015. P. 43-44

In light of the above, it is recommended (with the agreement of the inter-ministerial steering committees to formulate a national target of GHG emissions mitigation) to review imposing a requirement on electricity providers for energy efficiency - they will be required to implement efficiency measures among the electricity consumers of the different sectors. Based on the conclusions of the committee, the total necessary annual budget is NIS 144 million from 2016 to 2025 and another NIS 107 million from 2026 to 2030. This sum is significantly smaller than the projected incomes to the state from the pollution levy, which based on the data from 2015 is estimated at about NIS 340 million a year (in the lowest levy studied). This government investment is expected to leverage significant investments of capital of about NIS 10 billion by 2030.

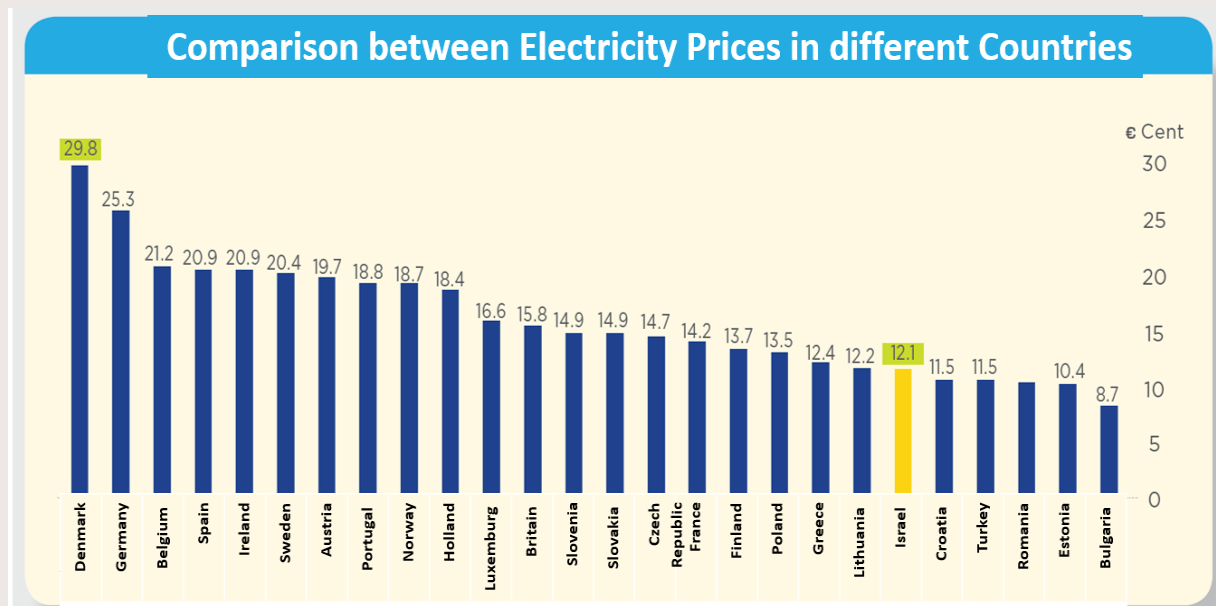
In 2015, energy efficiency was defined in the US as the third largest "energy source" mostly because electricity producers were required to meet an annual energy efficiency of about 1.5%.

**Percentage of Electricity Generation Sources in the USA in 2015**



Israel electricity tariff is relatively small (see graph below) compared to other countries around the world. Thus it does not encourage efficiency in electricity use in the market. Also, the feasibility of energy efficiency projects is measured opposite the alternative cost, that is, the cost of electricity use. Meaning, a low electricity tariff lowers the feasibility of these projects.

## Comparison between Electricity Prices in different Countries



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