Energy Saving Activities

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Industrial Research Institute (IRI)
Summary

- Introduction.
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- Code of Ethics.
- Laboratories.
- Conformity Assessment Subject to Technical Regulations.
The Industrial Research Institute was established in 1953.

It is a Lebanese, not-for-profit institution, for industrial studies, research and scientific material testing and analysis.

It is deemed, under the Decree No. 10059 dated August 17th 1955, to possess public utility status.

It is related to the Ministry of Industry and it is totally independent administratively and financially.
Industrial Research Institute (IRI)
Figures of 2015

➢ More than 150 permanent employee.

➢ More than 330,000 tests performed.

➢ More than 40,000 Custom files treated.

➢ 14 laboratories, (7 Accredited).

➢ 4 international projects hosted.
Industrial Research Institute (IRI)
The Essential Resources

- Fully Equipped Workshops.
- Pilot Plant – for applied research and initiating pilot industries.
- Lebanese Welding Centre for training and certification of welders, and inspection and control of various types of welding.
- Inspection and Control Unit.
- Certification Unit.
- Sub-Contracting and Partnership Exchange (SPX).
- European-Lebanese Center for Industrial Modernization (ELCIM).
- Center for Innovation & Technology (CIT)
- Lebanese Cleaner Production Center (LCPC)
- External resources under sub-contracting such as BIVAC, SGS, TUV etc.
In carrying out its functions, the Institute adheres to ethical and professional standards whereby it safeguards the clients' best interests and regards as the client’s property any information, processes, patents or techniques developed during work for him and safeguards such matters in complete secrecy.
Industrial Research Institute (IRI) Laboratories

1. Wet Chemistry (ANAB Accreditation)
2. Physical Chemistry (ANAB Accreditation)
3. Petroleum and Petroleum Products
4. Central Laboratory for Bread and Wheat (ANAB Accreditation)
5. Microbiology (ANAB Accreditation)
6. Paint
7. Textile, Leather and Rubber
8. Soil mechanics and Civil Engineering (ANAB Accreditation)
9. Mechanical Engineering
10. Water Lab
11. Electrical (ANAB Accreditation)
12. Metrology and Calibration (ANAB Accreditation)
13. Reclaiming Refrigerants Centre (Established in 2011)
14. Solar Water Heaters Laboratory (Established in 2011)
There are two mechanisms for the Conformity Assessment of products subject to technical regulations

A. Conformity Assessment at Destination (Lebanon)
   - Horizontal standards
   - Importer’s warehouse
   - At borders

B. Conformity Assessment in exporting country
   - Pre-shipment Verification
Energy activities
Summary

- CFL Testing.
- Other.
Energy Activities

SWH Testing.

Solar Water Heaters
Energy Activities
SWH Testing.

Thermal Solar Systems and components. Solar Collectors:
NL EN 12975-1, 2006: General Requirements;

Thermal Solar Systems and components. Factory Made Systems:
NL EN 12976-1, 2006: General Requirements;

Thermal Solar Systems and components. Custom Build Systems:
NL EN 12977-1, 2006: General Requirements;
Energy Activities
SWH Testing. Marking on collector

Type plate (NL 12975-1 clause 7.2)

- Manufacturer brand name
- Serial number.
- Year of production.
- Gross area.
- Max. operating pressure.
- Stagnation temperature at $G_{glob} = 1000$ W/m² and $t_{amb} = 30$ °C.
- Volume of the absorber.
- Empty weight.
- Country of origin.
Energy Activities
CFL Testing.
Testing Activities
CFL Testing Lab.
**NL IEC 60968, 2007 : Safety Requirements**

**Main tests & inspection :**
- Marking ;
- Interchangeability ;
- Protection against Electric Shock ;
- Insulation resistance ;
- Electric strength ;
- Mechanical strength ;
- Resistance to heat ;
- Cap temperature rise ;
- Resistance to flame & ignition.
Energy Activities
CFL Testing.

**NL IEC 60969, 2007: Performance Requirements**

Main tests & inspection:

- Starting time;
- Run up time;
- Wattage;
- Luminous flux;
- Colors temperature;
- Etc…
Energy Activities
Other – The EcoTruck

Educational purpose, equipped with:

- Photovoltaic system 100 Wp;
- Wind Turbine 1000 W;
- Thermal solar system;
- Meteo-Station;
- Clean Energy training Kit;
- Audiovisual equipment;
Etc…
Objective:
A Concentrated training center on photovoltaic technologies.

In collaboration with:
UNDP, LCEC, TransEnergie & French embassy
The photovoltaic power plant

Summary

- The installed PV systems.
- Energy sources of the IRI premises.
- System characteristics.
- Data of the 56 KWp system.
- Energy consumption of the IRI premises.
- Benefits of the system.
- Normal operation day curves.
- Efficiency factors.
The photovoltaic power generator
The installed PV systems

Maximum 56 KWp
Operated on 5 July 2012

Maximum 30 KWp
Operated on 8 February 2016
The photovoltaic power generator
Energy sources of the IRI premises

56 KWP

30 KWP

IRI premises

EDL

2 x 500 KVA
200 KVA
The photovoltaic power generator
System characteristics

Max 86 KW

On Grid system

PV

Max 86 KW

EDL

Inverter

Load Min 70 kW

Generators
The photovoltaic power generator
System characteristics

<table>
<thead>
<tr>
<th>PV Specifications</th>
<th>System 56 Kwp</th>
<th>System 29.4 Kwp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of PV modules</td>
<td>204</td>
<td>147</td>
</tr>
<tr>
<td>Distribution of the PV modules, in series and in parallel</td>
<td>17 (parallel) x 12 (series)</td>
<td>10 (parallel) x 15 (series)</td>
</tr>
<tr>
<td>Total area in m² covered by the installed PV modules</td>
<td>396 m²</td>
<td>193.1 m²</td>
</tr>
<tr>
<td>Maximum unit power</td>
<td>275 Wp</td>
<td>200 Wp</td>
</tr>
<tr>
<td>PV modules</td>
<td>Monocrystalline Silicon - Suntech</td>
<td></td>
</tr>
</tbody>
</table>
The photovoltaic power generator
System characteristics

<table>
<thead>
<tr>
<th>Inverters Specifications</th>
<th>System 56 Kwp</th>
<th>System 29.4 Kwp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer</td>
<td>Fornius</td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>CL 48.0</td>
<td>Symo 5.0-3-M</td>
</tr>
<tr>
<td>Number of inverter</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Maximum output power</td>
<td>48 KVA</td>
<td>5 KVA</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>230 - 500 V</td>
<td>163-800 V</td>
</tr>
<tr>
<td>Output frequency</td>
<td></td>
<td>50 Hz / 60 Hz</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP20</td>
<td>IP65</td>
</tr>
<tr>
<td>Environmental conditions</td>
<td>-20 °C to 50 °C , 0% to 95 %</td>
<td>-20 °C to 60 °C , 0% to 100 %</td>
</tr>
<tr>
<td>Maximum efficiency</td>
<td>95.9 %</td>
<td>98/0 %</td>
</tr>
</tbody>
</table>
The photovoltaic power generator
Data of the 56 KWP system

Total: 5732.16 KWh/m²  Average: 1790.72 KWh/m²
The photovoltaic power generator
Data of the 56 KWP system

Total: 251.77 MWh
Average: 83.92 MWh
The photovoltaic power generator
Energy consumption of the IRI premises

IRI annual energy production from different energy sources

- Generator
- EDL
- PV

<table>
<thead>
<tr>
<th>Year</th>
<th>Generator</th>
<th>EDL</th>
<th>PV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>69.64%</td>
<td>23.02%</td>
<td>7.34%</td>
</tr>
<tr>
<td>2014</td>
<td>76.32%</td>
<td>15.54%</td>
<td>8.14%</td>
</tr>
<tr>
<td>2015</td>
<td>73.93%</td>
<td>18.06%</td>
<td>8.01%</td>
</tr>
</tbody>
</table>
The photovoltaic power generator
Benefits of the system

Amount of annual financial savings due to the installed PV system

- 2013: $17,032
- 2014: $16,800
- 2015: $9,833
The photovoltaic power generator
Benefits of the system

Yearly tCO₂ reduction

- 2013: 52.056
- 2014: 53.535
- 2015: 52.064
The photovoltaic power generator
Normal operation day curves

Sunday, April 27, 2014

Total 370.84 KWh
Total 7.24 KWh/m2
The photovoltaic power generator
Normal operation day curves

Total 367.83 KWh
Total 7.03 KWh/m2
The photovoltaic power generator
Normal operation day curves

**Wednesday, January 07, 2015**

**Output**
- Total PV System
- Insolation
- Sensor Card 1

**Total 12.77 KWh**
**Total 0.26 KWh/m2**

**Wednesday, June 24, 2015**

**Output**
- Total PV System
- Insolation
- Sensor Card 1

**Total 380.04 KWh**
**Total 7.46 KWh/m2**
The photovoltaic power generator
Normal operation day curves

Monday, February 03, 2014

Total 29.02 KWh
Total 0.52 KWh/m²

Tuesday, July 01, 2014

Total 376.93 KWh
Total 7.02 KWh/m²
The photovoltaic power generator
Normal operation day curves

Saturday, March 15, 2014
Total 255.64 KWh
Total 5.52 KWh/m2

Sunday, March 15, 2015
Total 250.33 KWh
Total 5.74 KWh/m2
The photovoltaic power generator
Efficiency Factors

Damages of the PV
6 Panels have been damaged
since 5 July 2012
The photovoltaic power generator
Efficiency Factors

Sunday, August 30, 2015

Limits settings to protect the inverter
The photovoltaic power generator
Efficiency Factors

Monday, July 13, 2015

Clouds in the sky
For additional Information:
www.IRI.org.lb
Questions

Thank You