Water Sector in Israel

Zoom on Desalination
CHALLENGES
In the Middle East it is a well known reality!
Recharge from Rainfall along years: 1975-2013

MEDIAN: 1209, STD: 456 MCM
Min. : 659 MCM    Max. : 2,929 MCM
Simulated and Expected Droughts

Drought magnitude, intensity and duration are expected to increase in the future

Standard precipitation index

LAST droughts period

NEXT droughts period

2013-2014 62% of Average
Average total natural enrichment – 1.170 billion m$^3$/annum

Water demand – more than 2 billion m$^3$/annum

Current potable water demand ~ 1.2 billion m$^3$/annum

Forecast for potable water demand:

2020 ~ 1.7 billion m$^3$/annum
2030 ~ 1.95 billion m$^3$/annum
2040 ~ 2.2 billion m$^3$/annum
2050 ~ 2.45 billion m$^3$/annum
SOLUTIONS

Governance & Regulation

Integrated Water Resources Management

Reuse of treated effluents

Brackish water for agriculture and industry

Seawater and brackish water desalination

Development of the national and regional infrastructure
**Water Resources Pillar**

**Manufactured:**
- Wastewater Reuse
- Seawater and brackish Desalination

**Natural:**
- Precipitations
- Enrichment

**Integration:**
- National water grid
- Total sewage collection and reuse
- Semiannual operational plan
- Preservation and Recovery constraints
In accordance with the Government decisions since 2001, large scale seawater desalination facilities are being built:

- **Completed facilities**
  - Ashkelon - BOT 120 MCM/Y (VID)
  - Palmachim - BOO 90 MCM/Y (Via Maris)
  - Hadera - BOT 127 MCM/Y (H2ID)
  - Sorek - BOT 150 MCM/Y (SDL)

- **Under Construction**
  - Ashdod - 100 MCM/Y (TK Mekorot)

- **Another 50 MCM facility in planning**

**Water Management Tool:**

Enlarge or reduce the quantities of desalinated water production in accordance with the annual water balance requirements!
Ashkelon Desalination Plant

Construction beginning January 2003

Operation beginning August 2005

Production capacity 120 MCM/Year
Palmachim Desalination plant

Construction beginning January 2005
Operation beginning January 2005
Operation capacity 90 MCM/Year

Operation capacity 90 MCM/Year
Hadera Desalination plant

Construction beginning June 2007
Operation beginning December 2009
Production capacity 127 MCM/Year

Production capacity 127 MCM/Year
Soreq Desalination plant

Construction beginning January 2011

Operation beginning August 2013

Production capacity 150 MCM/Year

Production capacity 150 MCM/Year
Ashdod Desalination plant

Construction beginning June 2011

Operation will start at mid 2015

Planned production 100 MCM/Year
Seawater Desalination

- Increasing existing SWRO plants.
- Encouraging construction of new SWRO plants.
- Encouraging technology improvements for SWRO plants in Pretreatment and Post Treatment.
- Encouraging Energy Saving Technology improvements for SWRO plants.
R.O. Desalination Process

- **SW Lift Station**: 288,000 / 576,000 m³/day
- **Floculation**
- **Dual Media Filtration (1600 m²)**
- **Backwash Tank**
- **Clear Well**
- **Rear End Permeate**
- **Pass 1 SWRO**: 6 trains 113,760 m³/day
- **IX Softening**: 78,000 m³/day
- **Re Hardening**
  - **Calcite**
  - **3 Trains 75,000 m³/day**
- **To Client**
- **XIX IXSOFTENING**
- **113,760 M³/DAY**
- **VFD**

**Additional Components**
- Sodium Hydroxide (NaOH)
- Antiscalant
- 

**Chemicals used**
- Coagulant
- VFD
- NaOH
- Antiscalant
- SBS
R.O. Membrane
<table>
<thead>
<tr>
<th>Quality parameter</th>
<th>units</th>
<th>Contractual Demands</th>
<th>Ashkelon Actual</th>
<th>Palmachim Actual</th>
<th>Hadera Actual</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ashkelon</td>
<td>Palmachim</td>
<td>Hadera</td>
<td>Ashkelon</td>
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<tr>
<td>Chloride</td>
<td>ppm</td>
<td>20</td>
<td>80</td>
<td>20</td>
<td>10-15</td>
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<tr>
<td>Boron</td>
<td>ppm</td>
<td>0.4</td>
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<td>0.3</td>
<td>0.2-0.3</td>
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<tr>
<td>pH</td>
<td>ppm</td>
<td>7.5-8.5</td>
<td>7-8</td>
<td>7.5-8.5</td>
<td>8-8.5</td>
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<tr>
<td>LSI</td>
<td></td>
<td>-0.2 to 0.5</td>
<td>-0.5 to 0.5</td>
<td>0 to 0.5</td>
<td>0 to 0.5</td>
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<tr>
<td>Alkalinity</td>
<td>ppm*</td>
<td>&gt;80</td>
<td>45-50</td>
<td>40-45</td>
<td>&gt; 80</td>
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<tr>
<td>Hardness</td>
<td>ppm*</td>
<td>&gt;60</td>
<td>&gt;75</td>
<td>80-120</td>
<td>90-110</td>
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<tr>
<td>Turbidity</td>
<td>NTU</td>
<td>&lt;0.5</td>
<td>&lt;0.8</td>
<td>&lt;0.5</td>
<td>0.15-0.2</td>
</tr>
</tbody>
</table>

* As CaCO₃
Environmental Aspects

Concentrate to the sea:
• Advanced defuses
• Monitoring plan

Coagulants Lend Removal

Using NG instead coal power plants:
• Impurities reduction of 80%

Green Chapter in the Desalination Tenders:
• Using local recycled material
• Environmental friendly design
Energy in Desalination Plants

- Reduced Specific Energy to 3.5 Kw/CM
- Every Desalination Plant will have its own IPP NG.
- Solar Panels at the new Desalination plants.
New Resources and Renewable Energy

The Ministry of Infrastructures had decided to have independent private power plants of a total capacity of 4000-5000 MW in the next 10 years.

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Capacity Range</th>
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<tbody>
<tr>
<td>NG IPP</td>
<td>2500-3000 MW</td>
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<tr>
<td>Solar Energy</td>
<td>250-500 MW</td>
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<tr>
<td>Wind energy</td>
<td>250-400 MW</td>
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<tr>
<td>Pumped storage</td>
<td>1000-1100 MW</td>
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</table>
# Water Desalination Prices

US$ Per CM

(VAT not included)

<table>
<thead>
<tr>
<th>Project name</th>
<th>Ashkelon</th>
<th>Palmachim</th>
<th>Hadera</th>
<th>Sorek</th>
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<tbody>
<tr>
<td>Fixed price</td>
<td>0.4</td>
<td>0.35</td>
<td>0.25</td>
<td>0.25</td>
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<tr>
<td>Variable price</td>
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<tr>
<td>Total price</td>
<td>0.7</td>
<td>0.8</td>
<td>0.65</td>
<td>0.52</td>
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</table>
Exceptional Cost Efficiency of Israel’s Desalination Facilities
SWRO facilities connection - Revolution in the National System operation
Brackish water Desalination

- Increasing existing BWRO plants.
- Encouraging construction of new BWRO plants.
- Encouraging technology improvements for BWRO plants.
Brackish Water Desalination

- Private sector
- Mekorot Co.
ISRAEL

Always a drop ahead