Sorek 150 Mm3/y SWRO Desalination Facility Build, Operate and Transfer (BOT) Project

Ronen Wolfman - Hutchison Water
Sorek Seawater Desalination Facility

One of the largest SWRO desalination plants worldwide

- **Capacity**
  
  150 Mm³/year (max. 26,000 m³/hr):
  ~ 20% of the domestic water consumption in Israel

- **Technology**
  
  Seawater Reverse Osmosis

- **Project Type**
  
  25 years BOT (Build, Operate & Transfer)

- **Location**
  
  Sorek, Israel
General description of the project:

- **26.5 years BOT** project for the construction and operation of a Seawater Reverse Osmosis (SWRO) desalination plant with a capacity of **150M m3/year**

- The plant will be designed, constructed & operated by **SDL Ltd**, formed by **Hutchison Water & IDE Technologies Ltd**

- According to the BOT contract, the **State of Israel** is obliged to pay a fixed price on a **take or pay** basis, and can **purchase up to 150M m3/year** for a **variable price**, over the period of the concession.

- **Construction period** is expected to be 30-34 months from NtP, the **operation period** is expected to be about 24 years from end of construction.

- **SDL** will purchase electricity from an IPP.

- At the **end of the term**, the facility shall be **transferred** to the State of Israel.

The Location of the Project:

- The facility will be located in Israel, about **15 km south of Tel Aviv**.
Project Milestones

- **January 2010**: Signature of the BOT agreement for 150 Mm$^3$/year
- **May 2011**: Financial close (execution of the Financial Agreements)
- **June 2011**: Issuance of the Notice to Proceed
- **August 2013**: Completion Date of Sub-Phase I (75 Mm$^3$/year) and PTO1
- **November 2013**: Actual Completion Date of Sub-Phase II (150 Mm$^3$/year) and PTO2
  (Contractual Date – **December 2013**)
- **May 2037**: Term of Agreement
Pipe Jacking
Risk Allocation

**Gov**
- Land acquisition
- General planning
- Demand
- Water Quality Standard
- Linkage Tariff
- Take or pay (fixed and variable)
- Assist on financing
- Connection to water network
- Connection to Electricity Grid
- Reliable process
Shareholders and Contractual Structure

**Shareholders Agreement**

- **IDE Technologies Ltd.** 51%
- **Hutchison Water** 49%

**SDL**

- **Senior Lenders**
  - Short/Long-term Project Finance
- **IPP Delek Sorek Ltd.**
  - Supply

**The State of Israel – “off taker”**
- Concession agreement with the State to sell water for a fixed price and a variable price

**EPC Company**
- Lump Sum, Turnkey, Date Certain Agreement
  - **IDE Technologies Ltd.** 51%
  - **Hutchison Water** 49%

**Operation & Maintenance Company**
- Operation Contractor
  - **IDE Technologies Ltd.** 51%
  - **Hutchison Water** 49%

**Funds → Services → Holdings**
Risk Allocation

Private concessionaire

- Detail planning
- Equipment
- Cost
- Financing
- Time table
- Operating
- Electricity
General View of the Facility
Process Flow
16” Vertical Membranes
Process Block Diagram

1. Open intake
2. Pumping station
3. Dual media filters
4. Cartridge filters / micronic filters
5. HP pumps / Energy Recovery System
6. Reverse Osmosis process
7. Re-hardening treatment
8. Product tank
9. Delivery point / WDA

Sea

Backwash water

Brine water

Backwash water
Key Technical Parameters

- Contractual desalination capacity – 150 Mm$^3$/year (Capability desalination capacity – Over 200 Mm$^3$/year)
- Plant footprint – 590 m x 170 m
- Feed seawater – 40,750 ppm TDS
- Product water requirements:
  Potable water according to the Israeli MoH, Public Health Regulations & the Water Desalination Administration (WDA):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
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<tbody>
<tr>
<td>TDS</td>
<td>300 ppm max.</td>
</tr>
<tr>
<td>Cl</td>
<td>20 ppm max.</td>
</tr>
<tr>
<td>B</td>
<td>0.30 ppm max.</td>
</tr>
<tr>
<td>pH</td>
<td>7.8 ~ 8.5</td>
</tr>
<tr>
<td>LSI</td>
<td>0 ~ 0.5</td>
</tr>
<tr>
<td>Turbidity</td>
<td>0.5 NTU max.</td>
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<tr>
<td>Hardness</td>
<td>80 – 120 ppm (CaCO$_3$)</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>80 ppm min. (CaCO$_3$)</td>
</tr>
</tbody>
</table>
Main Plant Features

- Double Line Intake
- Three Pressure Center Design concept (HP, RO, ERS)
- Introduction of large diameter (16”) membrane elements
- Innovative design incorporating vertical arrangement of membrane PV
- Membrane based Boron Removal System
- Self-Generating Energy Supply System (Start of 2017)
Vertical Pressure Vessels Arrangement
Water Price Structure

Indexed to:
- Currency basket
- CPI

To cover:
- Capital Expenditure
- Fixed Energy and O&M costs

Indexed to:
- Currency basket
- Electricity price
- CPI

To cover:
- Cost of Consumables
- Variable Energy and O&M costs

Fixed Component

Variable Component

Bid Water Price*
$ 0.585/m³

* As of October 1st 2009
Financing Plan

- Senior Debt (80%) and Equity (20%) injected by shareholders

- Two-tranche based financial structure:
  - NIS tranche (50% of the debt): short-term nominal NIS financing during construction, to be replaced with long-term NIS CPI linked by the same group of lenders (Bank Leumi and Bank Hapoalim) in the last quarter of the 2nd year of operation (Determining Date).
  - € tranche (50% of the debt): based on terms issued by the EIB to the Government of Israel – long term € financing, drawn during construction. The Euribor floating rate will be shifted to a fixed SWAP rate (at the Determining Date).
Remarks

Several factors contributed to the low water price offered by the Consortium:

- Contractual Structure with proper risk allocation
- Adaptation of SWRO technology for large-scale plants (pressure center concept)
- Introduction of large diameter (16") membrane elements
- Innovative design incorporating vertical arrangement of membrane pressure vessels
- Advanced Energy Recovery System (low energy consumption)
- Self-Generating Energy Supply System (low electricity cost)
- Creative structuring of a mixed NIS (New Israeli Shekel) and Euro Financing Plan
Environmental Awareness

The envisaged design, execution and operation of the plant anticipate minimal impacts to the environment

- Prevention/minimization of disturbances
- No marine/shoreline/land impacts thanks to pipe-jacking method and the location of the feed water pumping station on site
- Minimal entrainment/impingement effects at the intake suction heads
- Reduced electrical and chemical consumption
- Natural gas fired IPP
- Use of environmentally harmless chemicals and treatable cleaning solutions
- Treatment of media filters and limestone reactor backwashing
Sorek Site - Environmental Awareness
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IPP PROJECT
IPP Project - IPP Delek Sorek

◆ Capacity: 140MW, Conventional IPP (SDL & MEKOROT Max consumption - 120 MW )

◆ Configuration: 2 Gas turbine + 1 Steam Turbine

◆ Substation - Sheered Facility (SDL & MEKOROT & IPP Delek Sorek)

◆ Cooling Water System - Brine Water

◆ Products: Electricity, Steam
Project Milestone

- National Outline Final Plan Approval: October 2013
- Building Permits: November 2013
- Start of Construction: May 2014
- Start of Operation: January 2017
Summary - key success factors

- PPP
- Risk sharing
- Risk allocation
- Flexibility to the private sectors
- Understanding lenders need
- Reliable Time table
- Reliable regulation framework
Thank you!