SOREK 150 MILLION M3/YEAR SEAWATER DESALINATION FACILITY BUILD, OPERATE AND TRANSFER (BOT) PROJECT

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Abstract

This paper presents the business structure and some of the many technological features of the Sorek Project, which consists of the financing, design, construction, operation and transfer of a seawater desalination facility with a guaranteed production capability of 150 Mm^3/year for a term of circa 25 years. The Bid Price of US¢ 58.5/m^3 (as of October 1st 2009) offered by Sorek Desalination Ltd. (SDL), the consortium led by IDE Technologies Ltd. developing and constructing the Sorek Plant, is one of the lowest prices ever offered in a BOT project for seawater desalination.
Several factors contribute to the low water price offered by the Consortium:

- Contractual Structure with proper risk allocation
- Adaptation of SWRO technology for large-scale plants (pressure centers 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

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Keywords: Seawater Desalination; SWRO; BOT Desalination; Privatization

I. INTRODUCTION

In spite of Israel's advanced water resources management that allows a balanced demand for water and enables water allocations without decreasing the net income of the production sectors, Israel's water balance has shown an increasing deficit over the years. Together with other regional demands, desalination of seawater constitutes an almost unique solution for the water needs of Israel and its neighbors.

In 2000 the Israeli governmental agency Water Desalination Administration (WDA) launched the Desalination Master Plan, comprising large-scale seawater plants along the Mediterranean and envisaging a total volume of approximately 650 Mm^3/year by the year 2020.

Initiated with the southern Israel 118.7 Mm^3/year Ashkelon plant, followed by Palmahim (45 Mm^3/year) and Hadera (127 Mm^3/year), the Sorek Project in Israel, once concluded and operational in the 2^{nd} half of 2013, will be the largest Seawater Reverse Osmosis facility in the world.

Pursuant to an extensive bid process launched in January 2009 (preceded by a pre-qualification stage in 2008), the State of Israel, through the WDA, awarded on the 14^{th} December 2009, the 25 year BOT Project in Sorek to Sorek Desalination Company Ltd. (SDL), a single purpose company created especially for this project and led by IDE Technologies Ltd. The BOT contract, at the initial price of NIS 2.19/m^3 (US¢ 58.5/m^3), was signed in Jerusalem on January 19, 2010.

The Sorek Project encompasses the financing, design, construction, operation and transfer of a seawater desalination facility with guaranteed production capability of 150 Mm^3/year for a term of circa 25 years from the Notice to Operate Date. The production of the plant is sold to the WDA, whose obligations under the BOT agreement are deemed to be the obligations of the State of Israel. Following termination of the agreement, the facility will be transferred to the State.

The Sorek plant is located 2.2 km from the Mediterranean seashore at the Sorek site, circa 15 km south of Tel Aviv. The water quality is typical Mediterranean seawater. The facility design incorporates several features in order to mitigate/minimize negative environmental impacts.

The feed water flows by gravity to the pumping station located at the facility site. The desalinated water delivery point is at the site battery limit. The brine (concentrated feed water) will be discharged back to the sea at a depth of 20 m' and circa 2 km off-shore, through an outfall system designed according to the recommendations of a dispersion model, enhancing quick brine dilution. The electrical power for the plant will be provided from two independent sources: overhead line from the national grid and self-generating natural gas fired energy supply system (IPP).

The basic concept for the construction of the 150 million m^3/year plant is to have two 75 million m^3/year plants able to operate separately from and independently of one another. Most subsystems will be double (one for each 75 million m^3/year plant), with the exception of the Intake System and the Independent Power Plant. Those systems will be unified for the entire 150 million m^3/year facility, but will be designed with the required redundancy to serve each plant separately.

The Financial Closing process is well underway and is anticipated to be executed in the first Quarter of 2011. The plant is expected to begin water production in the 2^{nd} half of 2013.

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 centers 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

II. OVERVIEW OF THE CONSORTIUM AND THE PROJECT STRUCTURE

Sorek Desalination Ltd. (SDL) has 2 shareholders:

- IDE Technologies Ltd. (51%), leading the Joint-Venture;
- Hutchison Water International Holdings Pte. Ltd. (49%);

IDE Technologies Ltd. (IDE) is a 50/50 subsidiary of the Delek Group, a leading Israeli group of companies, and Israel Chemicals Ltd, a leading Israeli chemical company whose shares are traded on the Tel Aviv Stock Exchange. IDE is recognized as a world leader in water technologies, and specializes in the development, engineering, production and operation of advanced desalination systems. Over the past four decades, IDE has established itself as the clear leader of technology and cost effectiveness for both thermal and membrane technologies – such that many of the largest desalination projects in the world are IDE projects.

Hutchison Water International Holdings Pte. Ltd. (HWIH) is a new division of the Hutchison Group (HWL) with extensive expertise in desalination, wastewater treatment, and water reuse projects successfully executed by its team members. HWIH is wholly owned by Hutchison Whampoa Ltd, a leading international corporation committed to innovation and technology, with businesses spanning the globe. Hutchison has five core businesses - ports and related services; property and hotels; retail; energy, infrastructure, investments and others; and telecommunications.

SDL will implement the project through three main corporate entities: (1) an Engineering, Procurement and Construction Partnership (EPC); (2) an Operation and Maintenance Company (O&M); and (3) an Independent Power Producer major sub-contractor (IPP), supplying and operating a self-generating power plant.

The EPC will be performed in a fully integrated manner by an entity established by IDE (51%) and HWIH (49%). The EPC works and facilities are designed and constructed in accordance with the highest quality and standards, to ensure that the facility will be capable of operating efficiently and cost effectively for the entire term of duration of the BOT Agreement.

The O&M of the Project will be performed by an entity owned by IDE (51%) and HWIH (49%). The O&M will operate and maintain the facility and its installations in a diligent and professional manner, so as to avoid any deficiencies or malfunctions related to the quantity and/or quality of the water produced by the Facility.

With respect to the energy supply, SDL has entered into a Power Purchasing Agreement with IPP Delek Sorek Limited ("Delek") for construction of a self-generating system for the supply of energy to the facility. The self-generating energy supply system will be fueled by natural gas (expected to be available in 3 – 4 years). Minimal environmental constrains are anticipated and lower electricity costs will be secured. Savings in electricity costs definitely contribute to a lower water price.

III. PROJECT MILESTONE DATES

It took a record 11 months from issuance of the tender documents until the announcement of the Successful Bidder by the tender committee. The following are the key milestone dates:

January 2009:	Issuance of the Tender Documents
1 October 2009:	Bid Submission
14 December 2009:	Award of the Project to SDL
19 January 2010:	Signature Date (execution of the BOT Agreement)
1 March 2011:	Anticipated date for Financial Close
1 April 2011 (up to):	Issuance of Notice to Proceed
August 2013:	Completion Date of Sub-Phase I (75 Mm^3/year) and Permit to Operate 1 (PTO1)
December 2013:	Completion Date of Sub-Phase II (150 Mm^3/year) and PTO2
May 2037:	Term of Agreement

IV. FINANCING PLAN

SDL, together with its financial and legal advisors, invested great effort in examining and exploring various financial structures and sources of finance, until reaching the optimal and most attractive financing package for the Project, in view of the instability and the shortage of liquidity in the financial markets, mainly the lack of long term finance sources with competitive terms within the international commercial finance markets.

As a result, SDL has chosen to optimize a 2-tranche based financial structure: (a) a local tranche denominated in NIS; and (b) a EURO tranche based on the terms issued by the European Investment Bank (EIB) to the Government of Israel. Both tranches are equal in rights on a pari-passu basis. The Facility Agreements are expected to be signed by March 2011.

SDL has secured a financing structure based on a Senior Debt equaling 80% of the total project costs. The remaining 20% of the total project costs will be financed by equity injected by the shareholders during the construction period, pro-rata to the senior debt facility.

The BOT Agreement allows for financing in NIS, Euro and USD, and provides a mechanism to hedge against changes in the exchange rates, relevant inflations and base interest rates applicable to these currencies. This allowed SDL to optimize its price proposal by optimizing its sources of financing.
The Senior Debt comprises:

- NIS Tranche: 50% of the debt - consists of short-term nominal NIS financing during construction, to be replaced with long-term NIS CPI linked financing by the same group of lenders (Bank Leumi and Bank Hapoalim) at the Determining Date, which occurs during the last quarter of the 2nd year of operation. This long term financing will be repaid during the operation period.
- EIB Tranche: the remaining 50% of the debt - long term EURO financing, drawn during construction and repaid during the operation period.

This structure allows SDL to take advantage of the low short term interest rates and reduce the financing costs during the first period of the concession and until such time as the short term loans are replaced by the long term CPI linked NIS loans. This also applies to the EIB tranche, with the shifting of the EURIBOR floating rate to fixed SWAP rate at the same time as the NIS loans will be converted from short to long term.

In addition SDL has structured an Equity Bridge Facility, Standby Facility and a Working Capital Facility. The Equity Bridge Facility will be used to finance the equity contribution required for the project during construction, alongside the senior debt facilities. The standby facility is designed to fund cost overruns not absorbed by the Contractor pursuant to the EPC Agreement. The Working Capital Facility is a loan facility to fund working capital requirements.

V. FACILITY OVERVIEW AND SYSTEMS DESIGN APPROACH

The desalination process selected for this Project is Seawater Reverse Osmosis (SWRO), which resulted in the most feasible option from technical and economical points of view, based on project needs, site conditions and the Tender Committee's requirements.

The basic concept for the construction of the 150 Mm^3/year plant is to have two 75 Mm^3/year plants able to operate separately from and independently of one another. Most subsystems are double (one for each 75 Mm^3/year plant), with the exception of the Intake System and the Independent Power Plant. These systems are unified for the entire 150 Mm^3/year plant, but are designed with the required redundancy to serve each plant separately.

The System Design Approach was implemented after a comprehensive analysis of the different parameters that could have a direct and/or an indirect influence on the plant's feasibility, reliability and availability. A brief description of the main segments of the Facility and their key features is presented below. An artistic (3D) view of the Facility is presented in Figure 1, at the end of this paper.

5.1 Intake System

5.1.1 Intake Heads

In order to ensure an adequate and consistent flow of feed water, and proper quality of feed water over the entire life cycle of the facility, the most appropiate location for the intake heads was searched for. Feed water for the process will be drawn from two (2) open sea intake heads located circa 1150 m offshore, at a depth of at least 6 m of clear water above their highest point and 4 m above the sea bed, in order to avoid storm induced turbidities. In order to minimize the effects of entrainment and impingement of marine organisms, the suction heads are designed to assure slow suction velocity (0.15 m/sec). In addition, slow suction velocity ensures no noise impact related to the background sound of water flowing in the pipes. A fully automatic active cathodic protection system will be installed at the

intake structures in order to prevent corrosion. A number of navigation warning buoys will be installed to protect intake structures against accidental ship collisions.
Oil monitors will be installed near the suction heads and connected to the control system, indicating the level of hydrocarbon pollution of seawater in case of threats such as oil spills.

5.1.2 Off Shore seawater supply and brine outfall pipelines

Utmost emphasis has been placed upon selecting the installation method of the seawater supply pipelines in order to minimize impacts on the marine environment and assure a longer lifetime of the marine pipelines.

Two feed water pipelines, designed for 130% of nominal seawater flow, will be installed. One brine outfall pipeline will be installed up to a depth of 20 m, approximately 1850 meters from shore. Special outfall diffusers will be installed at the off shore edge of the brine outfall, and at a safe distance from the intake suction structures, thus preventing short-circuits between the brine out and the feed intake suction heads. The diffusers will be installed at the deeper end of the pipeline, creating better diffusion and diluting and mixing conditions of the brine with the seawater.

The pipe jacking method, a well proven tunneling method for the installation of underground pipelines, will be used to install the intake and brine pipelines for at least 600 meters, and as far as possible (subject to detailed design and surveys), from the shore, crossing the "wave breaking zone" and the strip of beach rock. The "cut and cover" method will be used at the minimum required to complete the installation. The pipelines are designed considering head losses due to barnacles or other marine growth on the internal surfaces of the pipelines. Advantages and benefits of executing marine works by the pipe jacking method are: minimal impact on the environment (air, land and marine); minimal surface (sea bed) disruption; lower emissions; minimal impact on existing infrastructures; no impact on navigation; longer lifetime of the pipeline.

5.2 On Shore Interconnection Pipelines

The majority of the on-shore pipelines are designed to be implemented by pipe jacking, following the infrastructure corridor route. From the on-shore chamber two concrete feed pipelines will be installed up to the intake pumping station, located 2,400 m from the shore line, at the designated desalination plant site. One brine outfall pipeline will be installed, parallel to the feed pipe line. The pipe-jacking approach entirely avoids all the environmental disturbances expected to occur if the pumping station was to be installed close to the sea shore and if the traditional cut and cover approach was to be used.

5.3 Seawater Pumping Station

The seawater pumping station will be located on the facility site, 2,400 m from the sea shore. It will comprise the intake pit, oil monitors, self-cleaning travelling screens and vertical pumps housed in a light ventilated building for their climate protection and noise isolation. The number of pumps in operation will vary according to the plant operation regime, based on daily and seasonal demand as well as on optimized utilization of economical electrical sources. The key features of this design are:

- Successful long-term experience with similar type large pumps, widely used in power stations and large scale desalination intake systems (large flow rates/small water head);
- Improved efficiencies of pump and motors are achieved in the Q x H ratio.
- The provision of Variable Frequency Converters is envisaged in order to achieve maximum system flexibility for the different operation regimes;

- High flexibility in the operational mode, allowing quick and easy activation (or de-activation) of the plant according to daily/seasonal demand;
- Low capital and operational expenses, directly related to economy of scale, also reflected in ancillary components (controls, electrical equipment, pipeline manifolds, valves etc.).

5.4 Pre-Treatment

The pretreatment section includes two identical facilities, each for the production of 75 Mm^3/year. The main components of the pre-treatment system for the Sorek project are:

5.4.1 Pre-filtration Process – Chemical Dosing and Flocculation Channel

Full redundancy is provided for each dosing station (double pumps). Each dosing pump is supplied with a Frequency Converter device, thus adjusting pumps' rpm and flow rate to the plant's real-time needs. The flocculation process is carried out inside the flocculation channel.

5.4.2 Dual Media Gravity Filtration

The Plant comprises gravity filters containing gravel, quartz sand and anthracite media. The main features of the Sorek Plant filtration system are:

- High filtration efficiency;
- Low weighted average filtration velocity;
- Distribution system that prevents clogging, short-circuits and channeling;
- Low energy consumption;
- Automatic backwashing without interrupting plant operation;
- Overall "spare filtration capacity" (standby);
- Backwashing Sludge Treatment

5.4.3 Low Pressure (LP) Feed Booster Pumps

Filtrated seawater in each 75 Mm^3/year facility is pumped to the RO section through a battery of low pressure booster pumps. The two LP booster branches, suction and discharge, are connected with an isolated valve in order to facilitate operation and increase plant availability.

5.4.4 Micronic Safety Filters

Two parallel batteries of micronic safety filters are positioned downstream from the booster pump branches. Their main features are:

- High filtration efficiency;
- Low weighted average filtration rate;
- Distribution system that prevents clogging, short-circuits and channeling;
- Low energy consumption;
- "Spare filters" (standby).

5.5 The Desalination Section

The desalination section includes two identical facilities, each for producing 75 Mm^3/year.

5.5.1 The Pressure Center Concept

The desalination section based on the Pressure Center principle comprises the RO membrane segment, and the High Pressure Pumping and Energy Recovery System. The pressure center concept is already proven to be the most reliable technology for mega desalination plants, as shown in the Ashkelon and Hadera plants. This concept has been adopted for the Sorek Plant, favoring economies of scale, simplification of erection, better operational flexibility and high reliability and availability of the plant. The water is supplied to the RO section by the feed pumping center, which comprises both the HP Pumps and Energy Recovery Systems (ERS).The HP pumping center, which supplies the HP feed to the RO banks via common feed lines, can been optimized by the selection of a minimal number of large HP pumps working at the highest efficiency rates and best operation conditions.

The Energy Recovery Center is able to provide further flexibility to the entire system by the enhanced capability of changing flow rates independently of the HP feeding center. The optimization of the energy recovery center is based on the minimum possible number of ERS units comprising optimal energy devices skids and ERS booster (circulation) pumps, which collect pressurized brine from all RO banks, transfer the energy to seawater, and pump it into a common feed line to all RO banks.

The pressure center design allows maximizing the benefits of variable production rates during the day since it allows increasing/decreasing the feed pressure to the RO trains; during decrease in production, all RO trains are kept in operation and the system recovery is decreased without increasing the total feed to the plant. This feature reflects the advantage of the Pressure Center concept to produce at low recovery yields, resulting in lower osmotic pressures and furthermore producing at lower permeate fluxes through the entire available membrane area.

5.5.2 Feed Pumping Center: HP Booster pumps, HP Pumps and ERS

A set of HP booster pumps delivers the boosted filtered water towards the high pressure pumps section. The pumps are equipped with variable frequency converters to compensate for the differences in pressure required by the RO membranes due to temperature variations and fluctuations of seawater salinity, as well as to comply with the different daily/seasonal operation regimes. A similar approach was implemented in the Hadera desalination plant.

The model chosen for the HP Pumps in Sorek is identical to that previously chosen and successfully proven in the Ashkelon and Hadera plants, which have shown increased availability and reliability, higher efficiencies and flexibility under variable operational modes and lower Capex/Opex costs. The same features are achieved by the ERS, which is identical to the one successfully implemented in the Ashkelon plant.

5.5.3 SWRO Desalination System and Boron Removal

The design of the Reverse Osmosis system adopted for the Sorek Project comprises multiple RO stages: the main 1st stage seawater desalination process, complemented by additional RO stages for further Boron and Chloride ion removal from the desalinated water, as per contractual requirements.

Utmost emphasis has been placed on the optimization of the RO banks' configuration by utilizing a unique IDE patent pending design that includes a minimal number of independent trains fed by both feed pumping centers. The present design adopts the use of 16 inch membrane elements installed in vertical pressure vessels. The combination of the proven 16" membrane technology and the long term operation of various size industrial RO systems installed in vertical pressure vessels results in an optimized design that envisages a significant reduction in membrane handling for maintenance purposes. Furthermore, this approach allows a significant reduction in plant footprint, shorter HP pipes and an improved membrane loading method. The behavior of the 16" membrane element, as complemented and confirmed by the installation and successful continuous operation of vertical 16" pressure vessels in IDE's Larnaca plant, is identical to that of the 8" membrane, resulting in identical salt rejection performance and a correspondingly 4.3 times larger flow rate at the same feed pressure and operation conditions.

- The key features of this design are: small plant footprint resulting in compact and efficient equipment arrangement; fewer membranes and pressure vessels resulting in simpler maintenance and handling; proven membrane technology; saving in connecting pipelines; higher plant availability and reliability as a result of fewer pipes, fittings, connections and welds, thus minimizing the risk of leakages and plant stoppage; lower capital investment required to achieve low Boron and TDS contents in product; the Boron removal system is flexible and easily adjustable to changes in feed water temperature; lower tendency for membrane fouling and polarization (due to larger volumes of feed water) in the 2nd stage; operation flexibility - if required, the same configuration can produce larger quantities of permeate. This is achieved by operating at the high production regime for longer periods, and increasing the flux through the membrane elements, still within the limits of manufacturer recommendations.
- An artistic (3D) view of the 16" vertical membrane's arrangement is shown in Figure 2, at the end of this paper.

5.6 Post-Treatment

The post-treatment envisages the re-hardening and disinfection of the permeate stream, bringing the water quality to the levels required. The post-treatment basically incorporates limestone treatment, followed by final disinfection.

5.7 Monitoring System

Online access enables continuous readings to ensure that the quality of the product water meets the Guaranteed Quality. More than 2,000 I/Os are expected for the entire facility. The readings will be monitored, recorded, logged and displayed on the monitoring screens in the on-site central control rooms. Protection alarms and appropriate alarm signals will be set off.

5.8 Auxiliaries

The auxiliary systems and equipment comprise the cleaning, flushing and suck-back systems. In order to accommodate possible power failure events, the flushing pump is connected to both an electrical supply system (i.e. to the grid) as well as to an emergency diesel generator.

5.9 Energy Supply

The Electrical Power for the Project will be provided by two (2) redundant sources:

- A self-generating energy supply system (Independent Power Producer – IPP) to be built on site as part of the project and will serve as the main source of energy.
- 161 KV overhead line from the Israel Electric Company Grid, operable mainly during “Off Peak” time.

The self-generating energy supply system will be fueled by natural gas (expected to be available in 3 - 4 years). Minimal environmental constrains are expected and lower electricity costs will be achieved, thus definitely ensuring a lower water price.

5.10 Others

In addition to the key features and benefits described above, the plant incorporates high quality materials of construction, standby and redundant equipment, standardization of equipment and facilities that contribute to higher plant reliability and expected annual availability as has been proved successful in the Larnaca, Ashkelon and Hadera plants. The implementation of instrumentation, controls, alarms, testing procedures, etc., is also part of the quality assurance policy to be adopted so as to ensure the highest standards of plant safety and reliability.

VI. CONTRACTUAL STRUCTURE

The contractual structure of the project was designed with a view to allocating the different risks to the parties most qualified to manage and control these. The main contracts under which the project is conducted are described below, and comprise the BOT Agreement, the Engineering Procurement and Construction Contract (“EPC Contract”), the Operation and Maintenance Contract (“O&M Contract”), the Power Purchase Agreement (“PPA”) and the Financial Agreement(s).. The Laws of Israel are the governing laws applying to all contracts.

The general contractual structure of the Project is presented in Figure 3, at the end of this paper.

6.1 The BOT Agreement

The parties to the BOT Agreement are (i) The State of Israel through the Water Desalination Administration (WDA) and (ii) SDL.

Under the BOT Agreement SDL undertakes to perform the Project as a BOT project, in accordance with the provisions of the BOT Agreement, including to develop, engineer, design, arrange all required permits and authorizations, raise all finance, manufacture, purchase, inspect, supply, transport, insure, construct, install, test, manage, train personnel, operate and maintain the project throughout the term of the agreement, and transfer the project to the State at no cost at the end of the term of the agreement.

6.2 Engineering Procurement and Construction Contract (“ EPC Contract”)

The parties to the EPC Contract are (i) SDL - Sorek Desalination Limited (as the “Seller”) and (ii) Sorek EPC Partnership, a 51%/49% consortium comprised of IDE (leader of the JV) and Hutchison Water Israel EPC Ltd., jointly the “Contractor” or “EPC Contractor”.

The EPC Contract is of a turnkey nature. The EPC Contractor is responsible for the development, engineering, design, construction, manufacture, procurement, inspection, supply, transportation and testing of the water desalination plant so as to achieve performance criteria, for a fixed lump sum price and in accordance with a final date certain Construction Schedule.

The EPC Contractor shall achieve Construction Completion by the date set forth in the BOT Agreement, within 34 months of the issuance of the Notice to Proceed, to allow the Seller to meet its obligations under the BOT Agreement. The performance criteria of the EPC Contractor are in accordance with the BOT Agreement, allowing the Seller to meet its obligations under this agreement.

6.3 Operation and Maintenance Agreement ("O&M Agreement")

The parties are: (i) SDL as the "Seller" and (ii) Sorek O&M, a 51%/49% O&M Company comprised of IDE and HWIH, jointly the "Contractor" or "O&M Operator".
The O&M Operator's scope of work includes:

- Operation and maintenance of the water desalination plant, except for the supply of energy;
- Delivery of guaranteed quantity and quality product water at the delivery point, in accordance with the provisions of the BOT Agreement;
- Pre-operation works including to:
    - Review and approve the EPC design and process, the EPC equipment and contracts with equipment suppliers;
    - Participate in the functional and completion tests and commissioning;
    - Provide personnel for training by the EPC;
    - Write O&M Manual under EPC supervision.

6.4 Independent Power Purchase Agreement ("IPP Agreement" or "PPA")

The parties are: (i) SDL, the "Seller" and (ii) the IPP developer,IPP Delek Limited ("Delek"), a special purpose company incorporated under the laws and regulations of the State of Israel.
Delek undertakes to finance, design, supply, erect, commission, operate and maintain the power plant and supply all the net output of the power plant, at its own cost. The power plant will be erected on the site.

6.5 The Financial Agreement

The parties are: (i) SDL as the Single Purpose Company undertaking the execution of the Sorek BOT Project, the "Borrower" and (ii) the Lenders who will finance the Sorek Project (EIB, Bank Hapoalim and Bank Leumi).
The Financial Agreement comprises an extensive number of documents, contracts and agreements that are designed to regulate the relationship between the Borrower and the Lenders for the financing of the facility.

6.6 Other Agreements

Other related agreements comprise:

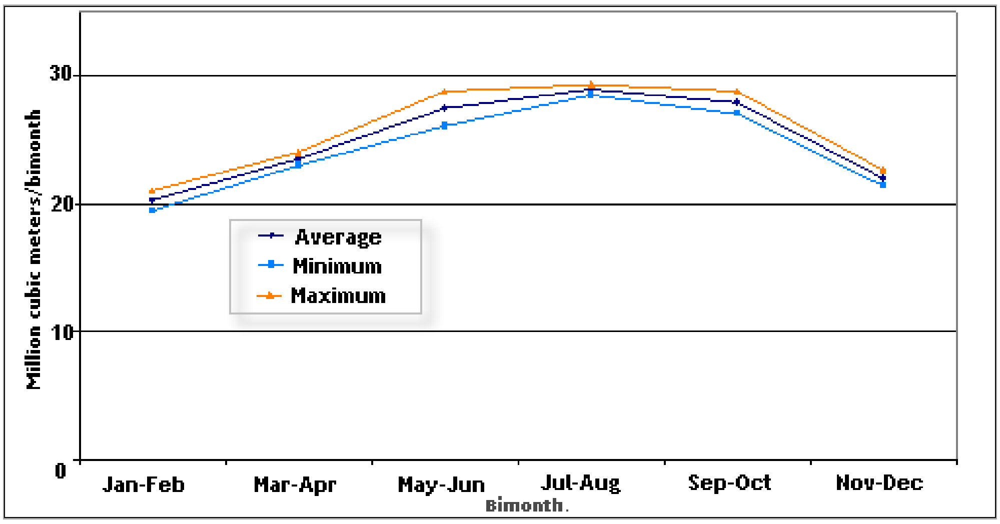
- Lease Agreement - the site has been made available for the purposes of implementation of the Project pursuant to a Lease Agreement between the State of Israel (through the Accountant General) with the Israel Land Authority;
- MOD (Ministry of Defense) Agreement – the State and the MOD entered into an agreement under which various arrangements concerning the construction and operation of the Facility were made.

VII. WATER PRICE STRUCTURE

The product water price, on submission of the offer, was NIS 2.19/m3 (US¢58.5/m3).
The water tariff is composed of a fixed component (to cover capital expenditure, fixed O&M costs and part of the profit) and a variable component (to cover energy costs, variable O&M costs, cost of membranes and chemicals, as well as part of the profit). Each component is indexed as follows:

- Fixed Component: indexed to NIS CPI, USD, Euro.
- Variable Component: indexed to electricity prices (Differential Regulatory Structure – Peak/Off Peak), NIS CPI, USD CPI and Euro HICP.

Desalinated water volume requirements are within a minimum and maximum range defined for daily, bi-monthly and annual quantities as described below:



The bi-monthly quantities required in the summer months are higher; therefore the facility will be designed to address this particular period.
While the variable price is paid according to the quantity of water actually delivered, the fixed price is paid according to the facility's availability, weighted as follows:

- 50% of the fixed price - related to the daily availability;
- 40% of the fixed price - related to the bimonthly availability;
- 10% of the fixed price – related to the annual availability.

LD's are payable for delivery of quantities lower than 92% of the requirements.

VIII. ENVIRONMENTAL AWARENESS

SDL strives to conduct its business with responsibility towards the environment and promotes the use of environmentally friendly technologies.
The potential impacts on the environment during the construction and operation stages of the facility have been thoroughly assessed. The envisaged design and execution of the plant anticipate minimal impacts to the environment, and for those that cannot be avoided, a detailed mitigation plan is proposed. In this regard, special emphasis has been placed on the prevention/minimization of disturbances, dust and noise emissions and pollution of the marine, land, underground and air media, the landscape and visual/aesthetic aspects, the rehabilitation of grounds, the use of recycled construction wastes and excess soil, and the use of environmentally friendly materials. No shoreline impacts of any nature are anticipated due to the method of laying the pipeline (underground pipe-jacking) and the location of the feed water pumping station far from the coast line!
For the operation stage of the facility, the design envisages minimal entrainment and impingement effects at the intake system, minimal electrical, and reduced chemical, consumption (especially CO_2), thus reducing the emission of related greenhouse gases and air pollutants, low noise emissions, the use of environmentally-harmless antiscalants, use of inorganic and treatable cleaning solutions, the treatment of media filters and limestone reactors backwashing, prevention and control of leakages and spillages, minimal external lighting.
SDL intends to utilize its Facility for the production of clean energy by installing solar PV systems on its grounds. Although limited in capacity, this feature emphasizes SDL's environmental awareness.

IX. CONCLUSIONS

The results of the Sorek 150 Mm3/year Seawater Desalination Tender indicate that the BOT structure provides the lowest seawater desalination cost. The structuring of mixed NIS and Euro financing is a challenging achievement. The Financial Plan was designed to optimize a competitive water price and to allow for maximum certainty in the ability to achieve financial closure within the shortest possible time. SDL has created a combined structure of financing by Israeli banks alongside long term financing secured by EIB. This financing strategy was developed, inter alia, taking into account present conditions and restrictions in the financing markets and the lack of long term finance sources with competitive terms within the international commercial finance markets.

The anticipated successful closing of the Sorek financing sends a positive signal as far as upcoming Israeli desalination projects are concerned, mainly the National Outline Plan aimed at reaching a volume of 650 Mm3/year of desalinated water by 2020, mostly for urban consumption. There is no doubt that the Desalination Program will boost water quantities and mitigate environmental problems, and will improve water supply quality through mixing operations.

Figure 1: An artistic (3D) view of the Facility

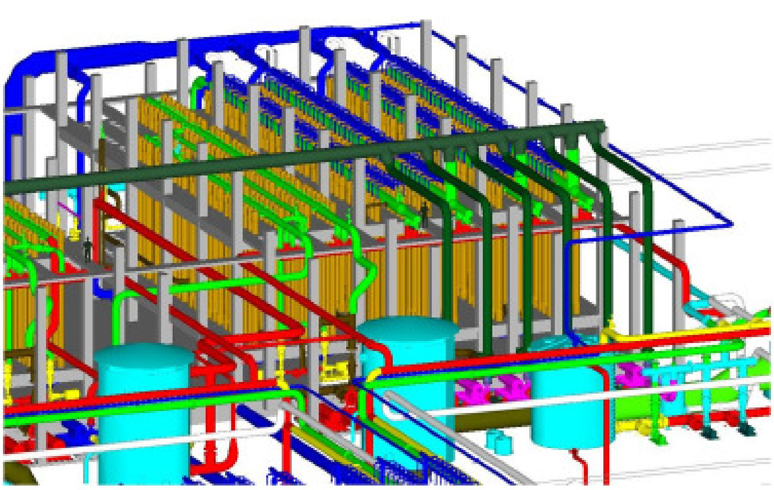


Figure 2: An artistic (3D) view of the arrangement of the 16" vertical membranes

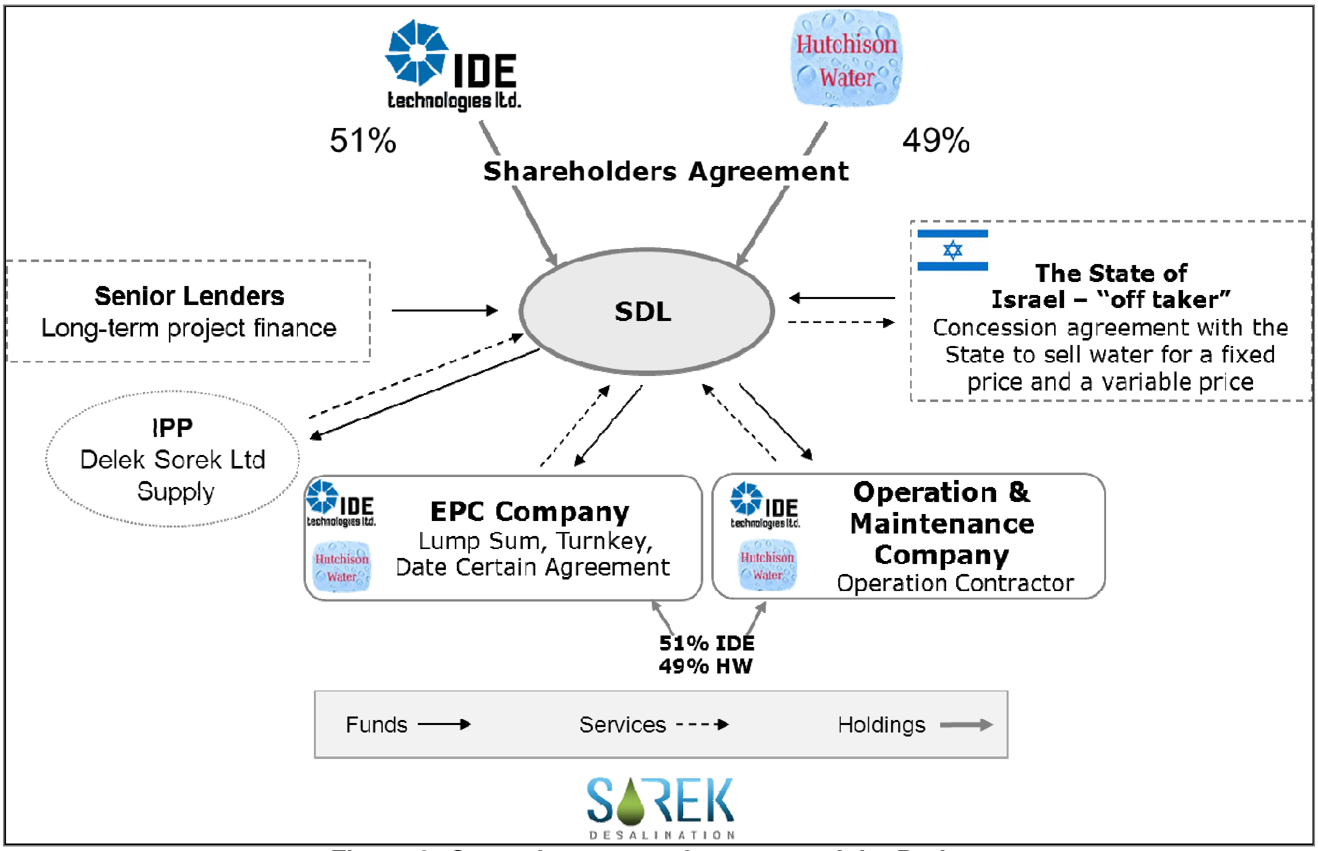


Figure 3: General contractual structure of the Project