The Ashkelon 50 Mcm/Year Sea Water Desalination Project
by V.I.D. Desalination Company Ltd.

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IDE Technologies Ltd.,
Dankner Ellern Infrastructures Ltd. and
Vivendi Water S.A.

Executive Summary

Project Description

The Ashkelon Build, Operate and Transfer Project consists in the financing, design, construction, operation and transfer of a sea-water desalination plant with guaranteed production capacity of up to 50,000,000 m$^3$/year. This plant will be located at the Ashkelon site of the Eilat-Ashkelon Pipeline Corporation.

The design of the Plant is such that it enables an extension of the production capacity during the operating phase of the Project. In addition, the initial annual production capacity exceeds by - 5 million m$^3$ the required guaranteed annual production capacity of 50 million m$^3$ in order to allow for some flexibility in the production levels, should the WDA decide to purchase more desalinated water from VID or allow VID to produce Excess Quantities.

The Plant will be designed, constructed and operated by a Consortium made up of three international Sponsors, who have created a special purpose company, V.I.D. Desalination Company Ltd. (the "SPC" or "VID") in order to carry out the Project. The companies and their respective initial participation in the SPC's share capital are the following:
- IDE Technologies Ltd. 50%
- Vivendi Water S.A. 25%
- Dankner Ellern Infrastructures Ltd 25%

The Project is governed by a Build, Operate and Transfer Agreement ("the Agreement") entered into between the Consortium and a government agency, the Water and Desalination Authority ("WDA") of Israel. The Agreement will be awarded for a period of 24 years and 11 months from the Effective Date. The production of the Plant will be sold to the WDA, whose obligations (incl. payment obligations) under the Agreement are deemed to be obligations of the State of Israel.
**Technology Used**

The Project will use the Membrane Reverse Osmosis technology. This is a modern process technology used to purify water for a wide range of applications, including semiconductors, food processing, biotechnology, pharmaceuticals, power generation, seawater desalting, and municipal drinking water. The reverse osmosis industry today represents a combined world-wide production in excess of 7.7 million m³ per day.

**Overview of the Consortium**

The Consortium will be made up of IDE Technologies Ltd. (“IDE”), Vivendi Water S.A. (Vivendi) and Dankner Ellern Infrastructures Ltd (“Dankner”).

**IDE Technologies Ltd.** 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 recognised as the world leader in low temperature distillation and has also considerable experience in reverse osmosis. IDE is specialised in the design, research, development and manufacture of sophisticated desalination plants and equipment, including saline water desalination processes, water treatment and purification of industrial streams, heat pumps and ice machines.

**Vivendi Water S.A.** is wholly owned by the Vivendi Group, the world leader in the environmental sector and the second largest communication company in the world. More specifically, Vivendi Water is part of Vivendi Environment, the world leader in environmental services operating in more than 100 countries. Vivendi Water, created by the merger between Générale des Eaux and US Filter in September 1999, is the international brand name of Vivendi’s water business.

**Dankner Ellern Infrastructures Ltd.** is a subsidiary of the Dankner Group, one of Israel’s leading privately-owned companies, with diversified interests in energy, chemical, petrochemical and plastic industries, residential and commercial development, cable TV and telecommunications. Dankner is active in residential and commercial development, cable TV and telecommunications and is traded on the Tel-Aviv Stock Exchange. Dankner is regularly searching for new investment opportunities.

**Project Status and Timetable until Financial Close**

It took a record 14 months from issuance of the Tender Documents until the announcement by the Tender Committee of the Successful Bidder:

- **July 2000:** Issuance of the Tender Documents, except for Tender Document D (the Agreement)
- **27 September 2000:** Issuance of the Agreement
- **31 October 2000:** Questions Submission deadline
- **21 November 2000:** Announcement of Pre-Qualified Bidders
- **21 December 2000:** Announcement of Pre-Qualified Bidders
- **7 January 2001:** Submission of comments to the Agreement by Pre-Qualified Bidders
- **25 February 2001:** Issuance of Amended Agreement
- **1 May 2001:** First Bid Submission
- **15 August 2001:** Second Bid Submission
- **3 September 2001:** Best and Final Offer and Award of the Project to the Consortium

Financial Close is expected to take place 6 months at maximum following the Signature Date, as shown below:

- **November 2001:** Signature Date (execution of the Agreement);
- **End November 2001:** Selection of Arranger or Co-Arrangers
- **February 2002:** Finalisation of the Financing Agreement(s)
- **March 2002:** Syndication, if any
- **April 2002:** Financial Close
Overview of the Contractual Structure

The tender documents outline, among other things, the fundamental principles of the Agreement. The main contracts will be 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 general contractual structure of the Project is described below:

Construction is expected to last two years and will be undertaken under an Engineering and Procurement Contract (“EPC Contract”) entered into between the Consortium and the Construction Company made up jointly of Vivendi Group and IDE Technologies Ltd.

Operations will be governed by an Operation & Maintenance Agreement (“O&M Agreement”) entered into between the Consortium and the Operating and Maintenance Company made up jointly of Vivendi Group, IDE Technologies Ltd., and Dankner, the latter being a financial partner.

Financing Plan

Equity will consist in Share capital and capital notes (6% of the total Financing Requirements) and Subordinated Loan (16% of the total Financing Requirements) provided by the Shareholders. Drawings on Equity will be used to fund a constant 20 to 25% of the total Financing Requirements.

The Credit Facility will be provided by Lenders to fund a constant 80 to 75% of the total Financing Requirements.

In addition, Standby Facilities will be provided by Shareholders and by Lenders to cover unforeseen cost overruns during the Availability Period of the Facilities (2.5 years), with all undrawn amounts
being cancelled at the end of the Availability Period. The Standby Facilities represent 10% of the total Financing Requirements.

Advisers to the Tender Committee and to VID

The WDA and the Tender Committee have hired the following external advisers:
- Financial: Ernst & Young/Tasc
- Legal: Joseph Levy & Co, Attorneys-at-Law
- Technical: Adan Technical and Economic Services Ltd
- Environmental and Permits: Mr. Dan Peri

The Consortium is being advised by the following companies:
- Financial: PricewaterhouseCoopers
- Legal: Gornitzky & Co.
- Technical: Israel Kroitzer Ltd. (for electricity)
- Tax: Deloitte and Touche
- Insurance: Marsh Israel

Technology, Design Process and Information Related to the Site

Reverse Osmosis

As indicated above, the desalination process selected for this Project is the Seawater Reverse Osmosis (SWRO), which appeared as the best option from a technical and economical points of view, based on the Project’s needs and the Tender Committee's requirements.

Facility Overview, Battery Limits and Systems Design Approach

The System Design Approach has been established after a comprehensive analysis of the different parameters that may have a direct and/or an indirect influence on Plant’s feasibility, reliability and availability. In the following sub-sections, a brief description of the main segments of the Facility and their key features is presented, with particular attention being paid to the critical and relevant parameters that have been considered and finally reflected in the Design Approach.

A) Intake System

Three alternatives have been initially considered:
- Open (submerged) Intake Sub-system
- Seawater Wells Sub-system
- IEC’s Seawater Supply Point (Power Station’s cooling water discharge)

Based on experience gained on other desalination projects with similar characteristics, the Open (submerged) Intake alternative has been selected as the most feasible one for this Project. This technical solution is well-known and allows to pump seawater with a better quality than the other alternatives that have been considered. Moreover it offers a better protection from hydrocarbon pollution.

Among design parameters selected, the following should be mentioned:
- safety margins in feed-water flow rate;
- two parallel pipelines (each for half of the capacity), thus increasing both the availability and reliability (ensuring that at least 50% of the plant remains operable, in case of failure or shut-down of one of the pipelines);
- non-turbulent in-flow rates;
- high-density plastic pipelines, which demand low maintenance, have a lower tendency for bio-growth, are simpler to clean and have no hazardous materials for the membrane elements;
• hydrocarbon pollution pre-warning system.

B) Intake Pumping Station
Vertical pumps are envisaged, for normal routine operation of the system (“base load”). The key features of this design are:
• Long-term successful experience of this approach widely used in Power Stations intake systems (large flow rates/small water head);
• Higher efficiencies are achieved;
• Lower capital and operating expenditures, directly related to economies of scale - also reflected on the ancillary components (controls, electrical equipment, pipeline manifolds, etc.);, improved efficiencies of pump and motors.
• High flexibility in the operational mode, allowing for a quick and easy activation (or de-activation).

C) Interconnection and Static Mixers
The design contemplates two parallel lines interconnecting between the Intake Pumping Station and the Pre-Treatment section of the Plant. This approach increases Plant availability and reliability (ensuring that at least 50% of the plant remains operable, in case of failure in one of the pipelines or static mixers).

D) Chemicals dosing (at the Pre-Treatment segment of the Plant)
Full redundancy is provided for each dosing station. Each pump is supplied with a device adjusting pumps’ flow rate to Plant’s real-time needs. All the dosing pumps have a long track record in similar applications.

E) Gravity Dual Media Filters
The Plant comprises gravity filters, containing gravel, quartz sand and anthracite media. The main features of this approach are:
• High filtration efficiency;
• Low weighted average filtration velocity, approx. 50% of the max. allowed;
• Distribution system which prevents clogging, short-circuits and channelling;
• Low energy consumption;
• Automatic back washing without interrupting Plant operation;
• Overall “spare filtration capacity” (stand by) of 33.3%.

It should be noted that the main principles of the design and operation modes of the Media Filters have been tested and piloted.
The ability of the system to handle higher (storm-induced) turbidities has been also checked.

F) Micronic (cartridge) Filters
A battery of filters is planned, grouped in two parallel branches. The main features of this approach are:
• High filtration efficiency;
• Low weighted average filtration rate;
• Distribution system which prevents clogging, short-circuits and channelling;
• Low energy consumption;
• “Spare filters” (stand by) of 40%.

G) High Pressure Pumps/Energy Recovery Devices (ERD)
High-pressure pumps and couples of ERD of the type Double Work Exchanger Energy Recovery (DWEER) are envisaged. The high-pressure and energy recovery components can be operated independently, thus increasing the number of alternative operation modes of the system.

The key features of this approach are:
• Plant availability and reliability
Higher efficiencies are achieved; 
Lower capital and operating expenditures, directly related to economies of scale - also reflected on the ancillary components (controls, electrical equipment, pipeline manifolds, etc.) - , improved efficiencies of pumps and motors; 
High flexibility in the operational mode, allowing for a quick and easy activation (or de-activation) 
Long term successful experience with this type of equipment

H) SWRO Desalination System and Boron Removal

The design of the Reverse Osmosis system adopted for this Project, comprises multiple RO stages, implementing a process for boron ions removal from the desalinated water each one operating at optimum design point.

The proposed multiple RO-stage desalination and Boron removal system has the following features:
- High removal efficiency and product yield for Boron removal. The system can reach a removal efficiency as required; 
- Low specific power consumption;
- Low chemical consumption;
- Lower capital investment required for achieving low Boron and Total Dissolved Solids (TDS) contents in product;
- The boron removal system is flexible and easy adjustable to changes in feed water temperature;
- Lower tendency for membrane fouling;
- Reduced energy consumption is achieved;
- If required, the same configuration can produce larger quantities of permeate. This is achieved by increasing the flow through the membrane elements, still under the limits of manufacturer recommendations.

I) Post-Treatment

While the final Boron levels are achieved by the multiple stage membrane process, the Post-Treatment envisages mainly the re-hardening of the permeate, bringing the water quality up to the levels required in the Tender Documents. The offered Post-Treatment incorporates two distinct processes, limestone and water of lime treatment (and, optionally, Caustic Soda dosing). This approach, based on several Pilot Tests and Trials, achieves the lowest capital and operational costs.

J) Auxiliaries

The “auxiliaries” systems and equipment comprise the cleaning system and the flushing and suck-back system. In the event of power failure, a diesel driven pump for flushing is also provided.

K) Energy Supply

The Electrical Power for the Project will be provided from two redundant sources:
- by a Self-Generating Energy Supply System that will be built as a part of the Project adjacent to the desalination plant.
- by a 161 KV overhead line from the Israel Electric Company Grid.

This approach contributes to the high reliability of the Project and increases its availability. From an operational point of view, the desalination system will work most of the time on a continuous “base load”, thus avoiding frequent (daily) changes in the operation mode.

The self-generating energy supply system will be fueled by natural gas (expected to be available at the site in 2 years) and is committed to be available at the beginning of full commercial operation of the VID’s plant. Minimal environmental constraints are expected and lower electricity costs will be achieved.
L) Others
In addition to the above-described key features and benefits, the Plant comprises high quality materials of construction, stand-by and redundant equipment, standardization of equipment and facilities that contribute to higher Plant reliability and expected annual availability. The implementation of instrumentation, controls, alarms, testing procedures, etc., is also part of the Quality Assurance policy to be adopted in order to assure the highest standards of safety and reliability of the Plant.

M) Simplified Diagram of the Process

Information related to the Site

A) Site Description
The desalination plant is located at the Ashkelon Industrial zone, 700 meters north of an existing IEC (Israel Electrical Company) power station, within the EAP (Eilat-Ashkelon Pipeline Corp.) facility. The feed water to the plant is pumped from the Mediterranean sea. The pumping station is located on the sea shore, 200 meters from the Site. The water quality is typical Mediterranean sea water.
The desalinated water delivery point is at the site battery limit. The brine (concentrated feed water) will be discharged back to the sea.

The electrical power for the plant will be provided from two independent sources: overhead line from the national grid and self-generating energy supply system (IPP) installed at the site.

**B) Lease Agreements**

The Accountant General leases the Site from EAP in accordance with the provisions of the Lease Agreement.

Under the Agreement, VID is granted the right to utilize the Site or any part thereof concurrently with the issuance of the Notice to Proceed for the term of the Agreement. VID has no other right than the right to use the Site for the Construction, Operation and Maintenance of the desalination plant.

### Contractual Structure

**Description of the Contractual Structure**

The Project's contractual structure has been designed with a view to allocating the different risks to those parties that are the most qualified to manage and control them.

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

The Heads of Terms of the EPC Contract submitted with the bid include the following:

**A) Parties**

The parties to the EPC Contract are (i) VID Desalination Company Limited (as the “Seller”) and (ii) a consortium comprised of the following companies:

- IDE Technologies Ltd (IDE): 50%
- Omnium de Traitement et de Valorisation SA (OTV): 50%

Together the “Contractor” or “EPC Contractor” (EPCC).

**B) Scope of Work**

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 minimum 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 24 months after the issuance of the Notice to Proceed to allow the Seller to meet its obligations under the BOT Agreement. The minimum performance criteria of the EPC Contractor are in accordance with the BOT Agreement allowing the Seller to meet its obligations under this agreement.

**C) Governing Law**

The Law of Israel shall apply to the EPC Contract.

**Operation and Maintenance Agreement (“O&M Agreement”)**

The Heads of the Agreement of the O&M Agreement (OMA) include, but are not limited to, the following.

**A) Parties**

The parties are: (i) VID Desalination Company Limited as the “Seller” and (ii) the O&M Company which shall be formed by:

- Vivendi Water S.A. (represented by its affiliates GdE and OTV): 49.5%
- IDE Technologies Ltd: 40.5%
- Dankner Ellern Infrastructures Ltd: 10%
- together known as the “O&M Operator” (OMO) or “Operator”.

**B) Scope of Work**
The O&M Company’s scope of works will include:
- Operation and maintenance of the water desalination plant except the supply of energy;
- Delivery of guaranteed quality water at the delivery point treated water in accordance with the provisions of the BOT Agreement;
- Pre-operation works including:
  - Review and approve the EPC design and process, the EPC equipment and contracts with equipment suppliers;
  - Participation in the Functional and Completion tests and Commissioning;
  - Provide personnel for training by the EPCC;
  - Write O&M Manual under EPC supervision.

**Independent Power Purchase Agreement (“IPP Agreement”)**
The Heads of Terms of the IPP Agreement include, but are not limited to, the following:

**A) Parties**
The parties are: (i) VID Desalination Company Limited, the “Seller” and (ii) the IPP developer which shall be Mishor Rotem - Delek Energy Limited Partnership (“MRD”)

**B) Scope of supply**
MRD undertakes to finance, design, supply, erect, commission, operation and maintain the power plant and to supply all the net output of the power plant, at its own cost. The power plant will be erected on the Site.

Artistic view of the facility
Contractual Structure

WDA

O&M Company
IDE Technologies Ltd.
Vivendi Water S.A.
Dankner Eilern Infrastructures Ltd.

BOT Agreement
Sale of desalinated water and transfer of desalination plant upon termination of the Agreement

Delek Investments and Properties Ltd.

Guarantee for IPP completion and operation, and for providing financing

VID DESALINATION COMPANY (VID)
Holds and depreciates the Plant IDE 50%, Dankner 25%, Vivendi 25%

EPC Company
IDE Technologies Ltd.
OTV

EPC Contract

Limited Recourse Lenders to VID

Financing Agreement(s)

Self Generating Energy Supply System (MRD)
Holds and depreciates IPP plant Mishor Rotem/Delek Energy Limited Partnership

Limited Recourse to MRD

IEC

Spot
Purchases of electricity

Power Supply Contract

Loan Agreement

Delek Investments and Properties Ltd.

limited liability to VID