Procuring desalination infrastructure and services

Choosing the right contractual arrangement and financial structure

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Rationale for private sector involvement

- Trigger innovation to get value for money
- Match risk exposure to managerial capacity
- Leverage commercial financing to fund the project
- Bring technology and/or managerial know-how to the project
Match risk exposure to management capacity

- Construction risks: Manage
- Site related risks: Share
- Financial risks: Transfer
- Inflation Risk: Insure
- Regulatory change
- Performance risks
- Force Majeure
- Currency risk
- Market demand
- Social environmental
When you have the pipes but don’t have the people: incen5ves to get households connected

The menu of options

- Asset transfer divesture
- Concession
- Build Operate and Transfer (BOT)
- Lease
- Operation & Maintenance
- Design Build and Operate (DBO)
- Management
- EPC
- Multi-contracts

Adapted from C. Sommariva, 2010
Multiple contracts approach

High client technical capacity

Previous experience with technology

Mature technologies

Lower costs than EPC for same solution

No room for bringing innovation

Client retains performance shortfall risks

High level of delay risks retained by clients

Suited for small SWRO plants (pre-engineered)
EPC contractual arrangements

High client technical capacity

Availability of fiscal resources or credit worthy clients

Higher costs than DBB for mature technologies

Room for innovation and value engineering

Broad specification - basic design developed by client’s engineer

Transfer of construction delay & performance risk thru liquidated damages (LDs) provisions
O&M and DBO contracts

- Fixed O&M cost fee commonly used under DBO contracts
- Cost plus arrangements for O&M contracts with experienced clients
- Staff cession agreements also an option
- Cost plus arrangements for RO require membrane manufacturer guarantee
When you have the pipes but don’t have the people: incentives to get households connected.

Build, Operate and Transfer Project

- **Sponsors**
- **Lender**
- **Energy Supplier**
- **EPC Contractor**
- **O&M Contractor**

Other agreements:
- Share holders Agreement
- Lease Agreements
- Security Agreements
- Direct Agreements
- Membrane Supply Agreement
- Sale Assets & Share Facilities Agreements

**WPA**: Water Purchase Agreement
**PPA**: Power Connection Agreement
**LA**: Loan Agreement
Construction risks

Costs overruns and construction delays risks
Delay risk transferred through liquidated damage provisions

DBB or EPC CONTRACTOR

Delay LDs
Public Developer
Private Developer

LDs payment (off-taker)
Alternative source water purchase
Debt interest
Project Co. overhead & equity return

Lost of operating revenue
Design and site related risks

**Design risks** transferred to developer under BOT arrangements. Reduced for client for EPC and DBO arrangements as compared to DBB.

**Site suitability** risk is transferred to the contractor during the bidding phase (site visit).

**Raw water quality risk** is partially transferred to the developer (performance adjustment curves).

**Raw water availability** could be an issue in brackish water and wastewater reuse projects.
Performance shortfall risks

**Operation related** performance shortfall risks transferred to the contractor when using O&M and DBO arrangements.

**Design related** performance shortfall risks transferred from the developer to contractor when using EPC arrangements.

<table>
<thead>
<tr>
<th>Performance LDs</th>
<th>$ per m3 of production shortfall</th>
<th>$ per additional KWh</th>
<th>$ per additional ton of steam</th>
<th>Specific chemical consumption: lump sum</th>
<th>Product water quality: lump sum</th>
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World Bank Group

Center for Mediterranean Integration
Fitting SWRO projects into EPC schemes

**Thermal desalination** performance can be accurately assessed during commissioning phase.

**Reverse Osmosis** membrane and cartridge filter replacement rate cannot be verified during commissioning.

Typical MSF performance ratio behavior between acid cleaning

Source: C. Sommariva, 2010

Possible SWRO long term departures from expected performance
SWRO EPC contract liquidated damages

SWRO performance is heavily dependent on pretreatment efficiency.

EPC contractor shall subscribe a membrane replacement guarantee from the manufacturer.

The manufacturer requires a guaranteed feed water in return.

| SWRO Performance LDs | $ per m3 of production shortfall | $ per additional KWh | Specific chemical consumption: lump sum | Product water quality: lump sum | Membrane replacement ratio guarantee | Pre-treated water SDI (upstream CF) |
Force Majeure Risk

Construction phase

“Human caused” force majeure
Natural disasters
Delay risk
Cost overrun

O&M phase under BOT

Availability
Capacity charge
Lost of revenue

CLIENT
CONTRACTOR
 CLIENT
DEVELOPER
Financial and economic risks

Financial risks

Financial risks transferred to Project Company under BOT agreements.

Currency

Investment and O&M tariff components partially nominated in USD or EUR. Currency risks partially transferred to client through tariff indexation.

Inflation

Tariff indexation to local and international CPI and PPI
Market demand risk

Usually transferred to client through “capacity-plus-volume” or “minimum take or pay” tariff structures

In some desal or wastewater reuse projects for industrial water supply demand risks transferred to BOT developer
Legal and regulatory change risk

Legal and regulatory change risk transferred to client
Aligning developer and client interest

Offering the client the opportunity to make equity contributions

Reduces exposure of private developer

Private developer to maintain the control of the project company

Facilitates the transfer of know-how

Source: C. Sommariva, 2010
Making desal projects bankable

Scarce fiscal and concessional resources
Return on equity higher than interest rates
Tax relief on loan interest paid

Capital intensive and long asset life
Well developed commercial framework
Lower demand risks than other BOT

Lower water price
Interesting for Banks
The financier’s perspective

As the demand for infrastructure grows, governments are increasingly looking to public-private partnerships. We see BOT/PPP are an effective way for developing infrastructure provided:

- All parties to have common & long term objectives
- Proper Risk allocation / well structured project
- Favourable political environment / regulatory framework
- Government’s supports & commitments

Other Financing criteria will also include:

- **The Sponsor**: Reputation, track record, resources & skills, profitability
- **The Project**: Viability, Risk allocation, Contracts, Qualified O&M operator
- **Financial**: Leverage (Debt to Equiy, Debt to Ebitda), Debt Service Coverage
- **Development Impact**: Community, Environment, Socially acceptable
Desalination costs and utility tariffs

When you have the pipes but don’t have the people: incentivizes to get households connected

Comparison of average utility water tariff and average SWRO desalination O&M and production costs for selected countries

Source: Developed by author based on IBNET and Water World Consultant data

When the retail water price does not cover production costs, tax payers make up the difference

Political risk for investors and lenders
Cross subsidies, utility & user efficiency

Average non revenue water rates (Source: IBNET)

Average industrial to residential water tariff ratio (Source: IBNET)

Industrial and commercial self supply schemes hinders sustainability

Average utilities’ operation costs coverage(Source: IBNET)
Other options for tariff sustainability

Local currency lending

Blended finance

Hybrid PPPs
Backing up the off taker

Lender

Energy Supplier

EPC Contractor

Sponsors

Project Company

O&M Contractor

WPA: Water Purchase Agreement

WCA: Water Connection Agreement

OSA: On-Sale Agreement

Off-taker

Utility
The Iceberg effect...
Desalination plant: Capex vs. Opex

Desalination plant BOT – Tariff breakdown
Example of desalination project

- CAPEX
- O&M var.
- O&M fix.
- Electricity
- Financing

FD-10

10 | World Bank - Suez Knowledge Partnership - Water Treatment Infrastructure PPP
Desalination plant as an iceberg

- **Capex**
- **OPEX**
  - Replacement
  - Manpower
  - Electricity

When you have the pipes but don't have the people: incentivizes to get households connected.
Selecting best offers based on lowest Life Cycle Cost (LCC)

Life cycle cost = capex + opex
Over 25-30 years

Traditional construction contracts & EPC focus on lowest capex: this does not necessarily mean that the selected bidders will build the desalination with the lowest LCC

BOT-DBO schemes allow to do that, because the price per m3 incorporates both capex and opex (LCC) and the private contractor is taking the risks
Conclusions and summary

Matching risk exposure to technical, managerial & financial capacity

With the right financial structure

Ensures the **lowest drinking water production cost**

And **optimizes the use fiscal resources**

Who’s better prepared to deal with different risks varies from project to project
Thank you!