Mr Khalid TAHRI
Technical & Engineering Director

DESALINATION A SUSTAINABLE SOLUTION FOR WATER SUPPLY IN ARID AREAS

Lisbon, 13-14 March 2018
Outline

• Introduction
• Water strategy in Morocco
• ONEE, Moroccan Public Operator overview
• Desalination, a solution for water supply
• PPP: Agadir Case
• Conclusion
Morocco, in brief

- Position: North Africa, 14 km from Europe
- Area: 710 850 km²
- Population: 35 millions
- Climate: Mediterranean
- Parliamentary, democratic and social constitutional monarchy
- GDP: 2000 Euro/capita
- Growth: 3-4 % per year
Morocco, Main Plans

- INDH: Social development
  - Energy: Solar Plan, Wind Plan
  - Infrastructures: ports, airports, highways, HST
  - Fishing: Halieutis Plan
  - Tourism: Azur Plan
- Agriculture: Maroc vert Plan
- Industry: Emergence Plan
- Housing: Sustainable Cities
- Environment: Environmental Charter
- Water Strategy

main vector for Sustainable development
ENERGY IN MOROCCO

An important dependency to thermal energy of which 95% imported.

Energy bill is a real burden for the national economy

Energy allocation 2010

6000 MW

- Thermal energy: 68%
- Hydraulic energy: 30%
- Renewable energy: 2%

Energy allocation 2020

14000 MW

- Thermal energy: 58%
- Hydraulic energy: 28%
- Renewable energy: 14%
REGULATION: Water Law

Institutional
- Institutionalization of the Supreme Council for Water and Climate
- Creation of river-basins agencies throughout the national territory
- Creation of provincial and prefectural committees of the Water

Planning
- National Plan for Water
- Plan on Integrated Management of Water Resources at the regional level

Protection:
- Quantity: perimeter of protection and prohibition of groundwater
- Quality: protection against pollution

Financial:
- Introduction of the principle sampler-pays and polluter-pays
Climate and water resources

Spatial distribution of Water resources

Potential of natural water Resources
22 Billion CM/Year

18 Billion CM/Year
Surface water

4 Billion CM/Year
Groundwater
Water resources regarding offer

Water resources per capita

Hydraulic stress

Water resources regarding demand

2008
13.7 milliards m³

2008

Irrigation (90%)

Drinking Water (8%)

Others (2%)
Mobilization of conventional water

- 140 large dams with a total capacity of nearly 18 billion CM
- Thousands of boreholes and wells
- 13 systems of water transfer: 1100 km and 210 m³/s
Mobilization of non conventional water

- Desalination program

- Wastewater treatment and reuse program

- Rainfall capture
ONEE, a Public Operator at National level

A strategy based on 4 axis

- Perpetuating, securing and reinforcing exiting installations.
- Improving technical performances.
- Generalizing potable water access to rural areas.
- Developing sewerage systems for communities.
## ONEE: Global Indicators – Water Branch

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Unit</th>
<th>Till 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urban</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investments 1999 – 2017</td>
<td>Billions €</td>
<td>2,5</td>
</tr>
<tr>
<td>Installed capacity</td>
<td>m³/s</td>
<td>71</td>
</tr>
<tr>
<td>Production</td>
<td>Millions m³</td>
<td>1.137</td>
</tr>
<tr>
<td>Length of production pipes</td>
<td>Km</td>
<td>11.000</td>
</tr>
<tr>
<td>Length of distribution network</td>
<td>Km</td>
<td>41.500</td>
</tr>
<tr>
<td>Access rate</td>
<td>%</td>
<td>97,1</td>
</tr>
<tr>
<td><strong>Rural</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investments 1999 – 2017</td>
<td>Billions €</td>
<td>1,2</td>
</tr>
<tr>
<td>Access rate</td>
<td>%</td>
<td>96,6</td>
</tr>
<tr>
<td>beneficiary population</td>
<td>Millions inhabitants</td>
<td>≈ 13,3</td>
</tr>
<tr>
<td>Number of localities</td>
<td>U</td>
<td>431</td>
</tr>
</tbody>
</table>

2,5% of produced water come from desalination
### Development Program 2017 - 2021

#### Investment 2017- 2021

**2,5 billions €**

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban water supply</td>
<td>1,6 billions €</td>
</tr>
<tr>
<td>Rural water supply</td>
<td>0,4 billions €</td>
</tr>
<tr>
<td>Sewerage systems</td>
<td>0,5 billions €</td>
</tr>
</tbody>
</table>
### Treatment plants under construction: 21 projects- 9 m³/s

<table>
<thead>
<tr>
<th>Location</th>
<th>Flow Rate (l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marrakech</td>
<td>2500</td>
</tr>
<tr>
<td>Fès – Meknès</td>
<td>2000</td>
</tr>
<tr>
<td>Berkane</td>
<td>130</td>
</tr>
<tr>
<td>Taounate</td>
<td>100</td>
</tr>
<tr>
<td>Beni Mellal</td>
<td>190</td>
</tr>
<tr>
<td>Ben Guerir</td>
<td>100</td>
</tr>
<tr>
<td>El Kelaa</td>
<td>60</td>
</tr>
<tr>
<td>Ouarzazate</td>
<td>250</td>
</tr>
<tr>
<td>Essaouira</td>
<td>250</td>
</tr>
<tr>
<td>Agadir</td>
<td>400</td>
</tr>
<tr>
<td>Taroudantate</td>
<td>200</td>
</tr>
<tr>
<td>Tiznit</td>
<td>145</td>
</tr>
<tr>
<td>Imin Tanout – Chichaoua</td>
<td>300</td>
</tr>
</tbody>
</table>

### Desalination

<table>
<thead>
<tr>
<th>Location</th>
<th>Flow Rate (l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Al Hoceima</td>
<td>300</td>
</tr>
<tr>
<td>Sidi Ifni</td>
<td>100</td>
</tr>
<tr>
<td>Tarfaya</td>
<td>15</td>
</tr>
<tr>
<td>Laâyoune</td>
<td>300</td>
</tr>
</tbody>
</table>

### Specific treatment

<table>
<thead>
<tr>
<th>Location</th>
<th>Flow Rate (l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zagora</td>
<td>56</td>
</tr>
<tr>
<td>Khouribga</td>
<td>1600</td>
</tr>
<tr>
<td>Dakhla</td>
<td>100</td>
</tr>
</tbody>
</table>

### Projects in prospects: 2018-2020

- **Conventional treatment**
  - 145 projects of which 20 under design

- **Desalination**
  - 45 projects of which 20 under design
Potable water Reinforcement of Rabat-Casablanca zone
From Sidi Mohamed Ben Abdellah dam

- Treatment plant 5 m³/s, 18 Mw raw water pumping station, 80 km of pipes, HV electrical lines.
- Cost: 200 Millions €
Desalination Know-How advancement

Testing
1975-1995
ED-MCV-RO
South regions

Optimization
1995-2010
Energy recovery
Materials
Membrane
Automatism

Mastering
Beyond 2010
Large Scale units
Generalization to other regions
Intakes
Environmental aspects

40 years experience

Laayoune-Boujdour
Laayoune-Khenifra-Khouribga-Tan Tan-Dakhla- Al Hoceima
Tarfaya-Smara-Boujdour
## Projects in progress

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Capacity</th>
<th>Cost</th>
<th>Progress Rate</th>
<th>Commissioning Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potable water reinforcement of Zagora city by brackish water desalination</td>
<td>6 000 m³/d</td>
<td>8 Millions €</td>
<td>65%</td>
<td>July 2018</td>
</tr>
<tr>
<td>Potable water reinforcement of Laayoune city by seawater desalination</td>
<td>26 000 m³/d</td>
<td>35 Millions €</td>
<td>35%</td>
<td>December 2018</td>
</tr>
</tbody>
</table>
Potable water reinforcement of Agadir by seawater desalination
Duration 30 years

- Shared project including irrigation needs for a total capacity of 400,000 m³/d at term.
- A Capacity of 150,000 m³/d expandable to 200,000 m³/d for potable water needs.
- Open intake
- Cost: 150 Millions €.
- Preparations for starting works under progress.
- Works commissioning date: 2020
Under Moroccan law 54-05 related to delegation of public services

1st BOT CONTRACT: June 29th 2017

- Partnership for a long term.
- Share responsibilities and risks

**Public Party**
- Feasibility studies
- To Mobilaze land and infrastructures: adduction pipes and Energy
- Biding
- negotiating
- Sign Contract
- Off taker
- Contract monitoring: performance indicators
- Public Service

**Private Party**
- Submit offer
- Negotiating
- Sign Contract
- Financing
- Design
- Built
- O&M
- reporting
- Sell drinking water
- Make a profit
- Transfer

Sharing roles

*Partnership for a long term.*
*Share responsibilities and risks.*
Some details about the BOT contract

2017: Contract effective

2018: Construction: 24 months

2019: Prerequisites to be satisfied

... 2049: O&M: 30 years

Remuneration structure:
4 Components:
1. Fixed Remuneration of investment
2. Fixed Remuneration of O&M
3. Variable Remuneration of O&M
4. Remuneration of Renewal

Financial instruments and guarantees:
- Mortgage of the ground
- State’s letter of support
- Tripartite Agreement
- Transfer of debts
Key of success

- To launch economic studies for the opportunity of BOT project
- To built a strong and sustainable PPP Contract because of the long term of the Partnership
- International consultancy have a supportive role to play in the 3 aspects: Technical- financial and legal, closely with authority for the main mile stones of the project: bidding- negotiating- Construction – commissioning
- Good allocation of risks between 2 parties: regulatory - Design- O&M- respect of calendar– budget- environment- performance indicators... with appropriate risk mitigation : subject of long negotiations
- Secure payment by public party to the private party for the provision of service and use of assets
- Assets reverting to public party ownership at the end of the contract must be in a good manner
- Capacity building and exchange experiences with international community is the school of a strength PPP
Desalination in arid area
A solution for planning WS

Strategy Regulation

Natural/human Resources

Solutions PPP

Know-how enhancement