Current & Future Status For Desalination In Egypt

Presented by :- Dr Ahmed Moawad
Vice Chairman Of The Holding Company

Contents

Current & future Situation In Egypt

General Information About Water Sector In Egypt

Water Production (Millions m3/day)	25.3
Number of Water Treatment Plants	2715 227 Filtration + 830 Compact + 1610 Well Plants + 48 Desalination
Water Distribution Networks (km)	165000
Number of Subscribers (Millions)	14.61

Coverage Percentage

96%

General Information About Wastewater Sector In Egypt

Wastewater Capacity (Millions m3/day)	10.74
Number of Wastewater Treatment Plants	400
Wastewater Networks (km)	45000
Number of Subscribers (Millions)	7.37

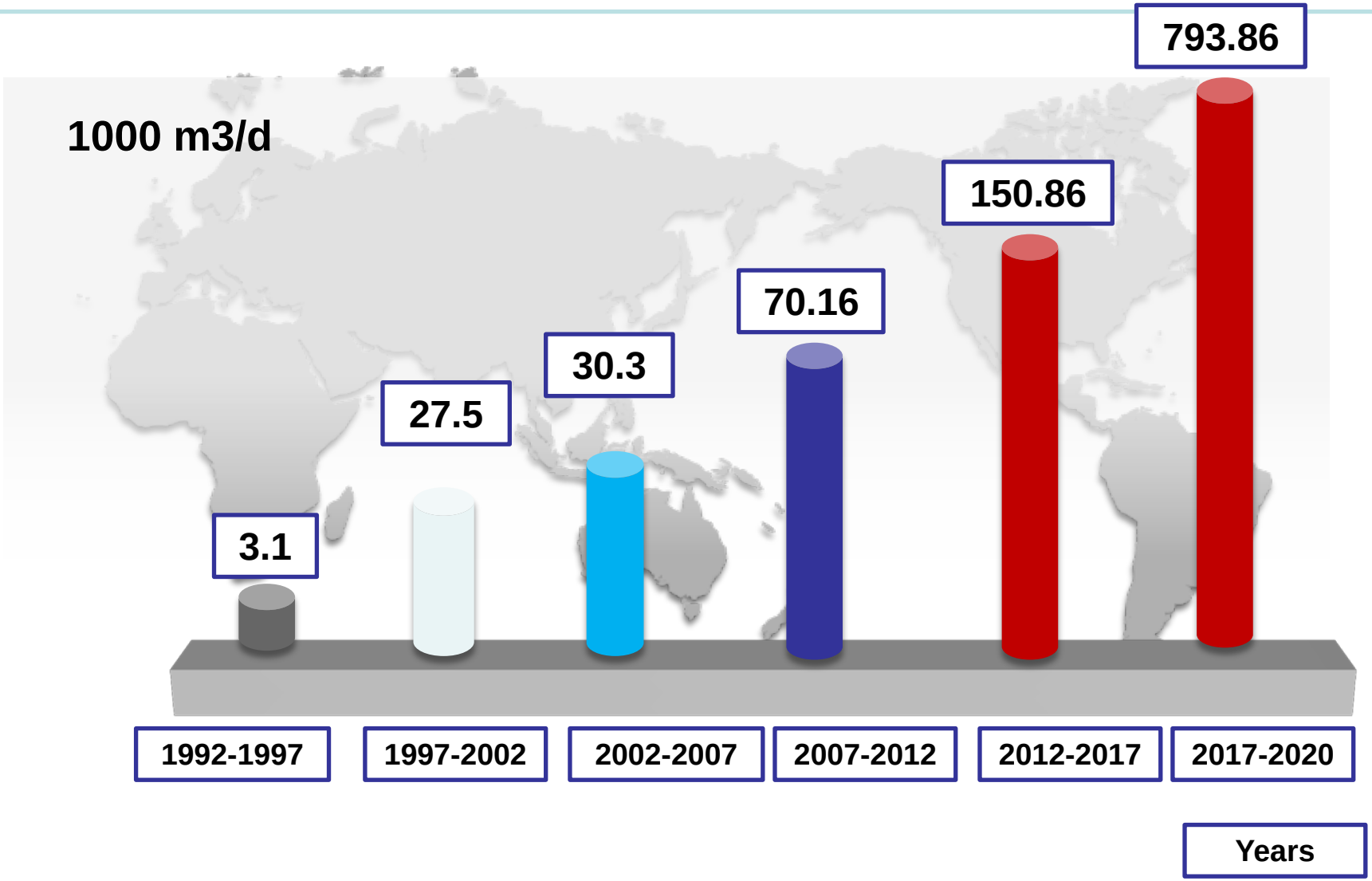
Coverage Percentage

56% (Population)

83%Urban (no. Of Cities)

15.5%Rural (no. Of Villages)

Accumulative Design Capacity For Desalination Plants



Water supply in Red sea Governorate, (existing plants, ongoing & planned projects)

Safaga Desalination Plant

Existing capacity 6000 m3/day

Desalination Plants El - qussair 7500 m3/day

Future capacity 60000 m3/day

Water supply in Matrouh Governorate, (existing plants, ongoing & planned projects).

Al-Remaila First Stage Desalination Plant

Existing capacity 24000 m3/day

Al-Remaila second Stage Desalination Plant

ongoing capacity 24000 m3/day

Cleopatra 4500 m3/d Desalination Plant TSM

Future capacity 60000 m3/day

Water supply in South & North Sinai Governorate, (existing plants, ongoing & planned projects)

Rafah Desalination Plant

Existing capacity 5000 m3/day

Arish Desalination Plants

ongoing capacity 25000 m3/day

future capacity 140000 m3/day

AlShabab Desalination Plant

Existing capacity 8000 m3/day

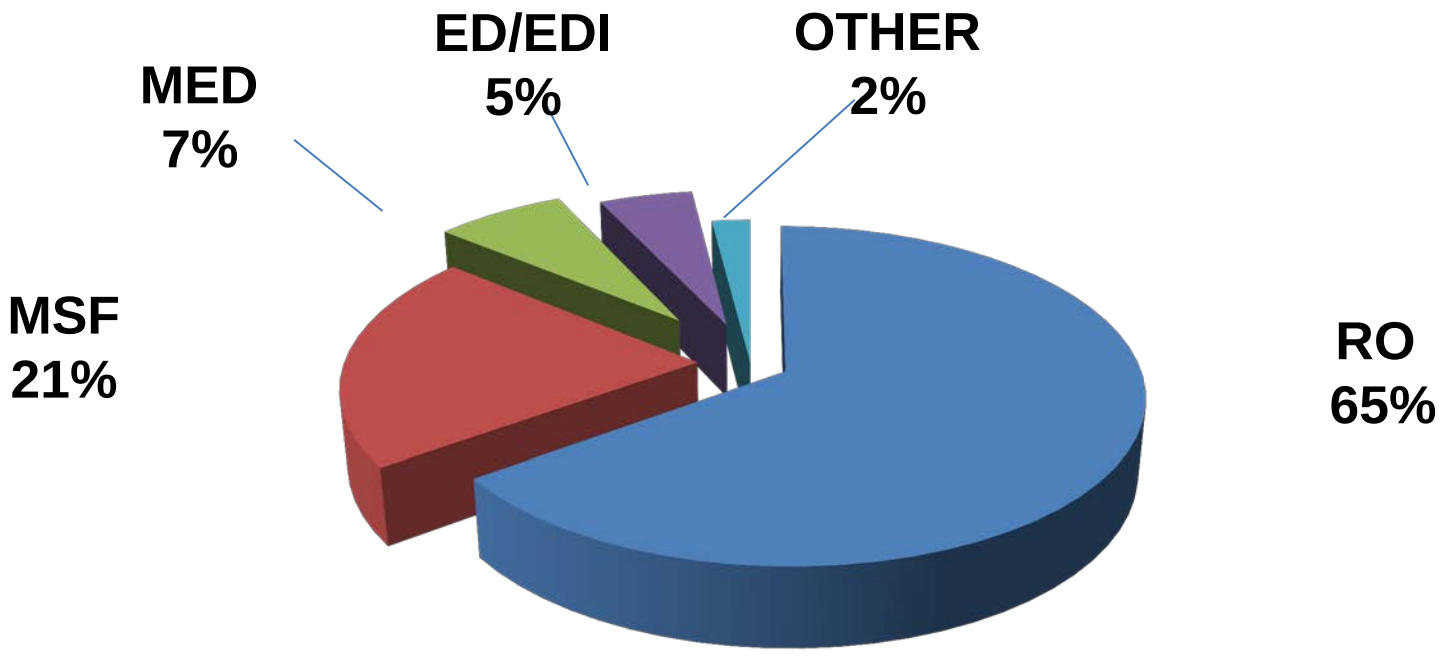
Total Accumulated Required capacities till 2037 for desalination plants In Egypt

Water desalination alliance

	NAME	
1	Holding company for water and waste water	HCWW
2	Academy Of Scientific Research & Technology	
3	Faculty of engineering- Assiut universty	
4	Faculty of engineering- Alexandria universty	
5	ADST	
6	British universty	
7	Desert research center	DRC
8	Science and technology center of excellence	STCE
9	Arab renewable energy company	ARECO
10	Sakr factory for developed industries	
11	Kaha company for chemical industries	Factory 270
12	Misr elkheir foundation	

Desalination Technologies

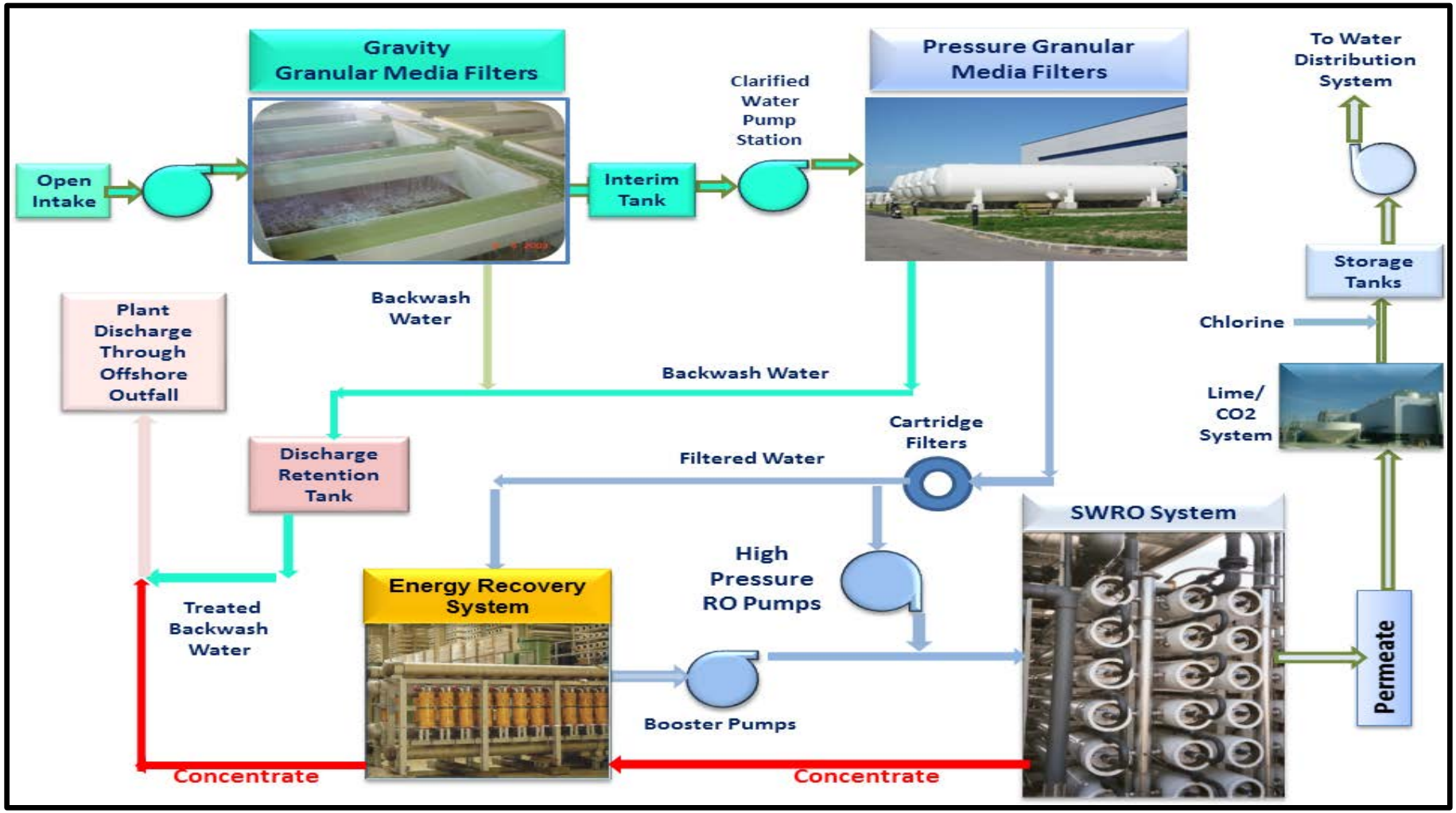
Use of different technologies for desalination all over the world



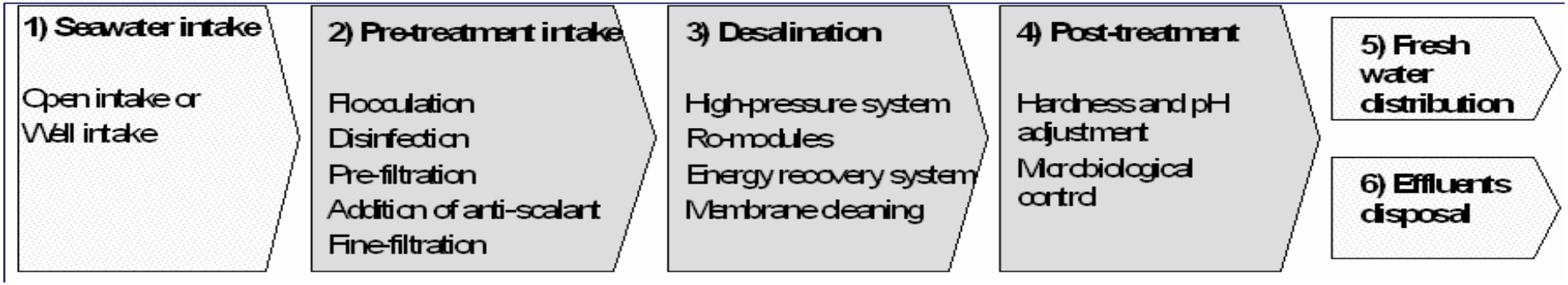
Reverse osmosis

Dominant technology when power plant is not associated to desalination

Recommended Desalination Plant Configuration



The SWRO Desalination Process



R.O. Desalination plants From Various Countries

Saudi Arabia

Produced capacity :150000 m3/d Start up : during 2009

Perth - Australia

Capacity : 160000 m3/ day

Start up : during 2006

Barcelona,Spain

Capacity : 200000 m3/ day

Start up : during 2009

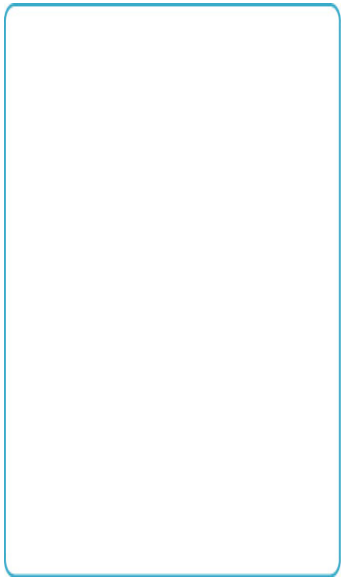
Hurghada (Elyosr) - Egypt

Capacity : 80000 m3/ day

Start up : during 2017

Desalination energy consumption

Stages of Power Recovery Systems

1960	1980	1990	2000	2010
				
Without Recovery System	**Francis Turbine**	**Pelton Turbine**	**Turbocharger**	**Pressure exchanger**
9 - 10 KW.h /1m^3 produced	7.5 - 8 KW.h / 1m^3 produced	6.5 KW.h /1m^3 produced	5 - 5.6 KW.h/1m^3 produced	2.5 - 3.5 KW.h/1m^3 produced

Turbo charger

Pressure exchanger

Reduction of RO Power consumption (case study)

Upgrading Of Marsa Alam SWRO Plant From 500 to 1500 M^3/d

Case Study

Scope Of Supply : Exchange of Pelton Turbine with 2 pressure exchangers PX300

Result

- The power consumption of the RO unit was measured before and after the upgrade and can be seen easily in the following table:

Equipment Name	Old unit	Upgraded unit
Actual capacity " M3/D"	340	**1520**
Feed pump consumed current " A"	29	**70**
High pressure pump consumed current "A "	259	**340**
Booster Pump consumed current " A"		**19.5**
Total consumed current "A"	288	**429.5**
Total Power consumption 'kWh"	151.6	**226**
Specific power consumption " kWh/M3"	10.7	**3.56**
Power Saving	**From 10.7 to 3.56 KWH/M^3**	
Annual Power Saving	**3,909,150 kW which costs 1.954 M.L.E "based on the cost of 0.5 L.E/kWh produced from the diesel gen-sets"**	

Brine disposal

Old Brine Outfalls

New technology of Brine Outfalls

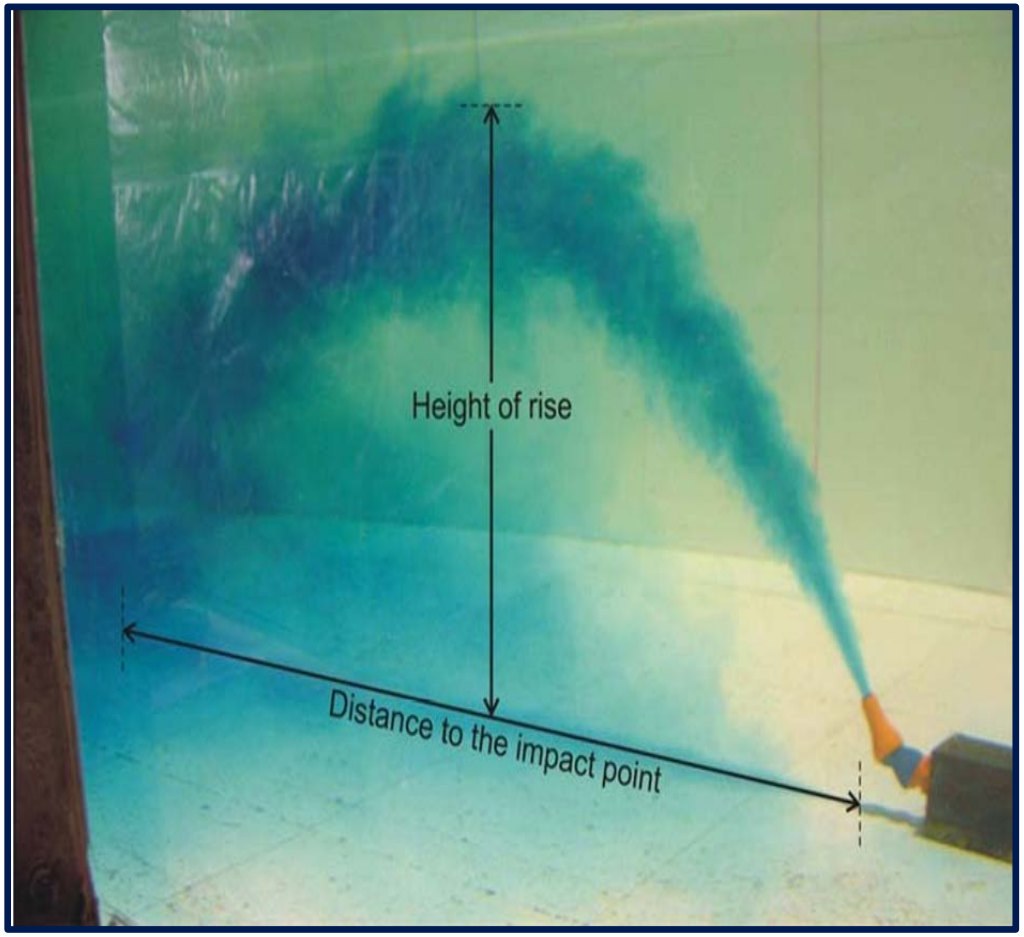
Hurgada Desalination Plant old Outfalls design

Hurghada Old Outfall, no diffusers, badly secured

Hurgada Desalination Plant (El YOSR) Outfalls design

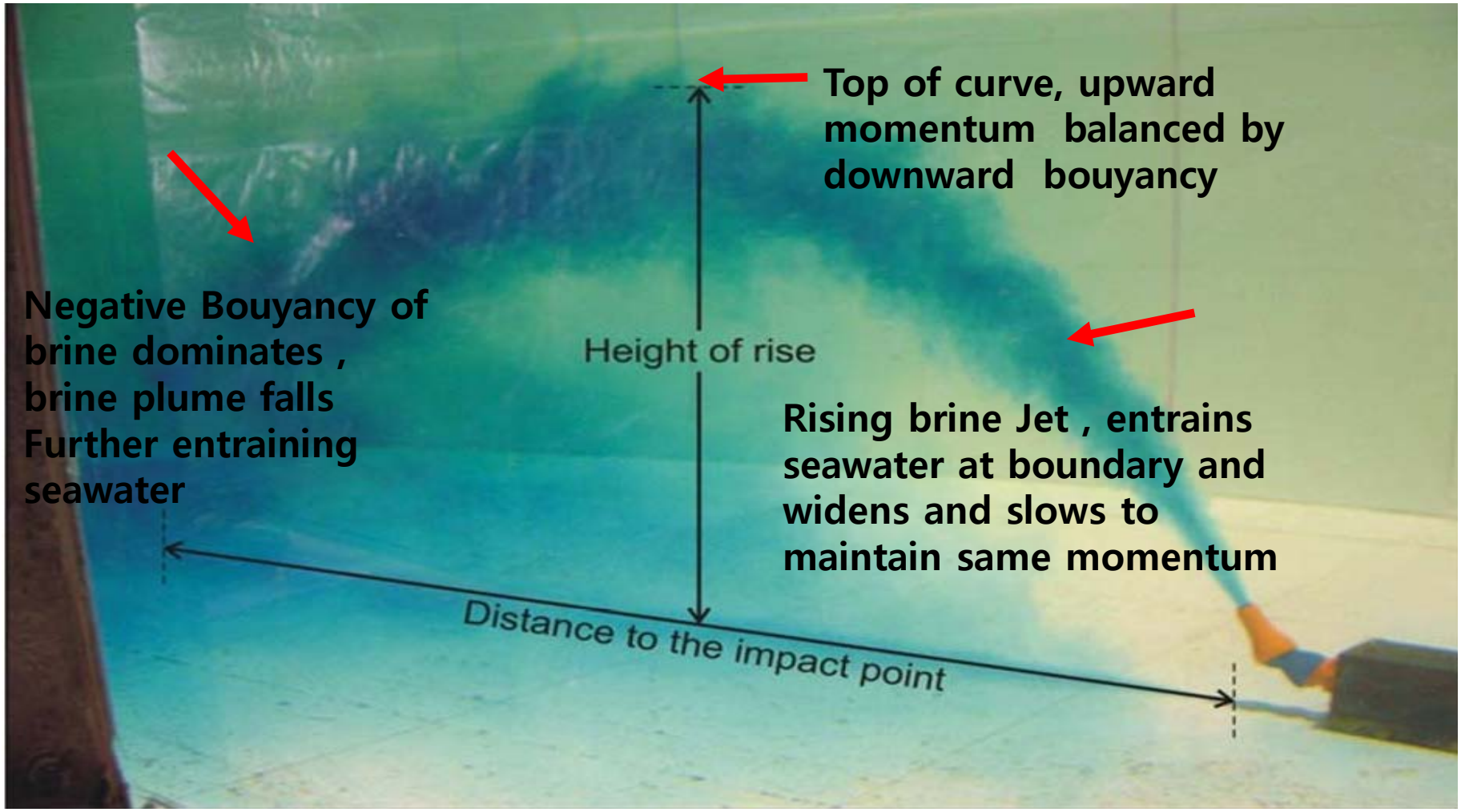
Outfall Diffusers Ensure Rapid Brine Dilution

Hurgada Outfalls design modeling

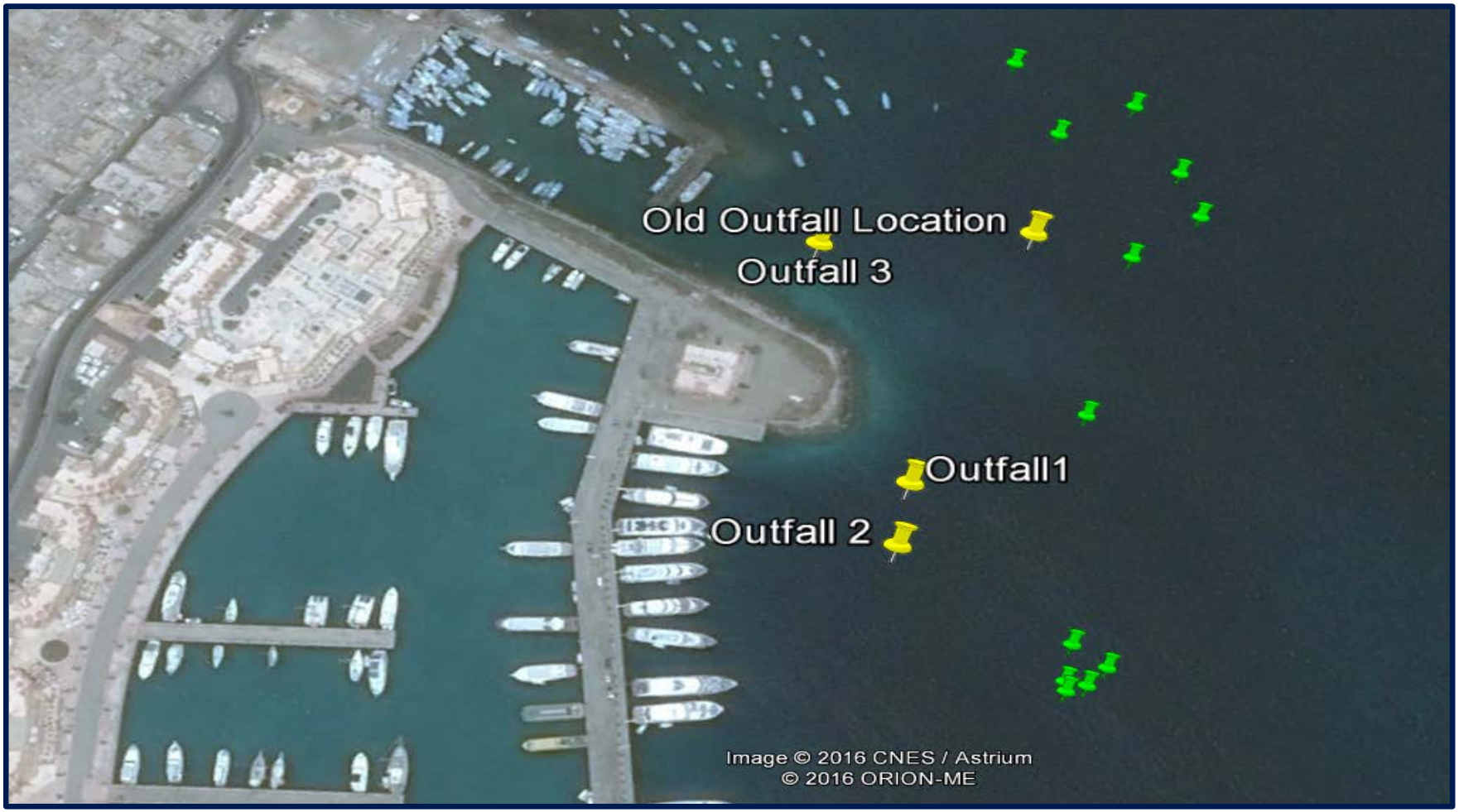


This is what a parabolic brine jet plume from a Diffuser looks like

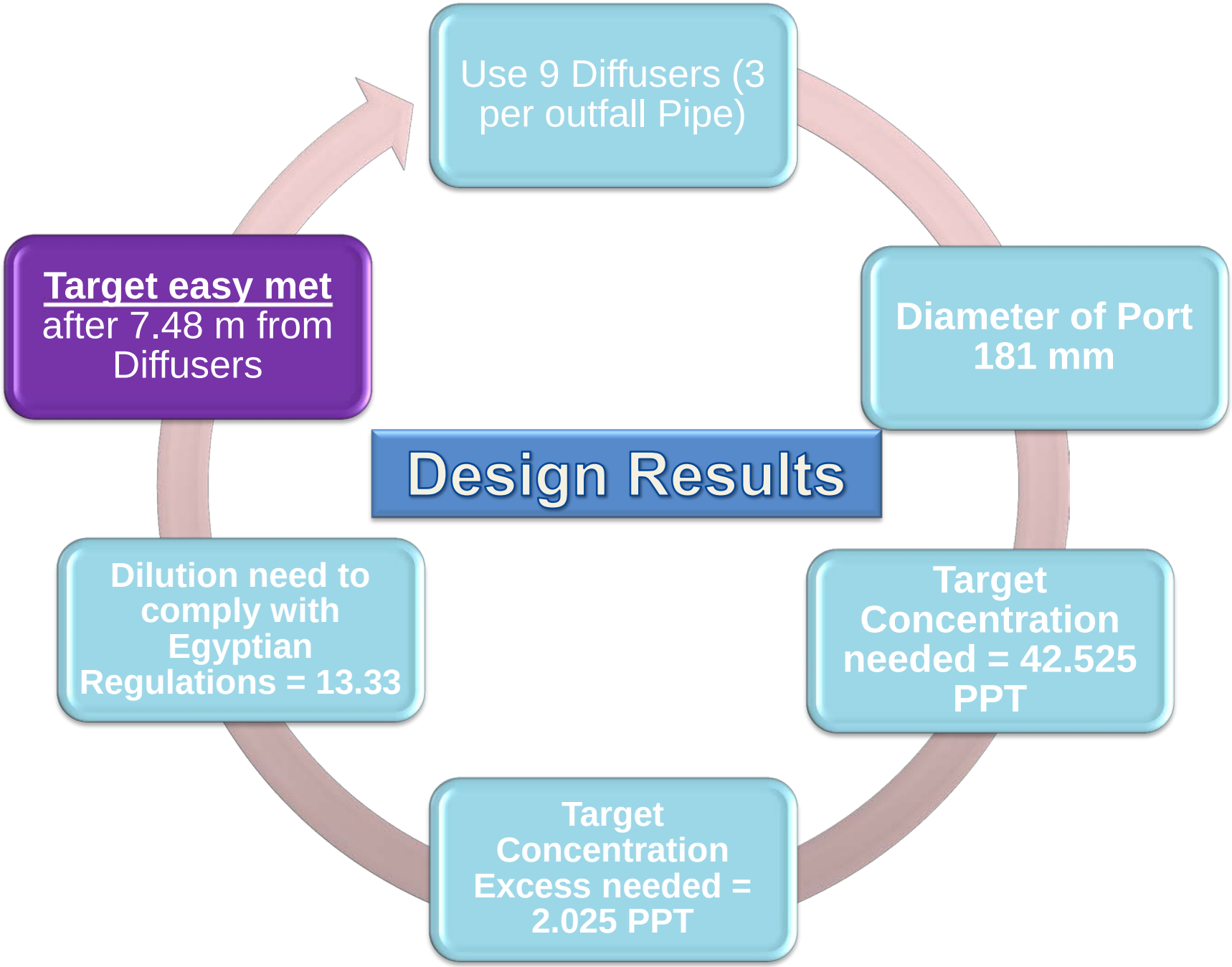
- We use angled jet diffusers to create parabolic jet plume
- The rising high velocity jet plume causes rapid entrainment of diluting seawater to the brine.
- The falling brine plume causes further dilution of the brine plume.
- Brine can be very diluted to near ambient seawater when it hits seafloor


Top of curve, upward momentum balanced by downward bouyancy
Negative Bouyancy of brine dominates , brine plume falls Further entraining seawater
Height of rise
Rising brine Jet , entrains seawater at boundary and widens and slows to maintain same momentum
Distance to the impact point

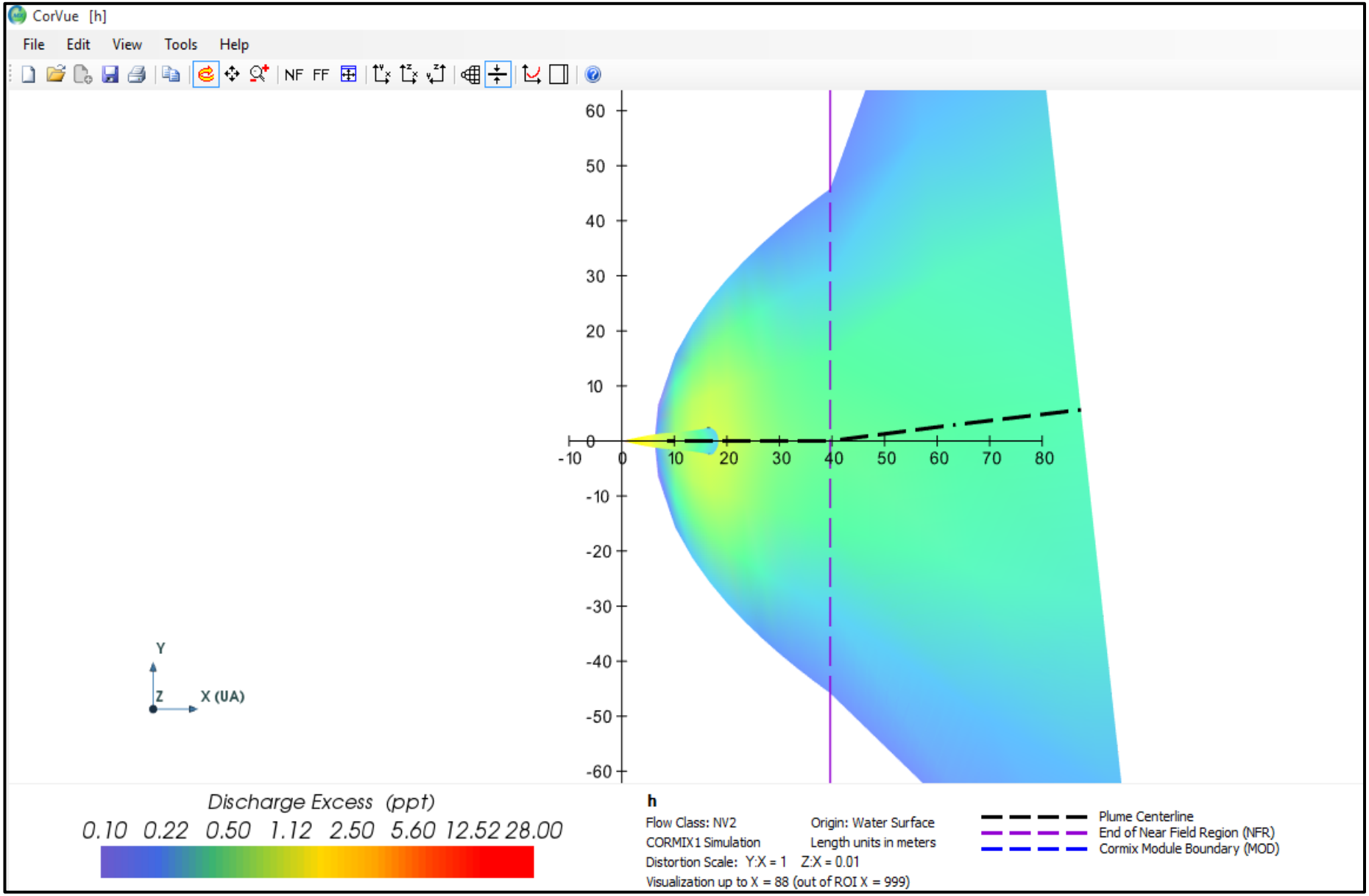
Hurgada Desalination Plant new Outfalls design



Design Capacity	80,000 m3/d SWRO
Overall Recovery (R)	40 % (pretreatment and RO)
Seawater Ambient Conc (Ca)	40.5 PPT (or g/kg)
Seawater Temperature	20 deg C
Water depth at diffuser	21 m @ Distance from shore : 221M
Mixing Zone Regulation	1 ppt @ 100 m (assumed)


Use 9 Diffusers (3 per outfall Pipe)
Diameter of Port 181 mm
Target Concentration needed = 42.525 PPT
Target Concentration Excess needed = 2.025 PPT
Dilution need to comply with Egyptian Regulations = 13.33
Target easy met after 7.48 m from Diffusers
Design Results

Discharge Excess vs. Downstream Distance



RO By Renewable energy

RO By Renewable energy

Three solar desalination plants (200 m3/ day for each)
in north sinai will be launched within Us aid


Thank you
HOLDING COMPANY FOR
WATER AND WASTEWATER

Questions