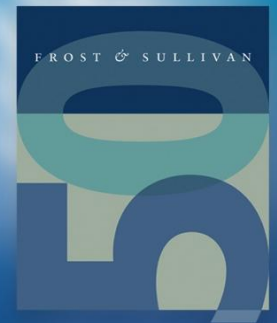


Market Opportunities in the China Desalination Plant Market

Melvin Leong, Program Manager
Environment & Building Technologies
22 Dec 2011



The Line-Up

- 1 WHAT'S HAPPENING GLOBALLY?**
- 2 DESALINATION PLANT MARKET IN CHINA**
- 3 KEY TAKEAWAY**

Before confusion starts... What is meant by Desalination Plant Market?

1

Desalination Plant*: Plants and equipment used in the treatment of seawater and brackish water, including all treatment components and civil contractors

2

Design Service and Engineering: Technical and engineering design and consulting, construction and project management of desalination plants

3

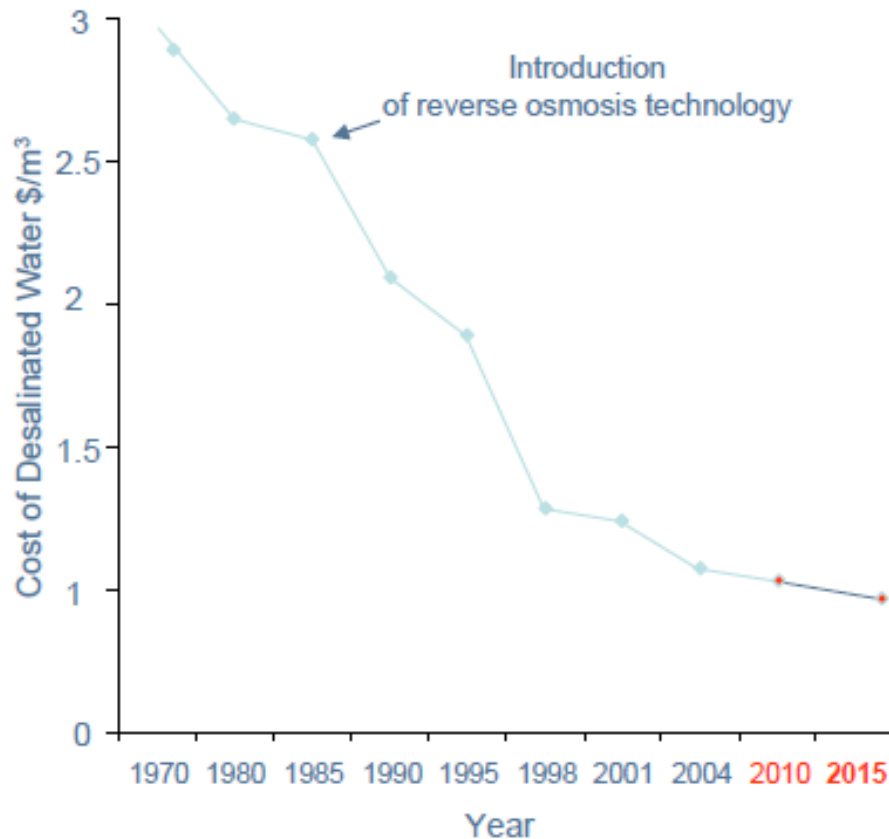
Utility Service: Attributed to water supply provided by both private companies that operate treatment plants as well as public utilities.

** Unless otherwise specified in this document*

What's happening globally?

Costs of desalination are expected to be reduced further during the next 5 to 10 years

Evolution of Desalination Costs, 1970-2015

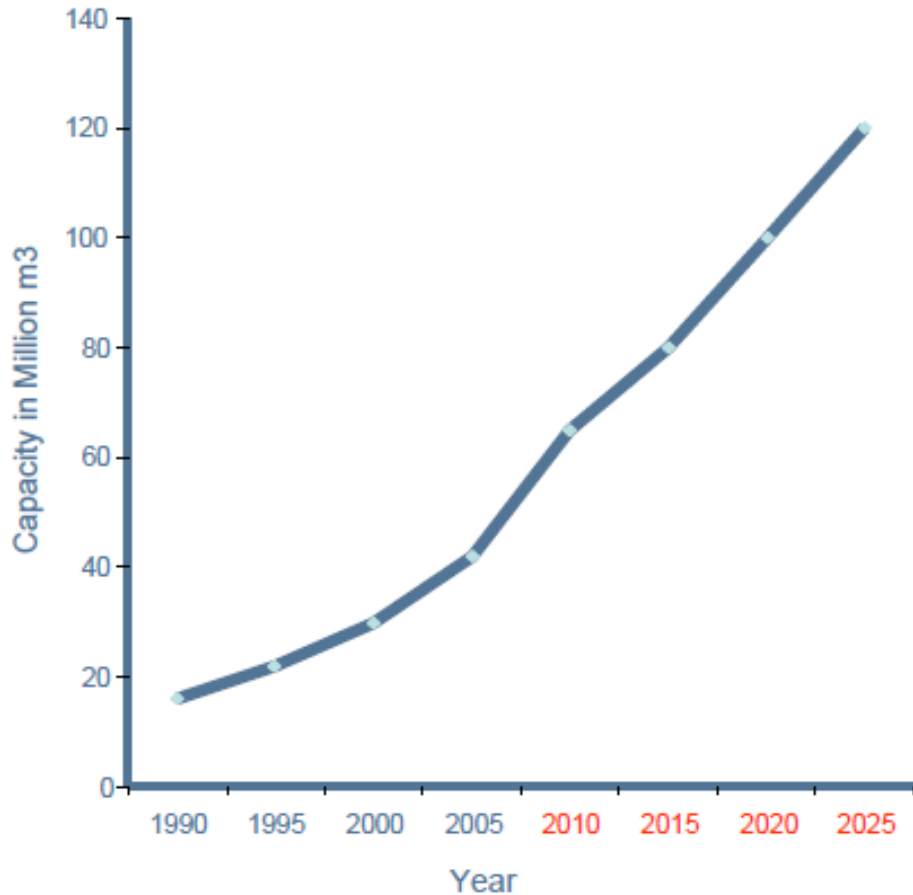


Cost will still depend on:

- Plant location
- Plant size
- Energy cost
- Pipeline for intake and discharge
- Type of technology

Exponential growth in desalinate water capacity since 1990

Evolution and growth Forecast of Desalination across the world (2009-2025)



Source: IDA, GWI and Frost & Sullivan

By 2025, treatment capacity to double

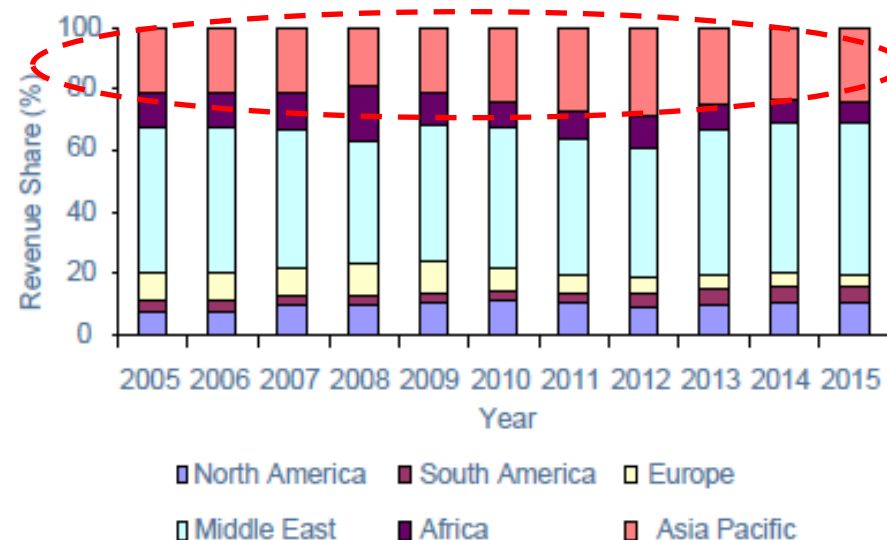
Price of membrane and operational cost to go down

Emerging desalination markets are China, India, and USA

Middle East continues to soar, Asia Pacific remains as second most important region

Desalination Plant Market: Revenue Share Trends by Geographic Region (World), 2005-2015

Year	North America (%)	South America (%)	Europe (%)	Middle East (%)	Africa (%)	Asia Pacific (%)
2005	7.9	3.2	9.3	47.2	10.7	21.7
2006	8.2	3.2	9.4	46.7	10.9	21.6
2007	9.2	3.1	10.1	44.5	12.2	20.9
2008	9.6	2.9	10.4	40.5	17.3	19.3
2009	10.0	3.1	11.0	44.0	11.4	20.5
2010	10.0	3.1	8.6	45.1	8.7	23.6
2011	10.3	3.3	6.6	43.8	8.9	27.1
2012	8.9	4.8	5.1	42.6	9.8	28.8
2013	9.4	6.1	4.6	46.3	9.1	24.5
2014	9.0	6.3	4.3	49.7	8.0	22.8
2015	10.0	6.2	3.6	49.1	7.0	24.1

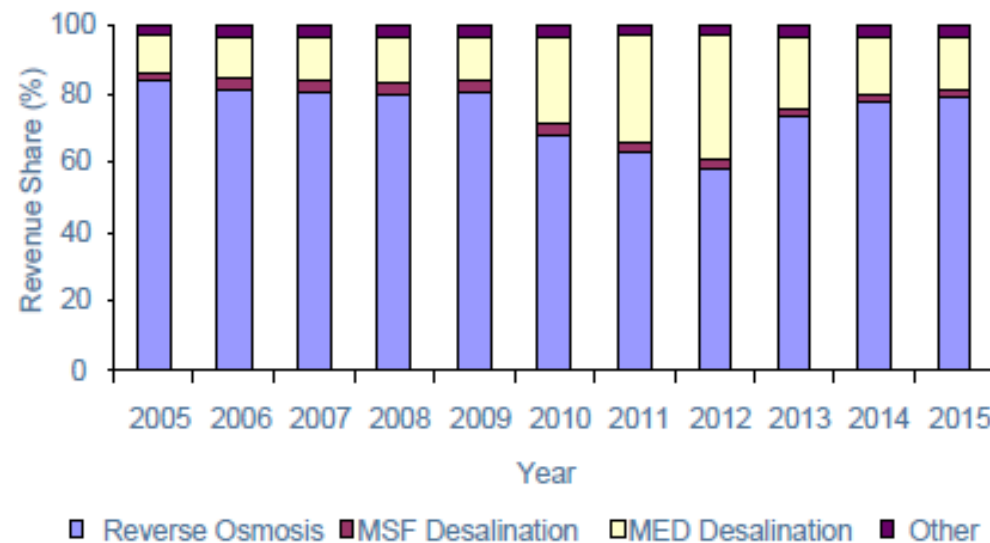


Note: Desalination plant market refers to only membrane technologies, and thermal / distillation technologies for desalination of sea water, brackish water, river water, and wastewater excluding pumps, valves, and civil structure. Source: Frost & Sullivan

RO continues to dominate the desalination market in Asia Pacific by market revenue

Desalination Plant Market: Revenue Share Trends by Technology Segment (Asia Pacific), 2005-2015

Year	Reverse Osmosis (%)	MSF (%)	MED (%)	Other (%)
2005	83.4	2.2	11.0	3.4
2006	81.3	3.4	11.4	3.9
2007	80.5	3.4	12.2	3.9
2008	79.7	3.4	12.9	4.0
2009	80.4	3.3	12.3	4.0
2010	68.3	2.6	25.5	3.6
2011	63.5	2.1	31.5	2.9
2012	58.7	2.0	36.5	2.8
2013	73.3	2.5	20.6	3.6
2014	77.2	2.8	15.9	4.1
2015	78.8	2.6	14.8	3.8

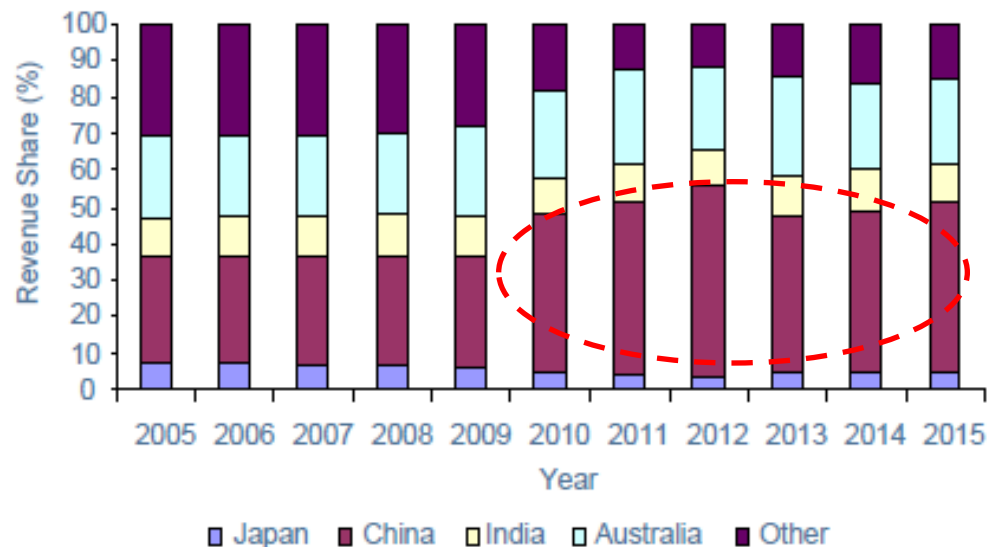


Note: Desalination plant market refers to only membrane technologies, and thermal / distillation technologies for desalination of sea water, brackish water, river water, and wastewater excluding pumps, valves, and civil structure. Source: Frost & Sullivan

China leads in Asia Pacific in terms of market revenue

Desalination Plant Market: Country Revenue Share (Asia Pacific), 2005-2015

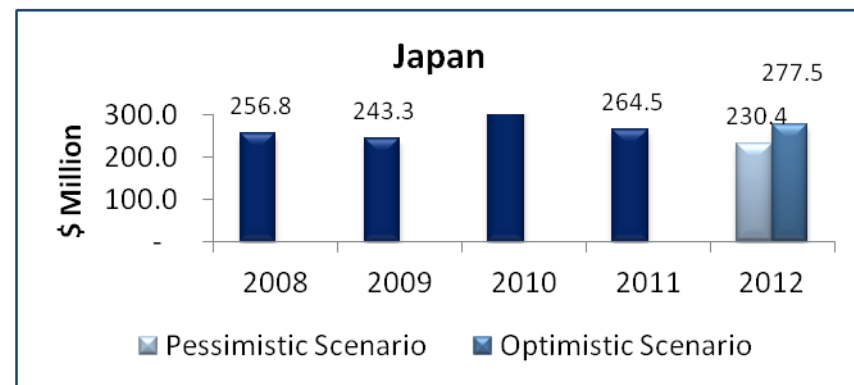
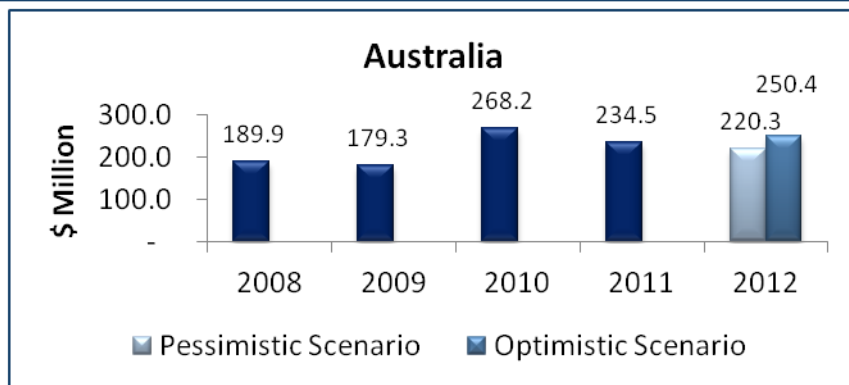
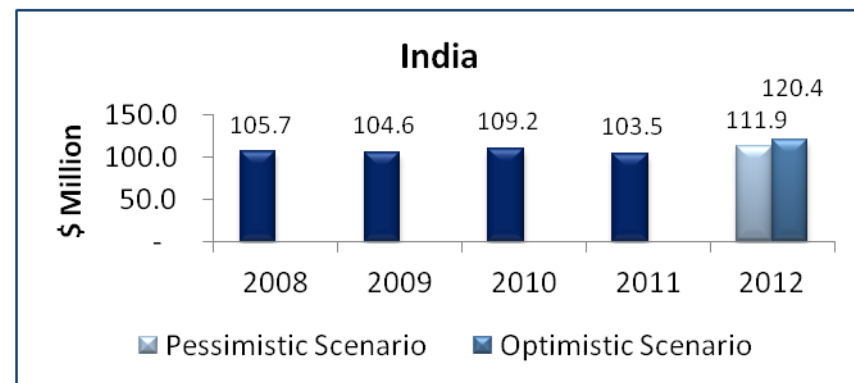
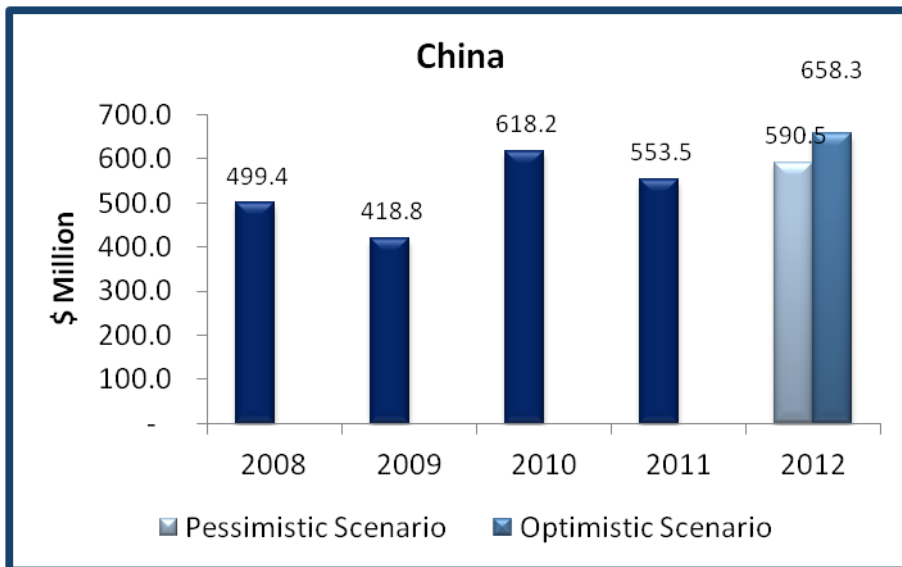
Year	Japan (%)	China (%)	India (%)	Australia (%)	Others (%)
2005	75	28.7	11.0	21.9	30.9
2006	7.5	28.8	11.2	21.8	30.7
2007	7.3	29.1	11.4	21.8	30.4
2008	7.0	29.4	11.6	21.9	30.1
2009	6.5	29.8	11.2	24.3	28.2
2010	5.2	43.1	9.6	24.1	18.0
2011	4.0	47.3	10.1	26.0	12.6
2012	3.8	52.3	9.4	22.6	11.9
2013	4.7	42.7	10.9	26.9	14.8
2014	5.2	43.7	11.5	23.2	16.4
2015	4.8	46.0	11.0	23.0	15.2



Note: Desalination plant market refers to only membrane technologies, and thermal / distillation technologies for desalination of sea water, brackish water, river water, and wastewater excluding pumps, valves, and civil structure. Source: Frost & Sullivan

China is the largest trading nation in Asia Pacific for water filtration and purifying equipment

Trade Value (Exports and Imports) of Water Filtration and Purifying Equipment, 2008-2012



Source: UN Comtrade, and Frost & Sullivan

Desalination Plant Market in China

What is the market status?

Who are the main end-user groups?

Who are involved in the market? Notable participants?

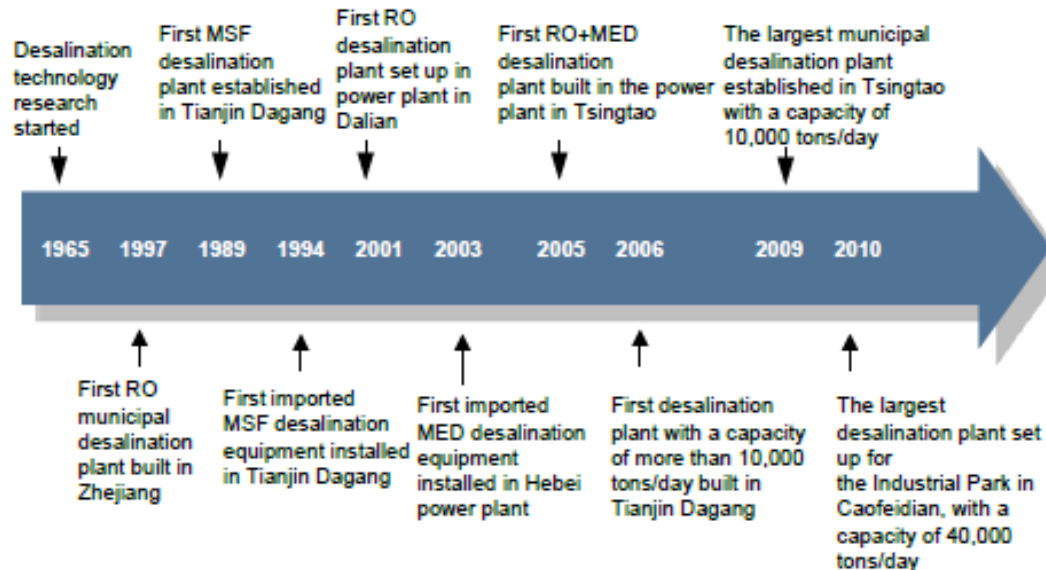
The status of China's value chain?

What are the likely opportunities?

Key highlights in 2011?

Moving forward, more desalination projects will be carried out

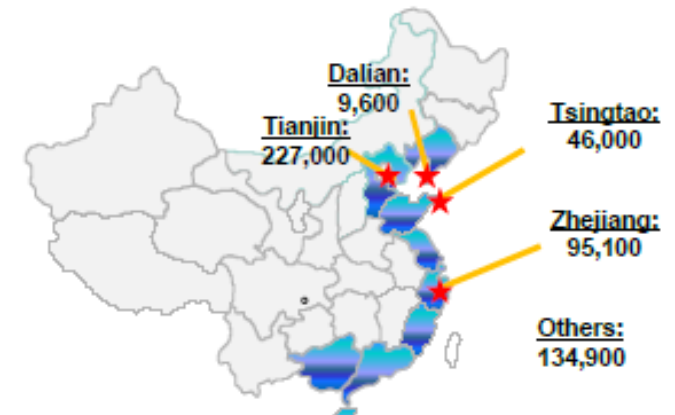
Desalination Plant Market: Evolution of Desalination Installation in Coastal Areas (China), 1965-2010



Source: Institute of Seawater Desalination and Multipurpose Utilization

In 2011, membranes from Toray are supplied to a plant in Qingdao of 100,000 m³/day capacity

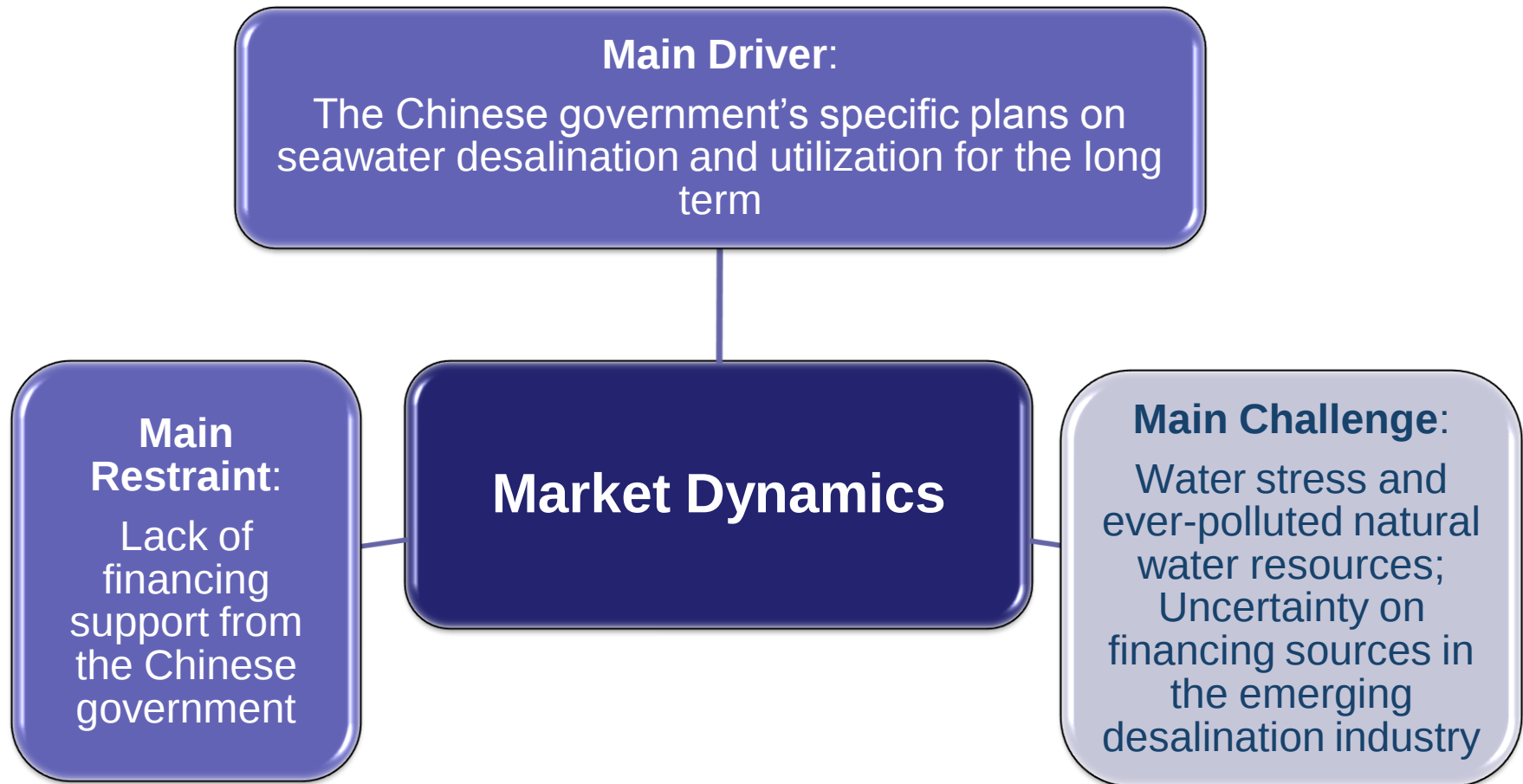
Desalination Plant Market: Desalination Capacity in Major Coastal Cities (m³/Day) (China), 2010



Year	Desalinated Volume		Contribution to Solving Water Scarcity in Coastal Areas (%)
	10 ⁴ m ³ /Day	10 ⁸ m ³ /Year	
2005	12	0.43	2
2010	80 to 100	2.6 to 3.3	16 to 24
2020	250 to 300	8.3 to 9.9	26 to 37

Source: Frost & Sullivan

Desalination is part of China's plan for its water security solutions



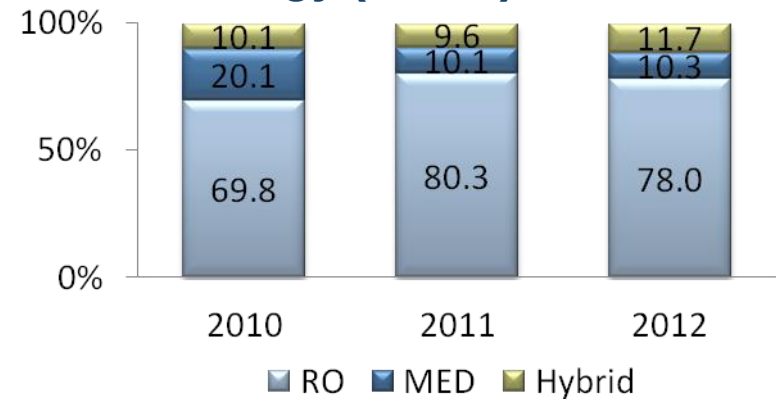
Source: Frost & Sullivan

Positive growth expected in 2012; RO+MED hybrids are emerging

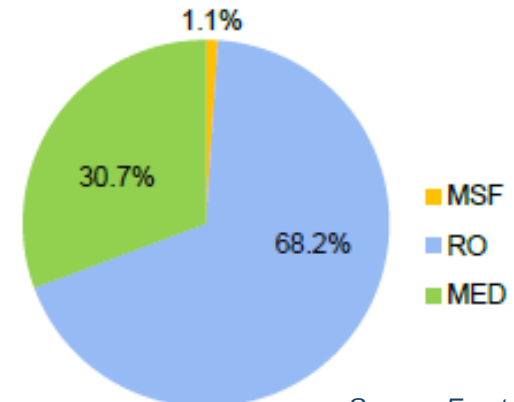
Revenue and Growth Rate of Desalination Plant Market (China), 2010-2012



Percent of Revenues by Desalination Technology (China), 2010-2012



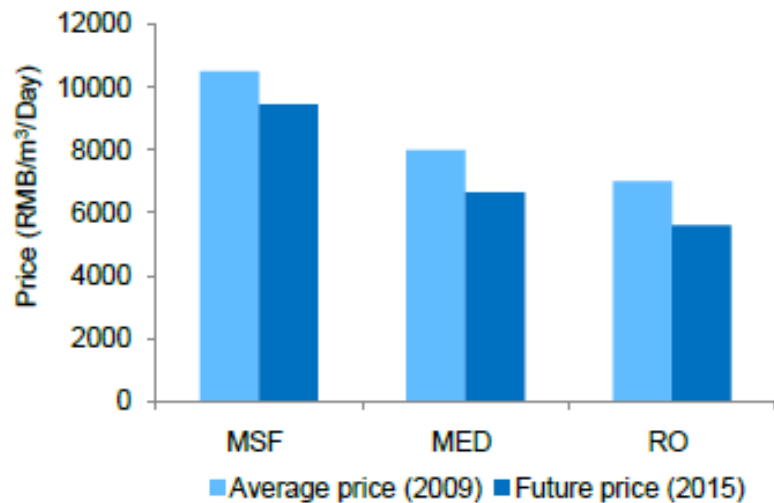
Percent of Treatment Capacity by Desalination Technology (China), 2010



Source: Frost & Sullivan

Domestic RO is most competitive, but imported RO is preferred

Unit Investment Price Variation for Domestic Equipment



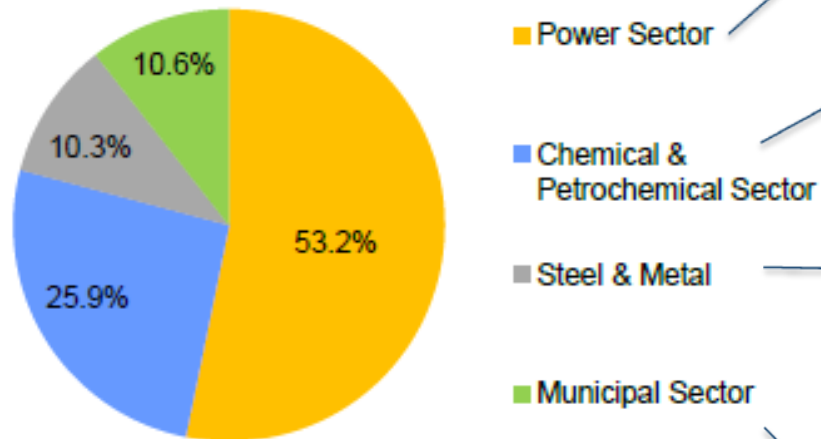
Investment Comparison

Number	Items	Investment Cost Per 60,000 m³/Day Plant (RMB 10,000) and (\$1,470)		
		MED (Domestic Equipment)	RO (Domestic Equipment)	RO (Imported Equipment)
1	Project investment (including technology)	48,000 and 7,058	42,000 and 6,176	54,000 and 7,941
2	Land cost	180 and 26.5	450 and 66.2	450 and 66.2
3	Other cost	2,400 and 353	2,100 and 308	2,700 and 397
4	Preparing cost	2,529 and 372	2,228 and 327	2,858 and 420
5	Interests during construction	1,859 and 273	1,637 and 240	2,100 and 308
6	Total investment	54,968 and 8,083	48,415 and 7,120	62,108 and 9,133

Source: Development Plan for Seawater Desalination Industry of Tsingtao

Industrial application dominates; drinking water application may see good prospects for future investment

Percent of Treatment Capacity by Industrial Sector (China), 2010



Coastal regions to witness increase in Gwe by rate of 15 to 20 percent

Water requirement will remain high with this emerging sector

There are ongoing relocations of steel plants from inland to designated new development zones coastal regions

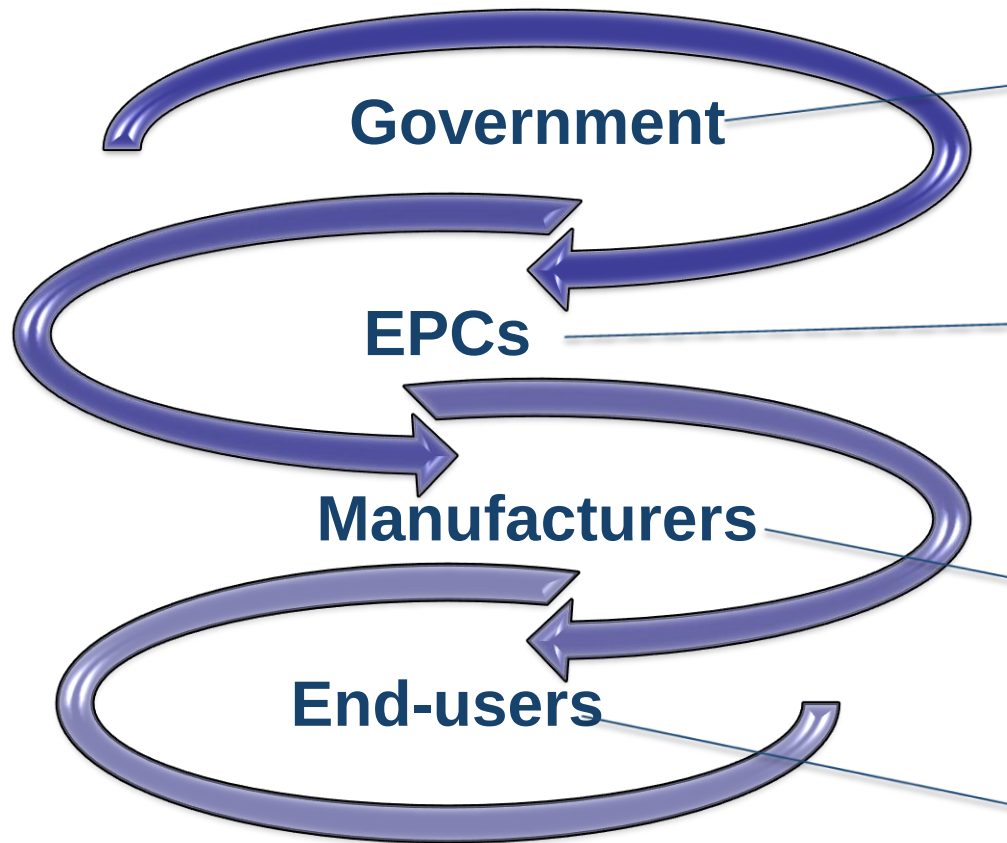
Currently, plants are built for industrial purposes. The future will see more application for drinking water when detailed economic analysis is streamlined

Emerging: Salt Production Plants

Salt production is likely to be included in 4-in-1 circular economic development mode (*power-desalination-brine salt production-land management*)

Source: Frost & Sullivan

Public tendering is dominant; market is driven by policies and guidelines



Control and provide project opportunities (Power design institutes provide desal. plant design)

Select proper equipment and products. May outsource M&E or part of projects to contractors.

Product supply and technical support

Responds to government's plan and implementation. Work closely with EPCs and manufacturers too

Source: Frost & Sullivan

At least 80% market share is held by international suppliers



Kit Suppliers of Desalination Membranes



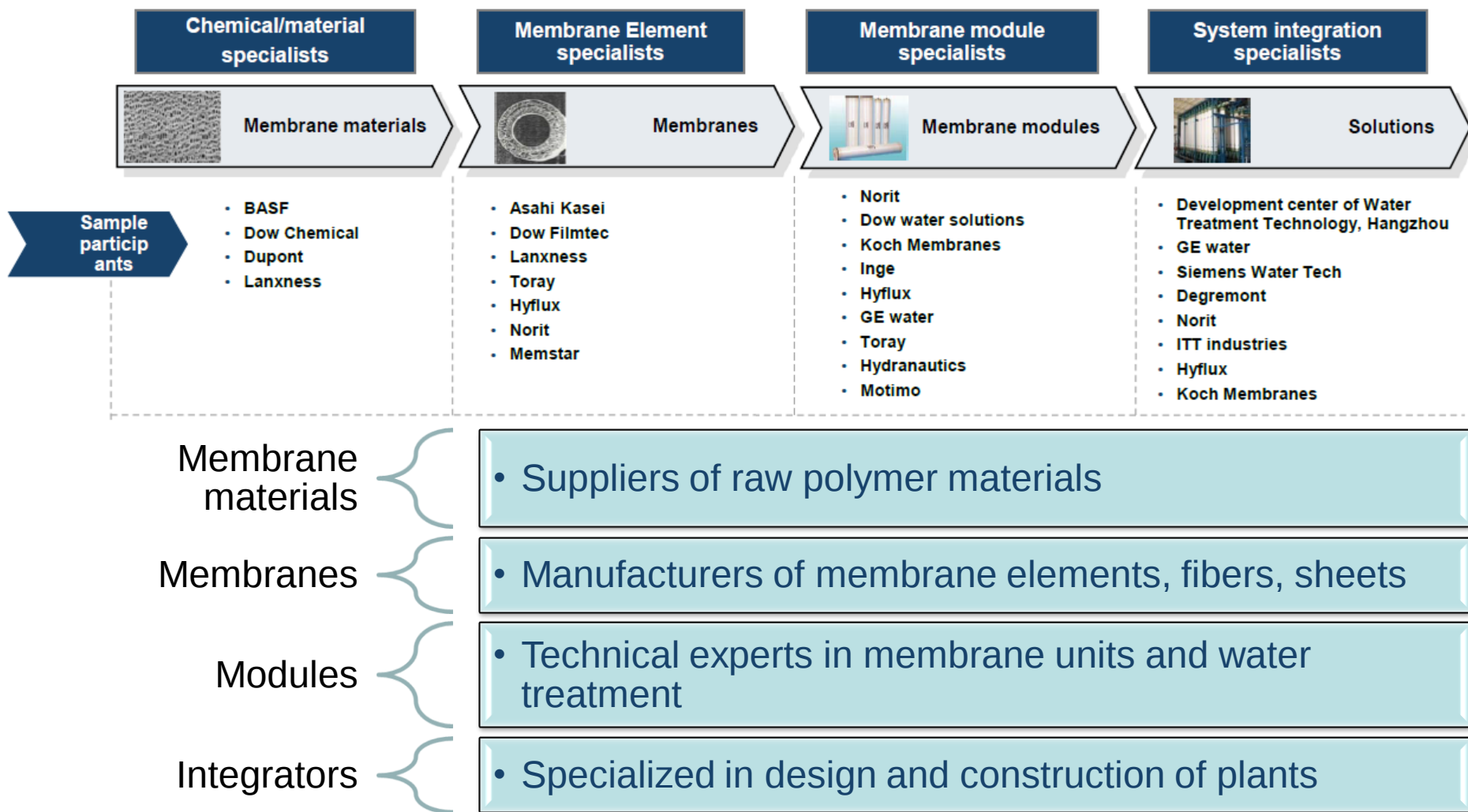
MSF, MED, and Component Specialists



Engineering Consulting Companies

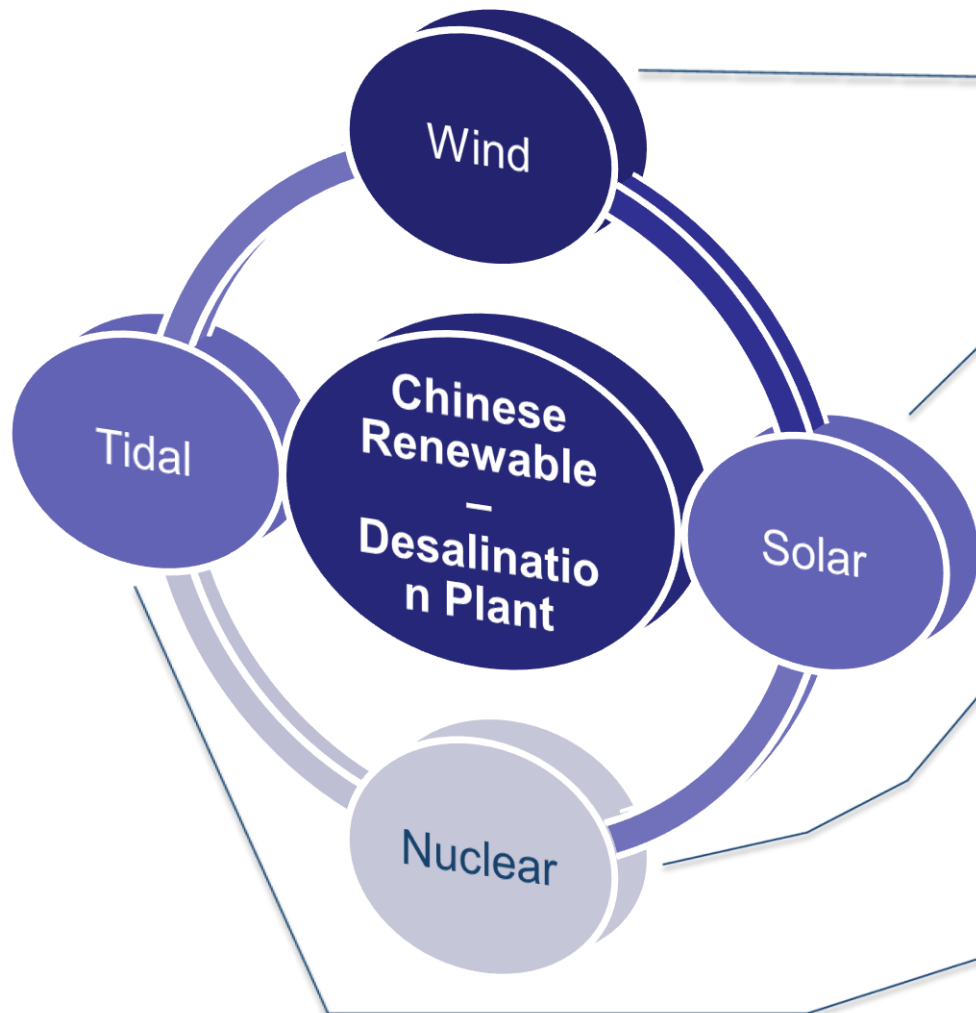
Source: Frost & Sullivan

Forward integration and backward integration is likely to take precedence



Source: Frost & Sullivan

Desalination to integrate with renewable energy plants



Rise of output by 60 percent to 18.8 kWh in Q1 2011, at least 30 percent higher than other renewable source

1.8 GW of new solar panels installed in non-residential Chinese buildings in 2011

China aimed for 86GW of nuclear energy output by 2020

Early stage of development with sporadic contracts

Some competitive developments in 2011...

IDE Technologies will build 4 MED units powered by waste heat from other sources for Tianjin SDIC electricity company

GE doubled its membrane manufacturing capacity in its Wuxi plant; first expansion in 2008

HK will build a desalination plant in 2014. It is in planning stage now.

Hyflux will build 3 BOT projects in Chongqing

United Envirotech has announced its plan to acquire Aton Environmental (Shenyang)

Tri-Tech Holding acquired JY International (a manufacturer of desalination and industrial wastewater system) for \$1.5 million

Source: Frost & Sullivan

Key Takeaway

Market boom as water demand rises for industries and urbanization

2011

- 6% market growth
- RO dominates
- Industrial applications
- 670,000 tons of water /day
- 80% imported equipment
- 3 important documents as industry guidelines
- International expertise is sought
- Value chain integration is sporadic; involves some participants
- Acquisitions
- Heads-on competition
- Hybrid plants (desal-renewable energy) are on the rise
- Government support and focus is high; incentive and funding is low
- Turnkey projects are common
- Current opportunities: General industrial applications

2012 and beyond

- At least 7% market growth
- Hybrids will gain market share
- More uptake of drinking water applications
- 800,000 tons / day of water (>2 million tons / day by 2015)
- 70-80% imported equipment
- 2 policy documents by NDRC as long term supporting guide
- More local R&D development will be expected
- Value chain integration is the way forward for business sustainability and diversification
- Acquisitions to continue; divestment by some companies
- More JVs, partnerships among suppliers
- More pilot plants with various renewable energy sources
- More emphasis and focus under the 12FYP; incentive and funding may still be unclear
- BOT and BOO likely to gain interest
- Next big opportunities: Municipal applications, steel industry, and power plants

Note: NDRC denotes National Development and Reform Commission. Source: Frost & Sullivan

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<http://www.facebook.com/pages/Frost-Sullivan/249995031751?ref=ts>

The LinkedIn logo, featuring the word "Linked" in black and "in" in white inside a blue square, followed by a period.

<http://www.linkedin.com/companies/4506>

The SlideShare logo, featuring a stylized icon of two people (one orange, one blue) holding a white screen, followed by the word "slideshare" in a teal, lowercase, sans-serif font.

<http://www.slideshare.net/FrostandSullivan>

The Twitter logo, featuring the word "twitter" in a light blue, lowercase, rounded font with a white outline, set against a light blue rectangular background.

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