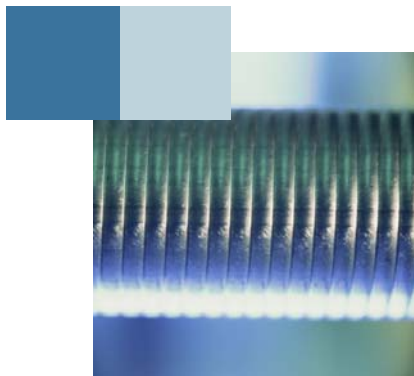




Global Trends in Industrial Markets

ITA Conference – Birmingham – May 12, 2015

Albert Bruneau, Executive VP Vallourec Heat Exchanger Tubes



Disclaimer

The information, estimates and projections contained in this presentation constitute the current judgment of Vallourec Heat Exchanger Tubes as of the date of this report. They are believed to be reliable, but Vallourec Heat Exchanger Tubes makes no representation or warranty regarding the accuracy, completeness or reliability. You rely on these projections and other information in this presentation at your own risk, and Vallourec Heat Exchanger Tubes assumes no duty to update any of this information should expectations change.

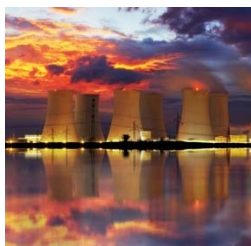


We have used for this presentation among other sources testimonies of some of our customers.

We want to thank all of them for their contribution.

Industrial Titanium – Perimeter

Power Generation



**Nuclear
Power Plant**



**Thermal
Power Plant**

Desalination



Thermal MSF/MED

Process



Chemical



LNG



Oil & Gas



PTA



Pool Heater



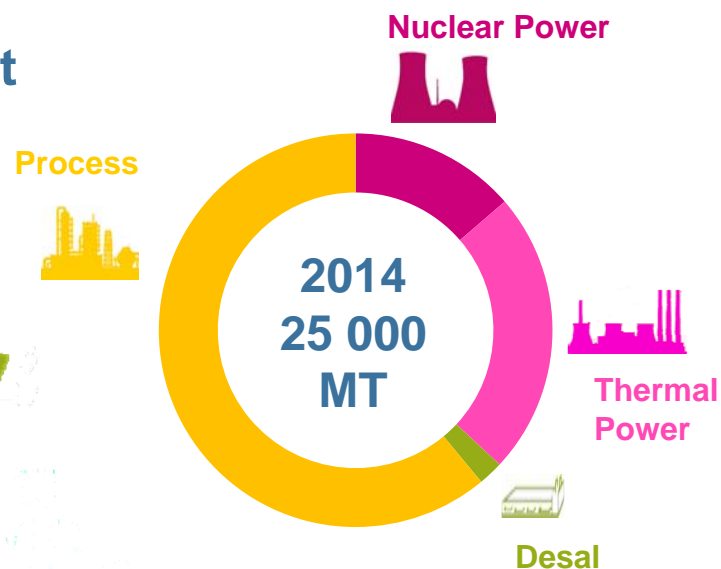
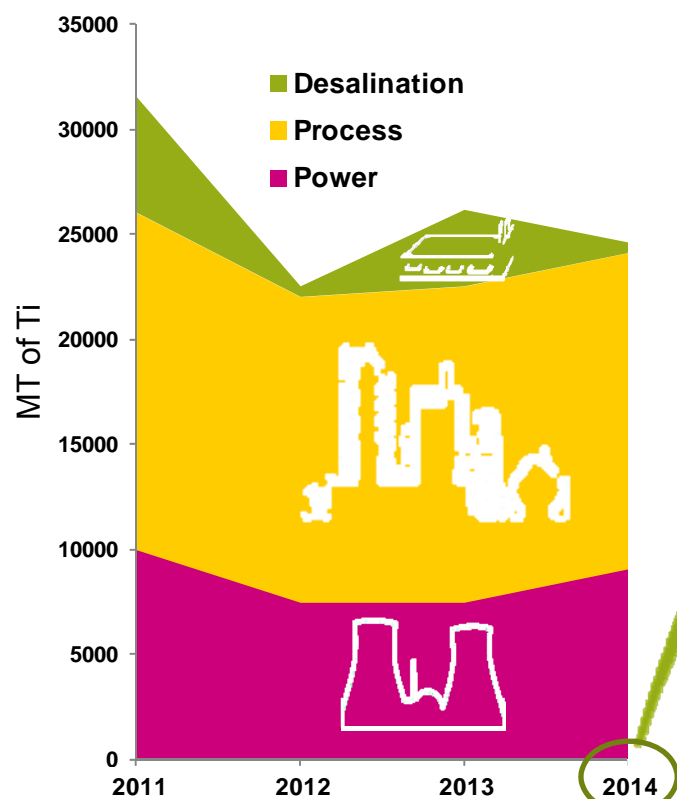
District Cooling



What titanium means to Industrial Customers ?



Industrial Titanium – Current Market



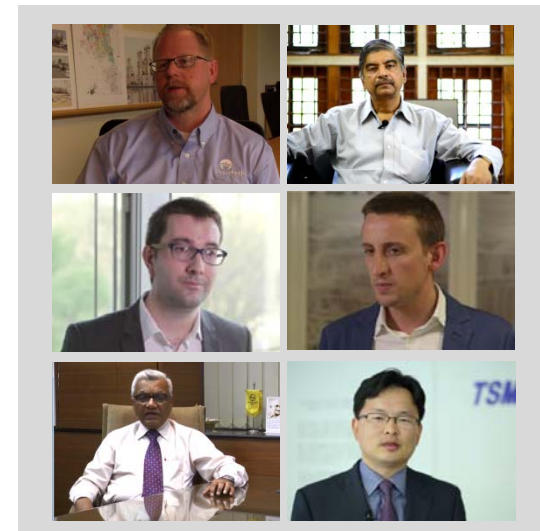
■ Demand has globally decreased compared to 2013 and limited improvement expected over 2015.

■ Desalination consumption has strongly decreased with no major project over the year

■ Process consumption remains stable

■ Power consumption has increased with the restart of Nuclear in China

Ti SWOT for Industrial Market
to forecast its potential and future evolution for such application





Ti SWOT for Industrial Market



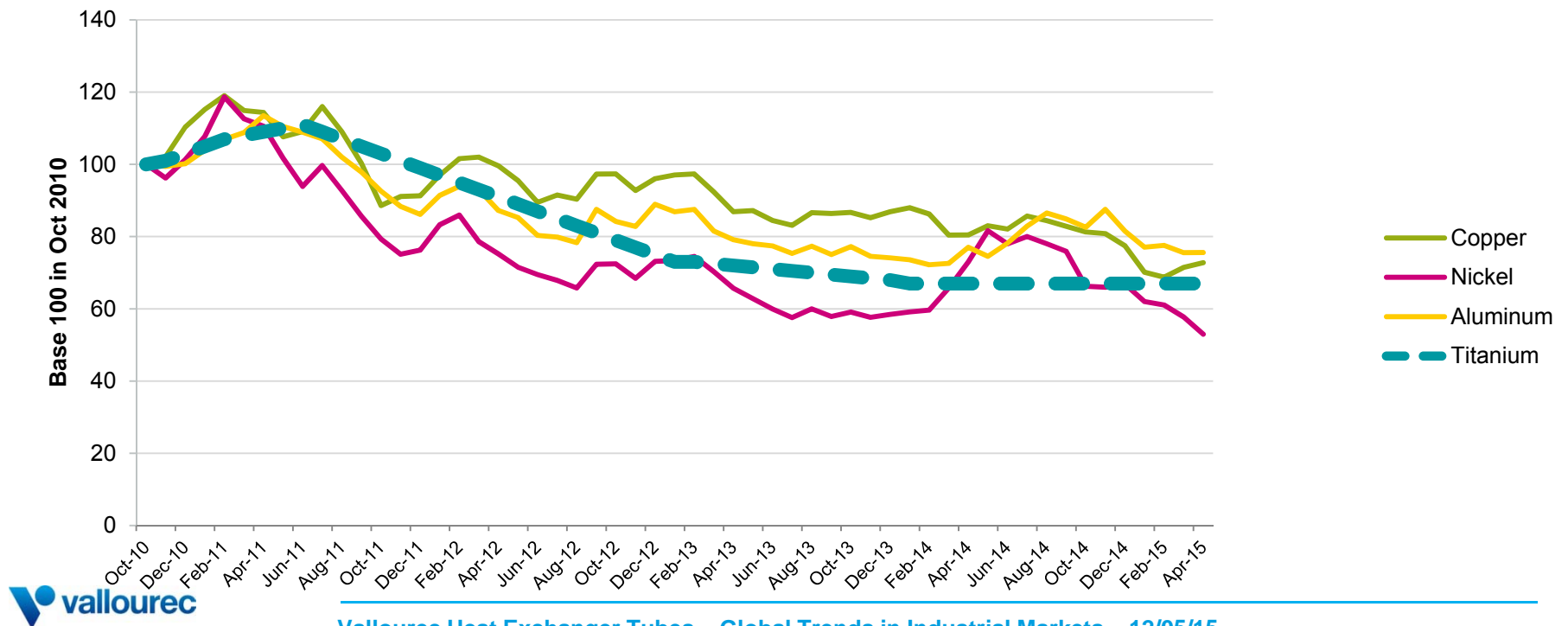
Strengths





Strength - Zoom desalination : Competitiveness

- Titanium competitiveness vs. other materials along last 4 years





Ti SWOT for Industrial Market



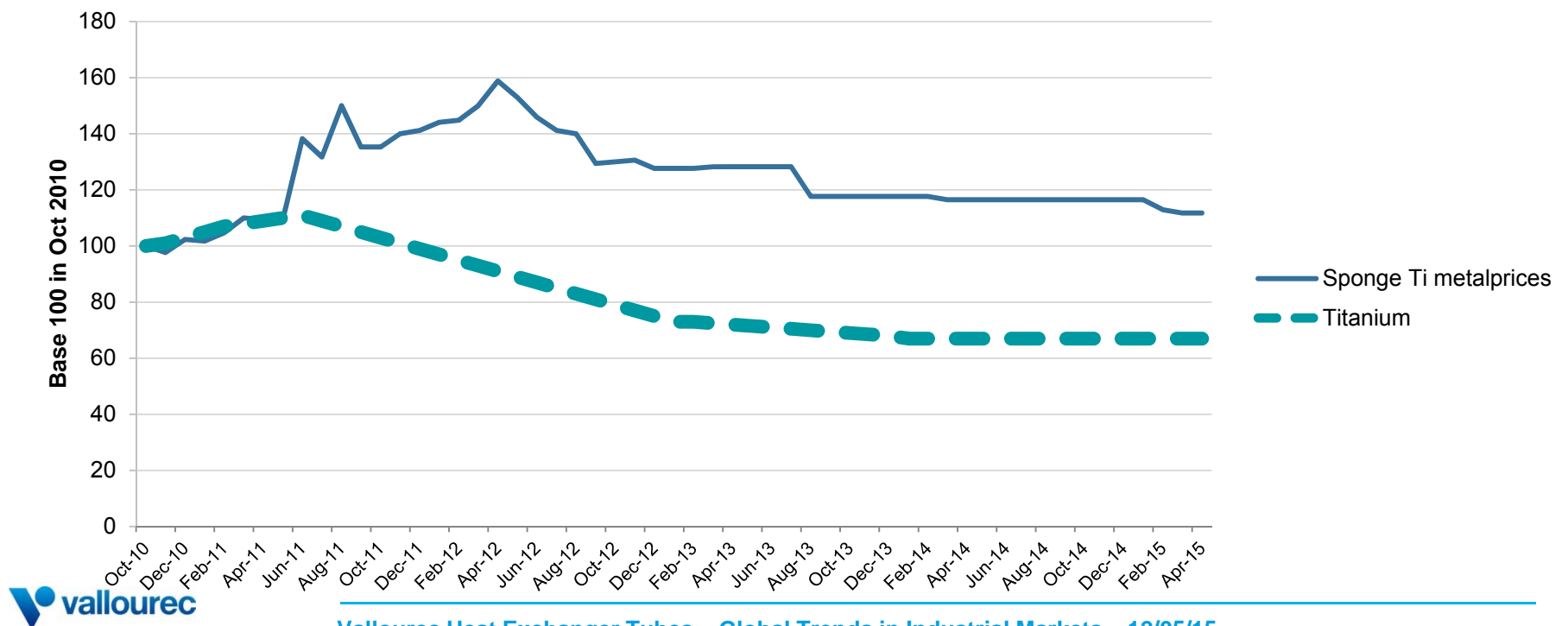
Weaknesses





Weakness - Zoom desalination : Visibility

- Lack of reliable index for Titanium forecast and follow-up

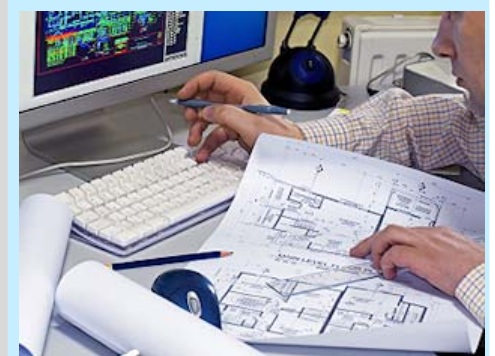




Weakness - Zoom Power Generation: Design Rules

Design rules not adapted to Titanium characteristics

- Conservative engineering companies toward heat exchangers design rules
- Thermal Equipment calculation
 - No minimum thickness reduction
 - No adjustment of tube design
 - Extra thickness for erosion
 - No extra Life time integration in the cost



$$\lambda = 1,6 \cdot 10^{-5} \frac{\Delta H_L D^6}{\rho L Q^2}$$



Ti SWOT for Industrial Market



Threats



Threat - Zoom desalination : Alternative material/design



- Titanium consumption will depend on capacity to convince end users to switch material or to use thermal technology



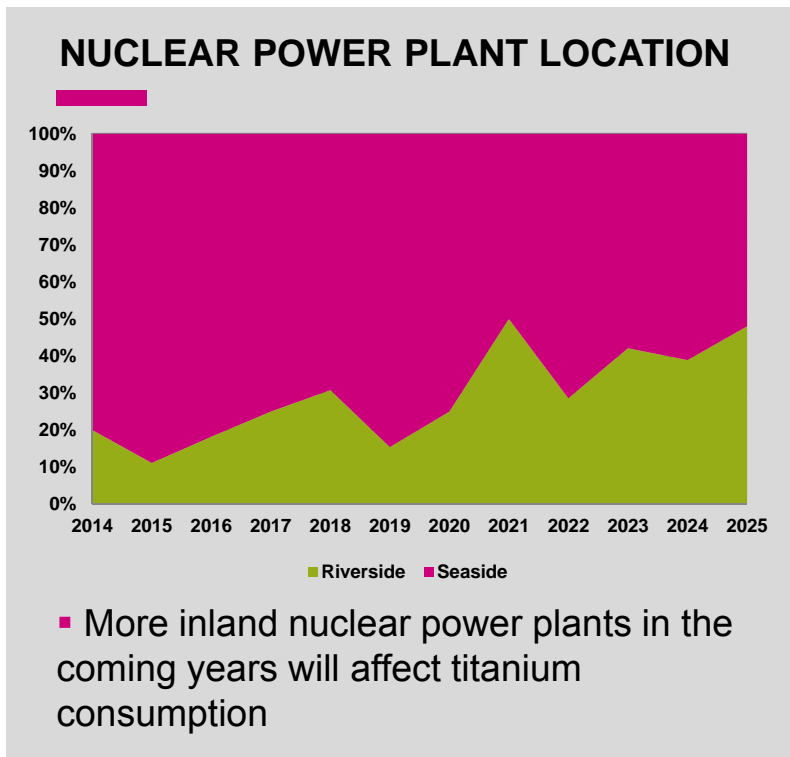
- Al Jubail tubes finally remained in Copper Nickel as in the initial design despite titanium competitiveness.



- Ras Laffan RO project has been preferred to Ras Abu Fontas A3 MED project



Threat - Zoom Power Generation: Location





Threat - Zoom Power Generation: Nuclear Technical issues

ZOOM NUCLEAR IN CHINA

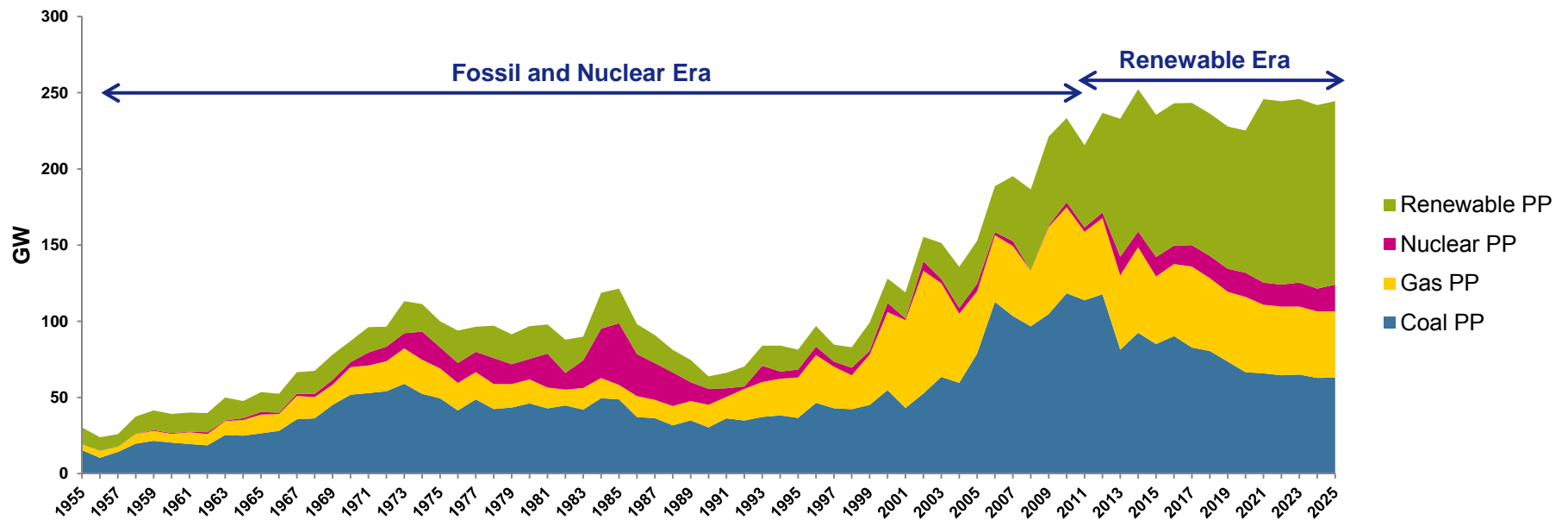
- Government pushes for consolidation to speed up nuclear development
- Target is still to reach 58GW installed in 2020 but pace is slower than expected:
 - AP1000 delayed due to technical issue
 - Potential risk of Taishan delay due to EPR vessel steel issue
 - Still some concerns on safety rules around nuclear
- ACC1000 is main choice for export
 - CNNC and CGN design “merged”
 - Localization rate at 85%, expected at 95% after 2 units

ZOOM NUCLEAR IN SAUDI ARABIA

- Initial schedule:
 - First reactor connected in 2022
 - 17.6 GW by 2032
- Projects are now delayed by 8 years
- Due to technical challenges including limited access to water to cool the plants



Threat - Zoom Power Generation: Change of fuel mix



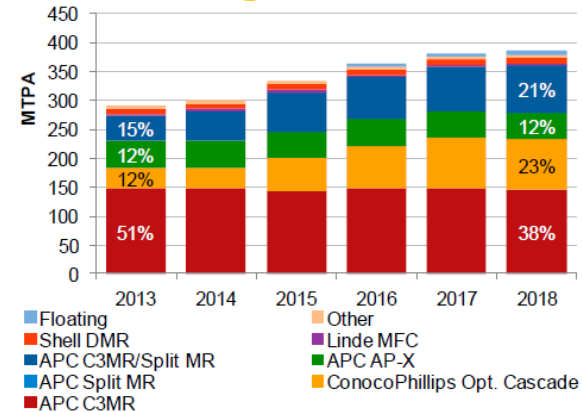
- Renewable additions will equal for the first time all other fuel in 2025
- Most of renewable projects will not use titanium



Threat - Zoom Process : Alternative material/design

ZOOM LNG MARKET

- 2014 is marking the first year of substantial liquefaction growth since 2011. Global LNG supply is expected to increase at an annual growth rate of 5.9% over the decade.
- LNG industry scope widening rapidly with 38 new liquefaction terminals scheduled for operation by 2020
- Due to low price of gas, APC technology is the most-used liquefaction process in LNG plants **but unfortunately does not use Ti tubes...**



Liquefaction Capacity per Technology 2013-2018
Source: World LNG Report 2014



Threat - Zoom desalination : Delays

- Decision date nearly systematically postponed by more than 1 year compare to initial plan





Ti SWOT for Industrial Market



Opportunities





Opportunity - Zoom desalination : India

ZOOM INDIA

- Chronic water shortages in some areas despite 100cm average rainfall
- Desalination is an alternate source to provide or increase drinking water sources
- World's largest hybrid desalination plant MSF-RO set up in Kalpakkam adjacent to Nuclear Power Plant



4.5 million litres per day

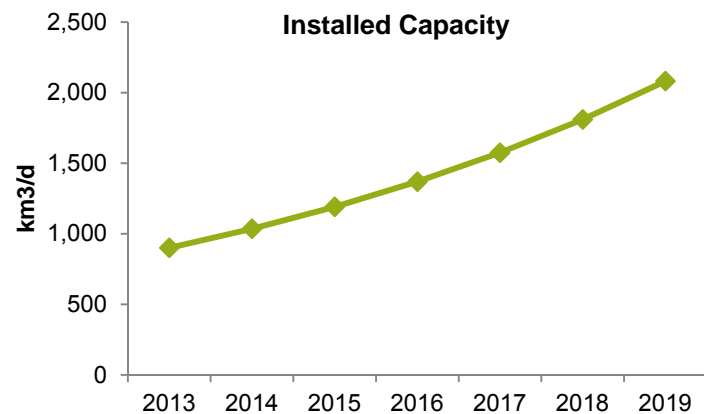




Opportunity - Zoom desalination : China

ZOOM CHINA

- Capacity installed to be doubled by 2019 with 35% using thermal technologies



Opportunity - Zoom desalination : Middle East



ZOOM MIDDLE EAST

New capacity addition 2015-2024 MSF/MED



Qatar
470 800 m³/d



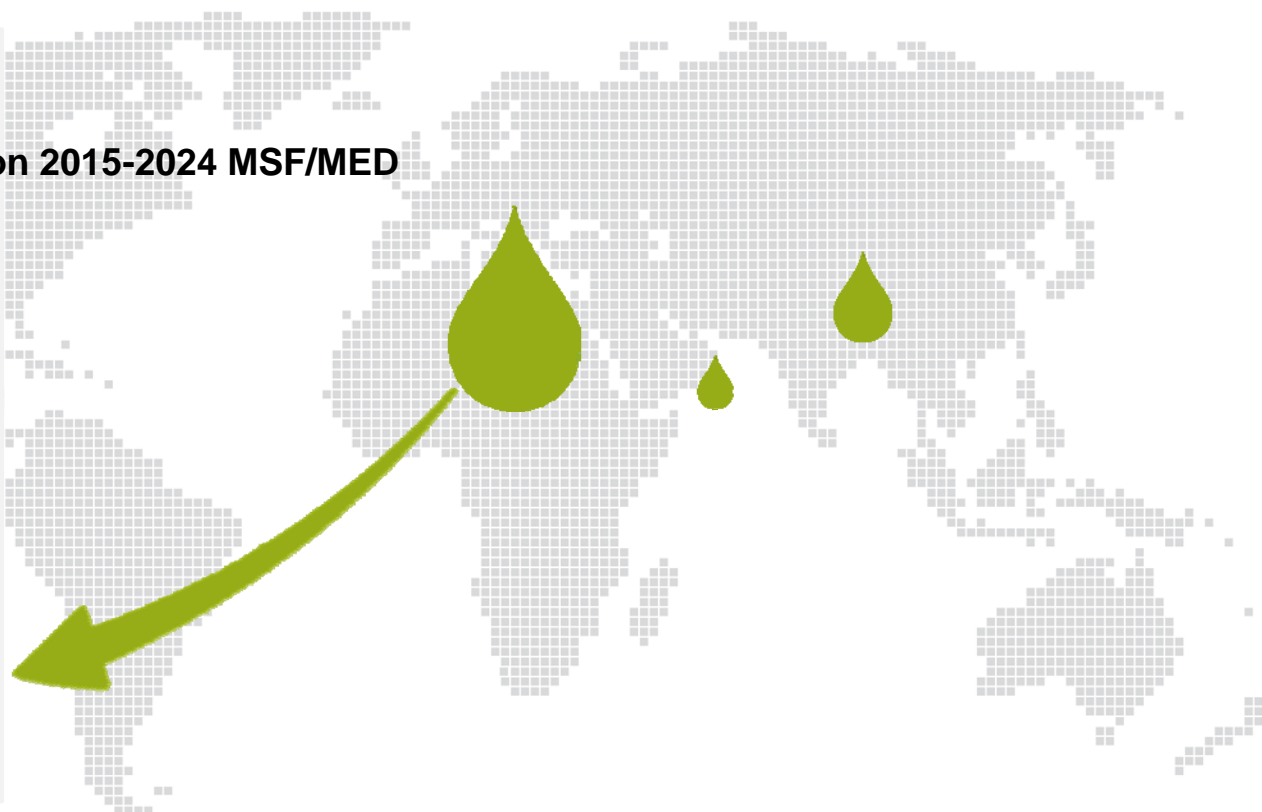
UAE
678 500 m³/d



Kuwait
1 180 900 m³/d



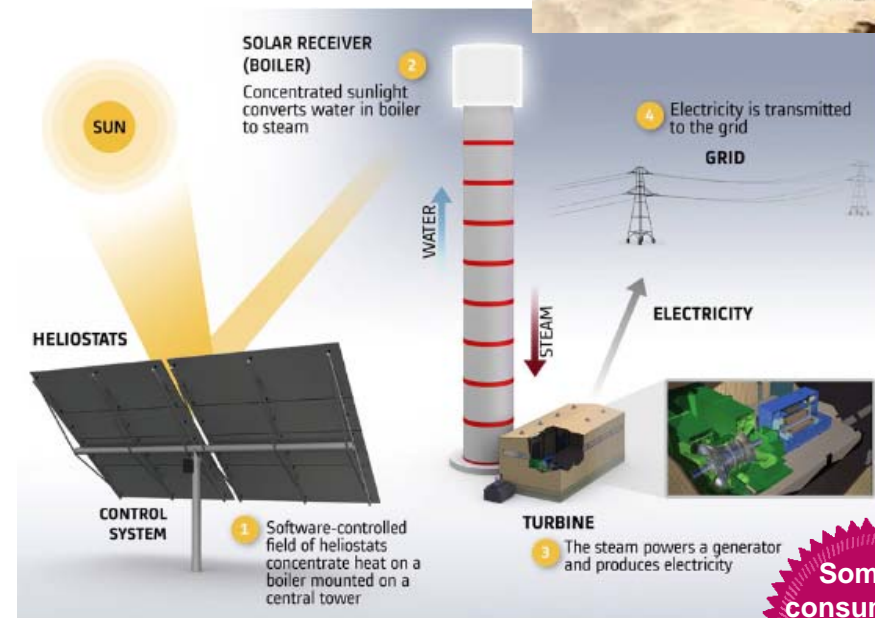
Saudi Arabia
2 993 000 m³/d



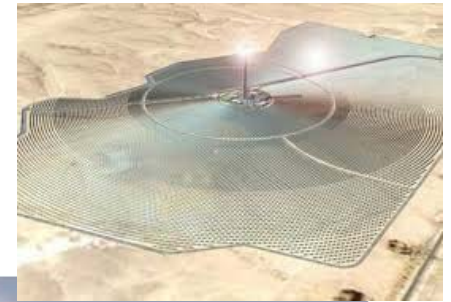
Opportunity - Zoom Power Generation: Renewable

ASHALIM POWER STATION

- Future solar power station to be established in the Negev desert in Israel
- CSP (Concentrating Solar Power) tower technology will be used similar to Inyanpah project in Southern California
- 5th largest in the world: 250 MW of electricity to be produced



Simplified functioning of a Solar Thermal power plant ©Alstom



Some Ti
consumption
related to
renewable
energy

Opportunity - Titanium differentiation

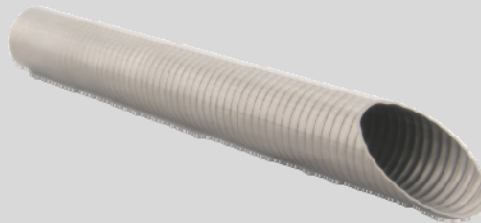
NEW GRADES

- New corrosion resistant titanium alloy



NEW PRODUCTS

- Heat exchange improvement through material deformation
 - Helix tubes
 - Dimpled plates



NEW PROCESSES

- Plates Cladding
 - Save up to 90% of titanium

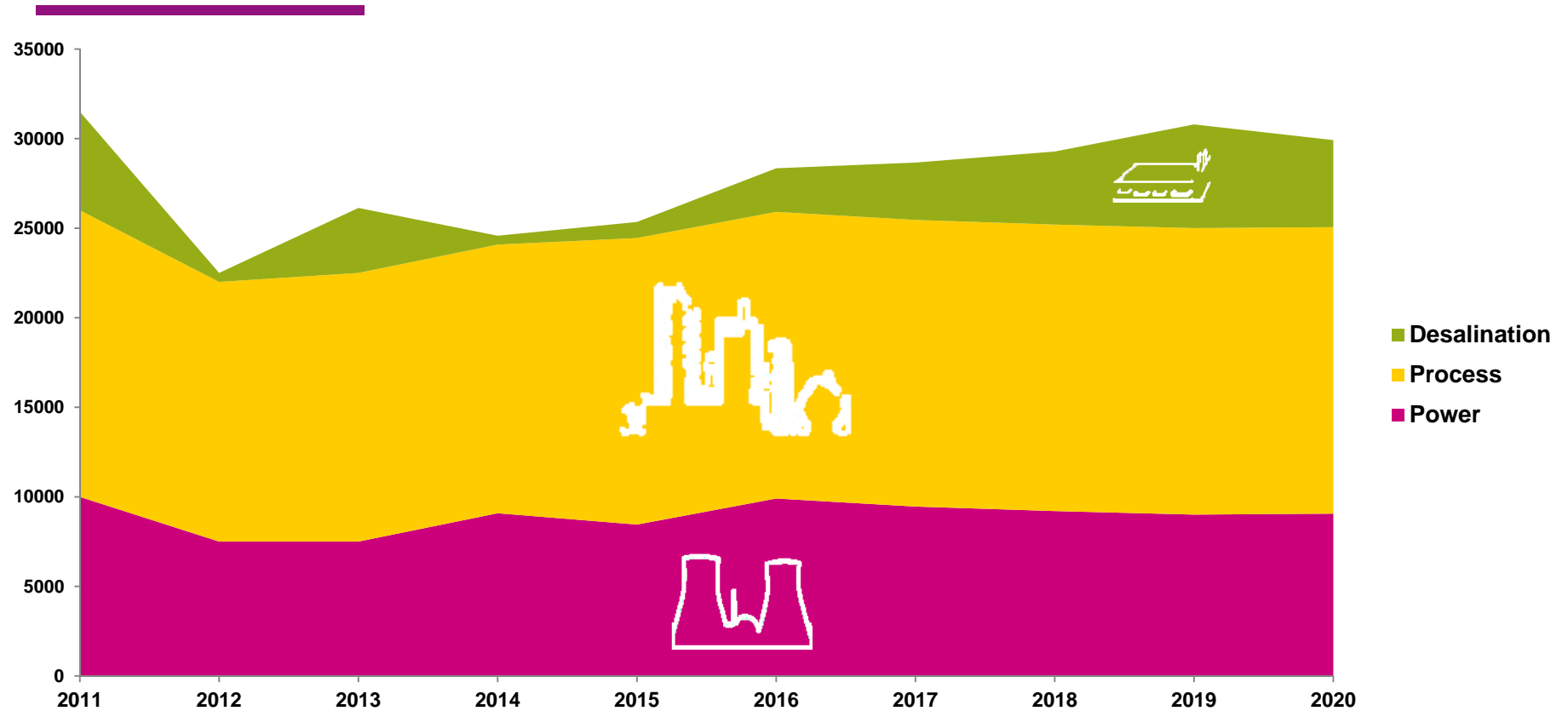




Resulting Demand Forecast



Industrial Titanium Demand till 2020



THANK YOU

