Climate Change
Adaption Response Technologies - Water

GE Power and Water
Water & Process Technologies
July 25, 2012

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VP – Government Affairs & Policy

imagination at work

Becoming the global water leader

Glegg

- ✓ Pure Water Solutions

BetzDearborn

- ✓ Water & Process Specialty Chemicals

Osmonics

- ✓ Equipment & Membranes

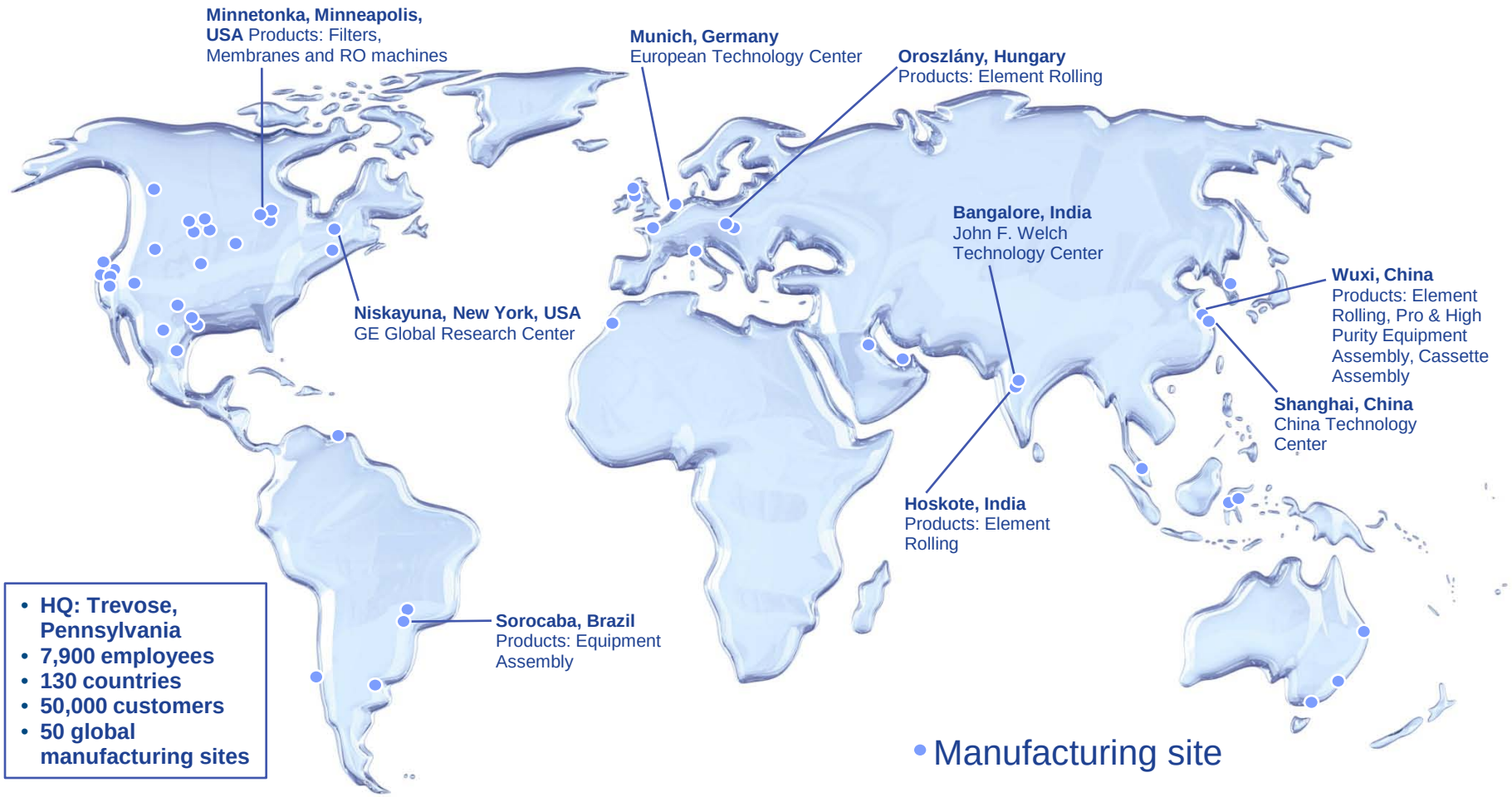
Ionics

- ✓ Desalination & Reuse
- ✓ Mobile Water

ZENON

- ✓ Hollow Fiber Technology
- ✓ MBR Technology

GE Water is a global leader



- **HQ: Trevose, Pennsylvania**
- **7,900 employees**
- **130 countries**
- **50,000 customers**
- **50 global manufacturing sites**

8,000 employees in 130 countries

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Images denote major manufacturing facilities

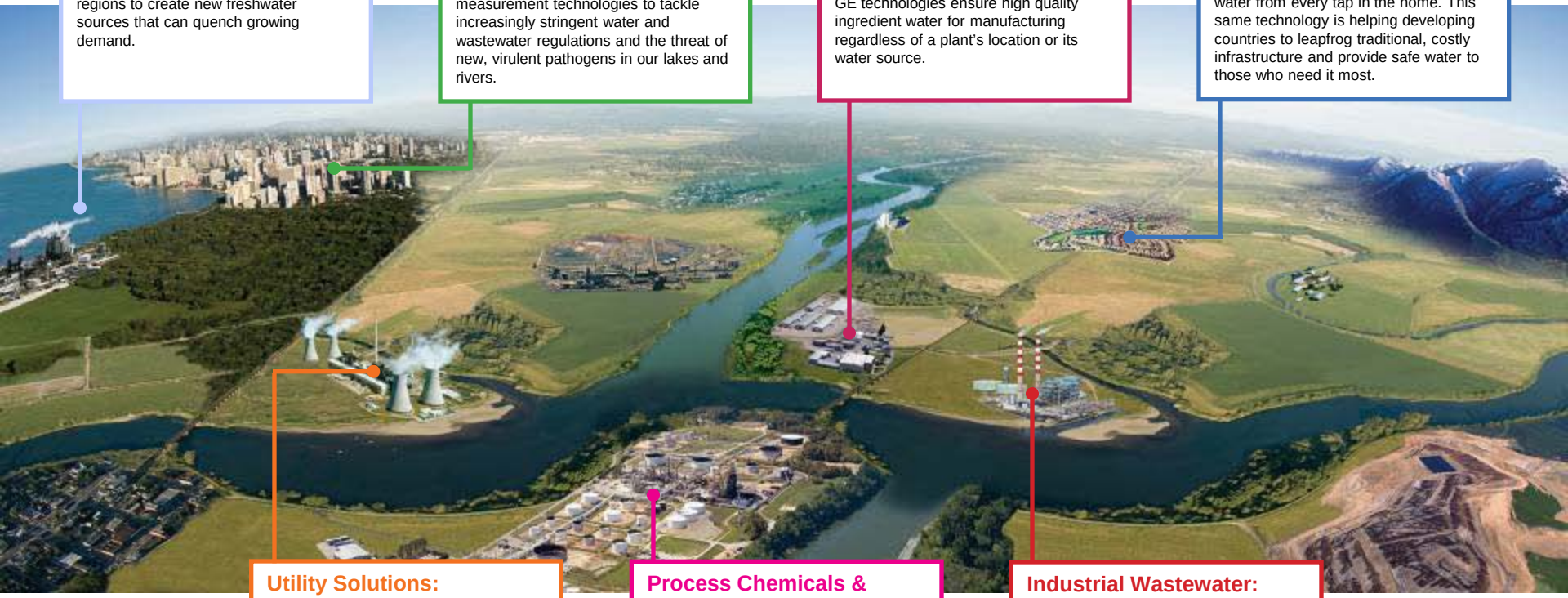
Broad portfolio of solutions

Desalination Solutions:
Drawing on the ocean's virtually limitless water resources, GE's desalination technologies are helping water scarce regions to create new freshwater sources that can quench growing demand.

Municipal Solutions:
Facing unprecedented growth and water demand, cities are turning to GE's advanced membrane and water quality measurement technologies to tackle increasingly stringent water and wastewater regulations and the threat of new, virulent pathogens in our lakes and rivers.

Product Water:
Consumers use the products they trust – whether it is pharmaceuticals, food, or beverages. As brands expand globally, GE technologies ensure high quality ingredient water for manufacturing regardless of a plant's location or its water source.

Residential Products:
GE point-of-use and point-of-entry filtration systems are enabling homeowners to produce higher quality water from every tap in the home. This same technology is helping developing countries to leapfrog traditional, costly infrastructure and provide safe water to those who need it most.

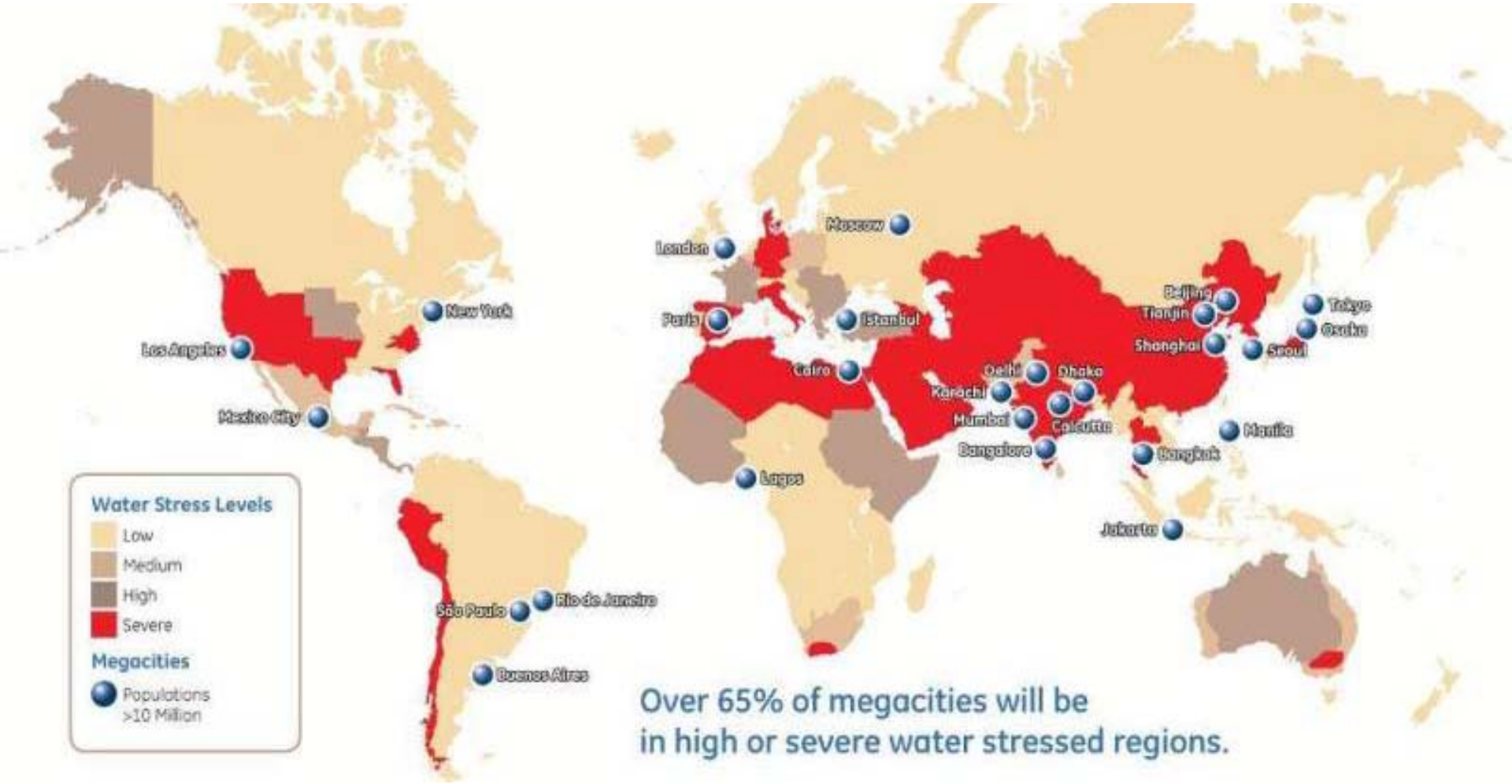


Utility Solutions:
GE is optimizing system efficiency & increasing uptime in cooling towers and boilers by reducing energy usage and greenhouse gas emissions. Advanced monitoring systems reduce the risk of pathogen growth, such as Legionella, in cooling systems.

Process Chemicals & Separations:
Silently working in pipes, tanks and process fluids, GE's advanced chemicals protect valuable production assets from corrosion and fouling faced in day-to-day operations, while improving overall manufacturing efficiency and quality.

Industrial Wastewater:
Once considered a by-product, GE's water reuse technology is transforming industrial wastewater into a sustainable, new water source that can often be used many times over—dramatically reducing the strain on our precious water resources.

Scarcity driving reuse and desalination



Scarcity driving reuse

IPER
Integrated Pump and Energy Recovery

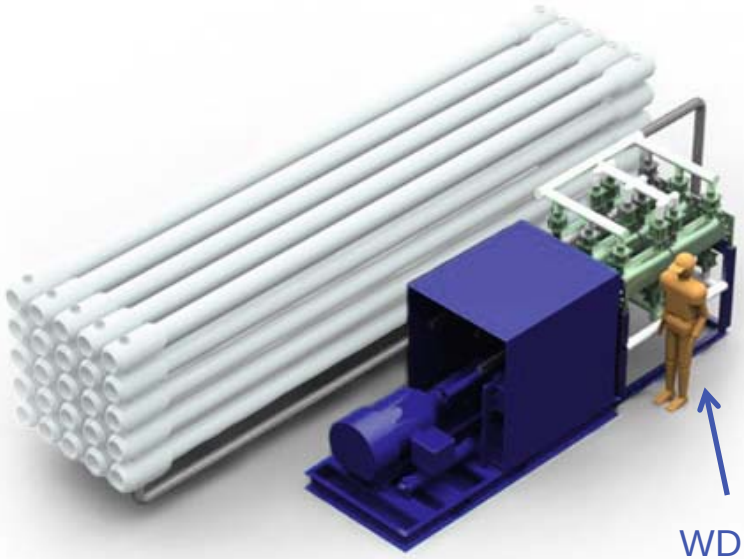
Positive Displacement Pump for Desal Applications

IPER

Uses 10% less energy than best available technology

Significantly lowers the cost of desalinating water

Acquired from Vari-RO in 2011



Best available Technology

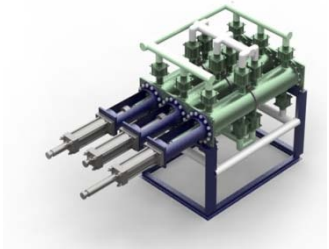
Pump & motor

ERD & booster pump

~ 2.2 kWh/m^3

@ 79 m3/h, 51 bar boost

IPER



Integral Pump & ERD

~ 2.0 kWh/m^3

@ 79 m3/h, 51 bar boost

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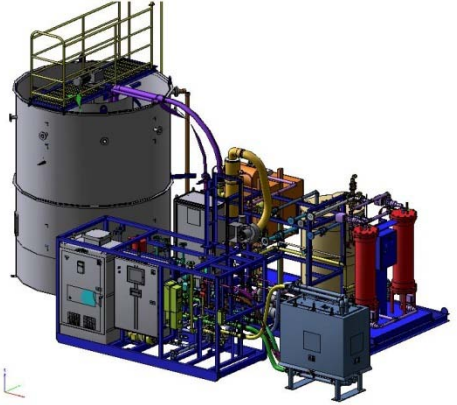
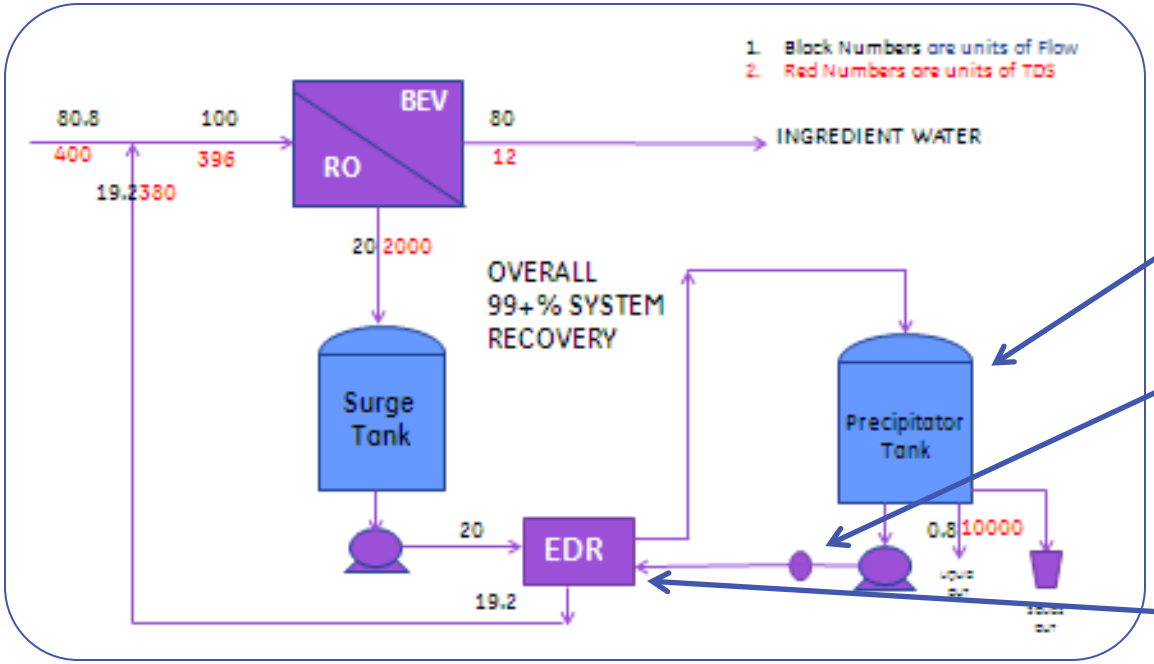
AquaSel



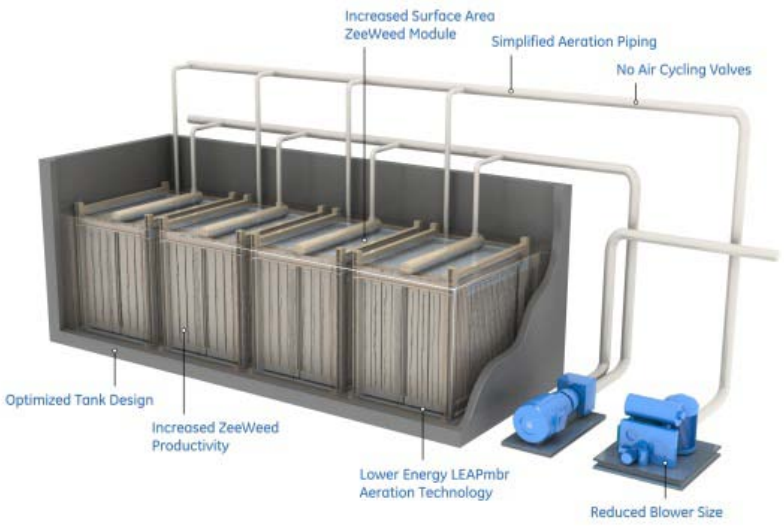
Non-Thermal Brine Concentrator for high water recovery

Environmentally friendly process that minimizes waste chemical and energy consumption, helping meet sustainability goals.



Advanced reuse using 30% less energy

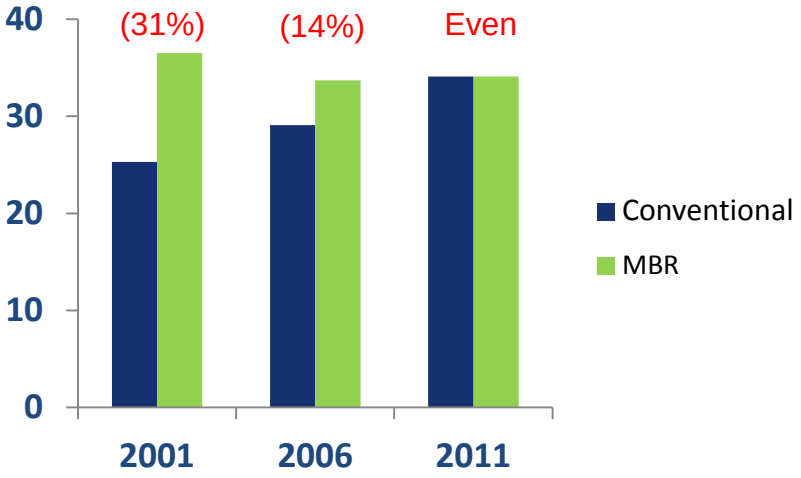
LEAPmbr
simple • reliable • efficient



- 30% Energy Savings
- 15% Increased Productivity
- 20% Smaller Footprint
- 50% Simplified Design

$9.5B

20 year lifecycle cost ($M)



Aspirational goal…
Net positive energy MBR

Today… wastewater as a burden to treat & discharge

Wastewater →

Energy →

- Biosolids to landfill
- Micropollutants to environment
- Waste water discharge to sensitive areas
- Green House gas emissions
- Huge energy drain

Future… 'opportunity water' treated to recover valuable resources

Wastewater →

Organic waste →

- Water for irrigation and reuse, limited solids disposal
- Energy back to grid
- Recovery of nutrients (N, P)
- Elimination of public health concerns

Shift from wastewater treatment to resource recovery

End

GE thought leadership on reuse

WaterReuse Association

World Water Week in Stockholm, September 5–11, 2010

NUS National University of Singapore

ConocoPhillips

OECD

World Resources Institute

Water Environment Federation the water quality people®

World Business Council for Sustainable Development

U.S. Trade and Development Agency

Alberta Water Research Institute

- **Global White Paper promoting greater reuse**
- **"A menu for policy makers"**
- **Downloaded >40,000 times**

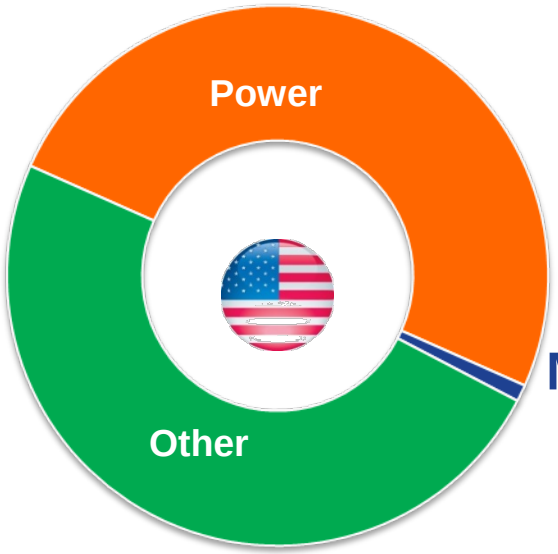
2011 Saudi Reuse Summit

Frac gas and oil development

Minimal increase to mining sector's water withdrawals

Total water withdrawals, 2005
Billion barrels per year (BB/yr)

3,563 BB/yr

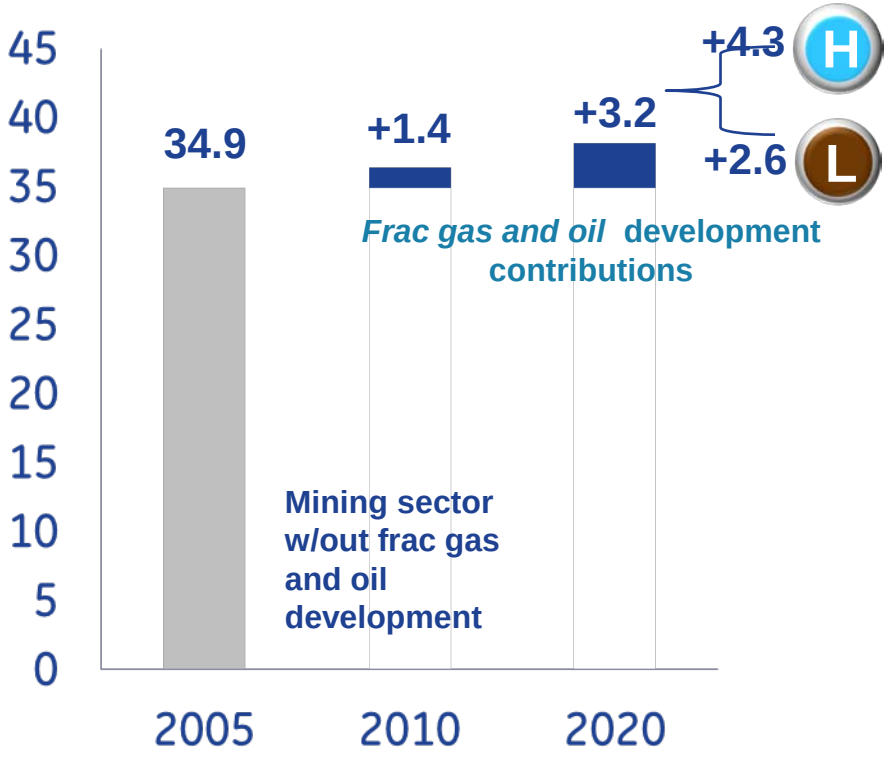


Mining*
1%

Source: USGS, 2005 data

* *Fracking fuels* water withdrawals fall into the mining sector

US Frac fuels injected water projections
Billion barrels per year (BB/yr)



Source: USGS 2005; GE Energy, GSP estimates 2012

imagination at work

GE solutions for frack water issues

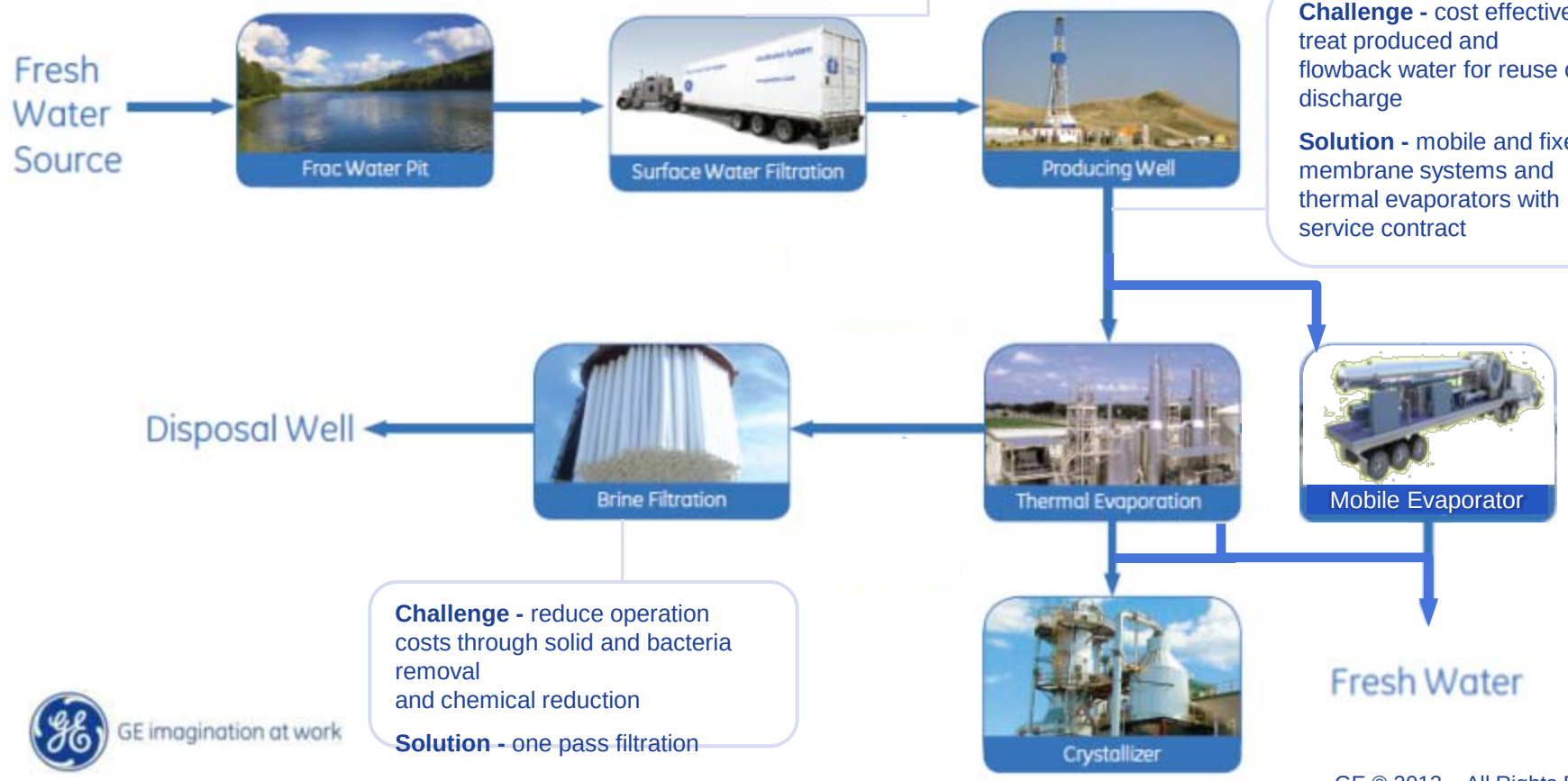
- Source water filtration to reduce chemical pretreatment
- Water reuse/recycling
- On-site mobile evaporators
- Fixed evaporation & crystallizers

Challenge - filter hydraulic fracturing source water to reduce chemical treatment and cost and meet environmental regulations

Solution - mobile ultra-filtration systems

Challenge - cost effectively treat produced and flowback water for reuse or discharge

Solution - mobile and fixed membrane systems and thermal evaporators with service contract



Challenge - reduce operation costs through solid and bacteria removal
and chemical reduction

Solution - one pass filtration

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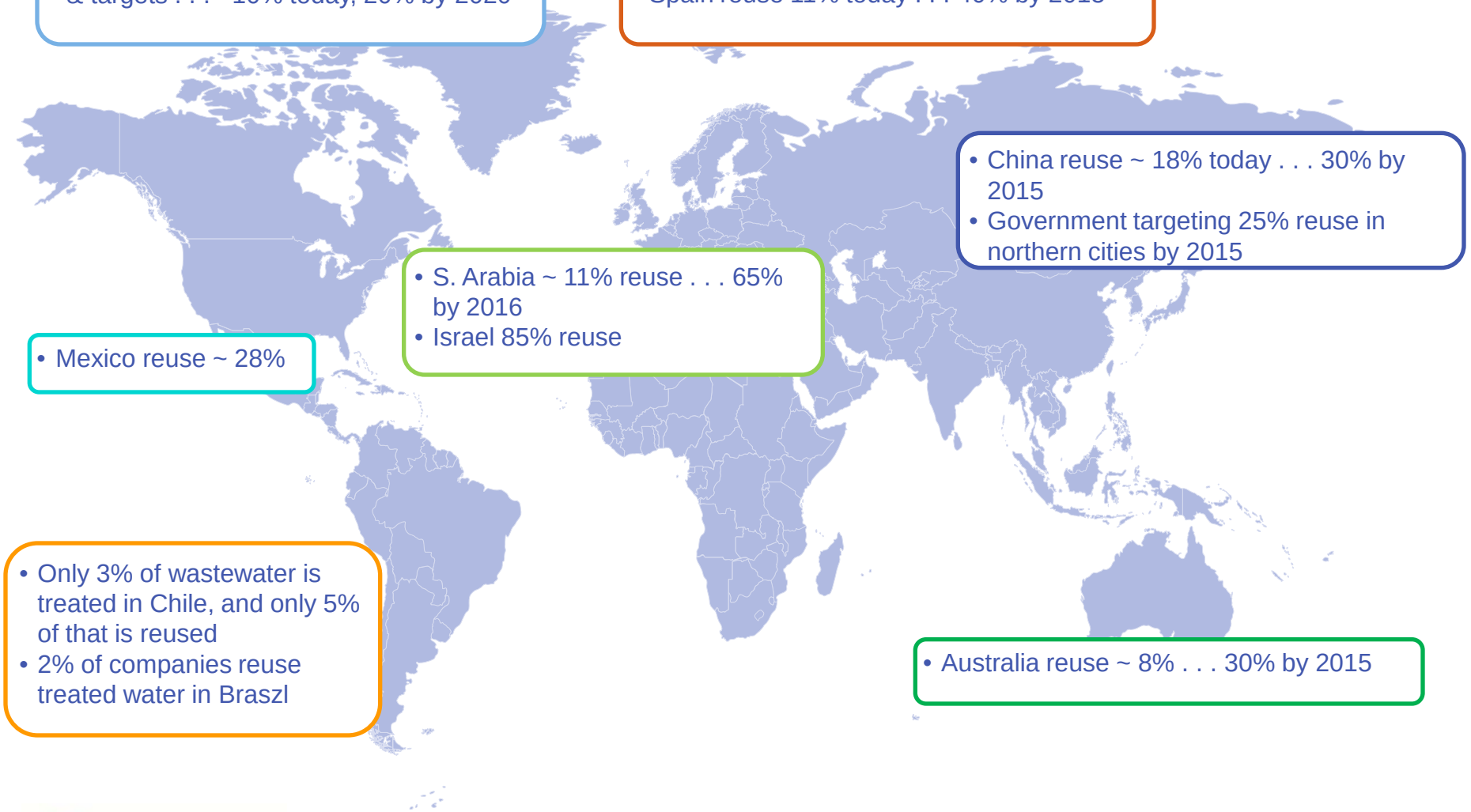
Global water reuse developments

- USA reuse ~ 8%
- No fed policy, but Calif setting standards & targets . . . ~10% today, 20% by 2020

- Europe reuse ~ 3%
- Spain reuse 11% today . . . 40% by 2015



- China reuse ~ 18% today . . . 30% by 2015
- Government targeting 25% reuse in northern cities by 2015

- S. Arabia ~ 11% reuse . . . 65% by 2016
- Israel 85% reuse

- Mexico reuse ~ 28%

- Only 3% of wastewater is treated in Chile, and only 5% of that is reused
- 2% of companies reuse treated water in Braszl

- Australia reuse ~ 8% . . . 30% by 2015