



Green Chemistry & Commerce Council

Moving Business Toward Safer Alternatives

GC3 Webinar Series



October 8, 2013

Accelerating Commercialization of Green Chemistry Technologies at GreenCentre Canada



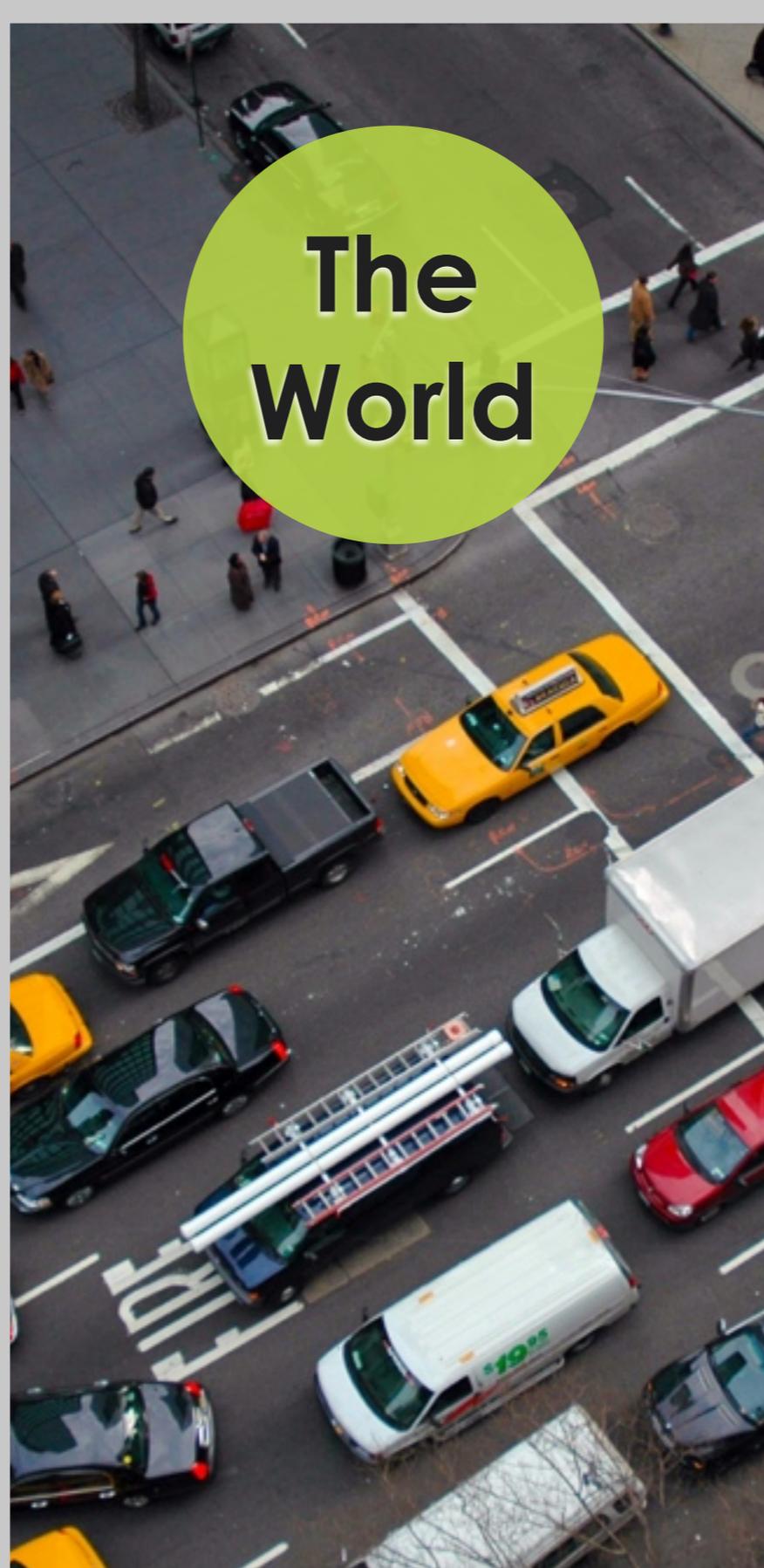
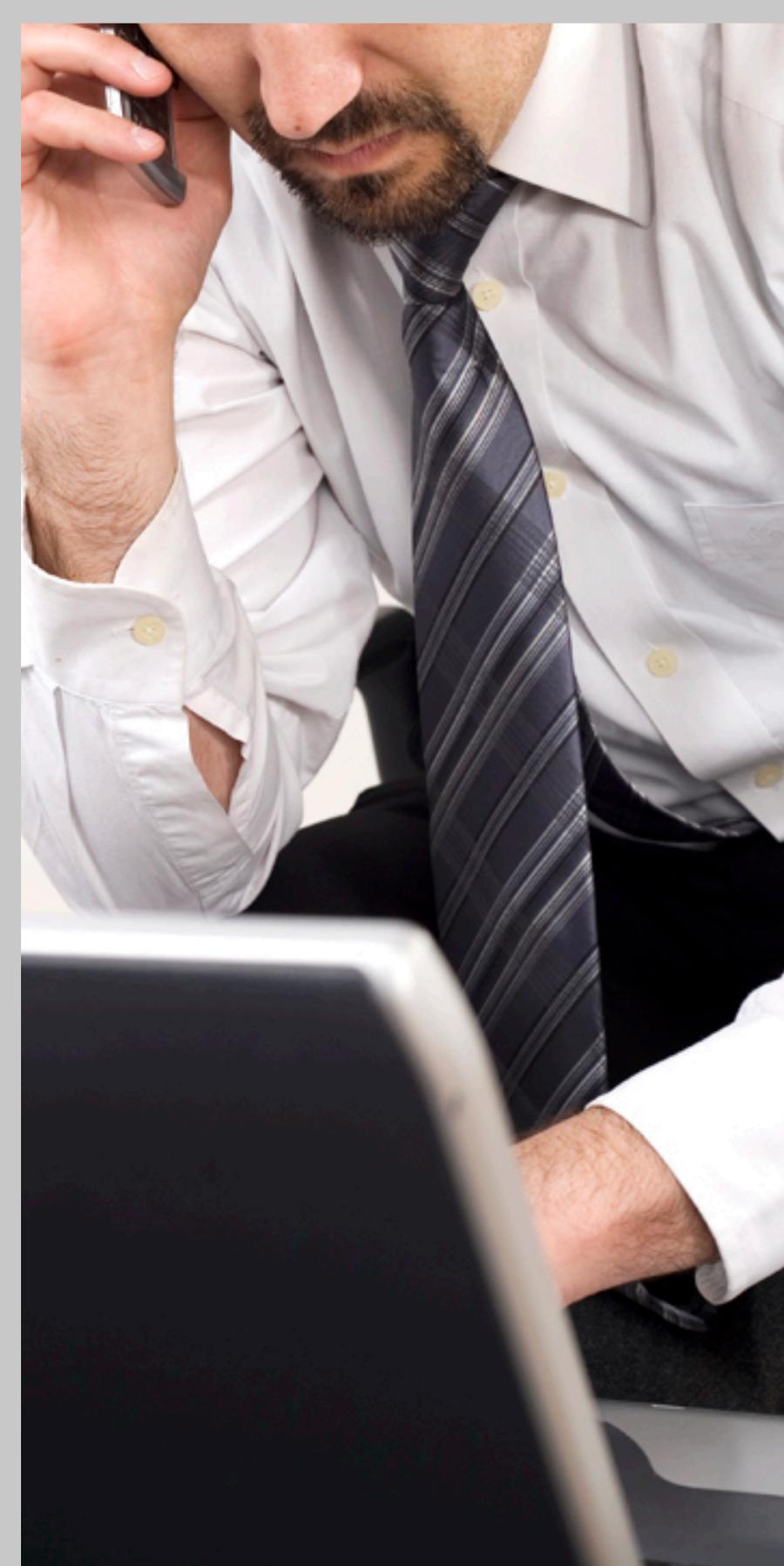
Rui Resendes, Executive Director, GreenCentre Canada

Webinar Discussion Instructions



- Due to the number of participants on the Webinar, all lines will be muted.
- If you wish to ask a question, please type your question in the Q&A box located in the drop down control panel at the top of the screen
- All questions will be answered at the end of the presentation.

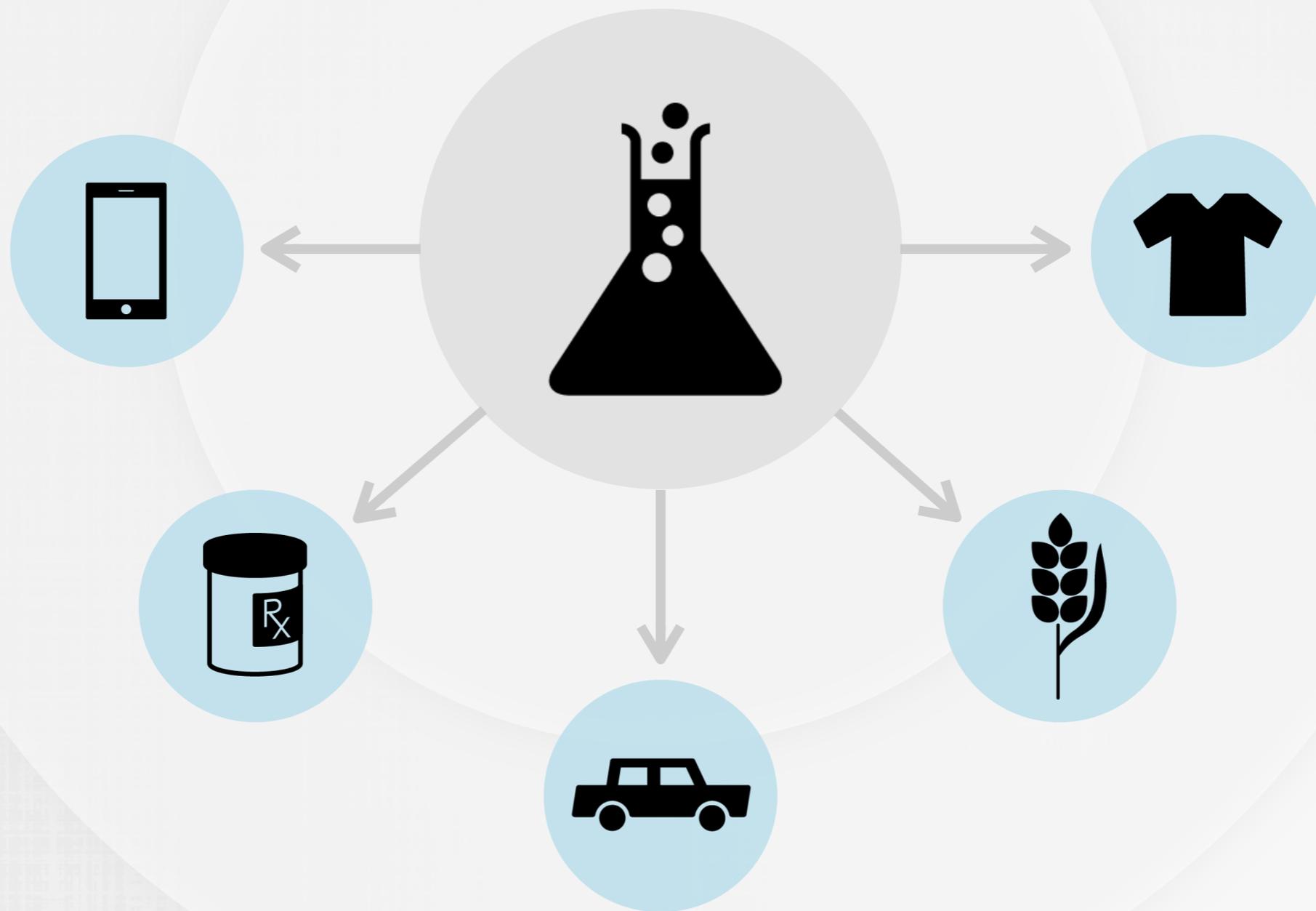






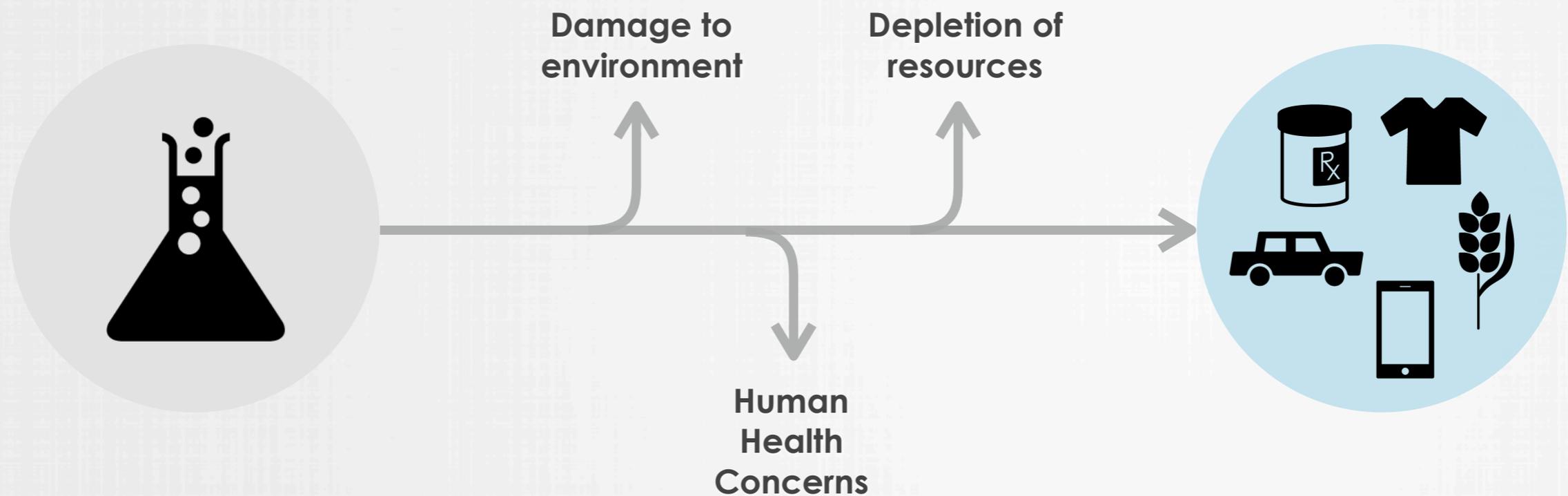
Chemistry is at the heart of everything we do
It underpins our quality of life

Our daily routines and the products we use are all made possible by the chemical industry



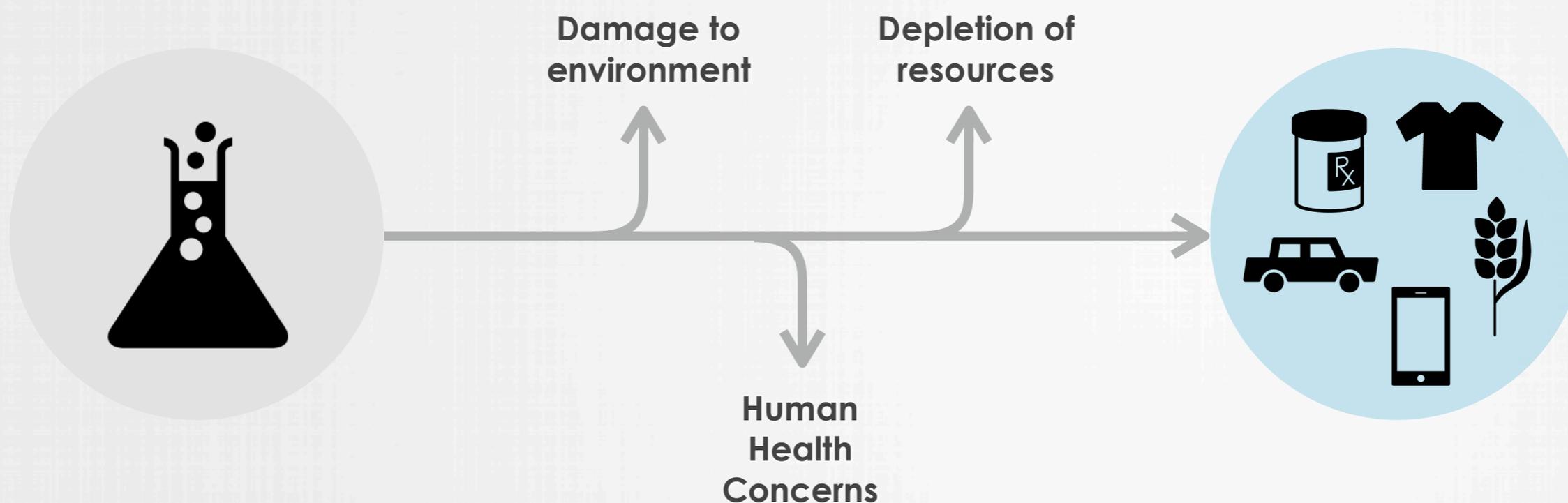
DILEMMA:

The chemical industry presents us with our most profound sustainability challenges



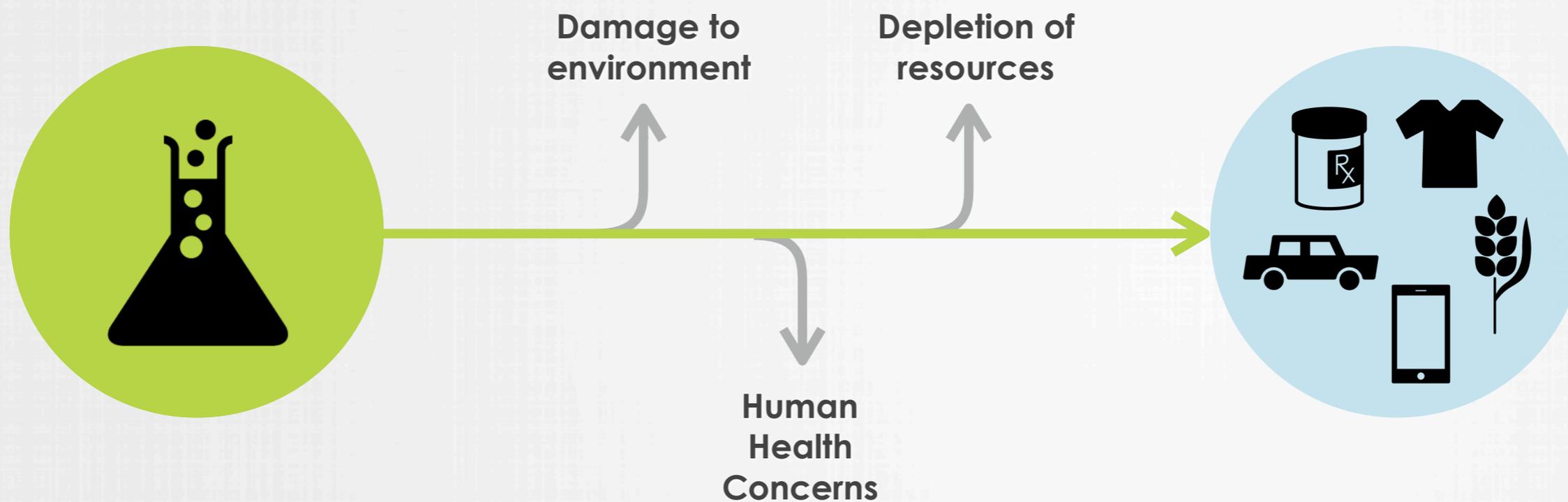
DILEMMA:

How can we continue to enjoy our quality of life without damaging the environment?

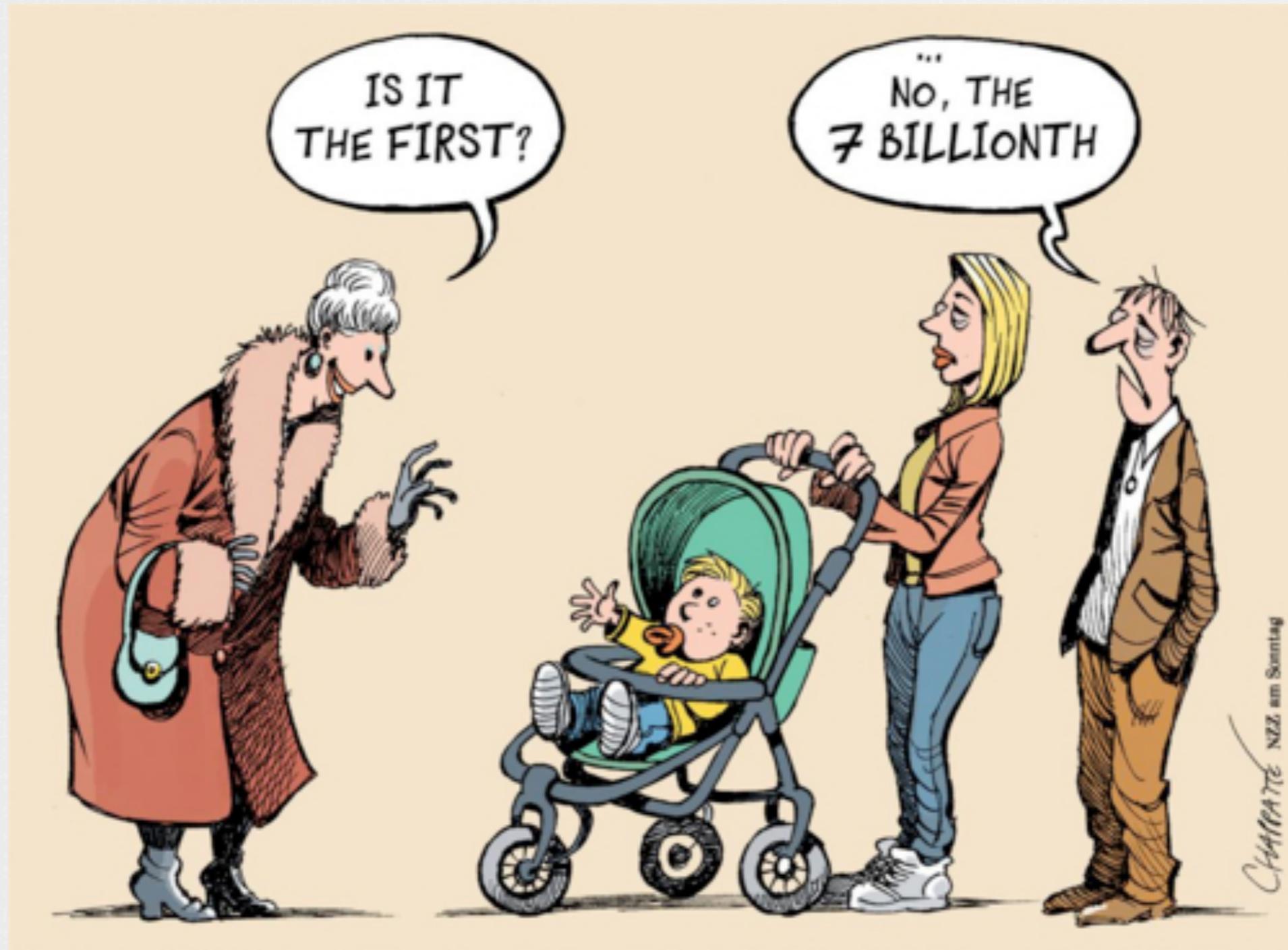


SOLUTION:

Green Chemistry



Green Chemistry - Its Not A Choice



The GreenCentre Team



Rui Resendes
Executive Director



Andrew Pasternak
Commercial Director



Philip Jessop
Technical Director



Adam Ozvald
Scientist



Vanessa Little
Patent Specialist



Howie Honeyman
CTO



Michael Szarka
Commercial Director



Julie McLachlan
Laboratory Director



Tim Clark
Sr. Scientist



Lyndsey Darling
Communications



Stephanie White
CIPO



Rina Carlini
Commercial Director



Robert Dumont
Laboratory Tech.



Karinna Yu
Scientist



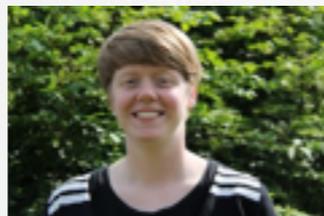
Lynda Reid
Administration



Paul Vickers
CFO



Brian Mariampillai
Analyst



Amy Holland
Scientist



Dominik Wechsler
Sr. Scientist



Marilyn McDonald
Controller



Leah McGinnis
EA & HR



Cher Powers
Operations Mgr.



Yun Yang
Scientist



Paul Thorton
Sr. Scientist



Huamei Zhou
Financial Analyst

The GreenCentre Mission

- Our mission is: **Changing Chemistry, Changing The World**
- Specifically, we identify, develop and deploy “game-changing” Green Chemistry innovations to advance the human condition
- By *human condition* we are referring to:
 - human health
 - environmental sustainability
 - economic prosperity



In-house
laboratories and
technical team



10,000
sq ft.
facility



State of
the art
equipment

Commercialization Services



**Technology
Assessment**



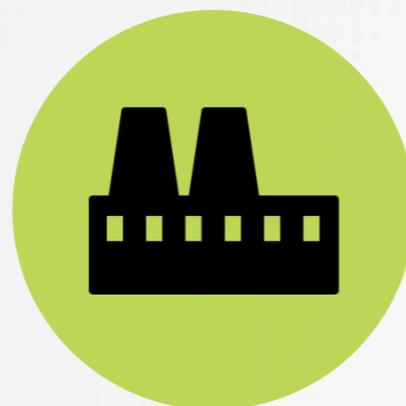
**Product & Application
Development**



IP Management



**Business
Development**



**Scale-up
Manufacturing**



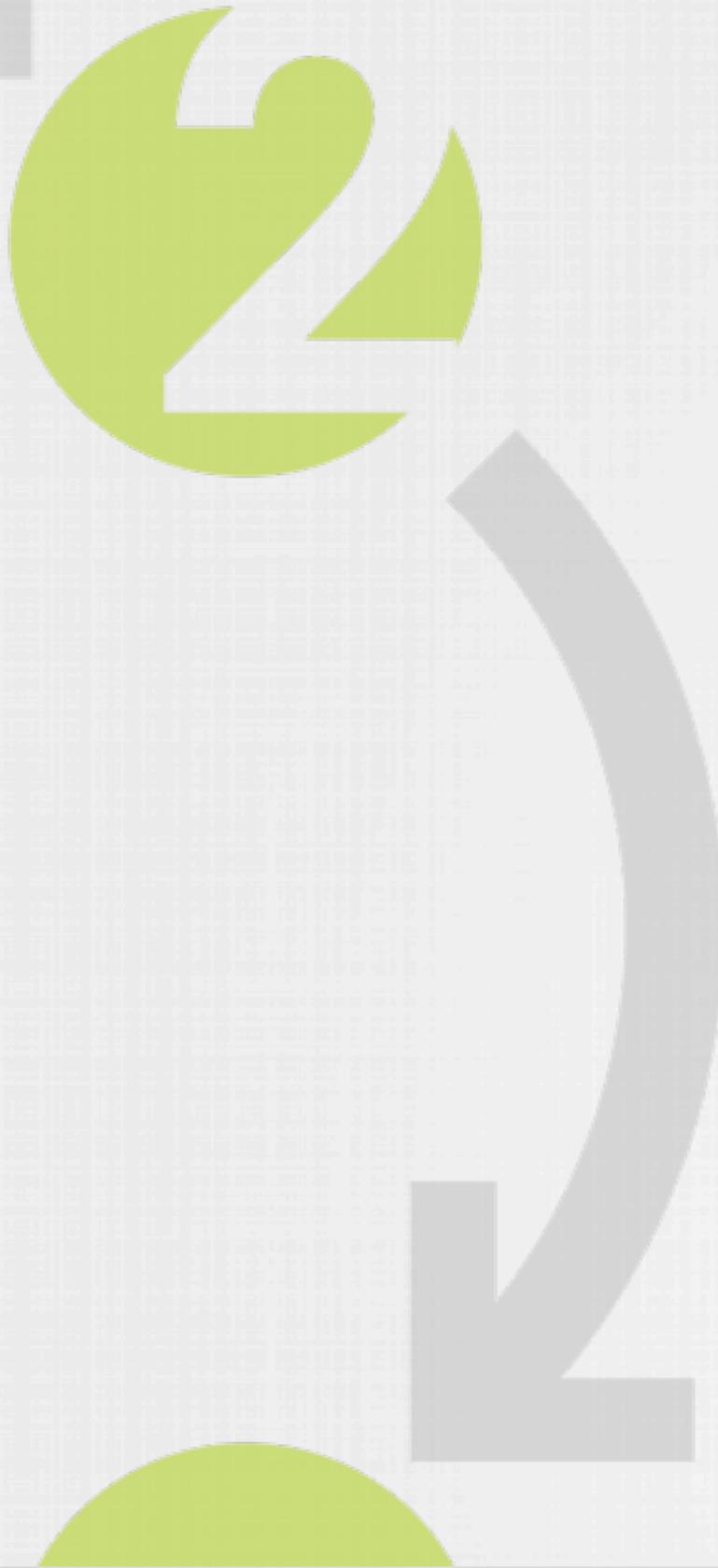
**Licensing &
NewCo creation**

DISCLOSURE

We accept early-stage technology disclosures from academic institutions and entrepreneurs

For academics, our principle point of contact is the technology transfer/industry liaison officer

GreenCentre will execute all necessary confidentiality agreements and ensure that project submissions are kept confidential



ANALYSIS

Under a 90-day exclusive option, we conduct a thorough technological assessment

GreenCentre's industry partners provide input

Analysis is shared with the institution

Possible outcomes: return, proof-of-principle funding or in-licensing



LICENSING

We will sign an exclusive license with the institution

There are no upfront costs; we cover all development and IP costs going forward

We return a large portion of all net licensing proceeds to the institution/inventors

Institution/inventors share in all licensing returns

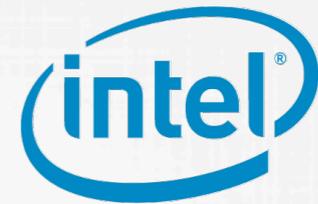
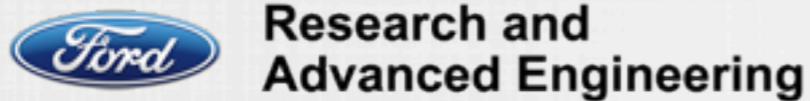
DEVELOPMENT

GreenCentre makes the investments needed to close the market gap:

- Process optimization
- Field-test proof of utility
- Scale-up of product candidates
- Application development
- Pre-commercial sales

GreenCentre will license the technology or create start-ups and start sending licensing revenue back to the inventors

Hands-On Industrial Sponsors



An International Technology Pipeline



Global Industry Network



Enabling the Future of Sustainability



Highlights To Date

- In less than 5 years we have assembled a world-class team, built a state-of-the-art facility, developed international networks and have become a globally recognized leader in Green Chemistry commercialization
- We have executed 6 out-licenses, created 3 companies and 80 direct jobs in Canada and have leveraged public investment dollar-for-dollar
- Our ability to reduce technological and commercial risk has re-kindled interest in Clean-tech investment

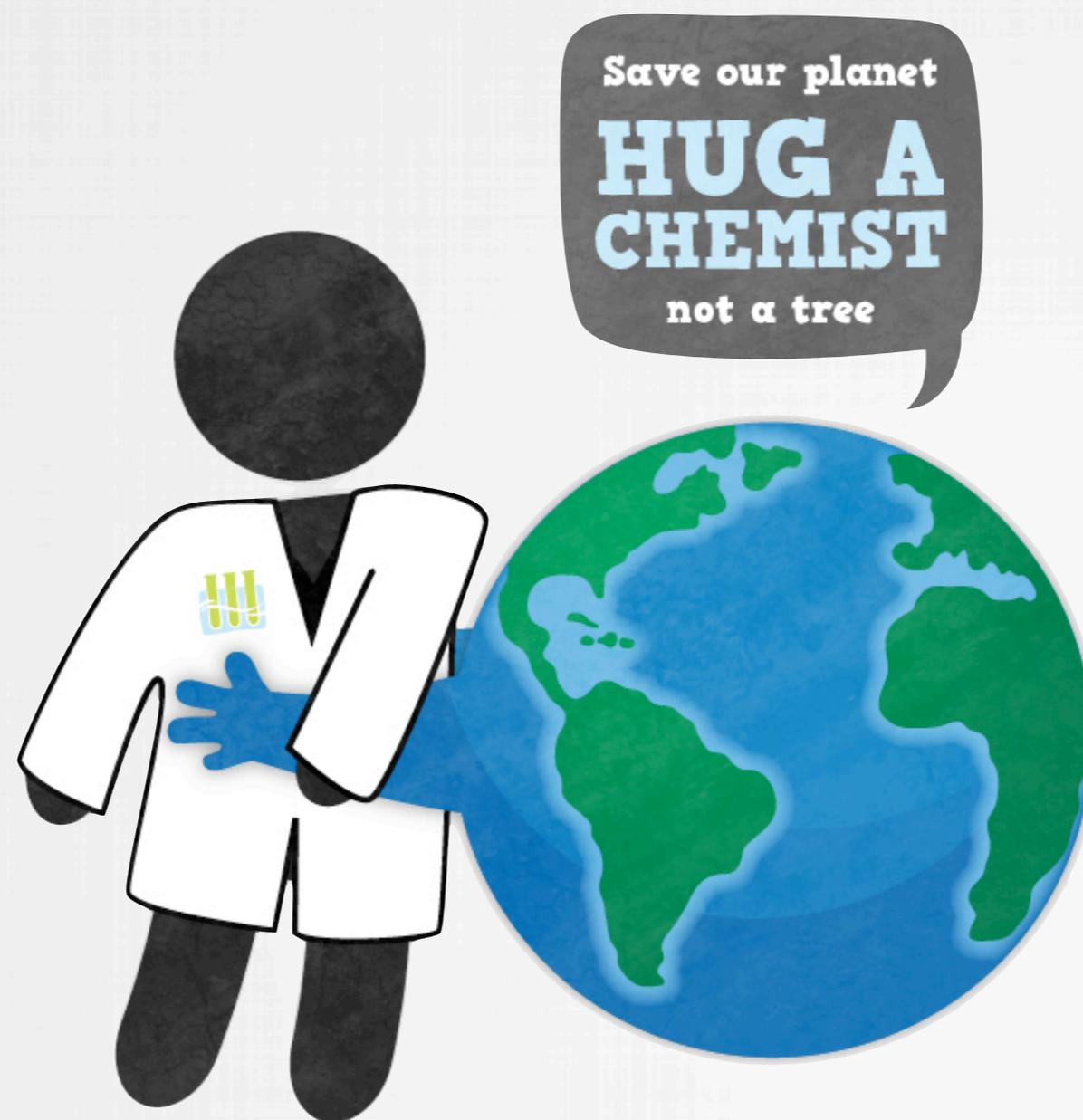
GreenCentre Canada

Communications and Marketing

- Goal is to create an ecosystem where *all* participants in commercialization process understand each other, the value of Green Chemistry and how to work together
- Building strong stakeholder relationships requires effective communication
- Communication strategy also seeks to:
 - improve public understanding and perception of Green Chemistry; and
 - improve resource allocation and policy frameworks to advance Green Chemistry.

Hug A Chemist

Green Chemistry Awareness Campaign

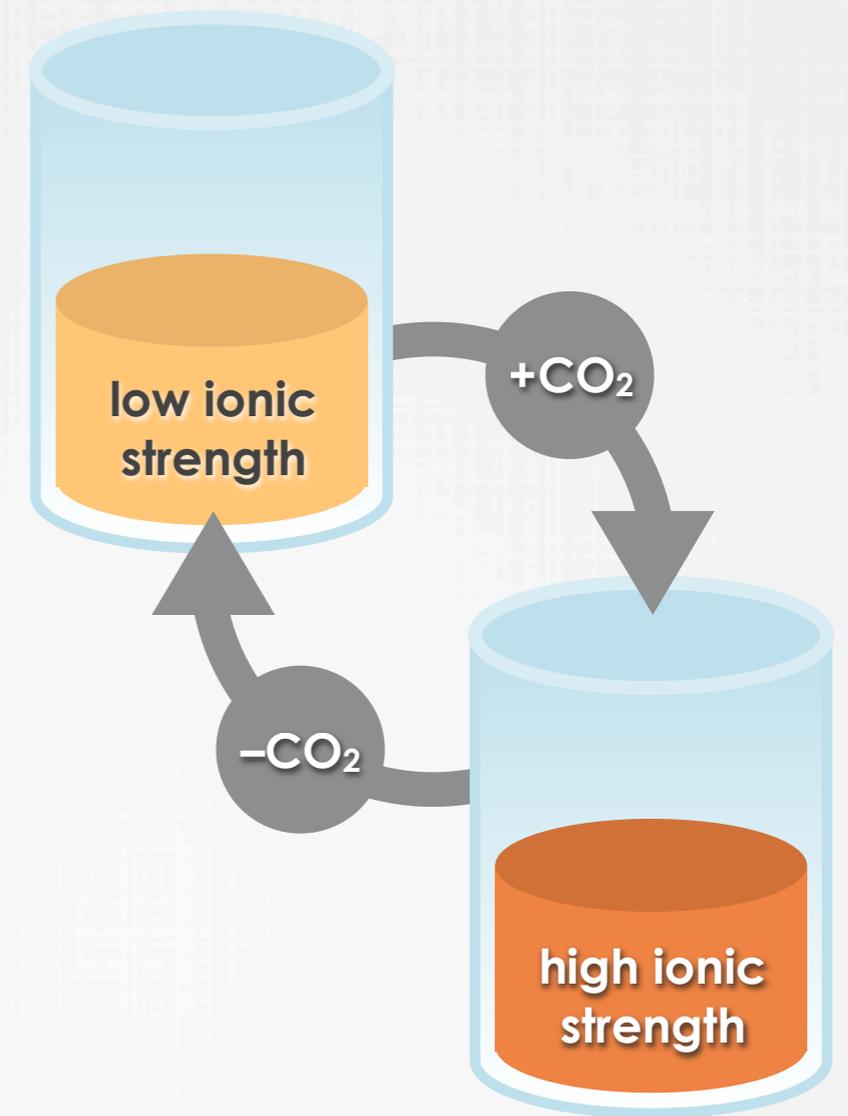


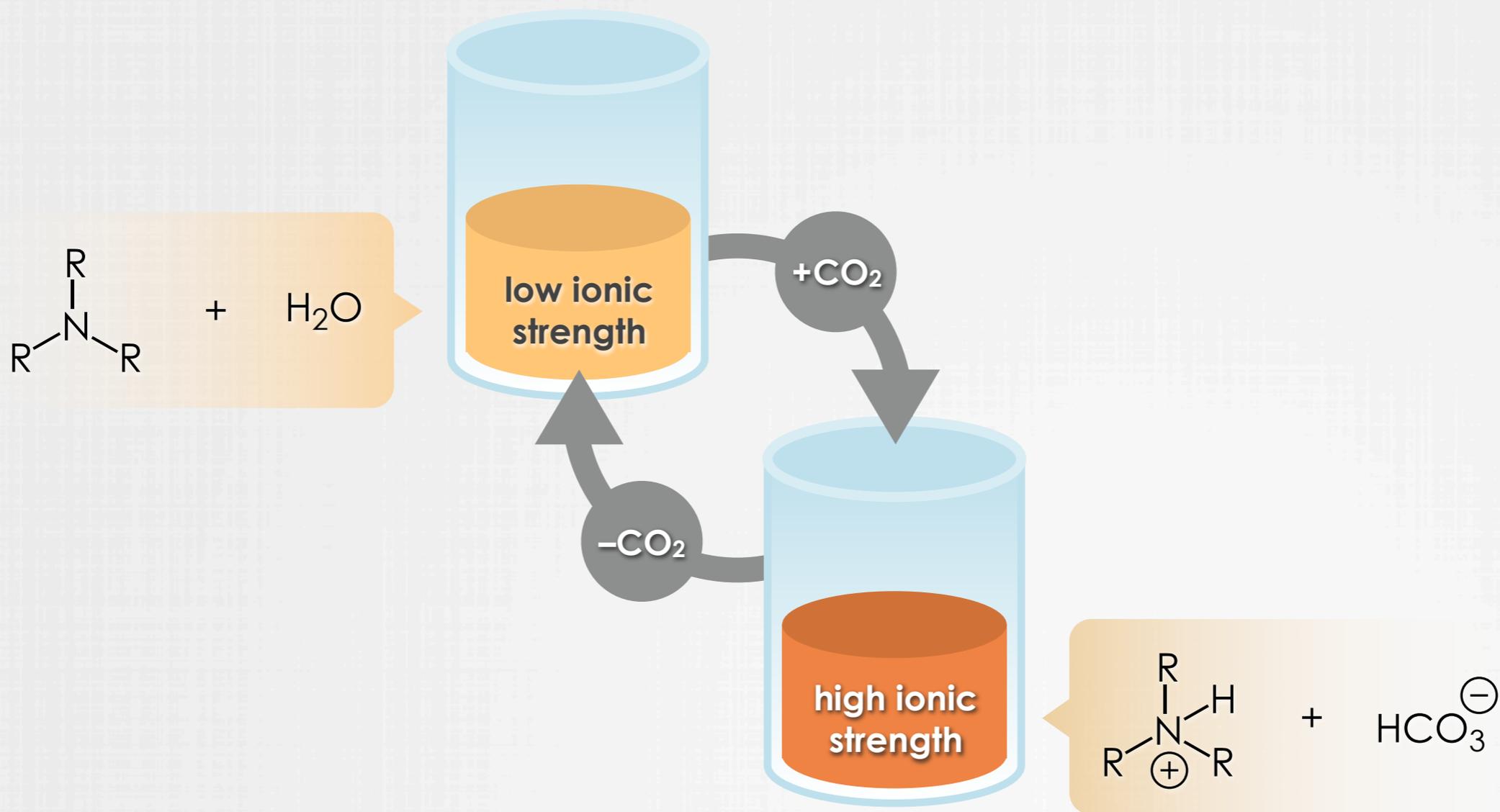


Switchable Water

Switchable Water (SW)

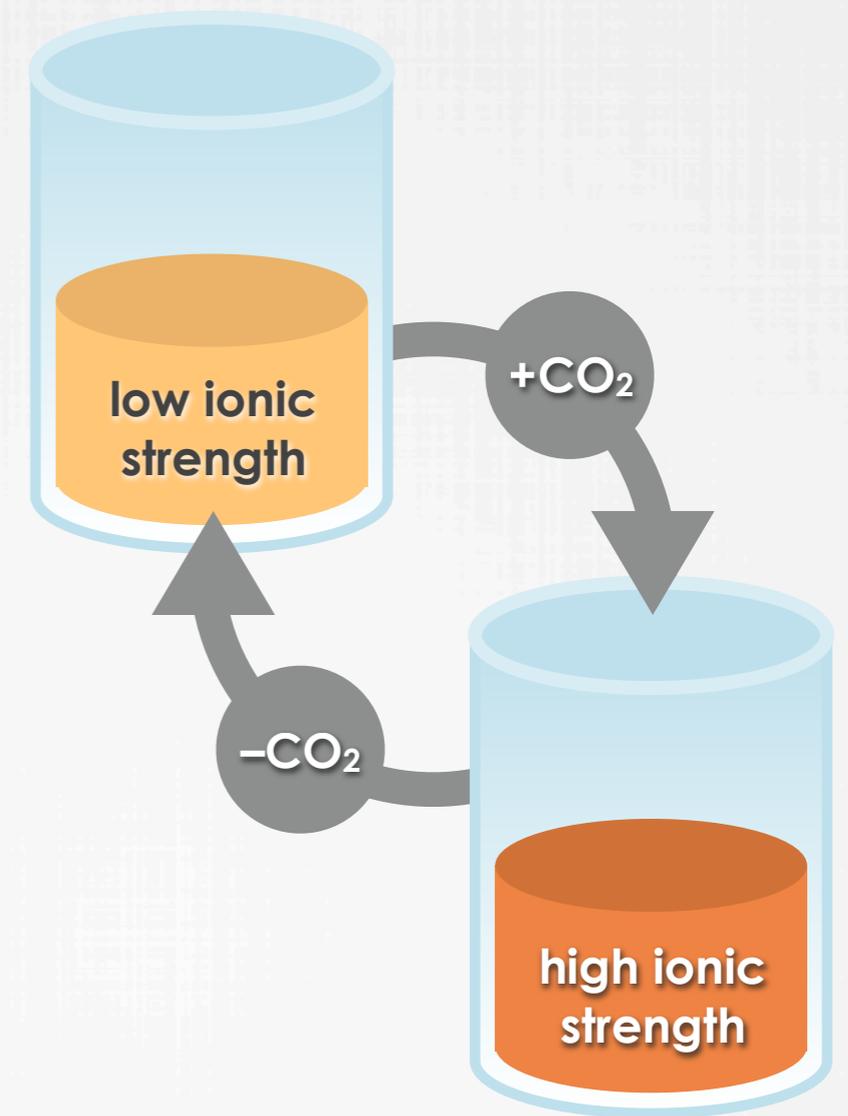
- CO₂-switchable water-soluble additive proving a reversible change in ionic strength of water
- Part of **GreenCentre**'s Jessop portfolio
- Addition of CO₂ converts additive to a salt, increasing ionic strength
- Removal of CO₂ (by bubbling air), reverts the additive to its non-ionic state





Switchable Water (SW)

- Potential Application Targets:
 - Desalination (osmosis)
 - Separating water-soluble organics
 - Switchable polyacrylamide surrogate:
 - increase water viscosity
 - flocculation
 - Biphasic catalyst recovery
 - Low foaming surfactants/emulsifier additive/emulsion breaker





Sustainable Clean Water

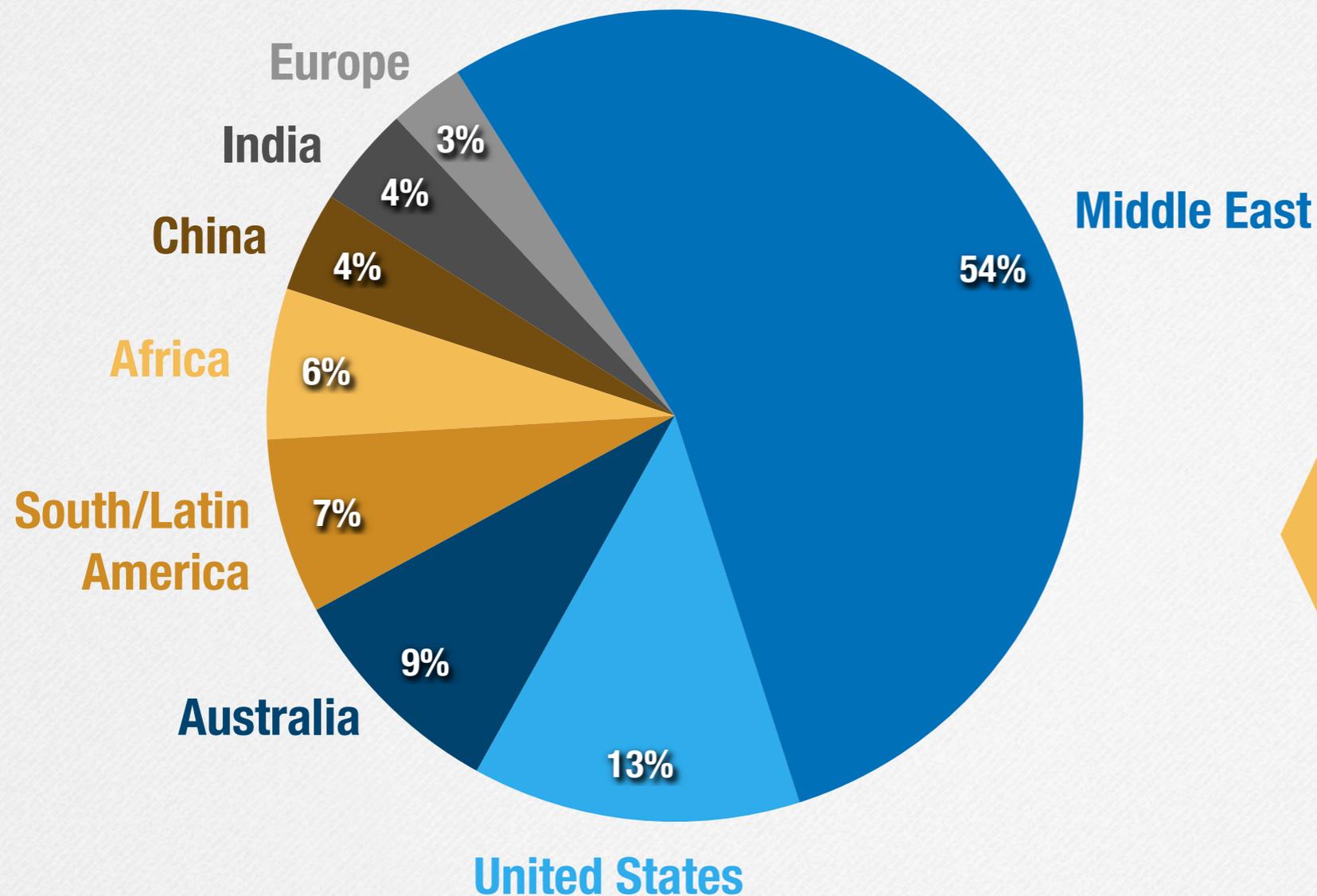


One of the greatest challenges facing humanity is abundant access to clean water for human consumption, agriculture and industry.

Innovative technologies are needed to address this challenge of the 21st century.

Forward Water Technologies aims to revolutionize the production of fresh water by tapping into an abundant source of water, our oceans.

Desalination Market



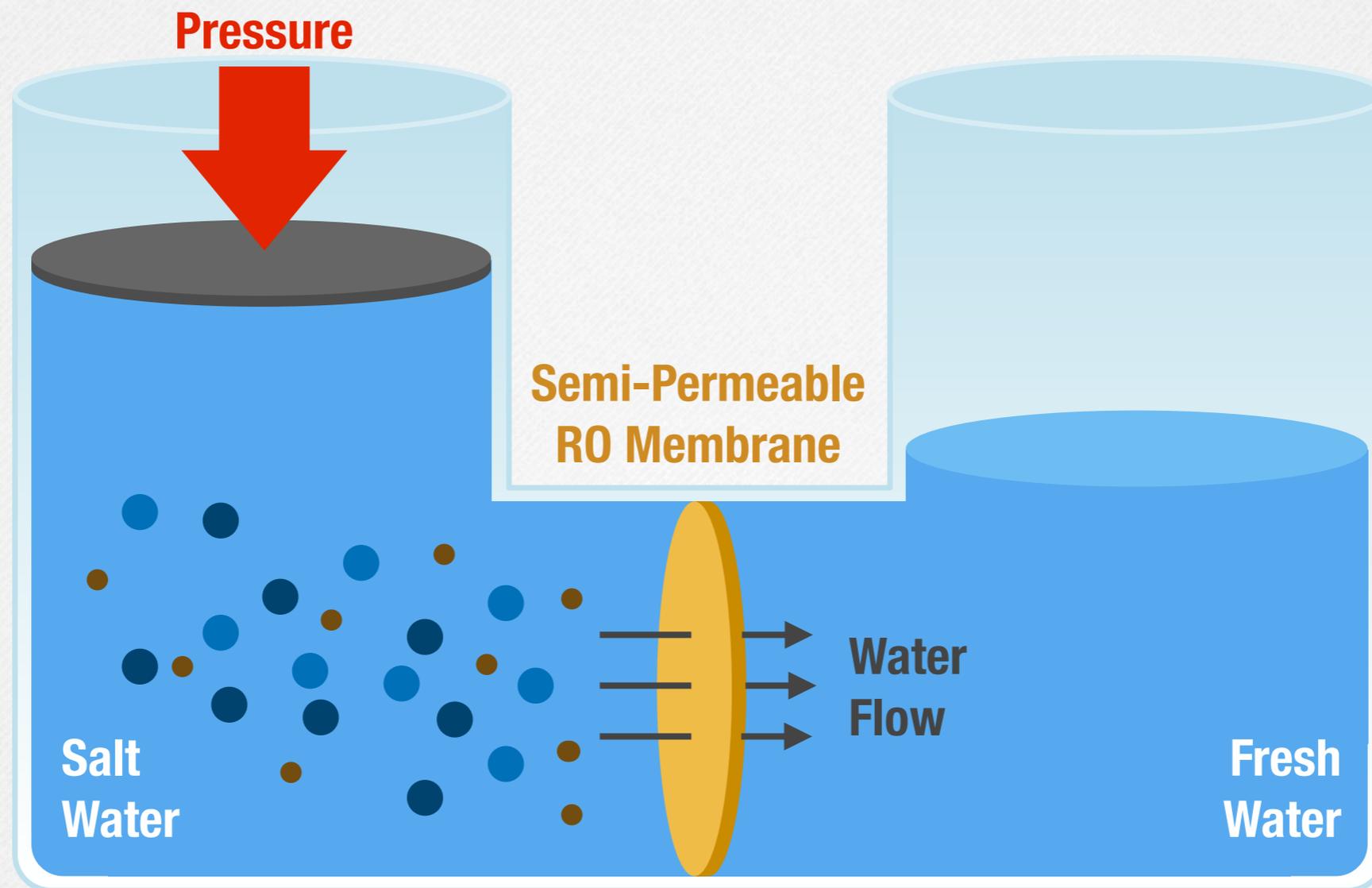
\$13 B

Projected 2013
worldwide market

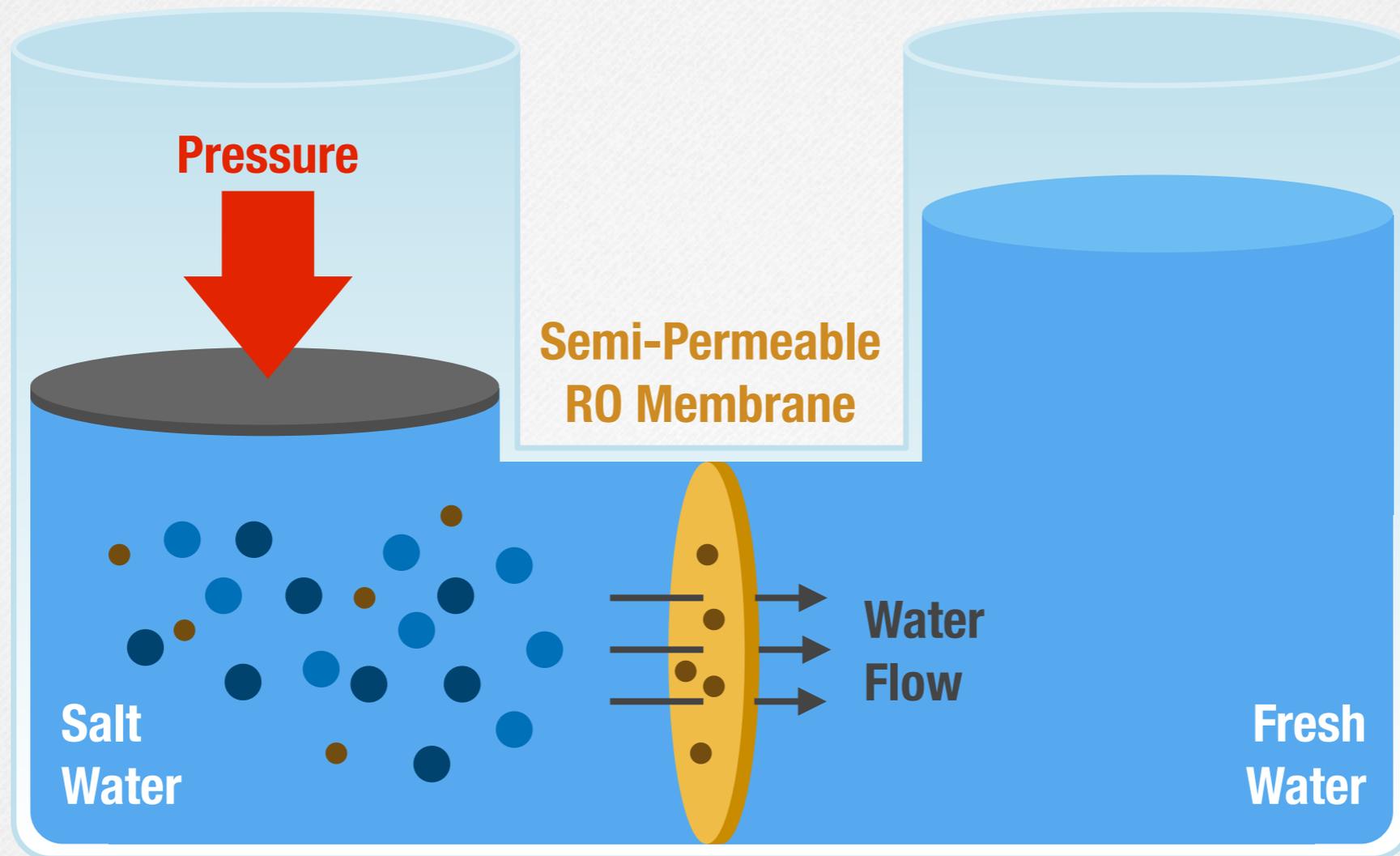
Major Players

IDE Technologies, Degremont (Suez), Hyflux, Veolia, Acciona Agua, and Doosan Heavy

Reverse Osmosis (RO) Desalination



Reverse Osmosis (RO) Desalination

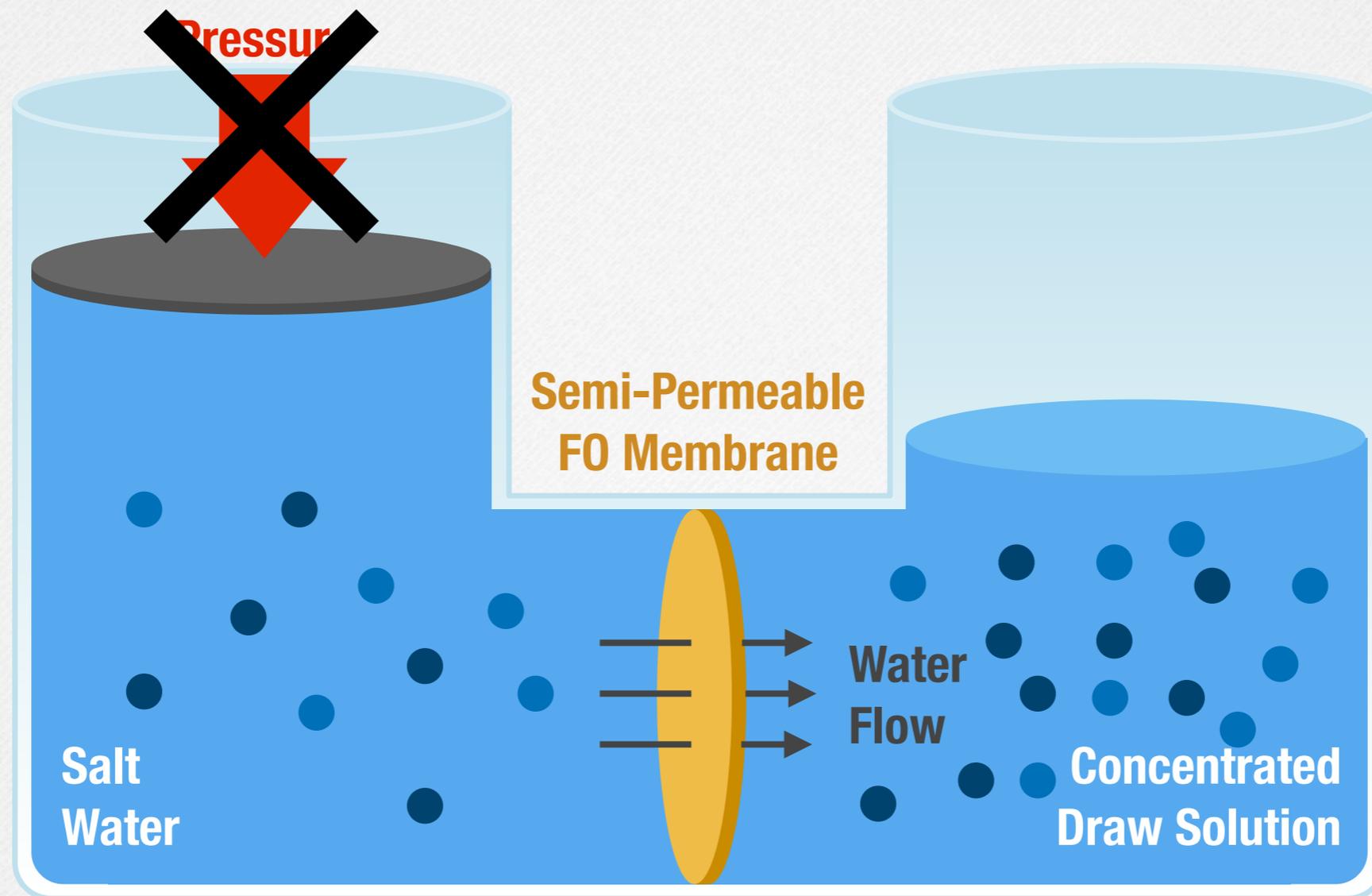


✗ High Pressure

✗ High Energy

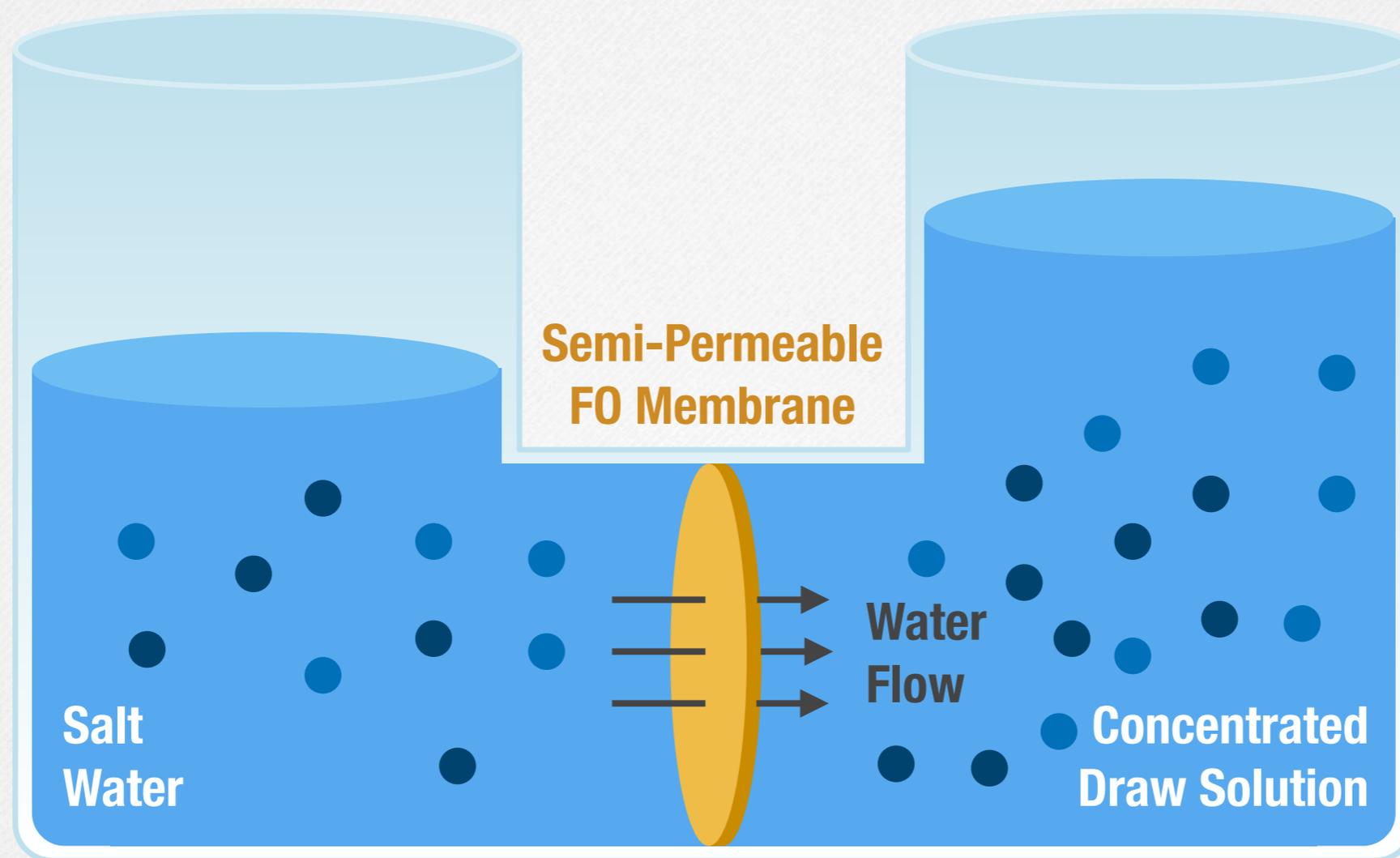
✗ High Membrane Fouling

Forward Osmosis (FO) Desalination



In FO desalination, a concentrated draw solution is used to “pull” water through the membrane instead of an applied pressure

Forward Osmosis (FO) Desalination



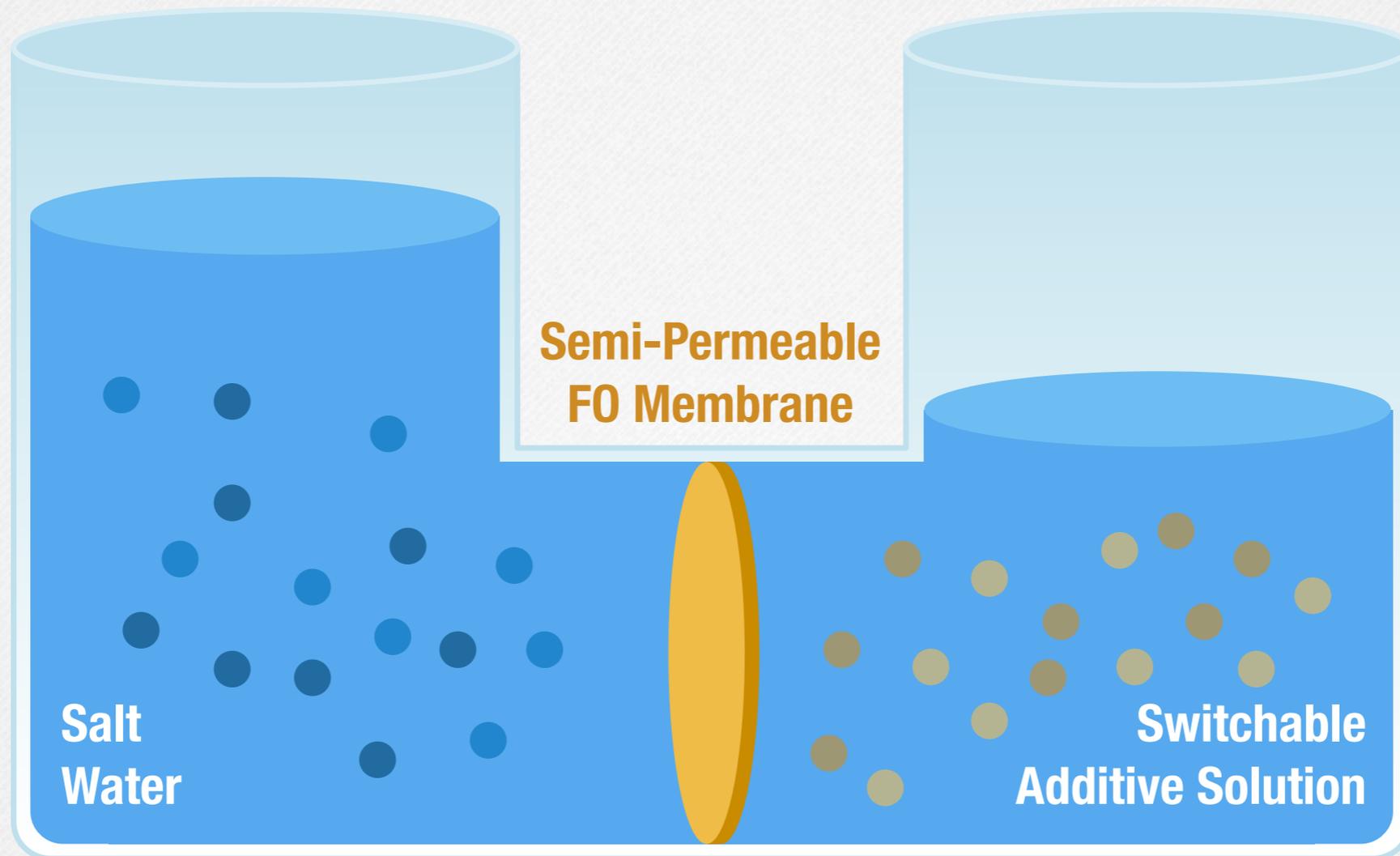
However, now we are left with two salty solutions, where the salt must be removed by another, energy-intensive, process to recover clean water

This is where Forward Water Technologies'

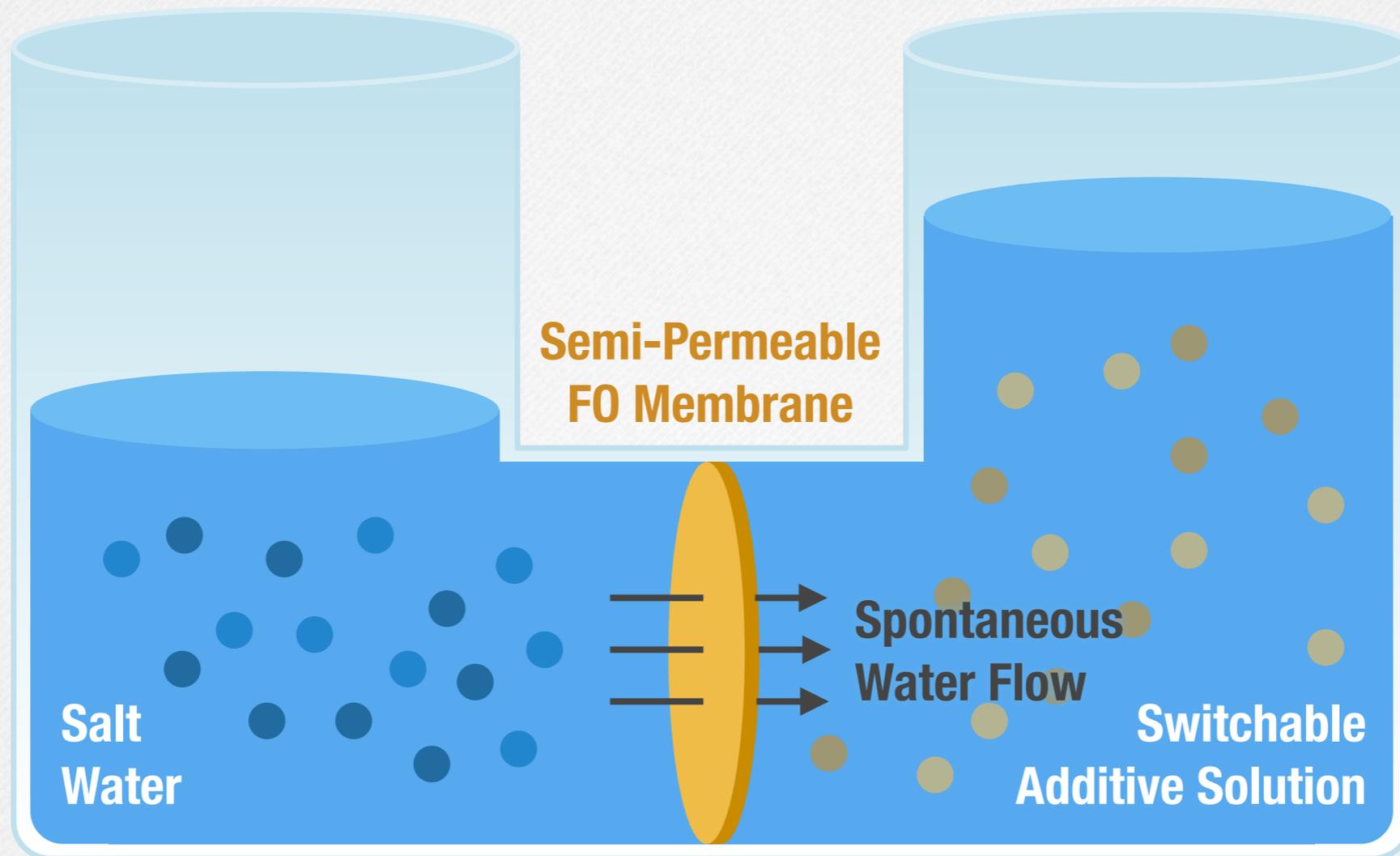
Switchable Water Technology

may be employed for a greener desalination process

Switchable Water Desalination



Switchable Water Desalination

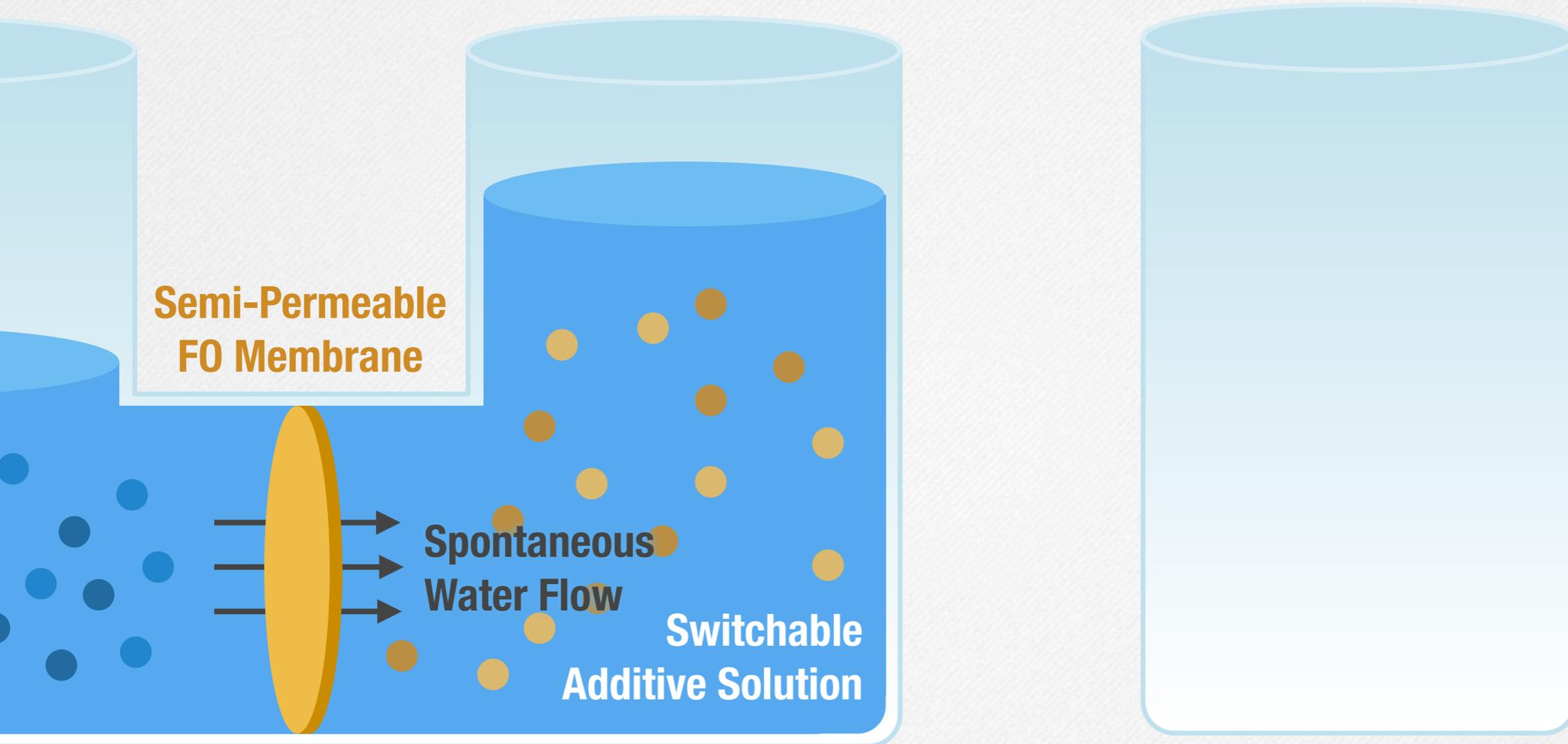


✓ Low Pressure

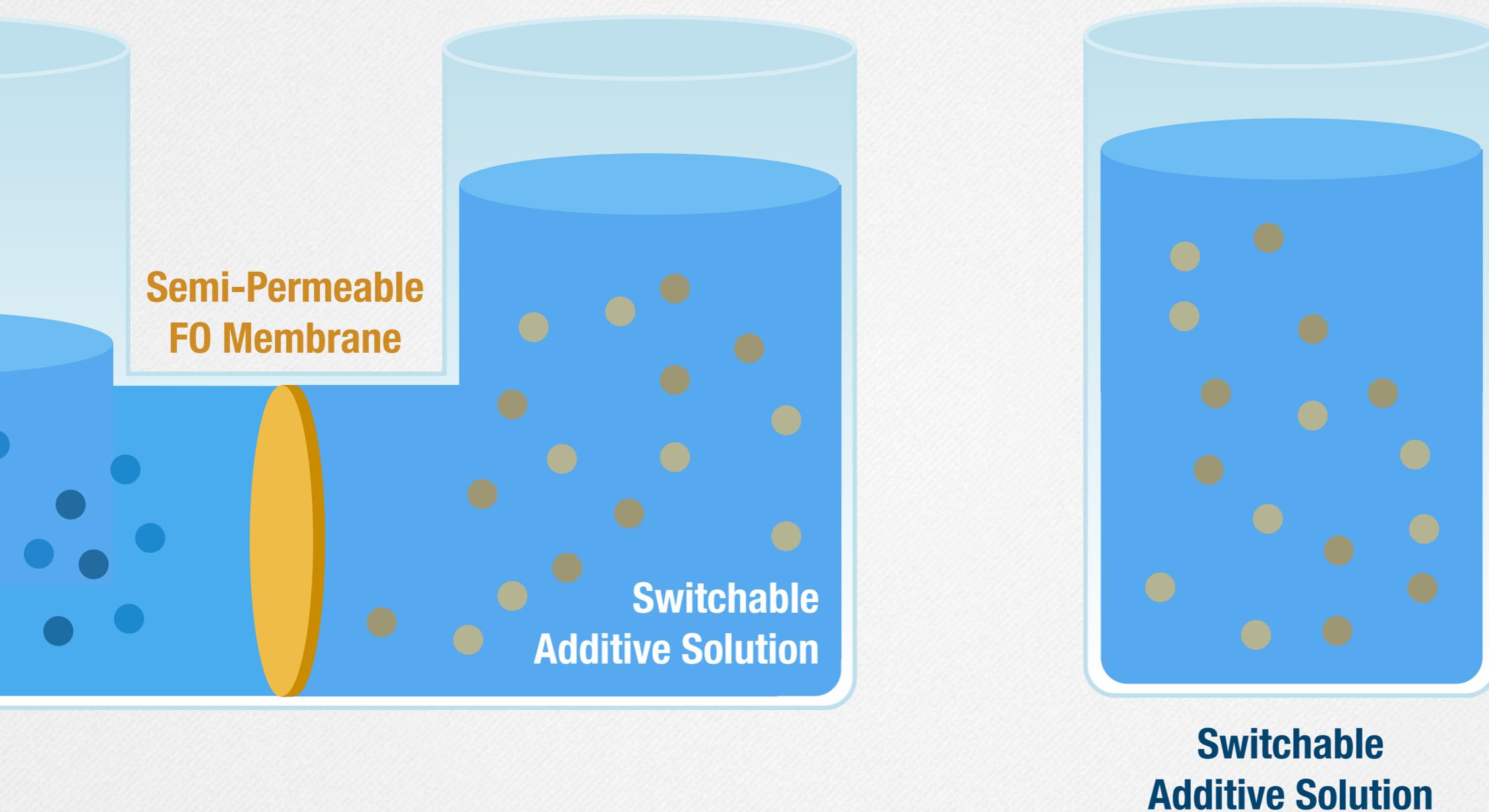
✓ Low Energy

✓ Low Membrane Fouling

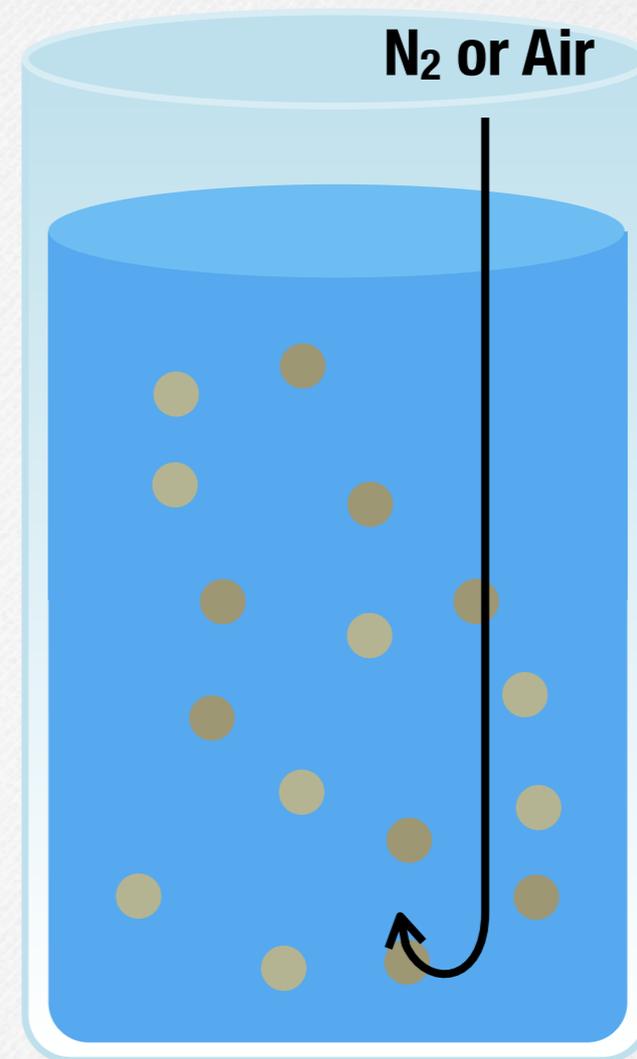
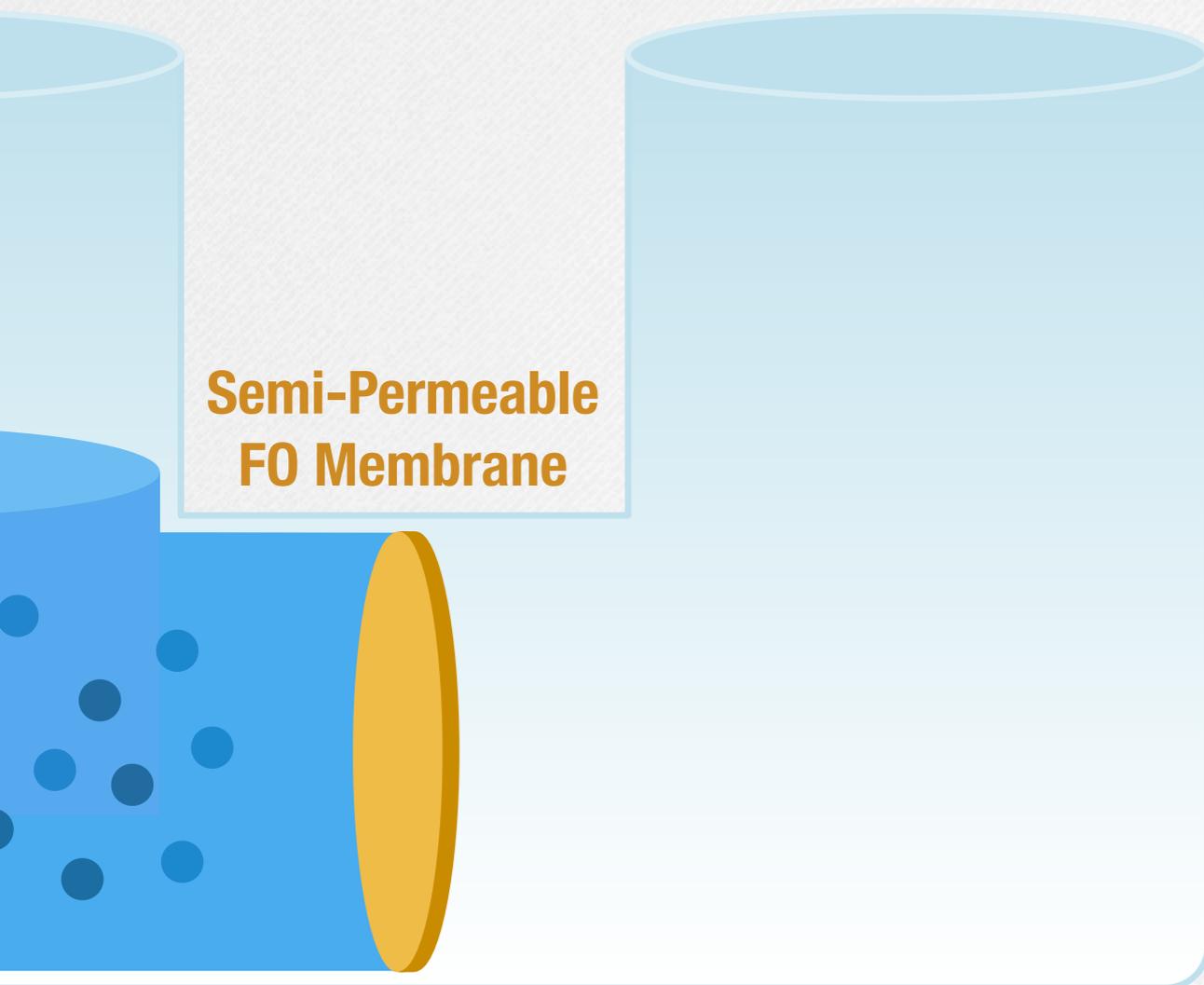
Switchable Water Desalination



Switchable Water Desalination

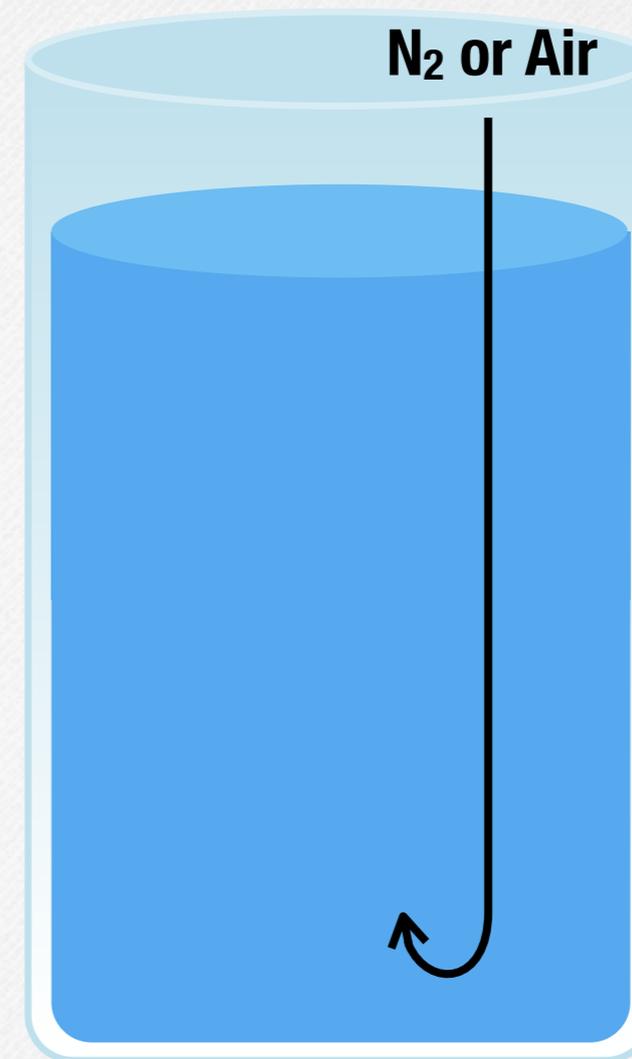
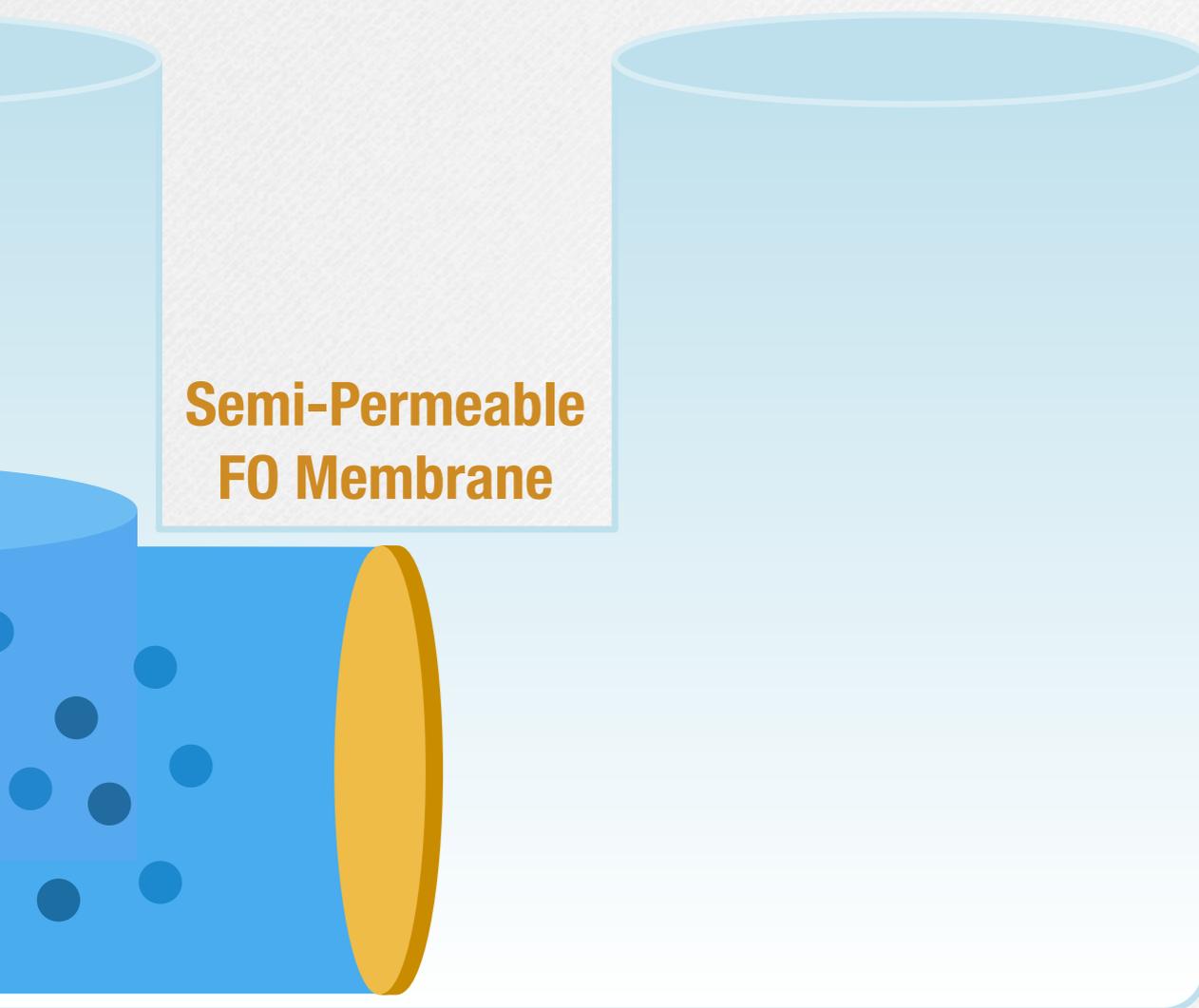


Switchable Water Desalination



**Switchable
Additive Solution**

Switchable Water Desalination



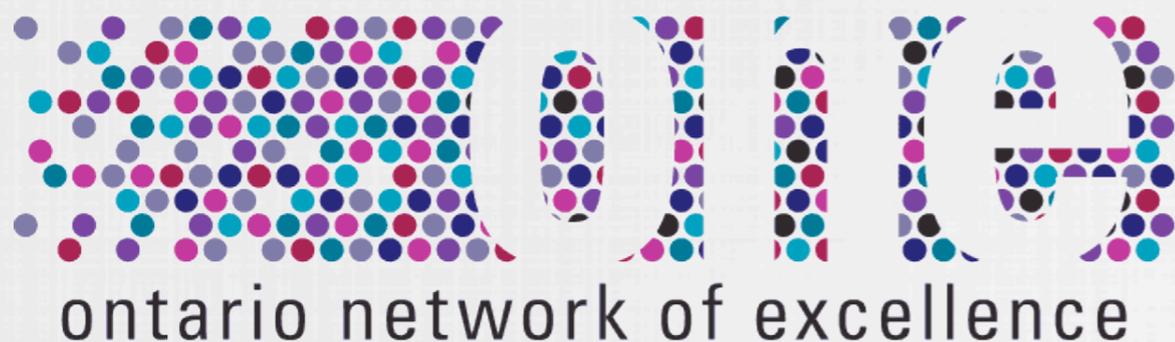


Moving Beyond Canada

GreenCenter USA

- Last year, as part of our growth strategy, we created a US subsidiary – GreenCenter USA (GCU)
- Since that time, GCU has received its 501 c(3) designation, has been working with US researchers and entrepreneurs and has been assembling a broad stakeholder group to support the expansion of the GreenCentre model into the US
- We are at the beginning of this journey but progress is being made
- Please feel free to contact me to learn more about GreenCenter USA

GreenCentre is a member of



and is supported by the
Government of Ontario



GreenCentre is a member of

**Centres of Excellence for
Commercialization and
Research (CECR)**

and is supported by the
Government of Canada's
Networks of Centres of
Excellence





The audio recording and slides shown during this presentation will be available to GC3 Members on the GC3 Website:

<http://www.greenchemistryandcommerce.org>

Non- GC3 Member Attendees who would like to view these slides please contact Sarah Shields at sarah_shields@uml.edu



Upcoming GC3 Webinars



InnoCentive: Using Crowdsourcing to Solve Green Chemistry Challenges & Create New Market Opportunities

Alph Bingham, Founder & Board Member, InnoCentive

Wednesday, October 23, 2013

2pm Eastern/11am Pacific



Advancing Green Chemistry Innovation in the Pharmaceutical Industry: The GCI Pharmaceutical Roundtable's Research Grant Program

Julie Manley, ACS Green Chemistry Institute

Others/Date/Time TBA



LAUNCH: How Nike, USAID and the State Department are Using Challenge Driven Innovation to Advance Sustainable Materials

Nike

Others/Date/Time TBA