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National Lab Day

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10-9-2019

Produced Water

Vincent Tidwell

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Produced Water



Vincent Tidwell, Sandia National Laboratories

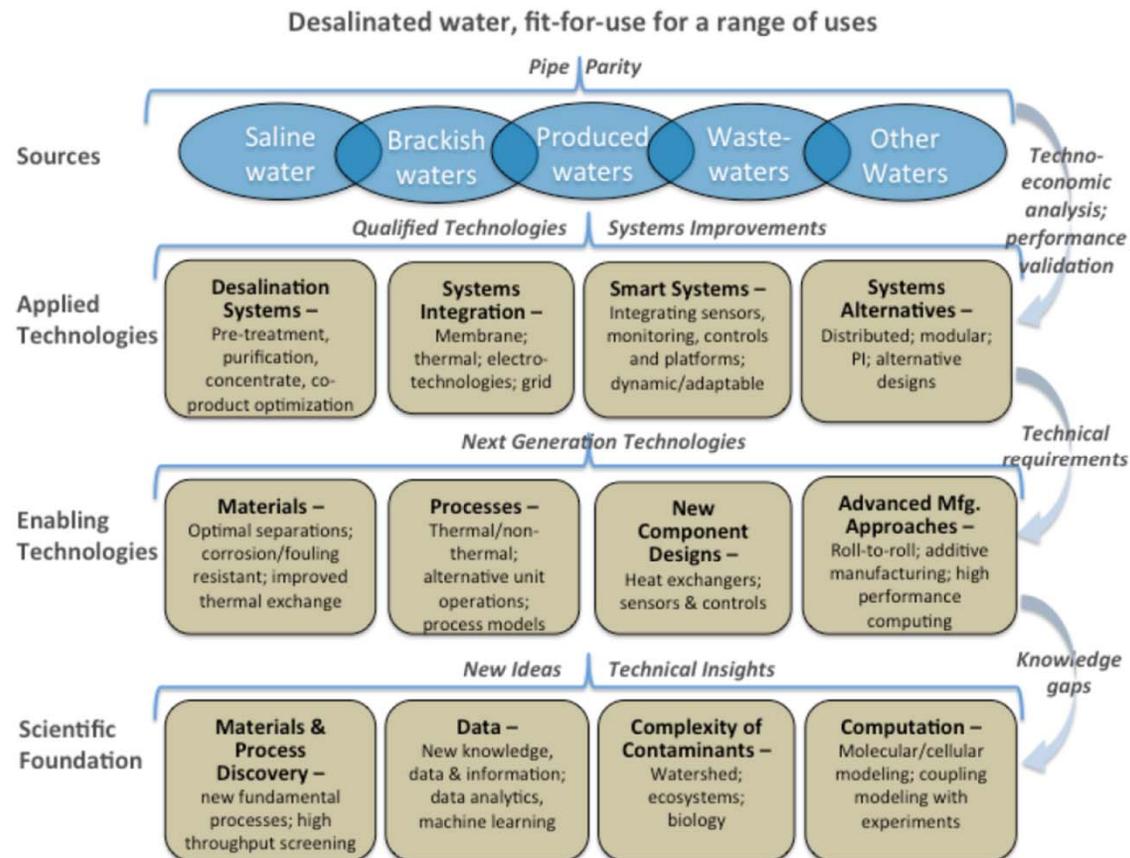
PRESENTED BY Montana Labs Day
October 9, 2019



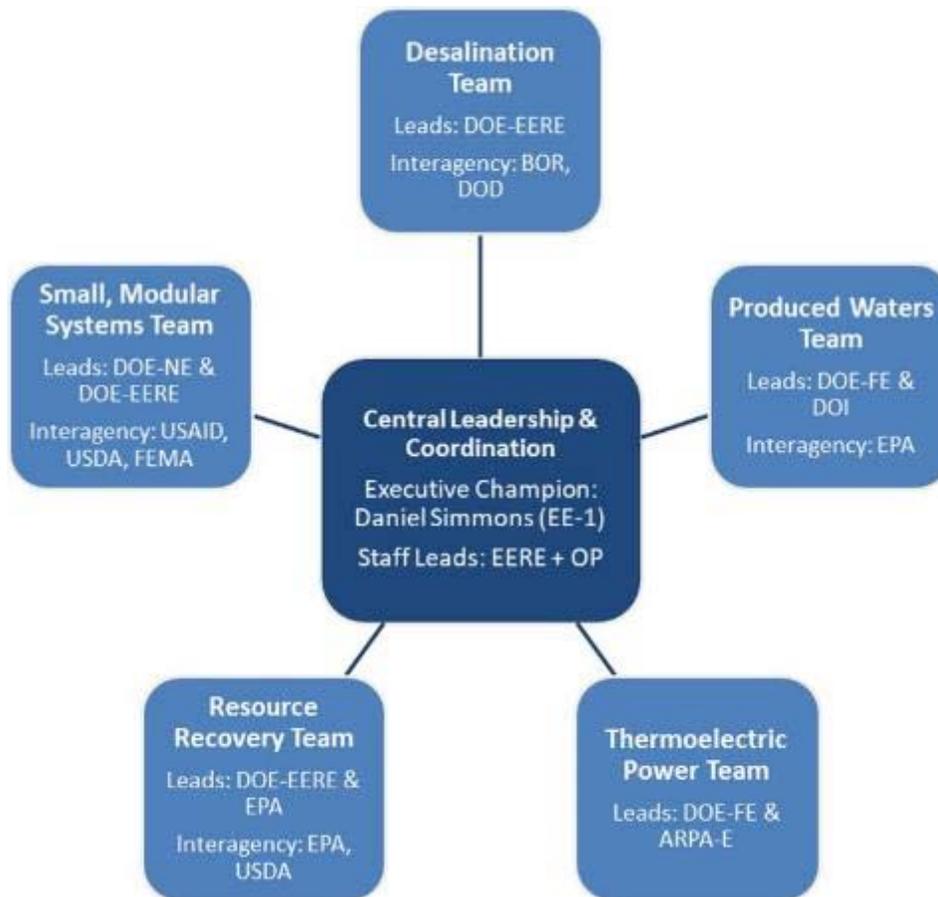
Sandia National Laboratories is a multi-mission laboratory managed and operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc. for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.



Energy-Water Desalination Hub



DOE Water Challenge Prize

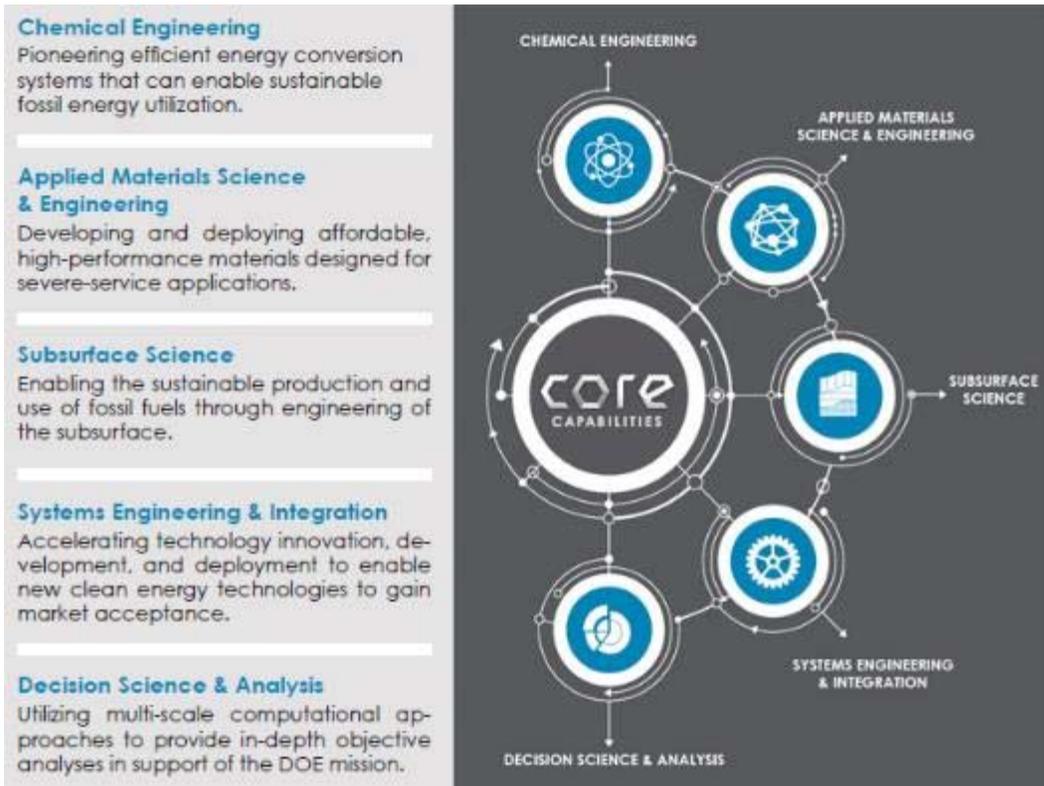


- Low Cost, Efficient Treatment Technologies for Produced Water
 - DOE is focused on treatment technologies to remove those constituents that complicate the use of current or future desalination technologies
- Chevron Technology Ventures, which launched a contest seeking cost-effective solutions for managing produced water from oil and gas operations;



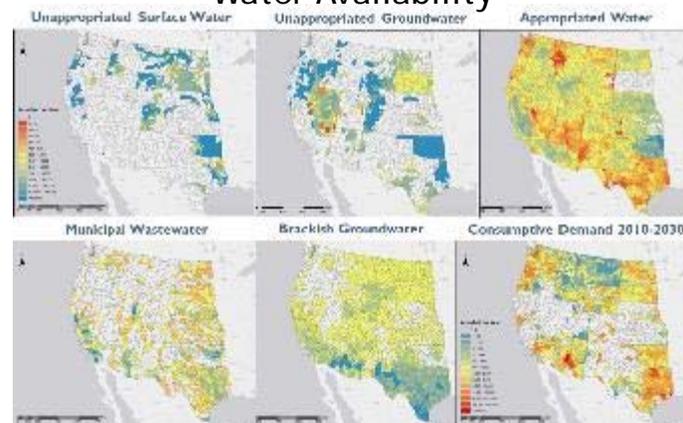
Fossil Energy

NETL Water Crosscut Program



- Advanced Cooling Technology
- Non-traditional Water Use
- Water Treatment and Detection
- Technology
- Decision Science and Modeling

Water Availability

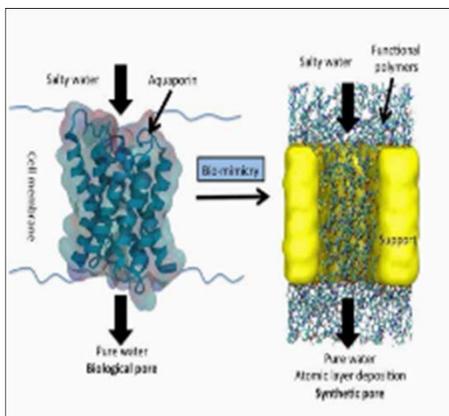


Source: Tidwell et al. 2014

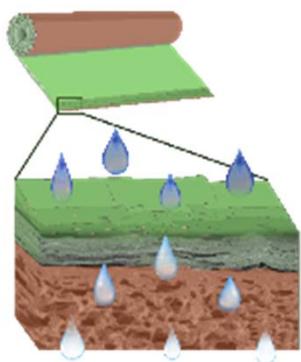
Next Generation Desalination Membranes

Developed biomimetic-based (kidney-like) reverse osmosis (RO) membrane with 5 times higher permeate flow per unit of pressure than traditional RO membranes (RD100).

Also developing bio-based electro dialysis membranes.



<https://www.youtube.com/watch?v=11RQ3N9uH1w>

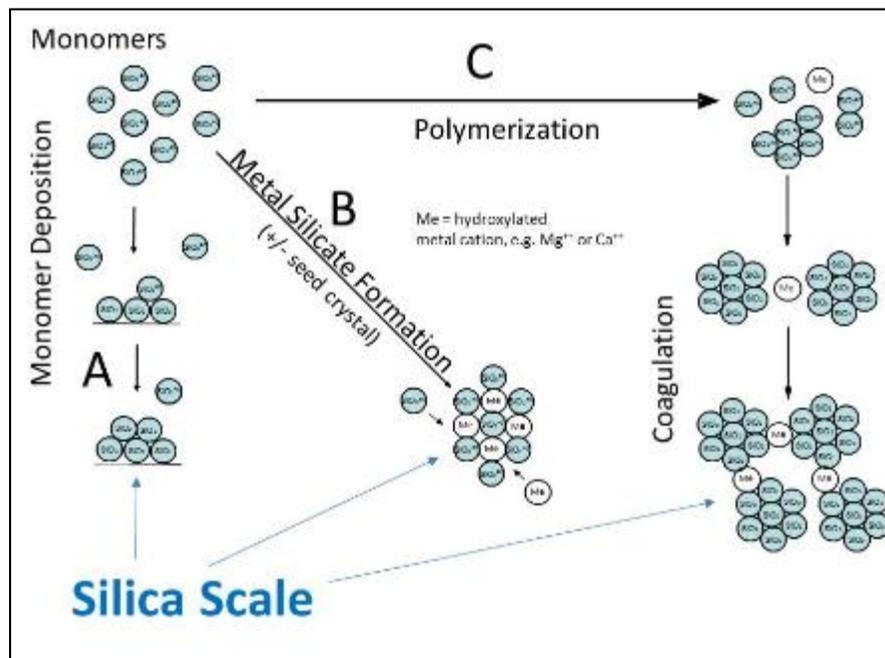


Developing laminar graphene oxide (GO) membranes, whose structure is ideal for water desalination. Structure is chemically tolerant to 1-ppm, one month, free chlorine exposure, as well as hydrocarbons (ie: toluene, oils)



Developed and tested reverse osmosis membranes with integrated antimicrobial peptide mimics to reduce biofouling.

Selective Ion Removal to Enhance Desalination



Recent Projects:

- **Impaired Water Reuse in Power Plant Cooling (Nenoff LDRD)**
- **pH control/scale prevention in Power Plant Cooling (Brady and Krumhansl, US Patent 9140145)**
- **Advanced coagulation for Oil Sands Water Recycling (Brady et al., WFO)**
- **Carbon Mineralization for Climate Change (Columbia/Sandia ARPA-E).**

SiO_2^{aq} concentration in some waters:

Los Alamos tap water, 88 ppm; Cooling tower, 123 ppm; El Paso desal conc. 148 ppm;
Canada Oil Sands, 239 ppm; Geothermal (Wairakei, Ohnuma), 520-560 ppm

Desalination Technology Large-scale Demonstration and Evaluation



Coal Bed Methane produced water treatment for rangeland rehabilitation, Bloomfield NM
In cooperation with Bureau of Land Management, Los Alamos National Laboratory, NM Oil
Conservation Division, New Mexico Agriculture Department, and New Mexico State



Laboratory and pilot-scale testing of
Zero Discharge Desalination (ZDD) at
BGNDRF with 97% water recovery -
technology license purchased by
Veolia



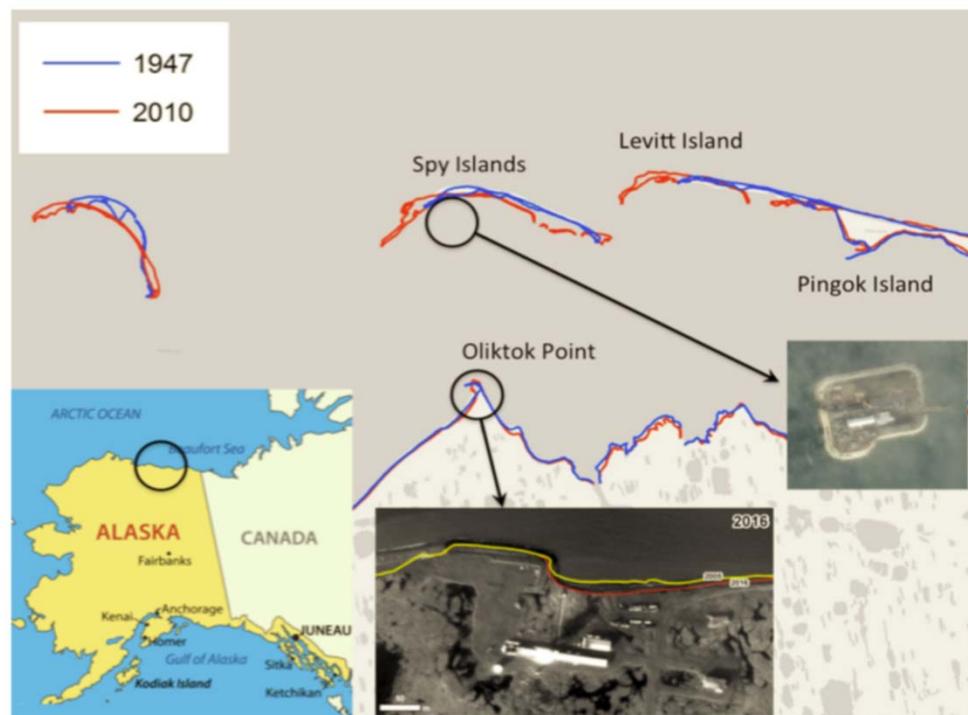
DOE EPSCOR



U.S. DEPARTMENT OF
ENERGY

Office of Science

Eligible States



Decadal-scale barrier island migration and
tundra bluff erosion