Clean Resource Innovation Network (CRIN)
CRIN Water

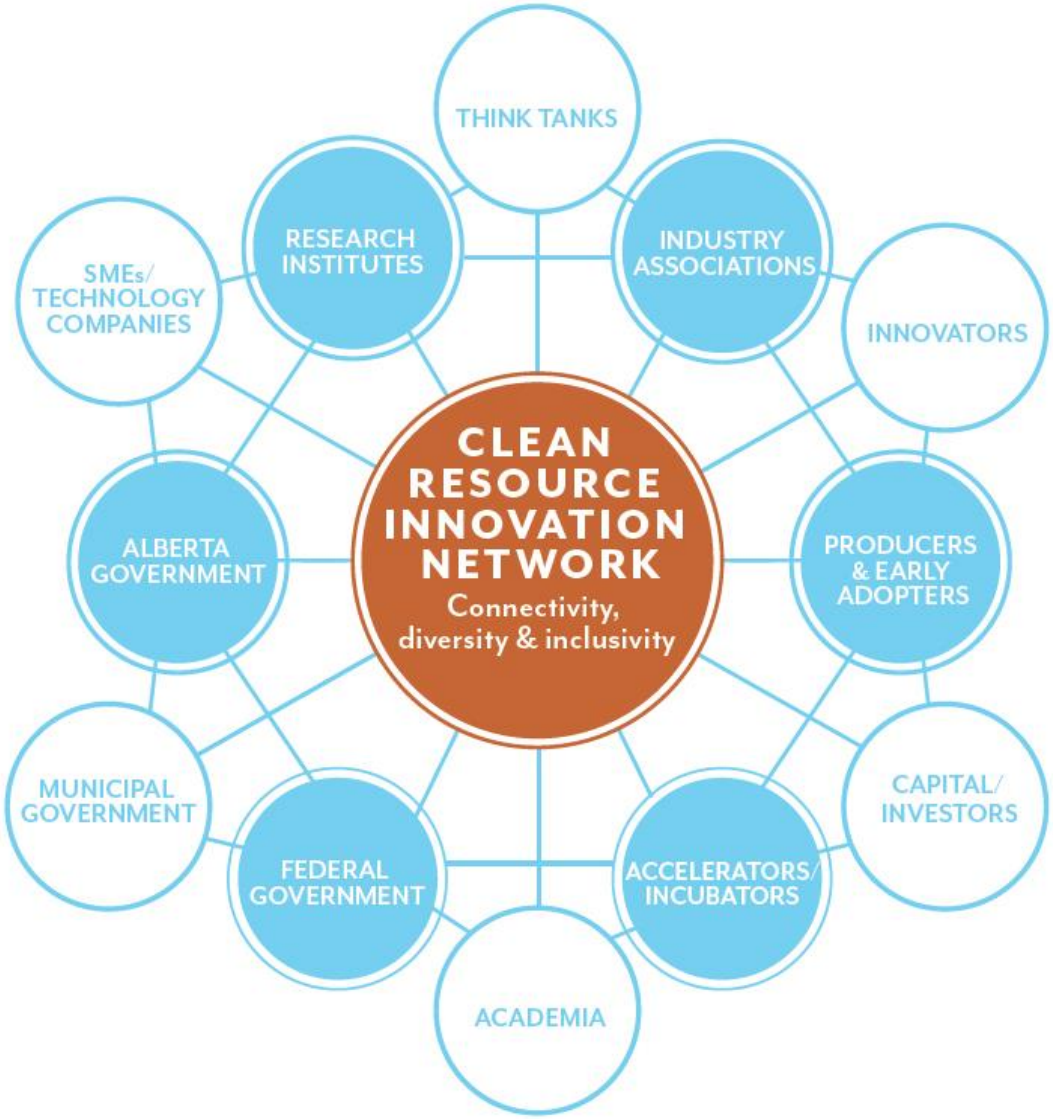
Adele Zenide, P. Eng. , PMP
Project Engineer, Technology
Technology & Innovation
Canadian Natural Resources Limited

October 3, 2019

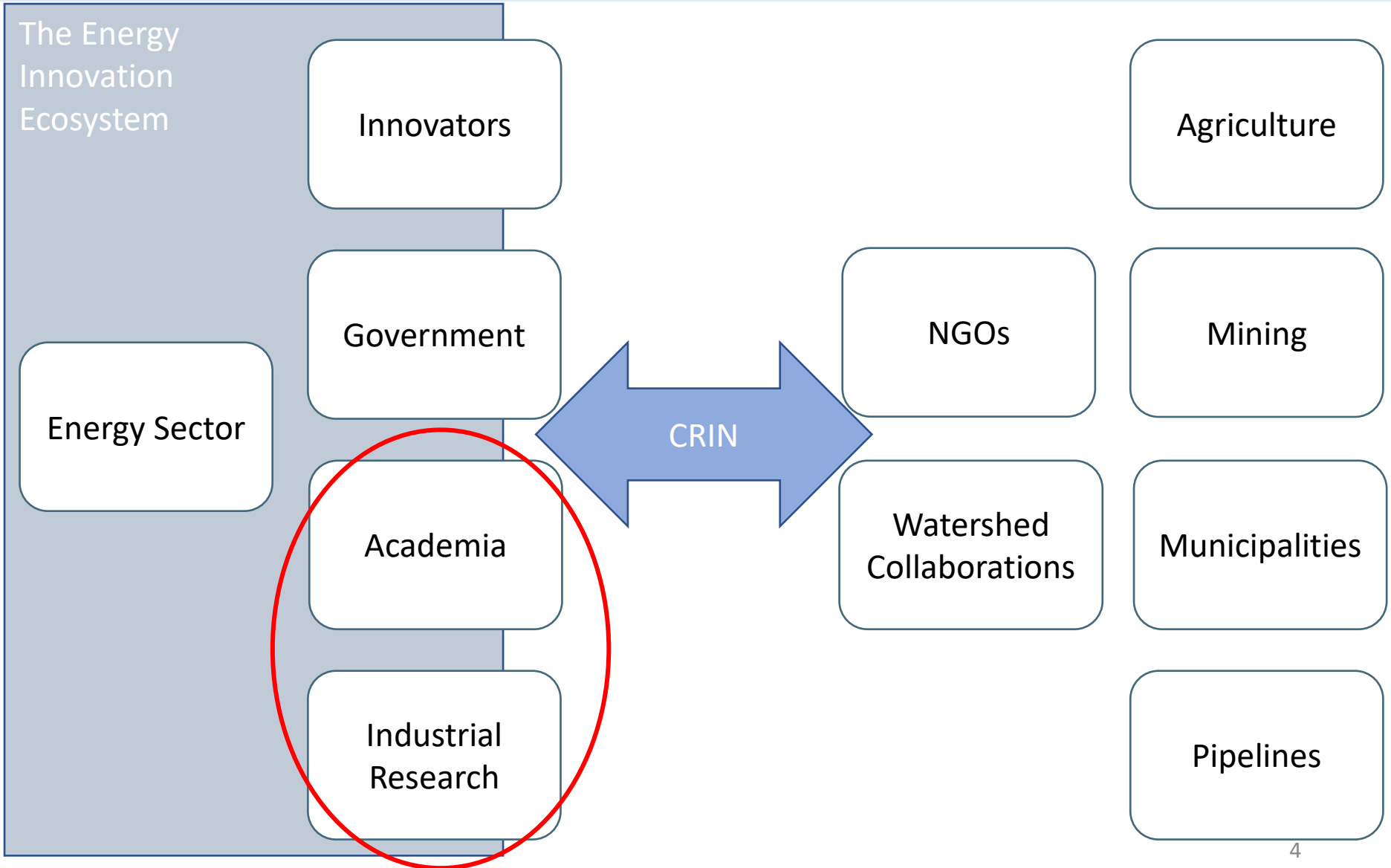
Agenda

1. Introduction to the Clean Resource Innovation Network (CRIN)
2. Goals of CRIN Water Working Group
3. Collaboration Tools & Examples
4. Additional CRIN Water Challenges – Coming Soon!
5. Q&A

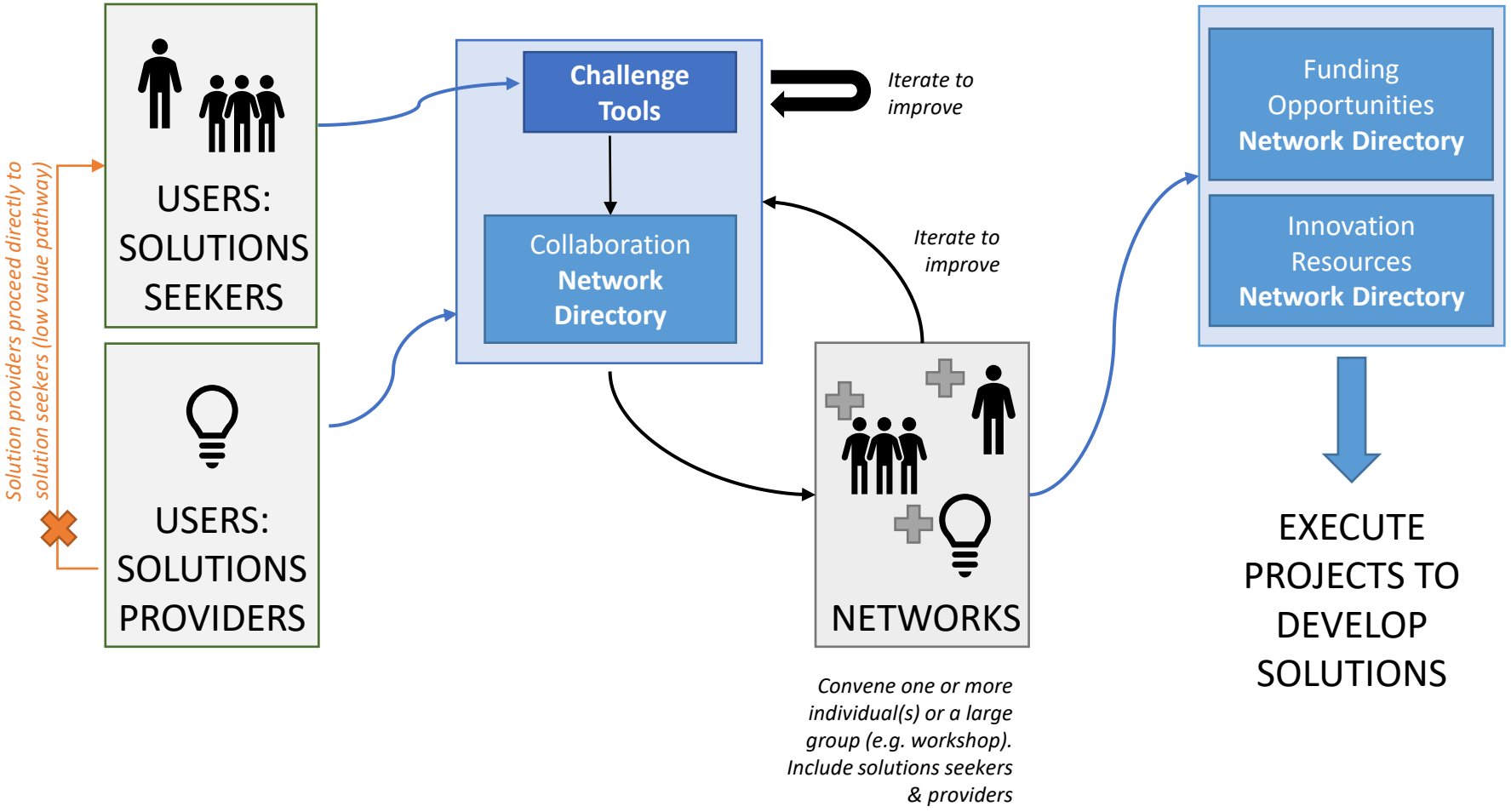
CRIN's Vision – Canada is the Global Leader in Producing Clean Hydrocarbon Energy from Source to End Use



Goals of the CRIN Water Working Group
CRIN Water – Connect Innovators, Vendors, and End Users



Collaboration Tools



Network Directories

Vision:

- A collaborative, online, searchable directory of…

1. Funding Opportunities
2. Testing and Support Facilities
3. Who's Who in the Water Technology Development Sector

…for the purpose of commercializing clean resource water technologies.

- Each directory will be easily accessible to CRIN members
- Each directory will be filterable by several applicable fields

Mapping Hydrocarbon Challenges to Other Sectors
Example Challenge Tool: Online Analyzers

DRAFT

Challenge overview	Categorization
• Modern, connected industry requires **high-temperature (80-105°C), robust, online analyzers**, with low operational requirements, for elemental analysis of water constituents such as **hardness, oil-in-water, selenium, silica, etc.**	Analyzers

Relevance in Oil &Gas Industry	Relevance in Other Industries	Technology Uses in Other Industries
Observed in: - Oil Sands – In-Situ - Oil Sands – Mining May be relevant to: - Conventional – Offshore	• Geothermal • Municipal drinking water • Pulp and paper • Agriculture	• Significant efforts ongoing across industries, but few products have been commercialized/universally adopted which are effective and low cost. • Municipalities have low/high range hardness sensors for municipal water accurate to +/- 5% between 5-50°C.

Challenge importance for Upstream Oil & Gas Industry (High/Medium/Low)	Challenge importance for your industry (High/Medium/Low)
High	*To be completed by participants / water technology personnel from various industries. Ranking will be industry-specific to enable a comparison of what is important for whom, hopefully resulting in alignment on one or more challenges*

ACTION: *We encourage you to connect with CRIN via LinkedIn if A) you have solved a challenge we identify as high priority or B) we have a high priority challenge in common*

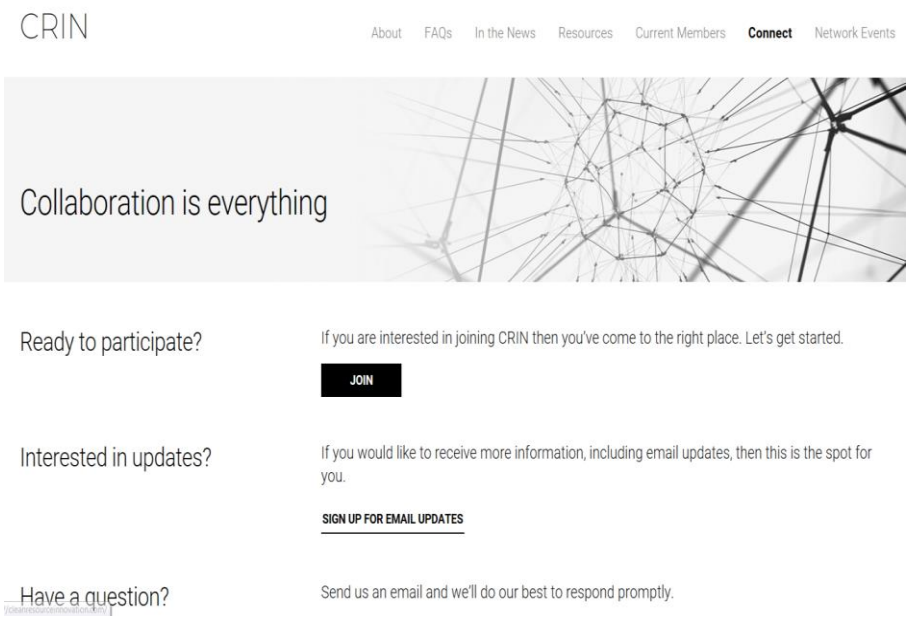
Additional CRIN Water Challenges – Coming Soon!

Challenge
Robust Online analyzers
Total dissolved solids/organics reduction
Oil and grease reduction
Steam from recycled feedwater
Groundwater Quantity & Quality
Water treatment chemicals
Silica reduction
Total suspended solids/turbidity reduction
Surface leak prevention
Heavy metals reduction
Boiler feedwater production
Other contaminants

DRAFT

How to Connect through CRIN

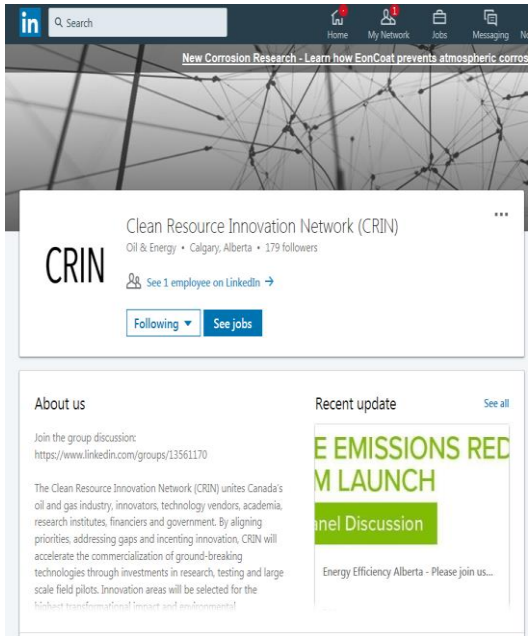
- **Become a member**
  - Visit cleanresourceinnovation.com
- **Sign up to receive CRIN monthly e-newsletters**
  - First join CRIN as a member and then will automatically be added to the distribution list
- **Connect on LinkedIn**
  - Follow our main CRIN page on LinkedIn to get the latest updates on current CRIN events, news and activities and discussions among network members
  - Join our Member-only group pages for technology-focus areas with exclusive content and discussions, accessible only to CRIN members:



Be a part of the Conversation & Share your Ideas!

- **Other CRIN Themes & Networks:**
- Cleaner Fuels – Reducing the Carbon Intensity of the Barrel
- Digital Oil and Gas Technology
- Methane Monitoring, Quantification and Abatement
- Low to Zero Carbon Hydrocarbon Production to End Use
- Novel Hydrocarbon Extraction
- Novel Land and Wellsite Remediation
- Water Technology Development

**Note: You must be logged into your LinkedIn account and request to join these groups.*



THANK YOU!

Questions?