

# UNWASTE

## A New Concept or Stating the Obvious?

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School of Engineering



As Chemical Engineers, we are responsible for the design, commissioning, operating and optimizing of physical and chemical processes.

As Petroleum Engineers, we are responsible for the design, commissioning, operating and optimizing of underground resource recovery processes.

As Professional Engineers, we have the ethical responsibility to operate at the best technical, safe and environmentally conscious manner while at the same time obeying criteria for profitability.

Such Criteria are adopted by the Engineers but they are dictated by the market and those who control it including governments and political systems.

With an ever increasing population and with most countries' desire to increase the standard of living to that of the "Western" world, we will need to scrape every piece of resource, food, water and material to support the human race.

All Resources will be devoured unless we find ways to optimize consumption and generate technology with maximum flexibility and efficiency.

Canada in general, and Alberta in particular, is a resource rich country (province) and we could and should demonstrate to the world how to manage resources in a more holistic approach.

The following presentations aim at presenting a possible model for Alberta Resource utilization in a way that there is no waste.

This is followed by more specialized presentations on how some of research groups in the department conduct research within that scope.

# WHAT ARE WE GOOD AT?

## Drilling deep wells and operating them safely

- Alberta: 619,404\*
- Saskatchewan: 159,388
- BC: 36,445
- Manitoba: 11,711
- Territories: 1,893
- All Canada: 828,841\*\*

## Handling very large amounts of (unsafe) fluids in Canada

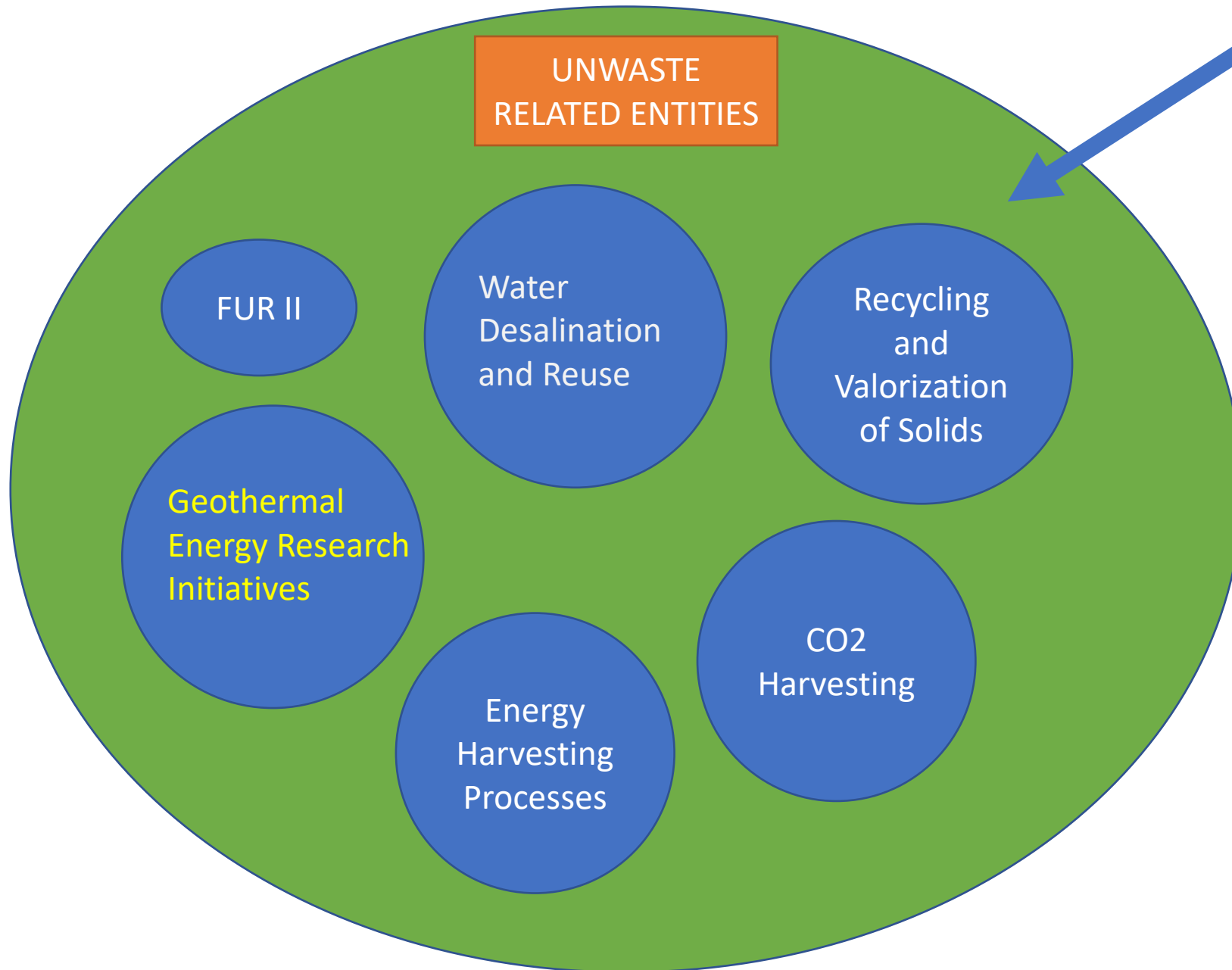
Cumulative oil production:	2,342,802,332 m <sup>3</sup>
Cumulative gas production:	3,796,106,540,000 m <sup>3</sup>
Cumulative water production:	13,250,862,962 m <sup>3</sup>
Cumulative condensate production:	37,230,496 m <sup>3**</sup>

## For Alberta only

Cumulative oil production:	1,816,325,362 m <sup>3</sup>
Cumulative gas production:	3,654,349,332,000 m <sup>3</sup>
Cumulative water production:	8,714,773,470 m <sup>3</sup>
Cumulative condensate production:	37,229,235 m <sup>3**</sup>

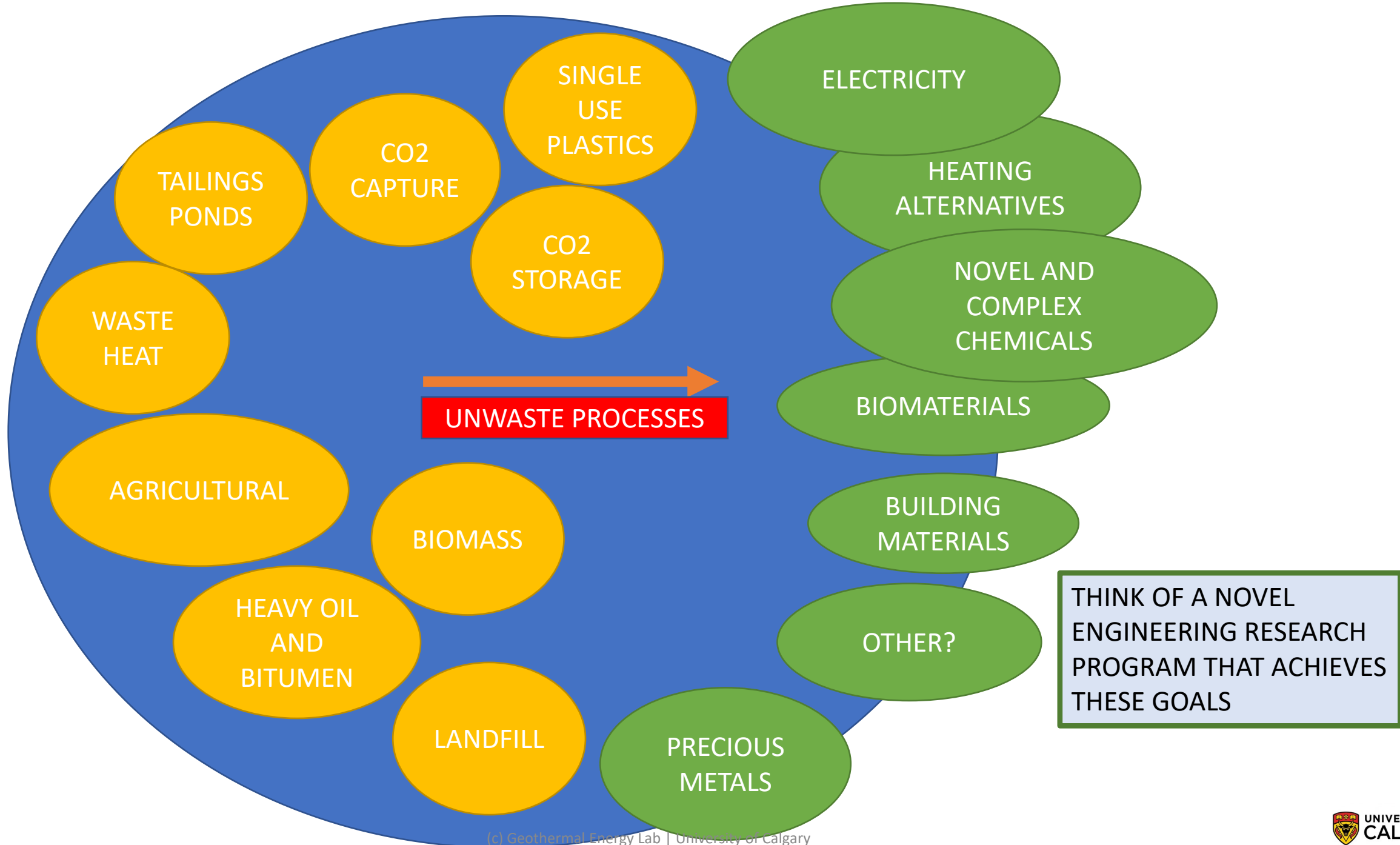
\*: More than half of those active

\*\* : Source Accumap Data Base mid March 2022



Benneker (CPE)  
Bryant (CPE)  
Kantzas (CPE)  
McCoy (CPE)  
Nassar (CPE)  
Natale (CPE)  
Ponnurangam (CPE)  
Roberts (CPE)  
Shor (CPE)  
Others.....

There are many folks that do cool stuff and want to work with you



# OUR GOALS

## Carbon

Centralize as much as possible combustion so that CO<sub>2</sub> can be managed easily (whether it is natural gas or other)

## Geo-energy

Geothermal  
Geo Heat  
Waste Heat  
Contribute to water economy

## CO<sub>2</sub> Management

Manage CO<sub>2</sub> through storage or displacement of H<sub>2</sub>O and /or hydrocarbons

## Valorize H<sub>2</sub>O (this is the most valuable commodity long term)

- Metal Extraction
- Desalination
- Water economy
  - Hydrogen
  - Agriculture
  - Storage

### What do we want from you?

Buy in before the governments force us

#### Targets

New Ideas

\$\$\$\$ for Alliance Grants

Industry consortia for pilots/field development

The **Industry Model** for funding  
\$\$\$\$ from Industry and \$\$\$\$\$ from ERA  
for pilots with \$ for the University

The **Federal Model** for Funding Research (public domain)  
Industry \$ - NSERC \$ for Majors  
Industry \$ - NSERC \$\$ for Smaller Entities  
Industry \$ - Mitacs \$ (sometimes waive public domain)  
Maximum 3:1 per company in a JIP  
Minimal support for field only students PDF and public domain



# SOME EXAMPLES

## **A pie in the sky?**

With today's environment these examples may appear too far fetched

## **We prefer long term vision**

If fuel is not the low hanging fruit anymore, what can we do to survive?

## **Expertise and Infrastructure**

How do we diversify our economy while at the same time take advantage of the existing expertise and infrastructure?

## **A Business Opportunity**

While many of us focus their energy on fighting change, we should be focusing of how to make money from upcoming changes

## **Creating a green culture**

We have the expertise, the entrepreneurial spirit and the resources to demonstrate to the world that we do not and will not waste

# EXAMPLE: MONETIZING CO<sub>2</sub>

Credit ~\$130/ton  
Tax \$50/ton (2022),  
\$170/ton (2030)

## A Business Opportunity

We are paid to store CO<sub>2</sub>, and we get to hold on to the resource

## Infrastructure

We have the competitive advantage of having the infrastructure and the expertise in the province for a WCSB-wide accumulation, storage and monitoring of CO<sub>2</sub> and get paid for it

## Marketing the resource

There is an active effort to reform CO<sub>2</sub> into chemicals. In this scenario we can have accumulated enough CO<sub>2</sub> to corner the market

## A Business Opportunity

All the voidage replacement for all the hydrocarbon and water resources we extract can be replaced by CO<sub>2</sub>

## Creating a resource

We have the competitive advantage of having the infrastructure and the expertise in the province for a WCSB-wide accumulation, storage and monitoring of CO<sub>2</sub> and get paid for it

# EXAMPLE: COLLECTING AND UPGRADING PLASTICS

Recent work indicates that MW and EM reactors can be successfully used to upgrade plastics and bitumen

The work appears to be chemical specific, but there is an opportunity to gather, and upgrade used plastics

Monetizing currently considered waste is a business opportunity with potential to corner the market

Similar to CO<sub>2</sub>, but not as developed yet, we could get paid to collect plastics and resell them to the same people as chemicals

Similar approach can be applied to other recyclable waste

And let us not forget that this technology can be applied into bitumen upgrading

# EXAMPLE: ELECTRIFICATION IN THE CHEMICAL INDUSTRY

Utilization of EM and MW reactors offers a new opening in the chemical industry

If furnaces are to be replaced with EM sources, a more centralized CO<sub>2</sub> management can be achieved

EM excitation enhances interfacial behaviour and promotes reactivity, with the most common example being cavitation

EM powered reactors can offer substantial advantages in more uniform (therefore efficient) heating

This is one of the most exciting emerging areas in Chemical Reactor Engineering

# EXAMPLE: MONETIZING PRODUCED WATER

The most valuable resource of the province is NOT Oil and Gas

The most valuable resource of the province is People

Second to that the most valuable resource is Water

Generation of large volumes of irrigation quality water can grow our agricultural industry exponentially and increase our population sustainably

We are experts in handling water but not in monetizing it. This has to change

Although water prices will be regulated further in the future, starting from today with mineral extraction can pay for surface utilization of underground water

# Thank you

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