



# Stone Horn Ridge

- Alaska energy company using underground coal gasification (UCG) to access coal energy without mining
- Joint venture of CIRI and Laurus Energy Inc.



# Project Partners



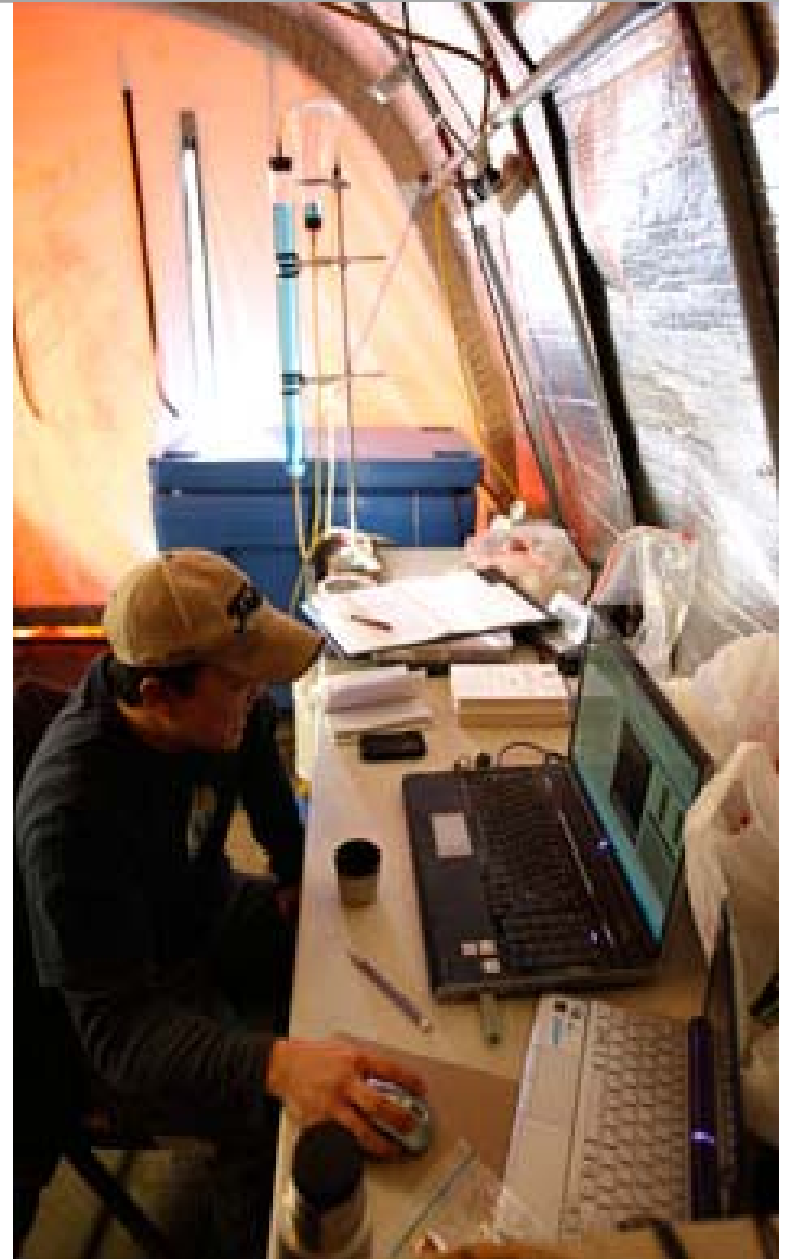
- Houston-based UCG technology provider
- Exclusive North America licensee of Exergy UCG Technology™ developed by Ergo Exergy
- Portfolio of projects in U.S. and Canada



- Alaska Native corporation
- Largest private landowner in Southcentral Alaska, with more than 1.3M acres of subsurface estate available for responsible development
- Diverse business portfolio that includes traditional and alternative energy development

# Enhancing Domestic Energy Supply

- Produce energy for local consumption and export
- Improve local energy price stability and reliability
- CIRI test drilling confirmed commercial coal resource and validated geological attributes for UCG development
- Commercial production as soon as 2015



# UCG: Proven, Clean Technology

- UCG is proven technology that gasifies coal in situ to produce synthesis gas (syngas)
- Process occurs below fresh water aquifers and impermeable geological layers
- Eliminates most environmental and safety risks associated with conventional coal mining, handling, transport and waste
- More than 50 test and commercial projects completed worldwide

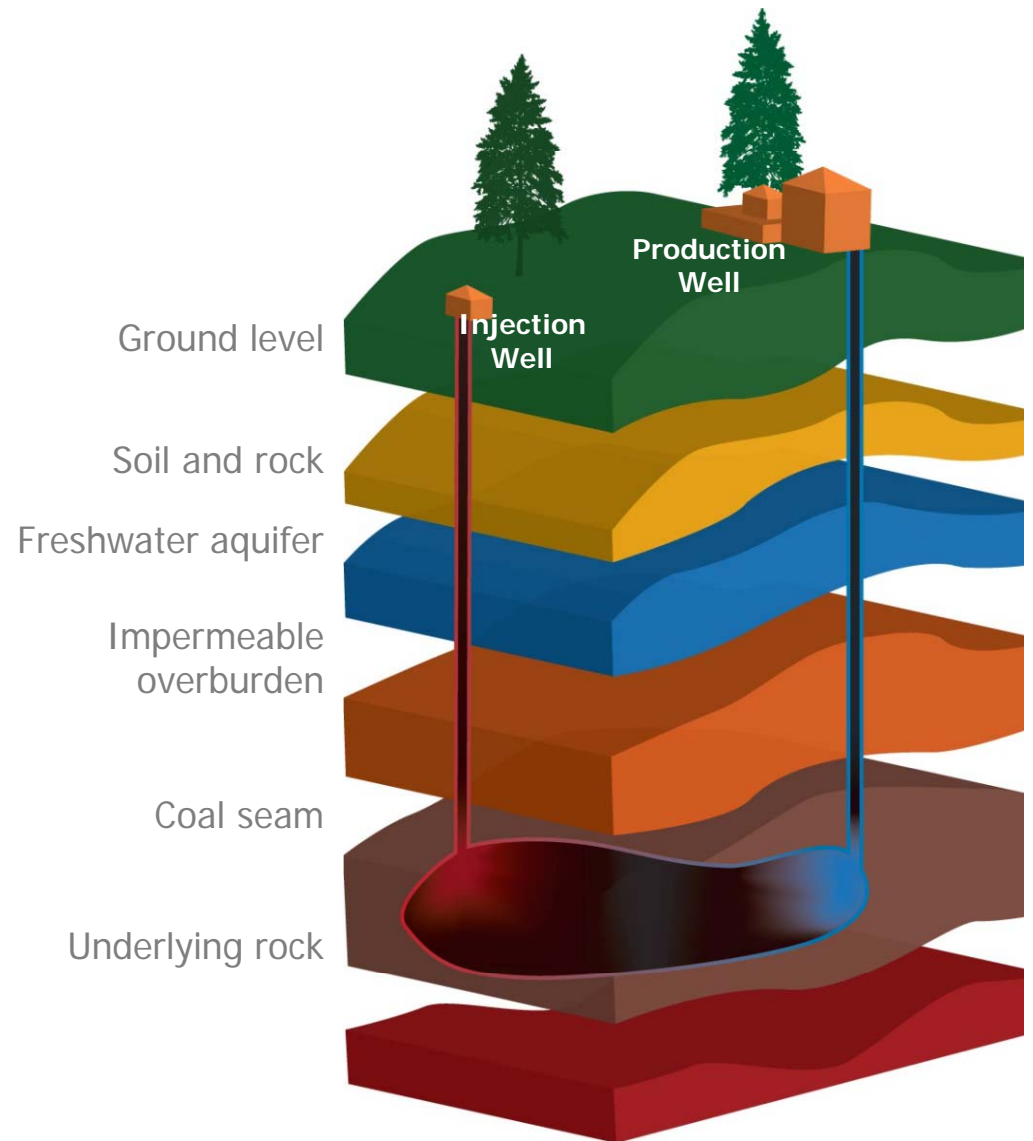


# Benefits of UCG

- Supports U.S. domestic energy policy
- UCG-produced syngas and natural gas leave similar carbon footprints
- Requires minimal surface infrastructure and leaves most coal byproducts and waste in place, underground, in the coal seam
- Targets coal otherwise stranded energy resource

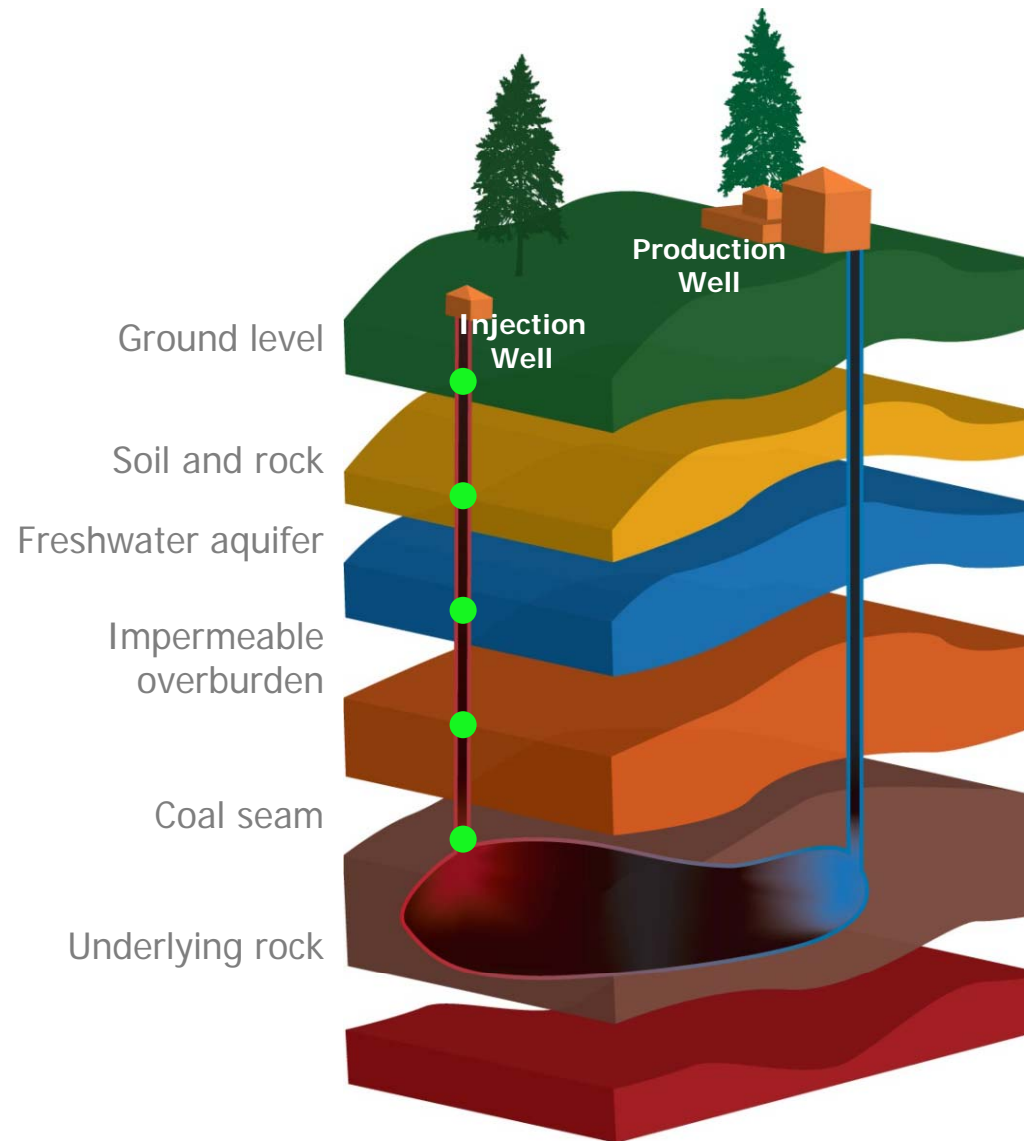
# How UCG Works

- Injection and production wells drilled deep into coal seam
- Impermeable rock layers isolate coal seam/reaction chamber from freshwater aquifers



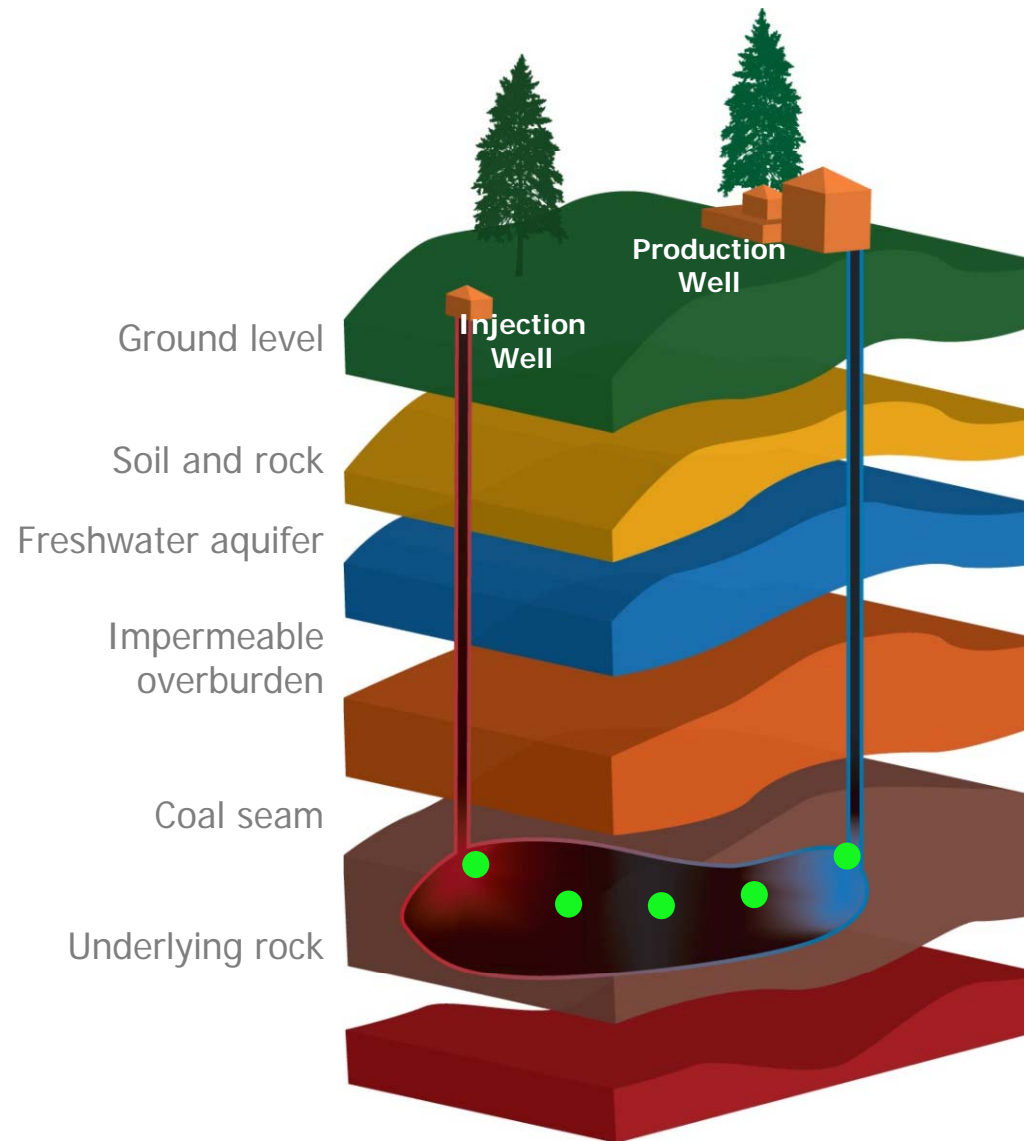
# How UCG Works

- Oxygen is pumped through injection well into coal seam



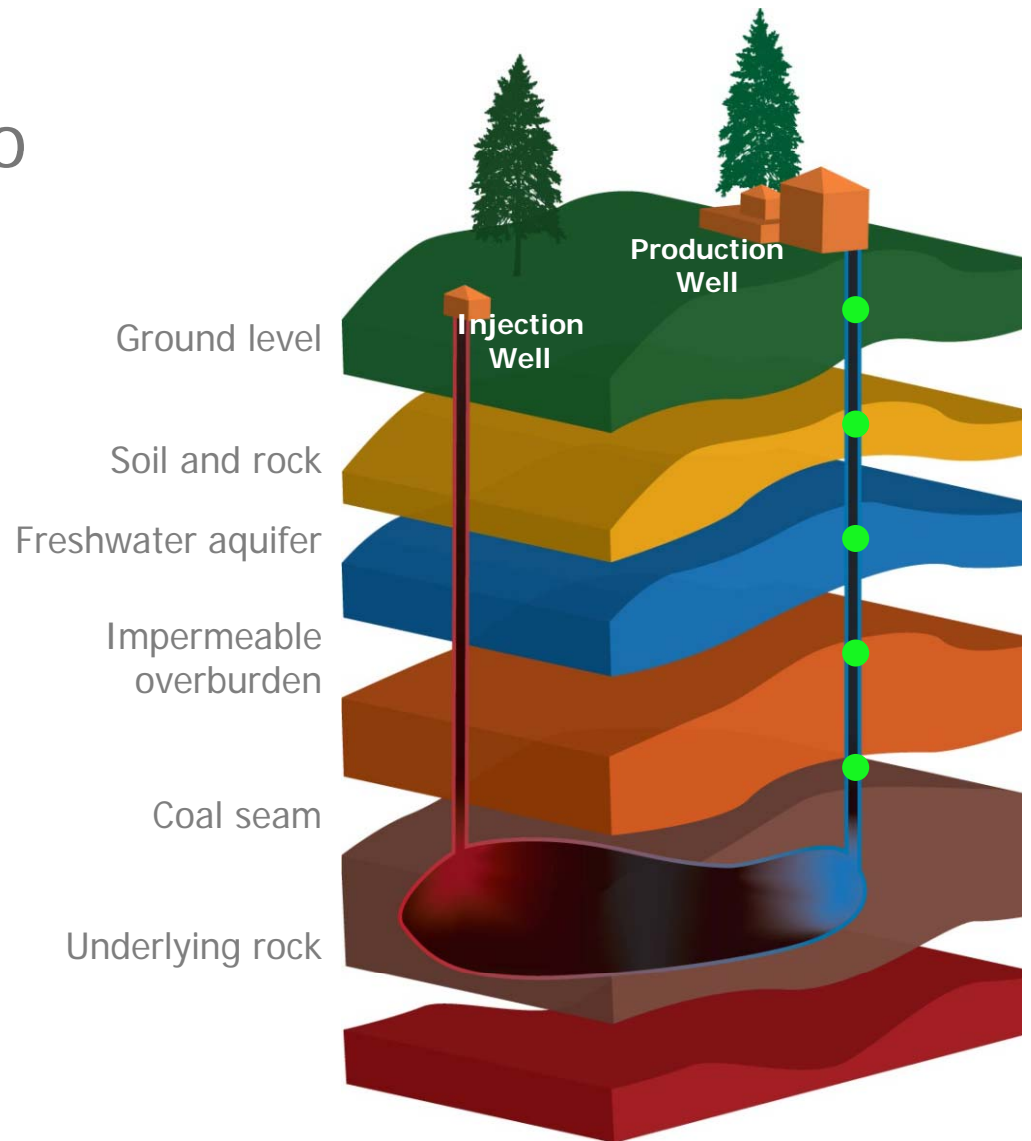
# How UCG Works

- Controlled combustion uses heat, water and pressure to gasify coal
- Syngas moves toward production well



# How UCG Works

- Syngas produced up to surface for cleaning and processing
- Ash and most byproducts remain underground



# Syngas: Clean, Domestic Energy

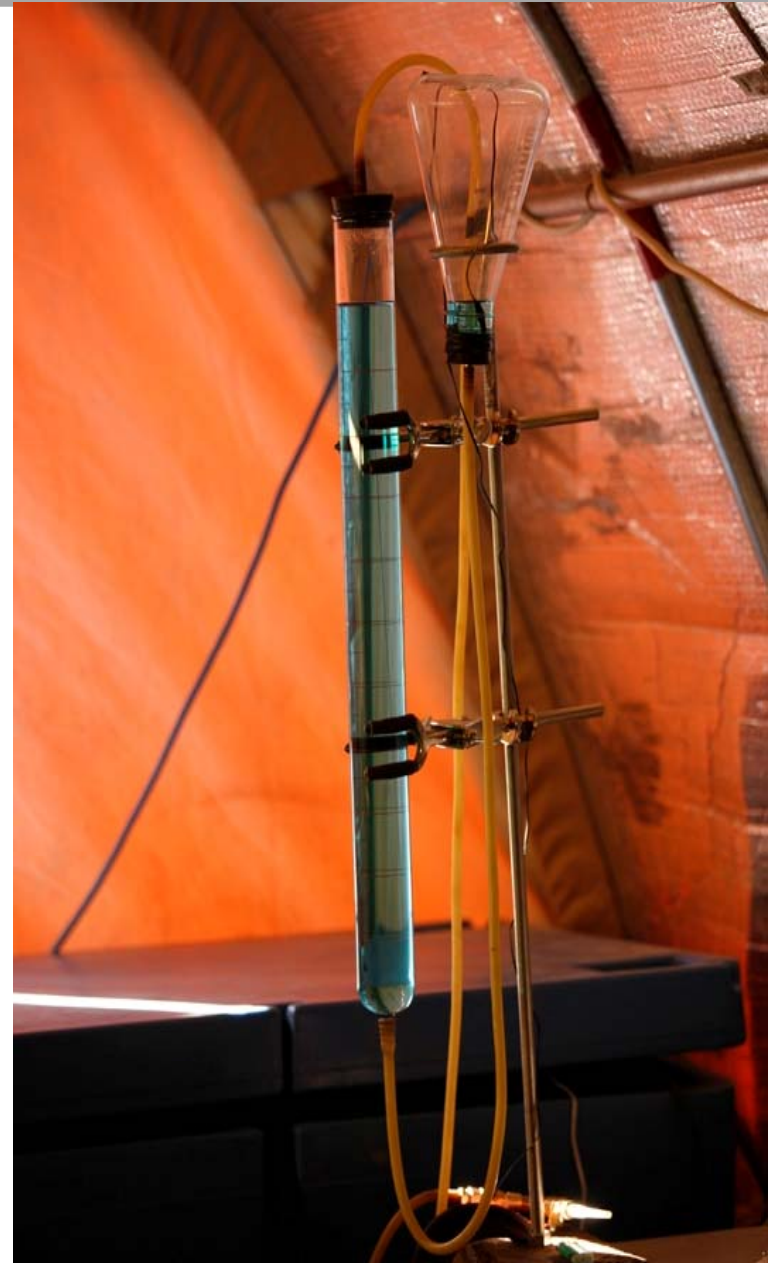
UCG-produced syngas:

- Is a domestic and secure source of clean energy
- Produces an environmental footprint and emissions similar to natural gas
- Minimizes production of criteria pollutants including  $\text{SO}_x$  and  $\text{NO}_x$
- Is economically competitive with natural gas



# Uses for Syngas

- Fuel for electric power generation
- Upgraded via methanation into synthetic natural gas
- Conversion via Fischer-Tropsch to synthetic liquid fuels (e.g., synthetic diesel)
- Feedstock for petrochemical manufacturing (e.g., fertilizer and methanol)

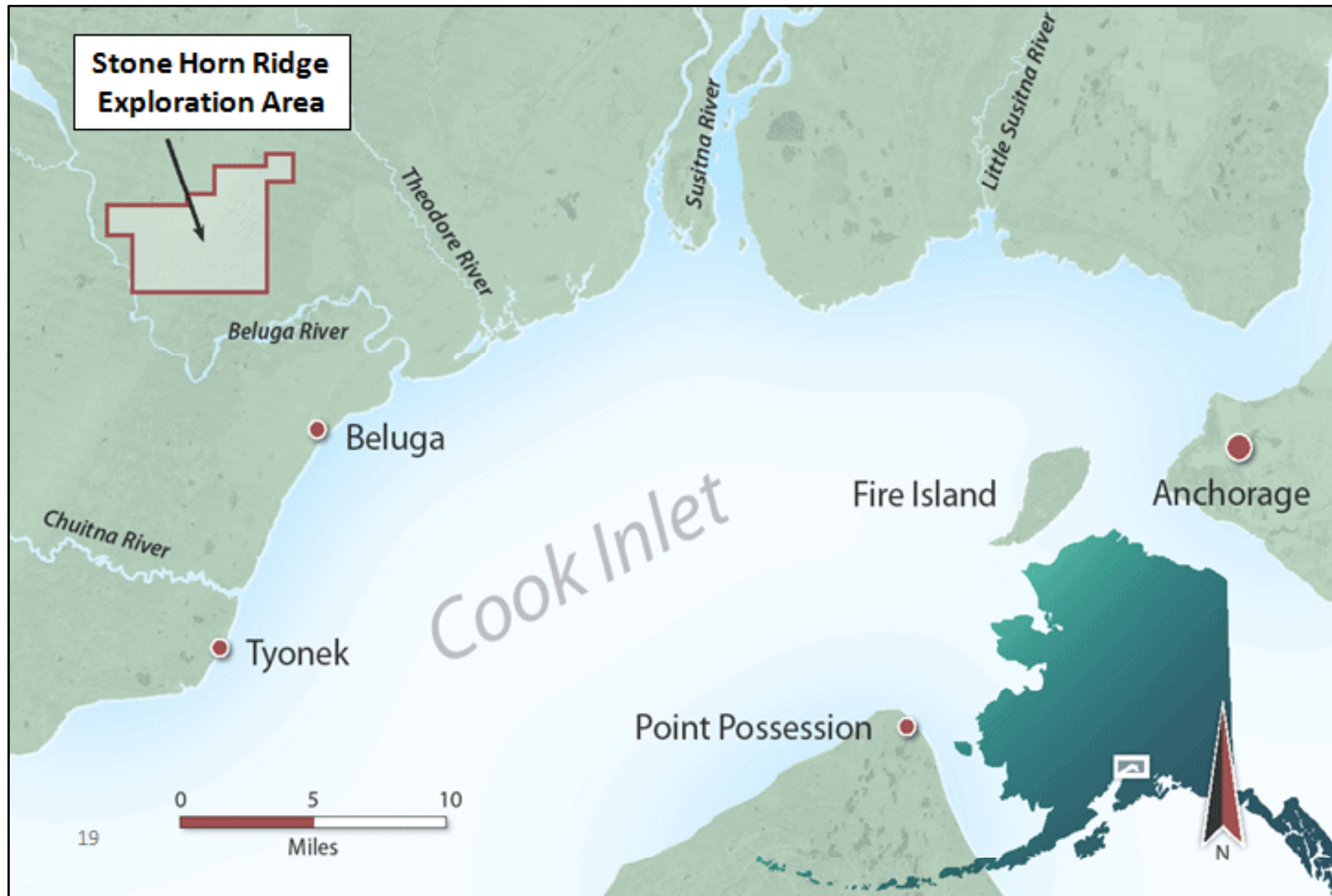


# Stone Horn Ridge Project

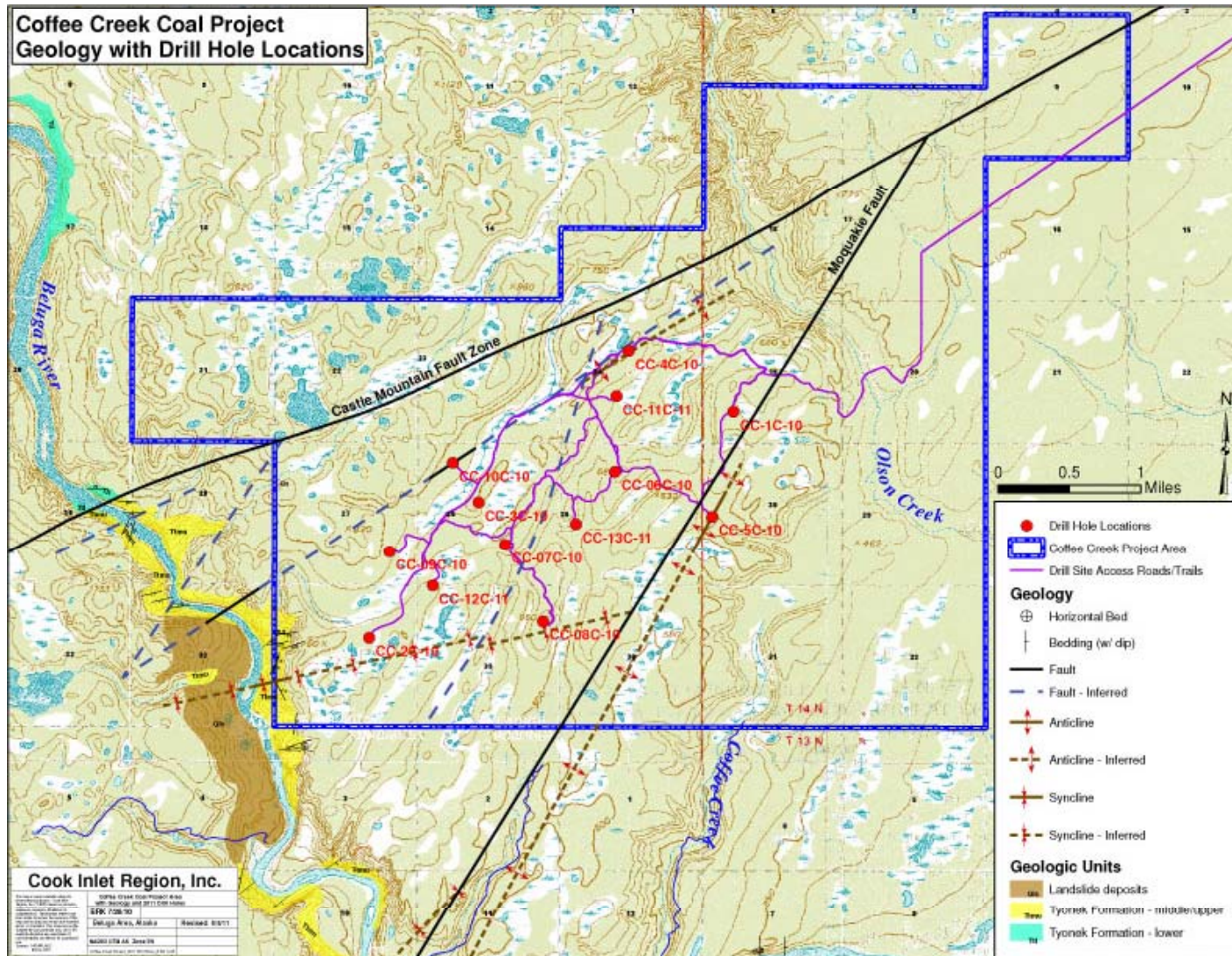
- Project located CIRI-owned land on west side of Cook Inlet
- CIRI test drilling validated site characteristics for responsible UCG development
- Multiple coal seams confirmed more than 650 feet deep, below impermeable overlying rock and isolated from freshwater aquifer
- Ongoing study, modeling, testing and monitoring



# Project Site



# Project Site



# Responsible Development

**Stone Horn Ridge will only develop a UCG facility after a deliberate, thoughtful process**

- Performing all due diligence, environmental risk assessment and necessary permitting
- Committed to carbon management and evaluating effective programs
- Consistently seeking input from community, environmental and technical interests

# Risk Mitigation

- Surface subsidence and groundwater contamination prevented with careful site selection, geological modeling, project design, operation and monitoring
- Process controlled by managing oxygen supply
- Natural water influx quenches reaction, eliminating possibility of unwanted coal seam fires
- Minimal surface disturbance easily restored upon completion



# Project Updates

## Current Status

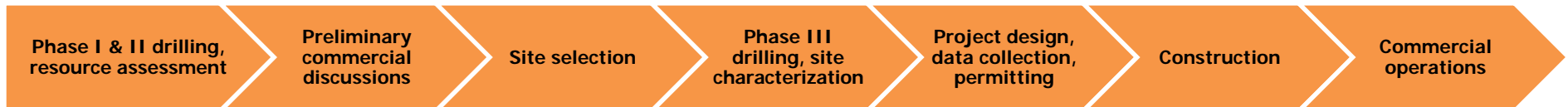
- CIRI completed phase I & II drilling programs
- Test drilling validated commercial coal reserve and geological formations required for UCG

## Next Steps

- Complete initial model of underground geology
- Select site
- Initiate permitting process, baseline environmental data collection
- Design site characterization drilling program and above ground facilities



# Timeline



**2010:** Phase I & II CIRI test drilling and resource assessment

**2010:** Preliminary commercial discussions

**2011:** Site selection

**2011:** Phase III test drilling and site characterization

**2011:** Project design, baseline data collection and permitting begin

**2014:** Construction begins

**2015:** Commercial operations commence