Safe and Permanent Isolation of High Level Waste and Spent Nuclear Fuel

Rod Baltzer, Chief Operating Officer
Expertise Spans Strategic Fields

Founded by a unique duo that unites strategic vision with technical savvy.
A Father-Daughter team that co-founded Berkeley Earth and has been working together for the past decade.

Full-Time Team Includes:
- MacArthur “Genius” and Bloomberg “Innovative Thinker”
- Former CEO of Waste Control Specialists
- Gov’t Affairs expert who has briefed Pres. Obama and Pres. Trump
- Outreach coordinator for the Blue Ribbon Commission

Advisors Include:
- 2 Nobel Laureates
- Former Secretary of Energy (under Obama)
- Advisor to Director for Yucca Mountain
- Member of Blue Ribbon Commission
- Member of Nuclear Waste Technical Review Board
- Political Influencers
DEEP ISOLATION IP:
Secured thousands of feet deep underground in sedimentary rock, a natural protective barrier.

Temporary emplacement rig, 160-feet high

Aquifer casing

Plugged vertical access drill hole (with steel casing and concrete)

Spent nuclear fuel canister storage

Dead end trap
Patent Pending

Plumbers trap
Patent Pending

(not to scale)
A Unique Technology

- Shale has held volatile gas (methane) for millions of years, making a prima facie case for isolation
- Minimize transportation by siting near existing nuclear reactors or regionally
- First patent issued for disposing in or under shale layer; six more pending, others in the works.
- Spent fuel is compact; one drill hole can store 200 to 400 metric tons
- 3-4 drill holes per nuclear reactor lifetime
Solution Features

• Safe and backed by sound science
  ▪ Superior retentive properties of sedimentary rock
  ▪ Completely below aquifer

• Vastly more economical
  ▪ Mature technology, 3-4 drill holes per unit
  ▪ Saves utilities, ratepayers, and taxpayers tens of billions USD

• Potential to solve problem faster
  ▪ Gets waste out of biosphere
  ▪ Ends utilities ongoing obligation to manage and DOE’s liability to pay them.
## Comparison of Concepts

<table>
<thead>
<tr>
<th>Vertical Borehole</th>
<th>Yucca Mountain/Mined Repository</th>
<th>Deep Isolation/Horizontal Drillhole</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Three mile deep shaft that was</td>
<td>• 1,000 foot depth with 5-miles</td>
<td>• Thousands of feet deep into a</td>
</tr>
<tr>
<td>completely vertical</td>
<td>of tunnels that were 18 feet</td>
<td>horizontal drillhole that is up to</td>
</tr>
<tr>
<td>• No shafts or testing done</td>
<td>wide</td>
<td>two miles long and 18 inches wide</td>
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<tr>
<td>before end of program</td>
<td>• Testing was started before</td>
<td>• Equipment test to place and</td>
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<tr>
<td></td>
<td>funding was eliminated</td>
<td>retrieve small disposal canisters</td>
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<tr>
<td></td>
<td></td>
<td>was completed using standard oil &amp;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>gas equipment</td>
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</tbody>
</table>
Technology Features

• Deep Geologic Repository
   Superior retentive properties of sedimentary rock
   Thousands of feet below the surface
   Smaller diameter holes (e.g. 8” to 30”) reduce the disturbed zone of geological environment
   Horizontal aspect allows thousands of feet of undisturbed rock between waste and surface

• Engineered Barriers
   Reducing environment at depth significantly reduces corrosion
   Corrosion resistant alloys provide an engineered barrier that will survive for tens of thousands of years
Engagement Features

• Early Community & Utility Engagement
  ▪ An early and authentic approach to engaging with communities to determine if they are interested in the Deep Isolation solution
  ▪ A core value we employ, even for equipment tests where no radioactive waste was used
  ▪ Encouragement of a two-way dialogue to determine the right approach for each individual community
  ▪ Discuss potential revenue-sharing benefits

• Environmental Groups
  ▪ We are engaging with a range of environmental groups to find common areas of interest and cooperation
Technology Demonstration – Jan 16th

Deep Isolation Technology Demo:
- Used a commercial oil & gas testing facility
- Mock disposal canister sized for Cesium / Strontium capsules
- Total length of 2700 feet – 2200 feet vertical and 500 horizontal
- Emplaced and recovered the mock canister
Path Forward: Three-pronged Approach to Commercial SNF Disposal

• Legislative & Regulatory
  ▪ Congressional Allowance to Pursue a Second Repository
  ▪ NRC License

• Community & Utility Engagement
  ▪ Identifying Receptive Communities
  ▪ Revenue Sharing Model

• Scientific & Technological Development
Takeaways

• Deep Isolation is a Supplement to Yucca
  ▪ Not everything will fit in a borehole
  ▪ Not every site or community will be favorable

• We want to work with industry
  ▪ We want a solution that works for everyone
  ▪ We can get started on high-level waste

• It is time to consider alternative options to address an issue that is growing in scope and scale.
Thank You!

www.deepisolation.com