Reconciling Offshore Permitting in Light of Commercial, Regulatory, and Research Considerations

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Presented by:
Michael L. Godec, Vice President
Advanced Resources International, Inc.
Arlington, VA USA

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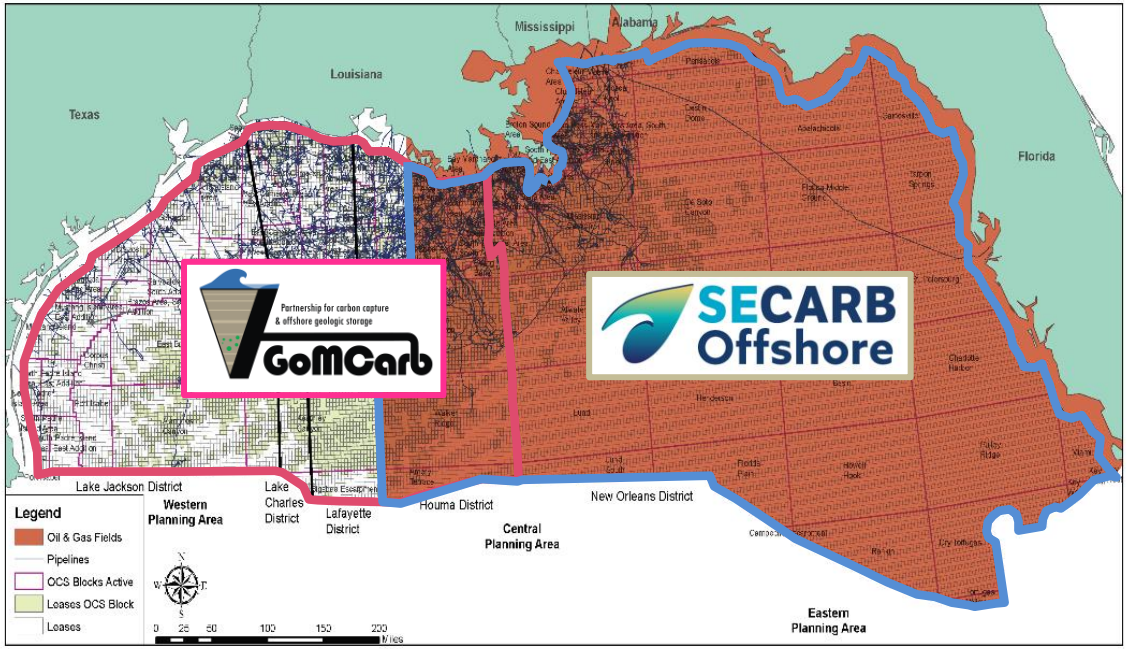
Advanced Resources International, Inc.

SECARB Offshore Partnership - Overview



Division of the SECARB Offshore and GoMCarb study areas. Figure courtesy of Advanced Resources International and modified by SSEB.

- Establishing the knowledge base required for secure, long-term, large-scale, subseafloor storage of CO_2 with or without enhanced hydrocarbon recovery
- SECARB: ARI, Aker Solutions, Battelle, CRI, Geological Survey of Alabama, IOM Law, LSU, OSU, SAS, Schlumberger, SSEB, Storegga, and Virginia Tech

Planned SECARB Offshore Research Outcomes

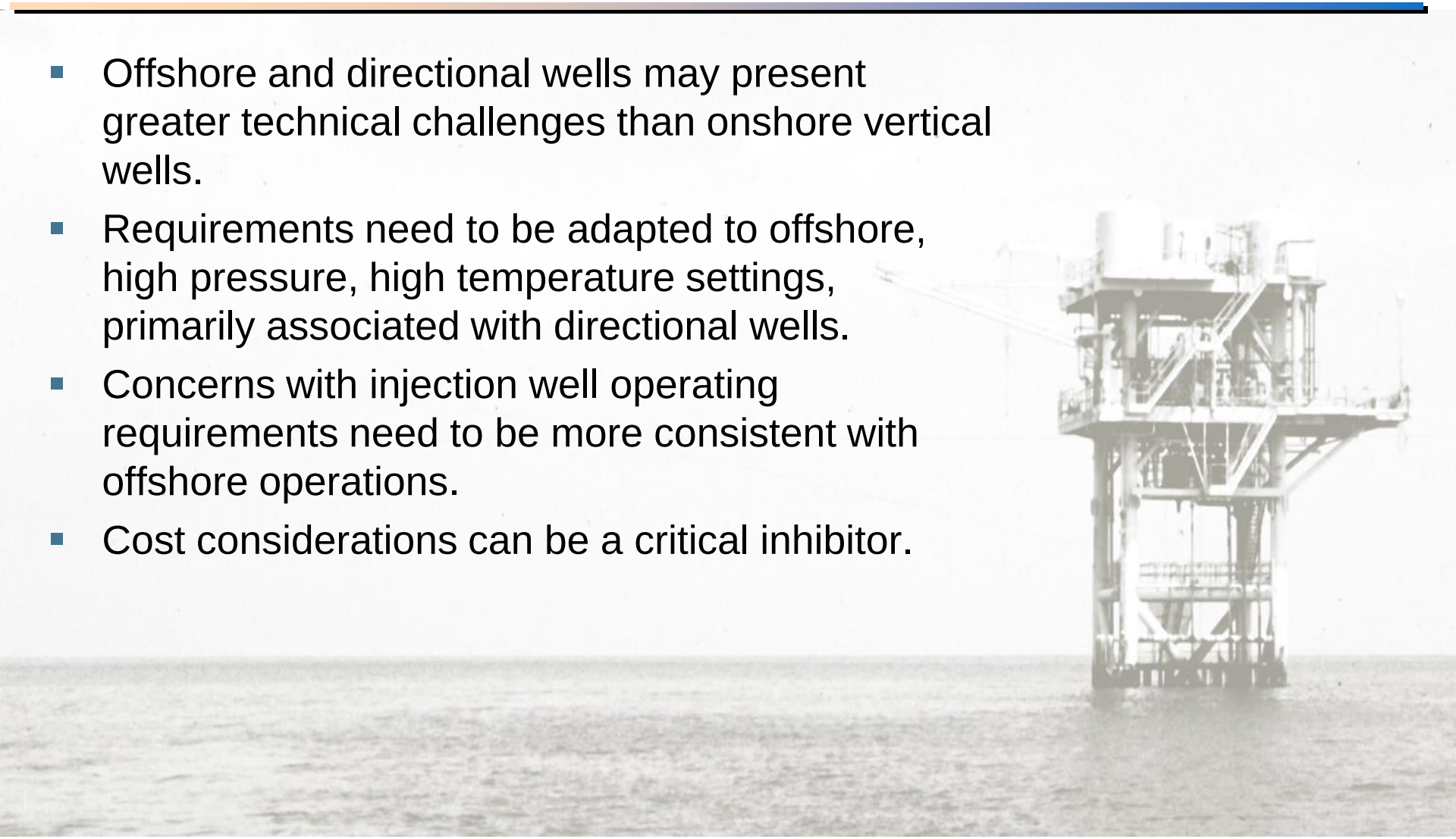
- Integrating data to characterize offshore CO_2 storage resources resulting in decision system to identify high-quality, potentially commercial "prospects."
- Development of concept for commercially viable CO_2-EOR and a saline storage prospects, perhaps using subsea completions/separation/ compression; with or without utilization of existing infrastructure.
- Refinement/adaptation of simulation tools, geologic models, risk assessment/mitigation strategies for site-specific assessments in the offshore.
- Development of "best practices" based on understanding of the offshore storage prospect(s) targeted
- Reduce uncertainties/risks, better understand MVA approaches
- Address regulatory gaps in the oversight and regulation of CO_2 storage activities (with and without EOR) in the offshore GOM.

Regulation of CO_2 Injection Offshore Evolving Rapidly

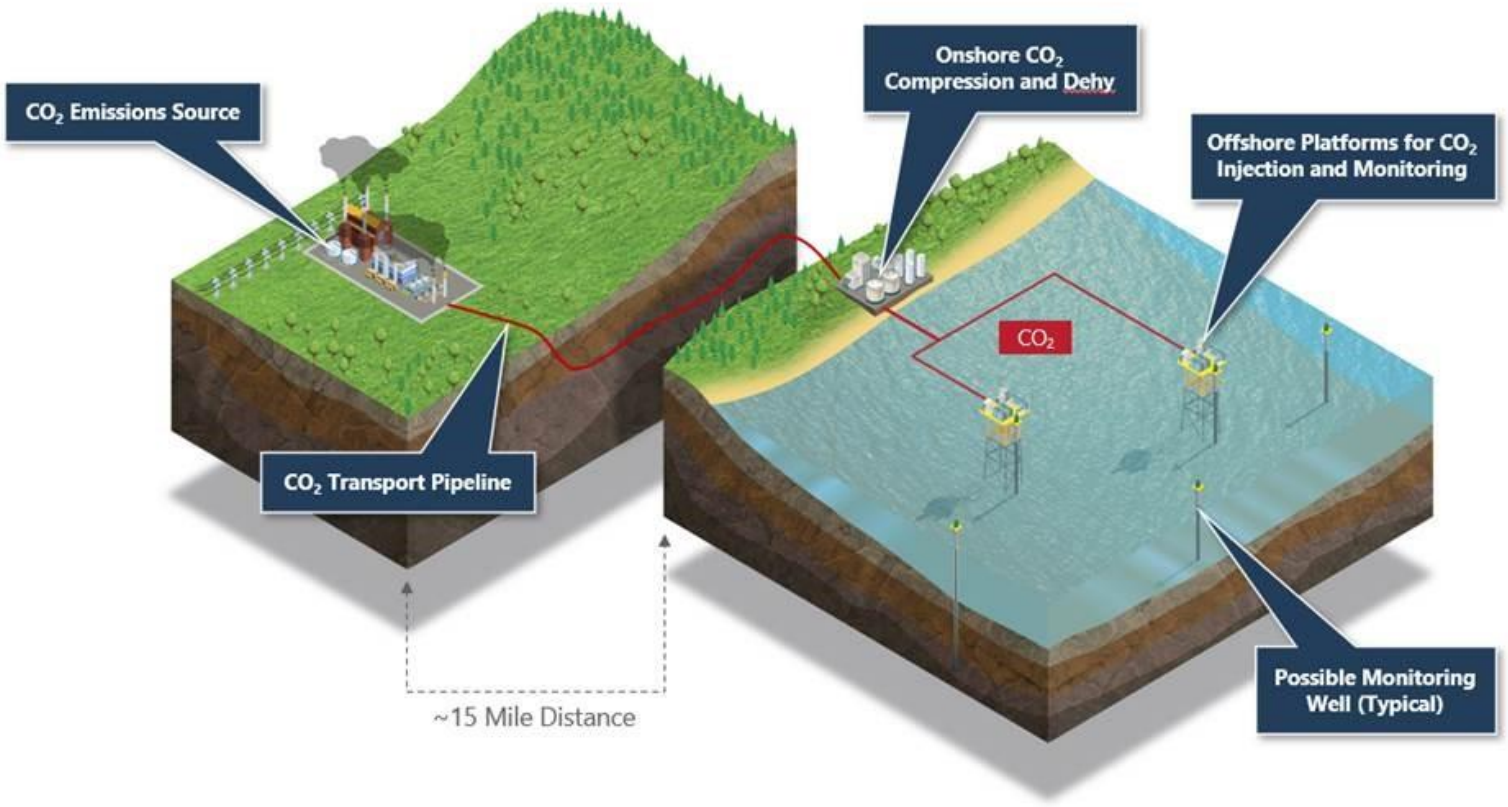
- CO_2 injection and CO_2-EOR offshore will be different from the experience of CO_2 flooding onshore.
- BOEM/BSSE and states like Louisiana and Texas are considering how to regulate offshore projects
  - Characterized by fewer wells, larger well spacing and higher injection rates per well.
  - Using regulatory frameworks primarily developed for onshore operations, at least at the state level
- The primary Class VI objective of groundwater protection is not a driver in the offshore.
  - Impacts on the seabed and the water column will take precedent.
- Cost considerations are of even greater consequence in the offshore.

Class VI Well Construction Standards in Offshore Settings

- Offshore and directional wells may present greater technical challenges than onshore vertical wells.
- Requirements need to be adapted to offshore, high pressure, high temperature settings, primarily associated with directional wells.
- Concerns with injection well operating requirements need to be more consistent with offshore operations.
- Cost considerations can be a critical inhibitor.



Bayou Bend CCS – Schematic Development Concept



Joint Venture of Talos, Carbonvert, and Chevron

SECARB Offshore Outreach Activities

- Providing SME to regulators and identifying areas of multi-state and multi-agency collaboration
  - Coordinating meetings to discuss technical aspects of Class VI permitting (e.g., well design)
- Hosted May 16 Regulator Workshop
  - AL, AR, and MS interested in primacy (consolidating authority)
  - Lots of industry interest in LA and TX
  - BOEM and BSEE developing regulations as required by the bipartisan infrastructure law

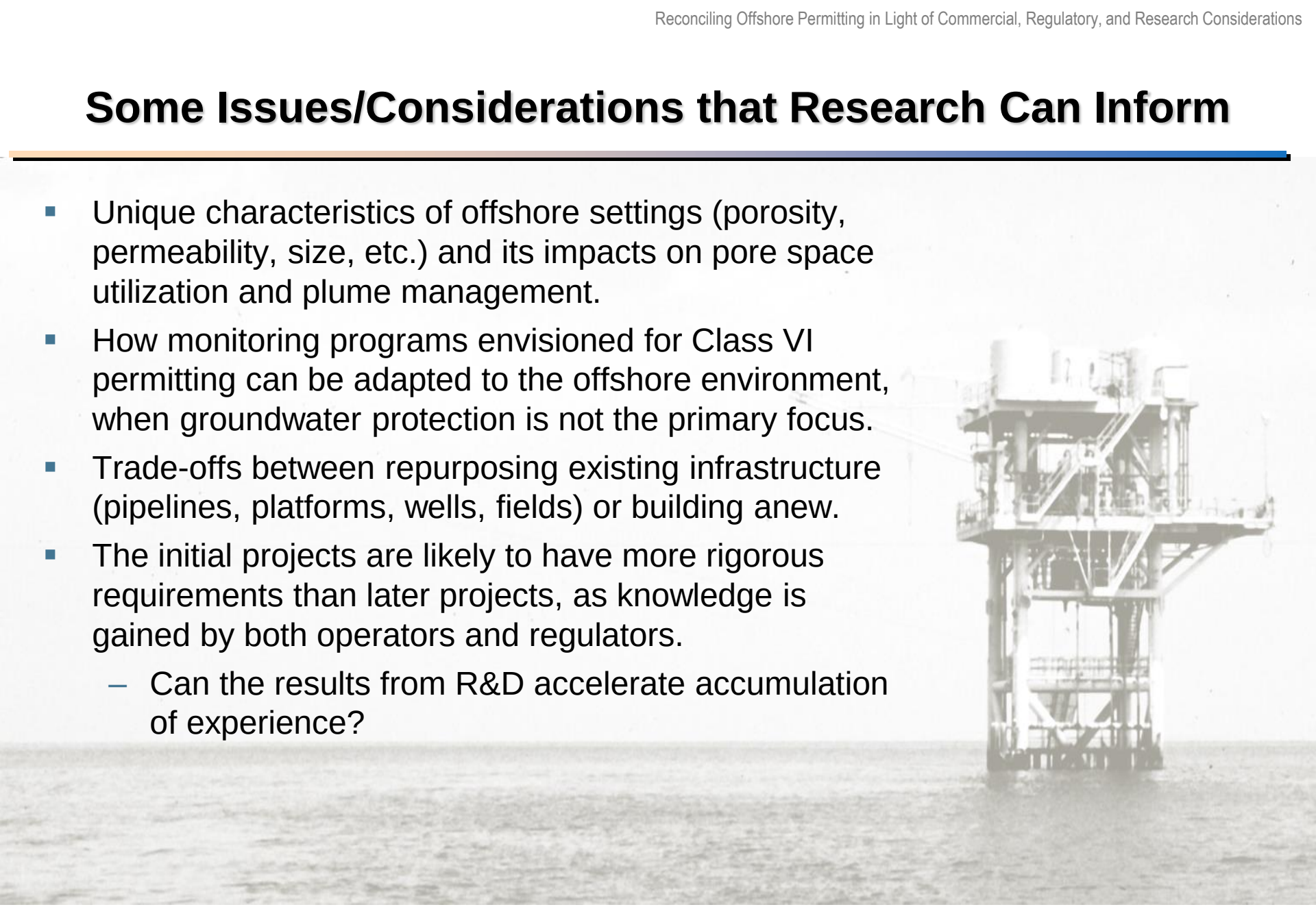
Participation in the 2022 Gulf Region Regulator Workshop

Key Industry Themes - SECARB Offshore/GoMCarb Regulator Workshop - May 2022

- **Policy and regulatory uncertainty is perhaps the biggest obstacle impacting large scale CCS deployment offshore**
  - Incentives may need to be different, expanded given high costs
  - Offshore regulatory frameworks are still under development
- **The capital costs for entry are high; with misunderstanding of the risks and rewards, particularly for private capital providers not familiar with CCS and/or offshore projects.**
  - High returns necessary to overcome uncertainty
  - ESG investors are still willing to pursue such opportunities
  - Not clear how critical long-term liability considerations play
- **Greater certainty on all fronts critical to establishing potential commercial viability.**

Some Issues/Considerations that Research Can Inform

- Unique characteristics of offshore settings (porosity, permeability, size, etc.) and its impacts on pore space utilization and plume management.
- How monitoring programs envisioned for Class VI permitting can be adapted to the offshore environment, when groundwater protection is not the primary focus.
- Trade-offs between repurposing existing infrastructure (pipelines, platforms, wells, fields) or building anew.
- The initial projects are likely to have more rigorous requirements than later projects, as knowledge is gained by both operators and regulators.
  - Can the results from R&D accelerate accumulation of experience?



Michael Godec
Vice President
mgodec@adv-res.com

Office Locations
Washington, DC
4501 Fairfax Drive, Suite 910
Arlington, VA 22203
Phone: (703) 528-8420

Knoxville, TN
1210 Kenesaw Ave.
Suite 1210A
Knoxville, TN 37919-7736

Advanced Resources International, Inc.