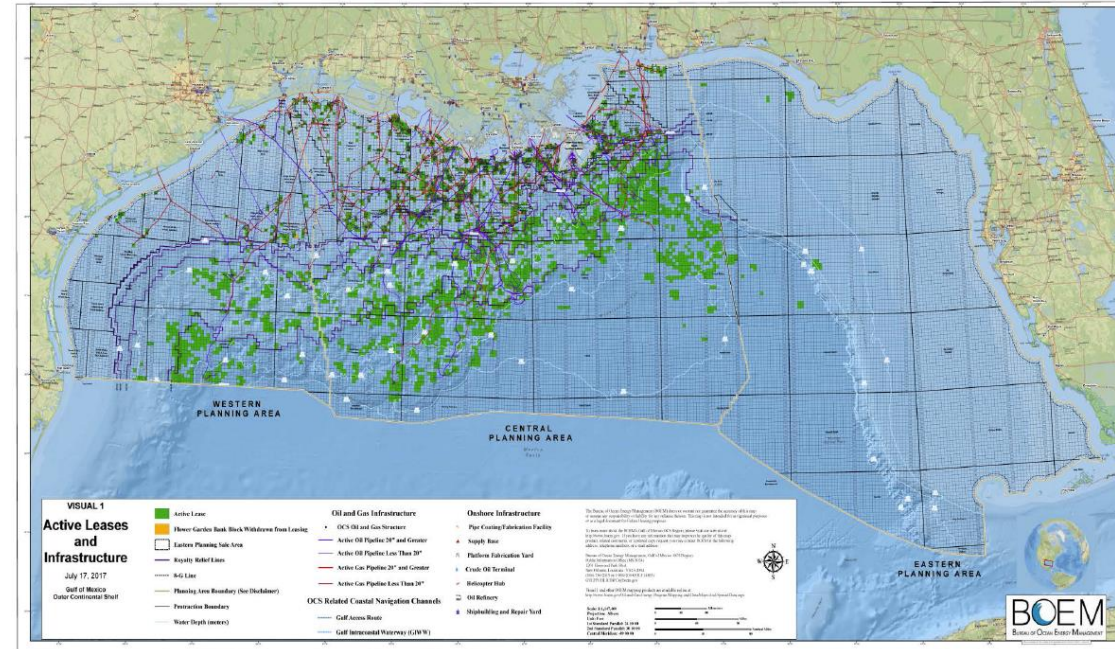


Research and Development
Needs & Opportunities
for CM and REE:
Gulf Coast Regional & Offshore

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Gulf Coast Regional & Offshore

- Deep technical expertise for the
 - Exploration of resources and quantification of reserves
 - Drilling and mining
 - Separation, production and monetization
 - Value and supply chain optimization: Local, National, Global
 - End – of – life options and Circular economy
- Impact of current energy crisis
- Offshore Gulf Coast: Network & Infrastructure
 - ~1,800 active platforms within the OCS; more than 40 % facilities are 25+ years old (~2000 decommissioned in last 15 years)
 - Industry averages >130 platform removals / yr



Research & Development Opportunities

- Application of data sciences, artificial intelligence, and machine learning for resource identification and quantification: Transfer and Adoption from Fossil Energy Applications including for Produced Water
- Automated extraction & concentration through robotics and automation as adapted to modular processing
- Processing & Separation: Intensified processes, Green chemistries, Novel energy inputs
- Green supply chain & Sustainable mineral extraction: Circular management of chemical reagents
- End-of-life management and recycling of REE: magnets, turbines, PVs, EVs
- Unconventional sources for REE: Laterites, Deep sea, Seawater

Adjacent & Integrated Advancements

- Permitting: Complex, Multi-jurisdictional, Environmental regulations
- Supply Chain Management: Managing market needs & market economics
- Managing Technology Transfer
- Workforce Development Challenges: Interdisciplinary and multi-level

Innovation and Entrepreneurship

- Convergence of multi-disciplinary teams of science, engineering, business, legal and policy
 - Defining a sustainability index
 - Defining a standard for LCA/TEA
- Various bottlenecks and potential solutions in value chain:
 - Marine harvesting of minerals (cobalt) through repurposing of offshore rigs: Incorporating Green Harvesting Membranes
 - Application of AI/ML for Identification & Resource Quantification for fossil based CM/REE resources
 - Robotics and Automation for automated drilling and production
 - HPHT Technologies for deep wellbore
 - Recycling technologies through Sustainable Hydrothermal Processes

Thank You & Questions

- Thanks for your attention

- Questions

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