Unlocking India's Energy Diversification: Leveraging Regional Geoscience Data and Subsurface Intelligence for CCS and Offshore Wind Development

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India has established ambitious national decarbonization targets, creating significant commercial and technical opportunities for Carbon Capture and Storage (CCS) and Offshore Wind development. While hard-to-abate industrial sectors such as power generation, steel, cement, refining, and chemicals – represent prime candidates for large-scale decarbonization, successful deployment of CCS infrastructure depends on stringent identification, characterization, and long-term monitoring of secure geological storage sites. Similarly, commercial-scale offshore wind development requires high-resolution spatial understanding of seabed conditions, shallow geohazards, geotechnical properties, and environmental constraints to de-risk infrastructure design and investment decisions.

Many of the technical challenges associated with these emerging sectors are analogous to those historically encountered in the oil and gas industry. Decades of subsurface exploration have generated extensive geological, geophysical, and well datasets that can be strategically repurposed to accelerate project screening and reduce subsurface risk in both CCS and offshore wind developments.

This paper examines a roadmap for navigating through India's evolving CCS and offshore wind landscape utilizing advanced data and geoscience expertise. Drawing upon TGS's extensive global footprint and proven data-driven workflows for basin-scale interpretations, and integrated site characterization, identification of prospective CO_2 storage complexes, assessment of containment risks, evaluation of injectivity and storage capacity, designing of robust monitoring programs is possible using comprehensive regional seismic datasets, with curated well information..

Furthermore, the paper demonstrates how TGS's integrated offshore data acquisition services, combined with data processing and interpretation models and digital analytics support optimized wind farm site selection and characterization foundation designing, cable route planning, and geohazard assessment.

Drawing on global analogues from emerging energy-transition projects, the study demonstrates how existing geoscience databases and multidisciplinary workflows can reduce project risk, shorten development timelines, and improve investment confidence for developers and capital providers alike. The paper further explores how collaboration among industry, academia, government agencies, and technology providers can accelerate the development of India's CCS and offshore wind value chains.

The authors conclude that the strategic reuse of legacy subsurface knowledge, combined with targeted acquisition of new geophysical and geotechnical data, provides a highly scalable, cost-effective pathway for enabling large-scale deployment of CCS and offshore wind projects in India – positioning TGS data and expertise as a critical enabler of country's transition toward a lower-carbon energy future.

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