ENHANCED OIL AND GAS RECOVERY STUDY - INFORMATION REGARDING THE REQUEST FOR PROPOSAL AND PROPOSAL RESPONSES

BACKGROUND INFORMATION

Section 42 of 2015 Senate Bill No. 2015 provides for a Legislative Management study of the current scientific and economic information regarding oil and gas recovery and enhanced recovery techniques, including the use of carbon dioxide, the timeline for implementing the techniques, and the estimated future annual economic impact, to evaluate existing and alternative tax incentives and recommend tax incentives that under current and foreseeable conditions, and within different oil formations, would best serve the interest of the state, political subdivisions, and fossil fuel energy production industries. The Taxation Committee has been assigned this study responsibility for the 2015-16 interim. Section 11 of the bill provides for an appropriation of $400,000 to the Legislative Council for purposes of securing consultants to study oil and gas tax incentives and oil and gas recovery techniques.

REQUEST FOR PROPOSALS

On July 31, 2015, as directed by the committee, the Legislative Council issued a request for proposals (RFP) for consultant services for assistance in the study of scientific and economic information regarding oil and gas recovery and enhanced recovery techniques.

Provisions of the RFP specified the study must include analysis of:

1. The current scientific information regarding oil and gas recovery and enhanced recovery techniques, including:
   a. A detailed analysis of the use of carbon dioxide in enhanced oil recovery;
   b. The feasibility of implementing various enhanced oil recovery methods; and
   c. The potential timelines associated with the implementation of enhanced recovery techniques.
2. The current economic information regarding oil and gas recovery and the estimated future annual economic impacts that may result from the application of enhanced recovery techniques. The analysis should take into consideration:
   a. The various oil formations within the state;
   b. The application of existing tax incentives to current and foreseeable conditions; and
   c. Recommendations for the elimination, modification, or addition of tax incentives and the effect recommended changes may have on the interests of:
      (1) The state;
      (2) Political subdivisions;
      (3) The environment; and
      (4) Fossil fuel energy production industries, including the lignite industry.

Proposals were due to the Legislative Council office on September 1, 2015.

SUMMARY OF CONSULTANT RESPONSES TO THE REQUEST FOR PROPOSALS

The following chart provides a summary of the information contained within each of the consultant proposals submitted for consideration.

Consultant	Energy & Environmental Research Center	IHS Energy
Consultant profile	The Energy & Environmental Research Center, in partnership with North Dakota State University, Department of Agribusiness and Applied Economics; Odney, Public Affairs & Government Relations; the University of Wyoming College of Business, Department of Economics & Finance; and the CETER Group, Inc., is proposing to conduct a scientific and economic study of oil and gas enhanced recovery techniques for applicability in North Dakota. The proposed project team is highly	IHS Energy is a leading source of information and insight in critical areas that shape today's business landscape, including energy and power; design and supply chain; defense, risk, and security; environmental, health and safety and sustainability; country and industry forecasting; and commodities, pricing, and cost. Businesses and governments in more than 165 countries around the globe rely on the comprehensive content, expert independent analysis, and flexible delivery methods of IHS Energy to make

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	experienced in the fossil energy industry, bringing expertise in oil and gas technologies, economics, taxation policy, and environmental impacts. An advisory board comprising members with immense knowledge of the oil and gas industry and interests of the state will also be accessible throughout the study duration to ensure project success.	high-impact decisions and develop strategies with speed and confidence. IHS Energy has been in business since 1959, incorporated in Delaware in 1994, and became a publicly traded company on the New York Stock Exchange in 2005. Headquartered in Englewood, Colorado, IHS Energy employs more than 8,500 people in more than 40 countries around the world.
Project manager	James A. Sorensen - Bachelor of Science (BS), Geology, University of North Dakota; Postgraduate course work in Geology and Hydrogeology	Irena Agalliu – JD, University of Houston Law Center; Master of Laws (LL.M.) in Petroleum Law and Economics from Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Scotland
Other team members	**Energy & Environmental Research Center** Wesley D. Peck - Bachelor of Arts (BA), Earth Science, North Dakota State University; Master of Science (MS), Geology, University of North Dakota Lonny L. Jacobson - Hydrogen Sulfide Certification; federal Occupational Safety and Health Administration Hazard Recognition Training; Well Control Training; Workover and Completion; BA, Economics, University of North Dakota **University of Wyoming College of Business, Department of Economics & Finance** Dr. Benjamin R. Cook - Certificate in Business Strategy, Cornell University; BS and Doctor of Philosophy (PhD), Economics, University of Wyoming, Laramie **North Dakota State University, Department of Agribusiness and Applied Economics** Dean A. Bangsund - Research Scientist, Department of Agribusiness and Applied Economics, North Dakota State University, Fargo Nancy M. Hodur - BA, Business Administration, Jamestown College; MS and PhD, Natural Resource Management, North Dakota State University **Odney, Public Affairs & Government Relations** Cory Fong - BA, Political Science and Speech Communications, Gonzaga University, Spokane, Washington; Coursework towards Master's in Public Administration, University of North Dakota, Grand Forks Shane Goettle - BS, Agricultural Economics, North Dakota State University, Fargo; Juris Doctor (JD), Hamline University School of Law Lacee Anderson - BA, International Relations, Business, and Spanish, Concordia College, Minnesota, JD, William Mitchell College of Law, Minnesota **The CETER Group, Inc.** Nicholas A. Azzolina - BA, Geological and Geophysical Sciences, Princeton University; MS, Hydrogeology, Syracuse University; PhD Environmental Management and Science, Carnegie Mellon University **Advisory Board** The advisory board consists of individuals from the North Dakota Petroleum Council, the North Dakota Industrial Commission Oil and Gas Division, the Lignite Energy Council, and the North Dakota Association of Oil and Gas Producing Counties	Dan Bendig – BS, Physics, Master of Arts (MA), Geology, Master of Science (MSc), Stratigraphy Aube Montero-Plop - MSc, Finance, University Rene Descartes, Paris; completed a certificate in Petroleum Projects Evaluation and Management at Texas A&M Harold Vance School of Engineering Dr. Mohamad Tavallali – BS and MSc degrees from Iran, PhD, Petroleum Engineering, University of Calgary Ray Mireault – Bachelor of Science (BSc) Agricultural Engineering, University of Manitoba at Winnipeg, Manitoba

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Experience	The Energy & Environmental Research Center has undertaken previous projects falling within this subject matter, namely studies conducted as part of the EERC's lead role in the Plains CO_2 Reduction Partnership program including: • Provision of an updated regional technology implementation plan for the Zama oil field in northwestern Alberta, Canada; • Provision of an overview of the Bell Creek combined carbon dioxide storage and carbon dioxide enhanced oil recovery project; • A study of the geological characterization of the Basal Cambrian System in the Williston Basin; • A study of the storage capacity and regional implications for large-scale storage in the Basal Cambrian System; • A determination of the estimated carbon dioxide storage capacity in selected oil fields of the northern Great Plains region of North America; • A study of the carbon dioxide storage and utilization in tight hydrocarbon-bearing formations, specifically, a case study of the Bakken Formation in the Williston Basin; • A study of the unitization of geologic media for the purpose of monetizing geologic sequestration credits; • A study on the results of the Plains CO_2 Reduction Partnership's Phase II demonstration in the Northwest McGregor oil field; and • A study of developing carbon dioxide sequestration opportunities for the central interior of North America. Studies conducted by the University of Wyoming include: • A study on Wyoming's miscible carbon dioxide enhanced oil recovery potential from main pay zones; and • A study of the economic contribution of carbon dioxide enhanced oil recovery in Wyoming. North Dakota State University research activities include: • Research and outreach projects pertaining to economic and fiscal impact assessment, community economic development, natural resource management, and rural social-economic issues pertinent to the Great Plains region; • Development of several economic models and analytical systems developed to address a wide range of issues for various consistent groups in the upper Midwest, notably, a modeling process to forecast regional employment, housing demand, and population in the Williston Basin; • Socio-economic impact assessment, community and economic development, and natural resource management; and • Research issues related to rapid expansion of the oil and gas industry, school enrollment projects for the Association of Oil and Gas Producing Counties, and an assessment of the characteristics, perceptions, and intentions of the oil and gas industry workforce.	IHS Energy has undertaken previous projects falling within this subject matter including: • A reservoir modeling study of carbon dioxide enhanced oil recovery potential for an Ohio naturally fractured tight sandstone reservoir; • A survey of miscible carbon dioxide projects in North America; • Carbon dioxide and hydrogen sulfide injection well pressure modeling; • Water-alternating-gas and gas injection for the recovery of heavy oil; • Screening to determine the enhanced oil recovery potential of a heavy oil reservoir; • Assisting Pemex--the Mexican state-owned petroleum company--with regulatory and commercial aspects of energy reform; and • A comparative assessment of the federal oil and gas fiscal systems for the United States Department of the Interior.

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	Projects Odney's team members have been involved with include: • The western North Dakota infrastructure development initiative; • Property tax valuation and assessment reform; • North Dakota Department of Commerce and Economic Development Foundation strategic planning; and • Multistate Tax Commission strategic planning. Projects CETER oil and gas have worked with the EERC in completing include: • An analysis of oil production date from 13 counties in this state for wells producing from the Bakken and Three Forks Formations to quantify uncertainty and forecast cumulative oil production and production decline; • Development of a Monte Carlo-based simulation model to quantify the additional financial liability associated with burial of stabilized drill cuttings in onsite cuttings pits as well as offsite disposal of stabilized drill cuttings in special waste landfills; • Statistical analysis of proprietary industry data set of oil reservoir performance data from 31 different carbon dioxide enhanced oil recovery sites in various states, resulting in a novel approach for describing key metrics that significantly influence the long-term performance and economic viability of carbon dioxide enhanced oil recovery projects; and • Assessment of the life-cycle greenhouse gas emissions associated with carbon dioxide enhanced oil recovery projects as compared to conventional and unconventional oil and gas development.	
Scope of work	The scope of the EERC's proposal includes a scientific study of potential enhanced oil recovery in North Dakota including a detailed analysis of carbon dioxide enhanced oil recovery, the technical feasibility of implementing various enhanced oil recovery methods, the estimated time line for implementation of identified enhanced oil recovery techniques, and an evaluation of identified technically feasible and commercially available enhanced oil recovery techniques for North Dakota. The proposal also includes an economic study of potential enhanced oil recovery in North Dakota including the estimated annual economic impacts, near-term and long-term, from implementation of carbon dioxide enhanced oil recovery; an investigation of current and potential tax incentives to encourage implementation of carbon dioxide enhanced oil recovery; and an evaluation of carbon dioxide enhanced oil recovery and potential tax incentives for North Dakota.	IHS Energy's proposal includes the provision of a detailed analysis of the use of carbon dioxide for enhanced recovery from oil reservoirs including an overview of carbon dioxide enhanced oil recovery techniques and fundamentals, information on reservoir and operational characteristics of carbon dioxide enhanced oil recovery processes, and the state of North American commercial carbon dioxide enhanced oil recovery projects, including various opportunities and challenges. The proposal also includes an analysis of the feasibility of implementing various enhanced oil recovery methods, and the timelines associated with implementation of enhanced oil recovery techniques. IHS Energy will also study the current economic information and the estimated future annual potential economic impacts resulting from enhanced oil and gas recovery techniques. In order to make recommendations for changes to the current tax system, IHS Energy would create a tax and fiscal model for conventional and unconventional oil and gas fields or plays. Once complete, the model would be used to create scenarios of hydrocarbon price levels and associated activity. Sensitivity analysis could then be used to see the impact of changes to the tax under the various model assumptions.

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Proposed cost	$125,148 for technical analysis $274,624 for economic analysis **$399,772 in total project costs**	$150,000 for technical analysis $245,000 for economic analysis $240,000 for ongoing support **$635,000 in total project costs**