BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 2006-01: ENERGY NORTHWEST; PACIFIC MOUNTAIN ENERGY CENTER	**EXHIBIT __** (JRT-T)

APPLICANT'S PREFILED TESTIMONY

WITNESS: JOHN R. TALBOTT

Introduction

Q. Please state your name, current employment position and business address.

A. My name is John Talbott. I am Project Manager for Big Sky Carbon Sequestration Partnership ("Big Sky"). Big Sky's address is Linfield Hall – Room 312, Montana State University, Bozeman, MT 59717.

Q. Please describe your educational and professional background.

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A. I have a BS and an MPA and I am currently a PhD candidate in public policy at Virginia Tech awaiting acceptance of my dissertation. A copy of my curriculum vitae is attached as Exhibit ___ (JRT-1).

Scope and Summary

Q. What is the scope of your testimony in this proceeding?

A. I will describe the structure of Big Sky, the relationship between Big Sky and Energy Northwest, and policy issues relating to carbon capture and sequestration.

Big Sky Carbon Sequestration Partnership

Q. What is Big Sky?

A. Big Sky is one of seven regional partnerships formed under the auspices of the United States Department of Energy ("DOE"). Big Sky focuses its carbon capture and storage ("CCS") efforts on the region that includes the Pacific Northwest, Montana, Wyoming, Idaho and South Dakota. Led by Montana State University, Big Sky is developing a framework to address carbon dioxide ("CO_2") emissions that contribute to climate change and working with stakeholders to create the vision for a new, sustainable energy future that cleanly meets the region's energy needs.

Q. Is Energy Northwest a member of Big Sky?

A. Yes, Energy Northwest has been a member for several years, and has made a number of contributions to our work.

Q. What is the relationship of Big Sky to its members?

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A. Big Sky's vision is to prepare its member organizations for a possible carbon-constrained economy and enable the region to cleanly utilize its abundant fossil energy resources and sequestration sinks to support future energy demand and economic growth. Big Sky will achieve this vision by demonstrating and validating the region's most promising sequestration technologies and creating the supporting infrastructure required to deploy commercial scale carbon sequestration projects.

Types of Sequestration

Q. Are you familiar with the terms "direct" and "indirect" sequestration?

A. Yes. "Direct" CO_2 sequestration involves capturing CO_2 at its point of generation before it is released to the atmosphere. The CO_2 is then put in long-term (hundreds to thousands of years) environmentally sound storage, usually in a deep geological formation. These formations can be depleted oil and gas reservoirs; saline aquifers; deep coal beds; and mafic rocks.

"Indirect" CO_2 sequestration involves capturing CO_2 that has already been released to the atmosphere. CO_2 is removed from the atmosphere through intake by plants or by fixing carbon in the soil.

Q. So does "direct" sequestration typically involve geologic sequestration, while "indirect" sequestration involves terrestrial sequestration?

A. Yes, typically that is the case.

Q. How do the economics of geologic and terrestrial sequestration compare?

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A. The costs of geologic sequestration involve the costs associated with capture, compression, transportation, and injection. Injection costs must include acquisition of the mineral rights or pore space to be occupied by the CO_2, surface rights for the areal extent of the injected CO_2, monitoring of the plume and reservoir pressures over long periods, and the costs of permitting and liability insurance. Large scale injection tests that can evaluate these costs for commercial scale geologic sequestration in a variety of geologic sinks are on the horizon but are not expected to be completed until approximately 2016.

Capture costs vary widely primarily due to the lack of commercially deployed capture systems for either pre-combustion or post-combustion systems. Capture costs include capital construction costs, and the "parasitic" costs of generated energy that must be used to power the capture plant. Depending on the type of capture system used, these costs can collectively approach $45-50/ton of CO_2 captured. Stated another way, capture costs can add 15-30% to the cost of generated electricity.

Most experts would agree that pre-combustion capture such as that proposed by PMEC is the most economical when compared to post-combustion systems. However, costs at this point are strictly hypothetical as there are currently no commercial analogues to be used for comparison.

Terrestrial sequestration involves purchasing CO_2 that has already been captured in the soil or in standing biomass such as forests. These costs are currently dictated by an emerging carbon market in the United States and a more established market developed by the European Union. The credits are created through landowners agreeing to employ cropping, tilling or grazing practices that increase soil organic carbon or through afforestation or reforestation

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practices that seek to tie up the carbon in the biomass of trees. The current price of CO_2 on the Chicago Climate Exchange is approximately $3.60 per metric ton sold in 100 metric ton blocks. To give an example, dry land no till grain production such as is used in eastern Washington can sequester about 0.5 tons of carbon per acre per year. One half ton of carbon is equivalent to 1.8 tons of CO_2. To sequester 1 million tons of CO_2 per year would require purchasing offsets on 545,000 acres of land (enrolled in the market) at a cost of $3.6 million per year at current prices. Obviously, from an economic perspective, these prices are appealing. However, it must be noted that carbon market prices are expected to increase substantially as more and more states implement legislation limiting green house gas emissions. Pending legislation in the United States Senate would cap this price at $12/ton, but that price cap is intended to increase incrementally over time such that terrestrial sequestration costs could approach geologic sequestration costs in the very near future.

Q. What if any role does risk assessment play in the design of a Carbon Capture and Storage project?

A. Risk assessment plays a very significant role because there are so many uncertainties at play. Some sequestration risks can be avoided relatively easily, such as tectonic instability; population centers; national parks; over-pressured reservoirs; and unstable mineral assemblages. A number of other hazards also exist, such as poor geologic characterization; mobilization of saline formation fluids; incomplete monitoring; unidentified or poorly completed wells; unknown chemical reactions; and long-term stewardship.

Q. How should risks be assessed?

A. Los Alamos National Laboratory and Lawrence Berkley National Laboratory have both developed risk assessment models that can accurately identify potential risks while proposing

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mitigation measures that lower risk to acceptable levels. Just as importantly, risks assumed by the power producer that invests in emerging technologies that capture and sequester carbon are more poorly understood.

Q. What type of sequestration would you recommend for PMEC?

A. My colleague, Travis McLing, can speak to technical issues.

Q. From a policy perspective, is there any reason to favor geologic over terrestrial sequestration, or vice versa?

A. Yes. Terrestrial sequestration provides a short term fix for CO_2 that is already present in the atmosphere. However, the magnitude or scale of terrestrial sequestration that would be required to address current and future emissions is simply not available. Although not currently employed at a large scale, the transaction costs associated with monitoring compliance with terrestrial sequestration protocols may increase the costs of terrestrial sequestration beyond that of geologic sequestration. Secondly, under some circumstanced, terrestrial sequestration is not permanent. Landowners will respond to the market. Land that is currently growing wheat today using no-till practices can be converted to corn production next year to respond to the biofuels market. Forests eventually mature and must be harvested or replaced with new growth.

Geologic sequestration offers permanent sequestration of CO_2 in formations where virtually all existing anthropogenic sources were derived. From a policy perspective, it is relatively easy to describe, define, evaluate, and implement public policy that assures that the CO_2 is permanently stored while minimizing risks to public health and other uses of subsurface resources.

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Regulatory Policies

Q. How would you characterize the regulatory environment for carbon capture and sequestration at this time?

A. The regulatory framework is in its infancy, although it is developing quickly. Sequestration poses a number of regulatory challenges that cut across regulatory regimes. For example, a CCS project could easily require regulatory approval under a panoply of laws from a number of permitting agencies because it would require elements of an air permit, a wastewater discharge permit, health department approval under safe drinking water laws, land use approval, mineral rights, etc.

Q. What regulatory policies govern geologic or terrestrial sequestration?

A. Currently, the Safe Drinking Water Act governs geologic sequestration through the Underground Injection Control program of EPA. States such as Washington have assumed primacy over this program. CO_2 injection falls under the Class V injection well permitting system because these wells are considered experimental and CO_2 is not classified as a hazardous waste.

EPA has issued a guidance document to facilitate geologic sequestration tests and demonstration projects. However, as geologic sequestration moves to commercial scale, the guidance document will need substantial revision as will the entire UIC program. Many states have already moved to supplement the UIC regulations with site specific regulations that envision large scale geologic sequestration projects.

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Terrestrial sequestration is regulated solely through the market and in some states by a state registry that qualifies and certifies carbon credits for the issuer and the purchaser.

Q. Are there regulatory issues relating to potential liability?

A. Yes. Liability concerns are quite significant. To date, geologic sequestration is likely to become feasible at a commercial scale only in those states that have enacted legislation effectively indemnifying developers from any liability associated with leakage, etc. The liability issue has not yet been resolved in any of the Pacific Northwest states.

Q. How do issues relating to policy and regulatory development, and to liability, affect whether and when geologic carbon sequestration can be done on a commercial scale?

A. The uncertainties associated with the paucity of national policy guidance on CCS and a plethora of emerging state policies and regulatory frameworks addressing CCS and the sale or purchase of "clean" electrons versus "dirty" electrons continues to delay deployment of this technology.

Q. Does this complete your testimony?

A. Yes it does.

EXHIBIT LIST

Ex. No.	Prefiled No.	Description
	JRT-1	Curriculum Vitae of John R. Talbott

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