TESTIMONY OF

THE HONORABLE DAVID D. FREUDENTHAL, GOVERNOR
STATE OF WYOMING

BEFORE THE

HOUSE SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING

EDWARD J. MARKEY, CHAIRMAN

AT ITS HEARING ON
THE FUTURE OF COAL UNDER CARBON CAP AND TRADE

Greetings

Mr. Chairman, distinguished members of the Select Committee thank you for the opportunity to appear before you and comment on the future of coal under carbon cap and trade. This is really a discussion on carbon management, more particularly carbon capture and sequestration, which inevitably leads to a discussion of the role of coal in fueling the American and international economy.

Wyoming in Context

Please allow me to place my comments in the factual context of Wyoming as a state committed to both energy production and environmental protection. I find people in Congress are most familiar with our two national parks – Yellowstone and Grand Teton -- and our role as the leading coal producing state in the nation with production of 446 million tons of low sulfur coal in 2006.

What is generally not as well known are the other forms of energy Wyoming produces. Depending on the day of the week and the mood of our friends in Oklahoma, we are either the second or third largest natural gas producing state in the country with annual production a bit over two trillion cubic feet or about 10% of the domestic supply. Wyoming has for several years been the largest producer of uranium in the country with approximately 2 million pounds a year of yellowcake (uranium concentrate) produced. We currently rank in the top quartile of states in wind generation, and have an estimated 8,000 megawatts of developable wind when the transmission constraint is released. Two

projects have been announced recently which will add approximately 200 megawatts of capacity and at least 10 wind power projects are in various stages of review and development with state regulatory agencies. We produce about 53 million barrels of oil annually placing Wyoming in 7th place among the states.

Put another way on a net BTU exporting basis, subtracting state consumption from state production, Wyoming is by far the largest energy exporting state in the nation providing about 10 quadrillion BTUs or roughly 10% of the country's energy supply.
[See attached graphic]

Coal in Context

My purpose today is not to argue, but to recognize some fundamental realities.

Like it or not, coal is going to be used in America and the world for some time to come. Even without any new coal fired plants there are 1,522 existing generating plants consuming over one billion tons of coal per year. Over the next twenty years, new and replacement generating capacity is forecast at 292 gigawatts, the equivalent of 25 coal-fired power plants each year. While conservation and efficiency programs are forecast to make a real dent in the rate of growth of electricity consumption, we are going to need every form of energy we can harness including clean coal, natural gas and renewable resources. Non-hydro renewable resources of wind, solar and geothermal meet less than 1% of our energy needs today. Fossil fuel sources provide over 80%. For the foreseeable future, carbon based resources are a necessity if we want to keep the lights on. Hence, any serious carbon management effort must include aggressive support for carbon capture and sequestration.

Who Pays?

Without question, long term carbon management is going to cost a lot of money. Private and public sector investment will be redirected and those costs will ultimately fall to tax payers and consumers. Carbon capture and sequestration will also consume significant energy in the capture processes, compression and transportation which of course will add to operating costs. It would seem an appropriate policy goal then to pick those processes most likely to yield the greatest effectiveness at least cost to the consumer/taxpayer.

Consumer energy costs are not a trivial matter in my state. A recent analysis we completed suggests that the lowest income quartile, those households earning less than $25,000 per year pay about 16% of their income for energy. Those in the highest quartile pay on average 2-3% of their income for energy. So those that can least afford it, pay 7 to 8 times as much a portion of their income for energy as most of us in this hearing room. Imagine what happens if the cost of energy rises 15, 20 or 25 percent and that differential begins to rise exponentially. In my small state that would affect over 51,000 households or 25% of my constituents. That means nearly 130,000 people are going to have to make very hard choices about how they spend scarce dollars. As policy makers we cannot ignore this issue in our search for solutions.

No Silver Bullets

It is clear the public attitude is changing with respect to greenhouse gas management and as proof you need look no further than the ads surrounding the Sunday morning talk shows. Company advertising now talks about how green they are, not how efficient they are, or how much growth they enjoy. Other advertisements publicly shame firms which make money off of projects or companies which do not meet the "green" test. And much of the public conversation is about increased consumption of natural gas in lieu of coal.

But even the current shift to natural gas is not without carbon implications. Burning natural gas has fewer CO2 emissions per unit of electricity produced but still has carbon emissions and if one considers the upstream footprint of exploration and production natural gas is an answer, but not a perfect answer. For example, in my state, natural gas processing plants emitted 6.9 million metric tons of CO2 equivalent in 2005, representing nearly 25% of our net carbon footprint. One of the two largest plants operated by ExxonMobil has a large well field and plant that produces natural gas, helium and CO2 for the enhanced oil recovery industry. However much of the CO2 is currently vented to the atmosphere. In fact, for every million cubic feet of natural gas produced, nearly two million cubic feet of CO2 is produced and a majority of it is vented to the atmosphere. My friends in California where much of the natural gas ends up don't always take this into account when they do their carbon footprint analysis.

State Perspective

We believe the state has a role in managing greenhouse gases and to that end we have begun to construct the legal framework to do so. However, even the simple question of who has the right to sequester CO2 under state law is amazingly complicated. Does that right belong to the surface owner or to the owner of the mineral estate? How do we take into account the vast federal ownership of both the surface and mineral estate?

From the point of view of a Governor, the absence of a well thought out, cogent federal policy that maps the pathway forward makes the task of setting workable rules, regulations and operating practices that much more difficult. This is equally true for the private sector. Until someone monetizes CO2 through performance standards with offsets, cap and trade or some variation of these schemes the marketplace is wandering in the desert. The level and pace of technology development will be set largely by the scheme you adopt as the price of carbon, the timeline for implementation and off ramps such as safety valves anchor the assumptions behind any economic investment. With these variables in mind, the structure needs to be set sufficient to promote large scale demonstration projects sufficient to resolve the outstanding questions in a rational but aggressive manner.

We meet with folks who are absolutely serious about developing new plants to supply energy and they assume they will live in a carbon constrained world. They fully

anticipate sequestration of CO2 or the necessity of some other mechanism to manage greenhouse gases. Most are not shy about their dislike of taxes or escalating costs, but uncertainty about future carbon rules absolutely overwhelms every discussion. It appears to me that a number of these investments will never come to fruition until the other shoe drops and the boundary conditions are established for the risk with respect to carbon management.

In a minute I will list some specific actions I think make sense, but first I want to make an observation as a predicate to those recommendations. It is the simple notion that when it comes to carbon management, it is difficult but necessary to admit what we don't know. Because in the absence of full knowledge we tend toward absolutist positions like 'only wind', 'no nukes', 'only biomass' or 'no coal'. I am not sure the federal government knows how we should construct the greenhouse gas management regime and I am not sure industry knows either.

If you will grant me this observation for a moment, it seems a prudent course would be to pick those activities we believe must be undertaken no matter what path ultimately proves to be the correct one. For example, we know we need studies and demonstrations putting CO2 in the ground in quantity to determine the physical facts i.e. measuring, monitoring and verifying sequestration data in the real world. We favor an array of these demonstrations as proposed by the Department of Energy carbon sequestration partnerships as a sensible approach given different conditions across the country.

Additionally, we know there are differences between enhanced oil recovery (EOR) and carbon sequestration which may or may not overlap. Monetizing a CO2 stream for the purposes EOR may mitigate the cost impact on consumers in the early years of a carbon policy. This needs to be studied with some degree of granularity.

Staying with the theme of moving from the abstract to real world data, I believe we need to accelerate those programs that lead quickly to economically viable, commercial scale electric generation plants. This would include both super critical pulverized coal plants with significant carbon capture and sequestration as well as integrated gasification combined cycle (IGCC) plants with carbon capture and sequestration. My observation is that substantial federal underwriting to hasten this process is required to assist those companies willing to pursue these types of plants. Short of constructing and operating these plants and learning the lessons required to engineer follow on plants, we will be confined to the laboratory bench and speculation.

While I have heard and seen a number of presentations I am not sure there is definitive information on available technologies and the quantitative analysis surrounding commercial deployment of carbon sequestration. Academics and companies have their plausible estimates but I have yet to see money changing hands in a commercial transaction. In fact the discussion with the individuals charged with financing these projects, quickly becomes an exercise working through a list of the uncertainties. On that list are not only questions about the technologies involved with carbon management but the impact of the hyper-inflation in material, manpower and construction costs. Simple

questions such as whether CO2 capture and sequestration costs (capital and operating) will be recoverable as part of a utility's rate base has yet to be answered.

With respect to the federal – state interface and their respective roles in this enormous undertaking, we favor a model of federal standards and state implementation. The Clean Air Act is an example of how this might work. One important difference however between that process and our current situation is the state of development of the technology enabling implementation. Hence another threshold activity would seem to be the federal underwriting of the research and development of capture and storage technology to the point of commercialization. We need to not only understand the capital costs but the operating and maintenance costs through time. Additionally, the likely internal energy requirements to implement both a robust capture system and preparing CO2 for transport and sequestration are most probably significant. This needs to be understood not only by the plant design engineers but by public policy makers as well.

Indemnification and risk assumption and at what juncture are also critical unresolved issues. There is precedent that the private sector absorbs the operational risk related to capture, transportation and injection. But post-injection risk, namely in situ liability of harm to human health, the environment and property related to CO2 leakages needs to transfer to the public sector at a reasonable point in time when the operational risk of the initial process has practically concluded. Funding for this long-term risk management pool would likely need to derive from the monetization of CO2 through a federal cap and trade or taxation system.

Another point of separation between the historically successful management of sulfur dioxide and carbon dioxide is the amount of material involved. In rough terms there is about 250 times the amount of material involved in dealing with CO2 as with SO2 in electric power generation. It would seem a detailed study of the required infrastructure would make sense. What will it take to move significant amounts of CO2 from generation source to ultimate sequestration site? How much pipeline capacity will be needed and where will it need to be installed? What are the energy requirements to move large amounts of CO2? What design standards will need to be in place and in force to ensure safe handling?

Resolving these vital questions requires a long-term commitment to fund demonstration projects at scale, to monitor, measure and verify the CO2 activity and begin to build a risk assessment profile. According to a recent MIT study, to do so requires an 8-10 year commitment and a federal commitment of at least $1 billion/annum. But with a projected decline in GDP growth of $400-800 billion if carbon capture and sequestration is not deployed, our economy stands to suffer a far worse outcome if CCS is not commercially available in the next few decades.

State Activities

As I mentioned before, Wyoming has undertaken a number of activities to address the management of greenhouse gases. We are a founding member of the Climate Registry.

We are in the process of conducting an inventory of greenhouse gas sources to establish our emissions baseline and begin to identify practical opportunities for reduction. Many of our significant oil and gas companies are members of EPA's Natural Gas STAR Program which implements best practices to reduce methane emissions in natural gas exploration and production. For a number of years, our Department of Environmental Quality has employed a permitting protocol requiring best available control technology (BACT) for oil and gas minor sources which significantly reduce greenhouse gases. We have for many years had a Carbon Sequestration Committee investigating terrestrial sequestration opportunities springing from our agriculture lands and forests.

We have funded a study underway by the Wyoming State Geological Survey to identify optimal CO2 sequestration sites and to date they have found a site that is calculated to store all emission from every source in Wyoming for 350 years (20 billion tons). We have funded and operated the Enhanced Oil Recovery Institute at the University of Wyoming which assists primarily independent oil producers in finding suitable fields and employ CO2 floods to produce more oil. We participate in two carbon sequestration partnerships and have proposals for large scale demonstration projects at two promising sites. We have established the Wyoming Infrastructure Authority, a state instrumentality to address the electricity transmission constraint that keeps our vast wind resource from the marketplace. Recently, Rocky Mountain Power has announced plans to build nearly 1200 miles of high voltage power lines across four western states. We have competed in the FutureGen competition making the case for a western mine mouth plant located near both enhanced oil recovery well fields and deep saline aquifers for long term carbon sequestration. We have actively and seriously pursued section 413 of the Energy Policy Act of 2005 which calls for an Integrated Gasification Combined Cycle (IGCC) electric generation plant with carbon sequestration at an altitude above 4,000 feet with low ranked coals in a western state. We have signed a Memorandum of Understanding (MOU) with the State of California and particularly the California Energy Commission and California Public Utility Commission to work toward the development of this IGCC plant. We have funded a clean coal request for proposal (RFP) process with intention of drawing the best ideas from industry partnerships to advance the state of the art in clean coal technology.

We have established the School of Energy Resources at the University of Wyoming and will dedicate a portion of our time on the National Center for Atmospheric Research (NCAR) supercomputer to sequestration reservoir characterization. We have passed statutory incentives for the development of wind energy. We are exploring an exchange with a Chinese province focused on CO2 sequestration.

Summary

As you can see we are expending a good deal of money, time and talent in the pursuit of greenhouse gas management and will continue to do so. But please recognize this is just the tip if the iceberg and we need federal involvement in a serious way to really move forward in a meaningful way.

My recommendations for the Committee's consideration are three. First, continue to focus the debate on the proper, rational and achievable framework that leads to the monetization of carbon. However, let me be clear here, I am not urging continued inaction. The lack of a federal plan essentially paralyzes the other players, both private and public sector.

Secondly, focus short-term spending and federal underwriting on the nearly universally agreed upon activities of carbon capture and sequestration. With respect to capture, a better understanding of the technologies particularly the economics and power requirements is fundamental. Given the amount of material involved, a comprehensive study of the infrastructure requirements to move CO2 from source to sink is necessary. With respect to storage, continuation or acceleration of the multiple current sequestration projects which will put CO2 in quantity in the ground is essential.

Finally, the Congress should take up the issue of parsing the long-term liability of carbon storage. Serious investment in plants which will make use of carbon sequestration will likely not be forthcoming until this issue is settled.

It is my understanding that there have been over 105 hearings on this and the broader topic of energy independence in just the last eight months. I ask to you consider what specific information is still required to chart the course. For while I'm only one Governor, we will commit our resources towards obtaining the answers you need, so that we can effectively move forward now. The problem at hand is enormous, climate change does not wait for us and we cannot afford to delay.

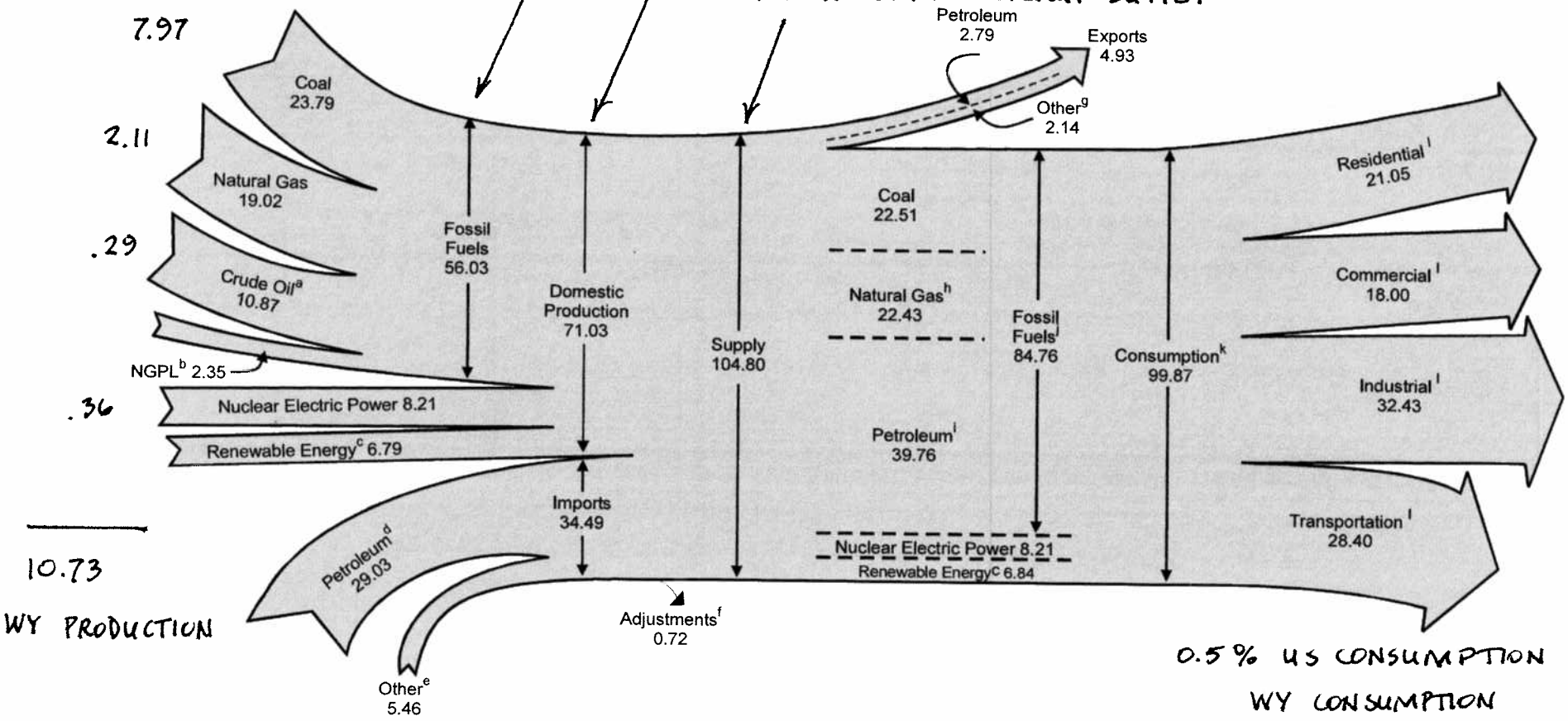
Mr. Chairman, thank you for your time and attention.

18.5 % DOMESTIC FOSSIL FUELS

Diagram 1. Energy Flow, 2006
(Quadrillion Btu)

15.1 % TOTAL DOMESTIC ENERGY PRODUCTION

10.2 % TOTAL ENERGY SUPPLY



[a] Includes lease condensate.
[b] Natural gas plant liquids.
[c] Conventional hydroelectric power, biomass, geothermal, solar/PV, and wind.
[d] Crude oil and petroleum products. Includes imports into the Strategic Petroleum Reserve.
[e] Natural gas, coal, coal coke, fuel ethanol, and electricity.
[f] Stock changes, losses, gains, miscellaneous blending components, and unaccounted-for supply.
[g] Coal, natural gas, coal coke, and electricity.
[h] Natural gas only; excludes supplemental gaseous fuels.
[i] Petroleum products, including natural gas plant liquids, and crude oil burned as fuel.
[j] Includes 0.06 quadrillion Btu of coal coke net imports.
[k] Includes 0.06 quadrillion Btu of electricity net imports.
[l] Primary consumption, electricity retail sales, and electrical system energy losses, which are allocated to the end-use sectors in proportion to each sector's share of total electricity retail sales. See Note, "Electrical Systems Energy Losses," at end of Section 2.

Notes: • Data are preliminary. • Values are derived from source data prior to rounding for publication. • Totals may not equal sum of components due to independent rounding.

Sources: Tables 1.1, 1.2, 1.3, 1.4, and 2.1a.