Summary of Meeting with Jeffrey Eppink

Civic Caucus, 8301 Creekside Circle, Bloomington, MN 55437

Friday, October 31, 2008

Guest speaker: Jeffrey Eppink , president, Enegis, LLC, energy consultant, Arlington, VA.

Present: Verne Johnson , chair; David Broden, Marianne Curery, Paul Gilje, Jim Hetland, Jim Olson (by phone), Wayne Popham (by phone), and Joe Shuster

A. Context of the meeting —Today's meeting is a response to a meeting the Civic Caucus held several weeks ago with Joe Shuster, engineer and author of a book on energy, "Beyond Fossil Fools", http://www.civiccaucus.org/Interviews/Shuster-Joe_09-12-08.htm.

B. Welcome and introduction —Verne and Paul welcomed and introduced Jeffrey Eppink, president of Enegis, LLC, Arlington, VA. Eppink has over 27 years of consulting, technical, and analytical experience in a wide variety of energy projects worldwide ranging from oil and gas to geothermal to biomass.

Eppink has worked for Chevron Overseas Petroleum, Inc., ICF Kaiser International, Inc., and Advanced Resources International, Inc. and has been an American Association for the Advancement of Science Diplomacy Fellow. He has a BS in geology from California State Polytechnic University, an MS in applied geophysics from the University of Southern California and an MBA from Virginia Tech. He has given numerous presentations to senior industry executives and government officials and has provided testimony and presentation to the U.S. Congress and the White House on energy issues on a frequent basis.

C. Comments and discussion —During Eppink's comments and in discussion with the Civic Caucus the following points were raised:

1. Key motivating factors for moving beyond fossil fuel —Eppink said the nation and world must move to other energy sources beyond coal, oil and gas. However, his reasons are different from those given by author-engineer Joe Shuster, who met with the Civic Caucus a few weeks ago.

The issues are energy security, economics (balance of payments), and climate change, which override the question of whether the world is running out of oil, gas, and coal, Eppink said. The USA needs to move to other fuels to lessen its dependence on foreign sources because they produce security and balance of payments problems. Eppink said there is evidence that climate change is occurring. An increasing presence of anthropogenic carbon in the atmosphere can be traced using carbon isotopes.

2. Abundant supply of oil, gas, and coal —The world decidedly is not resource constrained for the near term for oil, gas, and coal, he said. We are running out of conventional oil, but there is a large supply of unconventional oil: oil sands, oil shale, and oil from source rocks, he said. Natural gas and coal are not resource constrained either. The Powder River Basin in southeast Montana and northeast Wyoming could supply the nation with coal for more than 200 years at current rates.

Eppink distinguished between "resources", which represent the total supply, and "reserves", which represent that portion of "resources" that can be economically extracted with today's technology.

3. Geologists' estimates —Eppink highlighted the latest conference on energy supply by the American Association of Petroleum Geologists, known as the Hedberg conference, in 2006, (http://www.energybulletin.net/node/35312). Key findings:

—The world is using oil resources at a rate of one trillion barrels every 30 years. It took 140+ years to reach the first trillion.

—Most of the ultimate world oil potential remains to be produced (2.3-3.9 trillion barrels).

—The maximum level of annual world oil production is likely to occur between 2020 and 2040 and remain at that plateau for two or three decades.

—Achieving projected world oil production will require a massive, sustained industry effort for at least the next 40-50 years, and will require an accommodating political environment during a long transition from oil to other sources of energy.

4. Potential of oil from source rocks —One must be cautious about different terms that refer to unconventional oil sources, Eppink said. He highlighted a big difference between so-called "oil shale" of the Green River Basin in the Rocky Mountains and crude oil from source rocks such as the Bakken formation of western North Dakota, eastern Montana and southern Saskachewan.

The massive oil shale resource in the Green River Basin contains kerogen, a pre-cursor to crude that needs extensive preparation before it is usable as crude oil. By contrast, the Bakken formation crude is ready to be refined upon extraction.

The Bakken formation contains about 300 billion barrels, he said. Moreover, other similar oil-bearing sedimentary rock is present in Siberia and the Middle East, with potential resources of more than a trillion barrels, he said.

5. Off-shore offers more potential than Alaska —Even if environmental problems in the Alaskan Arctic National Wildlife Refuse (ANWR) could be addressed, Eppink said, off-shore sources off eastern Canada and New England probably offer more potential. ANWR resources may be small, he said.

6. Need for non-fossil-fuel sources —Eppink emphasized that the prime motivating factor to find non-fossil-fuel sources is environmental, economic (balance of payments) and energy security, not supply. The marginal carbon that is entering the atmosphere is coming from man-made sources, he

said. He defers to climatologists on whether the carbon is producing climate change, but since the earth is a closed system, there is likely to be an impact. He also referred to higher acidification of the world's oceans, caused to some degree by absorption of carbon dioxide from man-made sources.

7. Potential of sequestering carbon —Eppink said he currently is working for the U.S. Department of Energy on whether existing power plants can be retrofitted to capture and store carbon rather than release it into the atmosphere as carbon dioxide. A major problem, he said, is where finances and technical knowledge in sufficient amounts will come from to accomplish such changes on a large scale. Some governmental support and policy direction is essential, he said, particularly on questions of liability when large amounts of carbon are sequestered.

8. Potential of algae in bio-diesel —Discussing alternatives to what he called a "petroleum monopoly", which he believes must be broken, Eppink sees great potential in using algae to produce bio-diesel, an area that he currently is investigating. Because so much more product can be produced per acre, the area necessary to grow algae is but a smaller fraction of that needed by other crops that can compete with food such as corn or soy. He and two partners are experimenting with algae. He also is high on geo-thermal, tapping the natural heat beneath the surface of the earth.

9. Potential of nuclear —Eppink said he agrees with Joe Shuster about moving to nuclear power, although Eppink doesn't consider himself an expert on nuclear power and has his doubts that nuclear can be as large a part of the future energy picture as Shuster believes. Shuster said he agrees with Eppink on the need for bio-diesel and geo-thermal. A Civic Caucus member noted the importance of more education of the American public on nuclear energy's safety and potential.

10. Importance of leadership —A Civic Caucus member commented that overall leadership at the national level is essential to mobilize a commitment to obtain the technical competence and the necessary capital to bring non-fossil-fuel options to the forefront and to manage the industry on a national basis. Eppink and Shuster agreed on the need for more training for scientists and engineers in the nuclear energy field and energy disciplines in general.. Shuster said he is urging an energy summit at Argonne National Laboratory to recommend energy guidelines for the new President. Eppink said the current presidential candidates, while talking about the importance of new energy sources, haven't captured the scope of where action is needed. Maybe a national blue-ribbon commission is needed, a Civic Caucus member suggested.

11. Support for "cap and trade" —Eppink said he anticipates a "cap and trade" approach to reducing carbon emissions, although he would prefer a carbon tax. "Cap and trade" is described as follows, by Wikipedia:

A central authority (usually a government or international body) sets a limit or *cap* on the amount of a pollutant that can be emitted. Companies or other groups are issued emission permits and are required to hold an equivalent number of *allowances* (or credits) which represent the right to emit a specific amount. The total amount of allowances and credits cannot exceed the cap, limiting total emissions to that level. Companies that need to increase their emission allowance must buy credits from those who pollute less. The transfer of allowances is referred to as a trade . In effect, the buyer is paying a charge for polluting, while the seller is being rewarded for having reduced emissions by more than was needed. Thus, in theory, those that can easily reduce emissions most cheaply will do so, achieving the pollution reduction at the lowest possible cost to society.

12. Importance of energy sources that are economically viable— Shuster, who advocates a strong emphasis on nuclear, said he has been involved in the field of energy since 1973. Any solution must be quantified, he said. After the meeting he submitted the following comments on his position:

I use "reserves" (known economically available resources at reasonable cost) instead of "resources" (resources available at any cost). I and others believe we are resource constrained particularly in respect to oil. When the U.S. and the world run out of present fossil fuel reserves, nobody really knows definitively where we will get enough to run the economies of the world and/or at what cost. Nobody should be willing bet the future of our children without more certainty. If it was so easy why aren't we already taking advantage of these other sources? I want to know pretty accurately how much oil is available where and at what cost. Every time I investigate a new find, they never are as good as the hype.

With business as usual, the world in 30 years will need 45 billion barrels per year to carry on with a reasonable economy. If we find the maximum in Alaska and the maximum I've see predicted for deep water off shore—-this would be approx 135 billion barrels, which would last the word between 3 and 4 years. The minimum is 30 billion barrels. Also in many places while the oil is there, there is not enough process water available.

Why must we argue a cap and trade scheme, which will be a book keeping nightmare, and be another perfect system for politicians to manipulate?

Time to get on with a permanent solution.

13. Thanks —On behalf of the Civic Caucus, Verne thanked Eppink and Shuster for meeting with us this morning.