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World's next energy source may be just a moon away

By Mark R. Whittington

With congressional approval of President Bush's "Moon, Mars and Beyond" initiative, human civilization has begun a new age of lunar exploration.

An armada of robotic spacecraft — starting in January with the European Space Agency's Smart 1, followed by probes to be launched by China, India, Japan and the United States — will study Earth's companion world. Human expeditions will follow in about 10 to 15 years.

This new age has more potential to change Earth for the better than many supporters, or opponents, of space exploration imagine. According to scientists at a recent meeting on lunar exploration held in India, the moon may hold the solution to Earth's growing energy needs.

Scientists estimate the moon contains about 1 million tons of an isotope called **Helium 3**, deposited on the lunar surface by solar winds, which could yield 10 times the amount of energy available with proven reserves of fossil fuels on Earth. Helium 3 could be used as fuel for fusion reactors to provide nearly limitless clean energy.

Lawrence Taylor, a director of the U.S. Planetary Geosciences Institute, suggested that the technology to generate energy from Helium 3 could be had in 10 years. Other scientists said a fusion reactor using Helium 3 would produce little or no radioactive byproducts and could be built safely in the heart of any city. Unfortunately, given the current level of research and development, commercially viable fusion energy is at least 30 years away.

Impact of fossil fuels

Earth's energy needs are currently met, primarily, by fossil fuels such as oil, coal and natural gas. The byproducts of this reliance include pollution and, since much of these resources reside in unstable parts of the world, international turmoil and even war.

Inexplicably, many supporters of the space initiative have not mentioned the moon's potential as an energy source. The president did not mention fusion energy or Helium 3 in his speech announcing his initiative last January.

Gerald Kulcinski, director of the University of Wisconsin Fusion Technology Institute, said this oversight may be part of an institutional bias. "NASA doesn't believe we can ever get fusion to work, and the Department of Energy never thought we'd go back to the moon," he said.

Paul Spudis — a member of the Bush-appointed commission that recommended ways to implement his initiative — had a different explanation. "Fundamentally, the vision deals only with the creation of space-faring capability and the exploration enabled by such; it does not specifically deal in possible future lunar commodities, although it recognizes their eventual utility."

A puzzling silence

Government officials are silent as to why no one seems willing to talk about any commercial opportunity to justify the expense of returning to the moon. But as early as 1988, NASA sponsored a conference on fusion energy and Helium 3. The

conference concluded that Helium 3 "offers significant, possibly compelling, advantages over fusion of tritium, principally increased reactor life, reduced radioactive wastes and high efficiency conversion."

Opponents of the president's initiative also seem unaware of the moon's potential as an energy source. The American Physical Society recently issued a report that decried what it considers the high cost of the initiative.

Nevertheless, Helium 3 advocates believe the president's initiative provides a priceless opportunity. Scientists at the Fusion Technology Institute would like to send their mining equipment to the moon to see how it would work. For every ton of Helium 3 extracted from lunar soil, researchers say, nine tons of oxygen, water and other life-sustaining substances, as well as six tons of hydrogen useful for powering fuel cells, would be yielded. It would seem that, even given the 10- to 30-year time frame necessary to make Helium 3 fusion power a reality, its prospect provides an unassailable rationale for pressing on with the initiative.

Science and the "spirit of exploration" are noble things, but they are often considered optional when stacked against earthly needs. But the prospect of clean, virtually limitless energy from the moon would be enough to sustain any program of exploration over decades, across many presidential administrations and congresses, and costing tens of billions of dollars.

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