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THIS WEEK

RESEARCH NOTES

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DEPARTMENTS

COVER: Researchers are developing a computer that would analyze speech and flash cues onto eyeglass lenses to aid lip readers. ("Ca," the start of the word "can," is on this woman's lips.) This is just one of several active areas of research in the field of deaf communication. See page 90. (Photo: Research Triangle Institute)

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LETTERS

Solar-powered debate

The NRC report of recent issue on the use of solar power satellites (SN: 7/11/81, p. 20) addressed the question of whether the reference design solar power satellite can be economically constructed. This study missed the fact that there are some alternatives to the reference design which are less expensive by a factor of 1,000.

The reference design is based on using the expensive resources obtained from earth for construction. The cost of shipping them into space is astronomical, and invalidates this design from the word go, as was widely recognized 10 years ago.

The NASA-NRC reference design neglects the chance to use lunar materials for construction. The surface of the moon contains 99 percent of the materials necessary to construct the satellites. From the moon it is possible to launch these materials into space at an insignificant fraction of the cost of launching them from earth. Use of high automation to construct self-producing factories on the surface of the moon drops the cost of exploitation of these materials to the point that a seed factory for building other factories and solar power satellites can be put on the moon for about $10 billion.

The reference design was the only design studied by the NRC as a result of a deliberate attempt to destroy the space program. This fact should be universally recognized.

Judson Hewitt
Berkeley, Calif.

I read with a deep sense of regret the report telling of the NRC decision to recommend a policy of benign neglect toward the solar power satellite concept. However, it comes as no surprise. New technological systems are very difficult to develop and deploy when they: require large initial capital investment, challenge existing industries in the public sector, need only moderate assistance from the basic research community, and produce nothing of direct use to the military. Unfortunately, SPS meets each of these negative selection criteria, at least in the superficial sense that they are generally applied. The necessary capital is great in absolute numbers, but not when compared with the bill for nuclear and fossil fuel systems over the next few decades. Having already been persuaded by Congress and the scientific community to go nuclear, the public utilities are not interested in new expensive technologies while they watch their reactors corrode, pollute and embrittle their way into bankruptcy. Whereas basic science, "the industry," has derived great fiscal benefit from the nuclear fission and fusion programs, the SPS proposals appear to require only a scaling up and refining of current technology.

However, these facts of life notwithstanding, there are still many younger women and men in engineering and science possessed of a strong desire to make SPS their vested interest for the future. As the "science of change," current technology is always fighting, and losing to, the systems of the future and the people who conceive them. SPS and space industrialization are only just beginning to make their presence felt.

James A. Slavin
Los Angeles, Calif.

The National Research Council's negative report on solar power satellites (SPS) undoubtedly comes as a disheartening blow to many supporters, but it should come as no surprise. In 1976 when NASA and the Department of Energy (DOE) began their studies, Kenneth Billman, a physicist at NASA-Ames in Mountain View, Calif., pointed out that the proposed SPS system was too massive to be launched economically into orbit and too complex otherwise to compete successfully against other energy systems.

With permission of Ames Director Hans Mark (now NASA Administrator), Billman teamed up with two other physicists, William Gilbreath and Stewart Bowen, and carried out a series of studies to design an alternative space-based energy system of greatly reduced mass and complexity in orbit (see NASA TMX-73,2300). They called their system SOLARES (Space Orbiting Light Augmentation Reflector Energy System).

SOLARES would orbit exceedingly lightweight aluminized polyimide mirrors (essentially solar sails) to reflect solar energy from space down to photovoltaic collecting sites on the ground. Superior to central station photovoltaic systems (solar farms), SOLARES would produce nearly constant electric power day and night, eliminate all but a very minimal energy storage component, and increase the yearly power output by a factor of five. Contrasted to SPS, SOLARES would produce 200 times as much power per unit of orbiting mass. Whereas according to NRC a 60-satellite SPS system would cost $3 trillion, a rival SOLARES system equivalent in power output to a 100-satellite SPS system would cost less than $600 billion. Although this is still a large amount of money, the cost reduction is enough to make SOLARES economically competitive with the conventional mix of coal, oil, gas, hydroelectric and nuclear energy sources. The Electric Power Research Institute sets 4.5 cents per kilowatt hour as the competitive cost of electric power production in the 1990s (in current dollars). SOLARES at 3 cents per kilowatt hour clearly undercuts the competition.

The NASA/DOE study (DOE/ER-0085) released in November 1980 compared SPS to a number of different energy systems, including conventional coal, the light water reactor, coal gasification, the liquid metal fast breeder reactor, central station terrestrial photovoltaic and magnetically confined fusion. But although SOLARES had already demonstrated its superiority and the facts were well known at NASA and DOE headquarters in Washington in plenty of time for SOLARES to be included, the officials involved determinedly refused to include it.

Interestingly enough, another government agency from a different branch, the Congressional Office of Technology Assessment (OTA), did carry out a comparative study of SOLARES against SPS. The report of this study, as of this writing not yet released, concludes that by the 1990s SPS could not successfully compete, but SOLARES could!

SOLARES could supply a large fraction of both U.S. and total world energy consumption (it can manufacture transportable fuel as well as gen-

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. . . Shuttle *Continued from page 93*

mote manipulator arm and extend it as far as 50 feet out of the hold for studies of the space *around* the shuttle. This could reveal traces of contamination from such sources as the crew cabin and over-wing areas. On the flight after that — the last of the shuttle's four scheduled test flights — the IECM will be equipped with an eleventh instrument: a plume-pressure gauge, to be held outside the cargo bay to monitor the exhaust pulsations of the shuttle's attitude-control rockets at various distances and directions from the nozzles.

Besides the IECM, the upcoming mission will carry a second instrument package dedicated to the welfare of future payloads. Called DATE, the Dynamics, Acoustic and Thermal Environment experiment consists of accelerometers and force gauges to measure dynamic loads, microphones for acoustic vibration effects, and thermal sensors. The DATE results may help engineers in deciding how various payloads must be insulated or shock-mounted, or where they should be placed in the cargo bay.

The IECM, meanwhile, will not retire after the shuttle's final test flight. It is also scheduled to accompany the first two Spacelab missions (so far booked on shuttle flights #9 and #21 in 1983 and 1984), in effect to calibrate the environment through which the myriad Spacelab sensors will be conducting their research.

Even "empty," the shuttle's cargo bay is far from a perfect vaccum. The IECM is to find out how far. □

. . . Letters

erate electricity). It could make the United States energy independent and even a net energy exporter by selling reflected radiant energy to owners of foreign ground sites. Such a happy situation could reverse our negative balance of payments as well as the drift toward economic stagnation in this country. One study (Billman, "Recent SOLARES Results," 7/24/79) showed that the initial capital investment on a world SOLARES system could be recouped every two and a half years. But we may never know SOLARES's full potential, since short-sighted public servants cut off the last dime of SOLARES funding shortly after this study was completed.

Max Gordon Phillips
Director of Public Information
Delta Vee Solares Project
San Jose, Calif.

The National Research Council committee which evaluated the solar power satellite concept should be commended for their courage. Most of us crystal-ball gazers would not dare to claim that any energy technology still in the research and development stage will be economically uncompetitive as a source of energy 20 years from now.

The real irony is the NRC conclusion that no money should be spent on development of the solar power satellite concept, while simultaneously recommending periodic review of progress in new concepts and technologies that might bear on the idea. Hopefully the NRC will avoid study of nuclear fusion and other possible future energy sources, or we may find the United States waiting for others to do the development work so that we can periodically review progress in new concepts and technologies which might bear on these other energy alternatives.

James Ransom
Los Angeles, Calif.

It was with pleasure that I read that the National Research Council has had the good sense to recognize that solar-power satellites do not deserve further funds even for preliminary developmental planning.

The idea of enormous arrays of solar cells transmitting billions of watts of power to earth is technology run amok. The proponents of this outrage would have us sink $3 *trillion* in a project of uncertain feasibility at a time later in the century when parts of the world will quite possibly be facing starvation. All of this in order to provide the industrialized nations with electrical power more brilliantly to advertise their fried chicken and run their air conditioners.

As for the glorious beauty of the night sky, with SPS future generations would have to appreciate it through the accounts and photographs of their forebears, since the solar arrays would so fill the sky with light pollution. And that would be but a trivial side effect compared to other, potentially deadly, hazards of the system.

Imagine what it would mean for our nation to invest $3 trillion in energy conservation.

Denis Dutton
Dearborn, Mich.

Correction: The research reported in "Convincing consumers to conserve" (SN: 7/25/81, p. 58) originally appeared in the spring Journal of Social Issues.