

Letters

Women Engineers

The male image of the engineering profession should be recognized as a significant factor contributing to our present shortage of engineers. I would hope that the National Science Foundation and the Department of Education, responding to President Carter's request to "review our science and engineering policies" in relation to "quality and quantity of graduates for our long-term needs," will identify the need for a far-reaching program to cultivate the latent scientific and mathematical talent among the female population. This point is not included in the discussion (News and Comment, 4 April, p. 35) of President Carter's 8 February memorandum to Secretary of Education Shirley M. Hufstедler and National Science Foundation Director Richard C. Atkinson.

Encouragement of women to pursue scientific and engineering careers is now primarily carried on by organizations of professional women in these fields. Recruiting women to engineering is not only a women's issue, but a national necessity.

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CONAES Energy Scenarios

The article "Energy forecasts: Sinking to new lows" by Eliot Marshall (News and Comment, 20 June, p. 1353) can mislead the reader about both the substance and the intent of the energy scenarios of the National Academy of Sciences' CONAES (Committee on Nuclear and Alternative Energy Systems) report (1).

The first bit of misdirection is found in Lovins' table of forecasts, cited by Marshall. The CONAES scenarios included in the table are, first of all, *not* forecasts. Moreover, the CONAES scenarios are eight in number, and Lovins' table exhibits only the lower end of the range.

The scenarios cited by Lovins (as NAS I, II, and III) are subscripted with a 2 in the CONAES report, indicating a 2 percent per year growth in gross national product (GNP). CONAES also had a set, subscripted with a 3, that presented higher demand scenarios as forced by a 3 percent per year growth in GNP, other things being equal. Finally, CONAES worked with scenarios labeled IV, with the same 2 and 3 percent GNP growth assumptions, based on energy prices staying at the 1978 level in constant dollars, and these indicated still higher energy demands. We leave it to the reader to decide what scenarios are desirable or likely, which is why they are not forecasts, and the spread of the scenarios ranges from 64 to 188 quads in 2010, rather than the 67 to 101 suggested by Lovins.

Table 1 gives the CONAES scenario results for energy demand in 2010 (1, p. 598).

It should also be noted that the Exxon energy growth rate of less than 1 percent in the 1980's cited by Marshall is based on assuming that there will be fairly severe unemployment throughout the decade. Many CONAES members consider that a growth rate greater than 3 percent would be much more commensurate with achieving, effectively, full employment; notes to that effect may be found in the CONAES report (2).

The CONAES report was intended to be used as an information source by persons concerned with energy problems, and I am happy to see it so used: how-

Table 1. CONAES scenarios: energy demand in 2010.

Scenario label	Quads in 2010
I ₂	64
II ₂	83
III ₂	102
IV ₂	140
I ₃	85
II ₃	115
III ₃	140
IV ₃	188

ever, it is replete with "on the other hand" observations—after all, there were several physicists on the CONAES Steering Committee—that warn the reader to tread cautiously. Marshall's commentary, citing Sant, is an example of incautious treading. A CONAES resource group (3) said that 58 quads by 2010 *might* result if (i) GNP growth was less than 2 percent, (ii) society was completely restructured, and (iii) energy demand turns out to be highly sensitive to price. None of these are facts. To state that this is what the United States could do has little relevance to Marshall's topic, which is serious forecasting. This is a matter of what the forecaster thinks will happen: not a "could be," but an "I think."

In summary, the CONAES scenarios are not forecasts, but illustrations of possibilities; they cover a large range of energy demand, much greater than indicated in Lovins' table. CONAES implied that there might be severe environmental problems if the highest demand scenarios materialized and severe political problems if the lowest ones materialized. The latter subsumes the obvious point that, as long as there are significant numbers of economically deprived people in the United States, they will support measures to stimulate the economy and to keep the costs of basics, such as energy, as low as possible.

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References and Notes

1. Committee on Nuclear and Alternative Energy Systems, *Energy in Transition: 1985-2010* (Freeman, San Francisco, 1980); the CONAES scenarios are fully described in chapter 11.
2. *ibid.*, appendix A, "Individual statements by CONAES members," comments 1-8, 1-10, 2-1, and 11-4. I and other members of CONAES did not register specific agreements with these comments. I thought the text was sufficiently clear with regard to this point. Apparently it was not.
3. Consumption, Location and Occupational Patterns (CLOP) Resource Group, Synthesis Panel, CONAES, *Energy Choices in a Democratic Society* (National Academy of Sciences, Washington, D.C., 1980). Resource groups were commissioned by CONAES to investigate a variety of problems, and CLOP was such a group. Publication of their reports does not imply endorsement by CONAES. Many resource groups, with highly divergent attitudes, presented such reports.

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Erratum: In the reply to the technical comments of E. H. Hall and E. A. C. Crouch by J. L. McNichols, Jr., *et al.* (13 June, p. 1293), the last sentence of the second paragraph was printed incorrectly. It should have read, "We maintain that f depends on the system design and is not limited by fundamental thermodynamic considerations to 1/20 [the value obtained by Hall for the Ocean Thermal Energy Conversion (OTEC) Rankine system]. However, the OTEC Rankine system does provide a baseline. . . ."