The ATS Program is a Success Story

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Good morning. George Rudins sends his regrets. He very much wanted to be here this morning. He asked me to call your attention to the President's proposed Climate Change Plan. I would like to share with you a thumbnail sketch of the proposal.

The White House considers global climate change the premier environmental challenge and opportunity of the 21st century. The five key elements of the proposal are phased over three stages. First, there is a basic requirement that developing countries must participate. There can be no option of binding obligations without participation from all countries. The first stage includes binding targets to reach 1990 emission levels by the period 2008 to 2012, and reduction below 1990 levels in the 5-year period that follows. A $5 billion program is proposed in tax cuts for R&D on new technologies. There is provision for industry-by-industry consultation and for early credit. That's followed by an economic review that occurs near the end of the first stage. The second stage would include review and evaluation in preparation for a permanent rating system. And the third stage includes a mandatory emissions budget.

Climate change is a global problem and it requires a global solution. A $1 billion package of assistance from the U.S. and other measures are proposed to help developing countries that have difficulty reducing emissions. Again, the specific targets are reducing greenhouse gas emissions to 1990 levels by the period 2008 to 2012, and approximately a 30-percent reduction from a business-as-usual scenario to reduction below the 1990 levels within a 5-year period.

To encourage energy efficiency and the development of new technologies and to create lower carbon emissions, the President proposes a major new package of tax cuts and new R&D spending amounting to $5 billion over 5 years. Many of the ideas from the President's Committee on Science and Technology (PCAST) will be considered. The administration challenges key industries to prepare plans during the next 9 months on how they can best reduce emissions. And the administration will work with industry to develop sensible efficiency standards in a variety of areas. The President is committed to providing incentives for near-term actions to cut emissions; that is, for those firms that take action before the Stage Three mandatory emissions budget.

The proposal also encourages the use of existing energy-efficient technologies within government. Electricity restructuring will save money for consumers and provide cleaner technology. The U.S. supports developing specific long-term goals. The President is looking for

help from the National Academy of Sciences. He is encouraging bilateral dialogs with key developing countries in addition to agreements on meeting emission goals to promote clean energy. And he proposes economic and science reviews on a regular basis to keep policy in line with technology.

Finally, a trading system would begin after a decade's worth of experience with tax incentives, R&D, early credit, and electricity restructuring. According to the President's 1997 economic report, international emissions trading for carbon dioxide could lower the cost of reduction by 50 percent below the minimum achievable using purely domestic programs.

As we are all aware from recent news commentaries, this proposal has raised a lot of questions and debate among economists. For those of us involved with DOE programs, there are other questions as well. For example, what are the implications of this proposal for the FY 1999 budget? And specifically, what are the budget implications for the ATS program? I don't know the answers to those questions and I don't want to take up your time with speculation. I am pleased to note that an EPA spokesperson will be discussing climate change with respect to technology later this morning. I am looking forward to some insight from that presentation.

I am delighted to be here today. It is a privilege to participate in this meeting and I commend the meeting organizers for devoting time and energy to create such an excellent agenda. It is truly amazing how far the ATS program has come since its inception in 1992. At about the same time that the first ATS meetings were occurring at Clemson, a famous keynote speaker at a computer industries symposium in Washington predicted that hand-held super-computers would be available in the foreseeable future. I haven't seen one yet; however, I have seen micro-turbines that are a lot smaller than super-computers. And that makes me wonder which will get to the hand-held stage first.

All of us are firm believers in research and development (R&D). R&D has proven its worth to society. It has been estimated that technical innovations account for half of our economic growth. Most people in the U.S. would agree that technology has contributed to their economic well-being. A dynamic, comprehensive, independent, research and development system has enabled people in the U.S. to enjoy a high standard of living. The R&D efforts of Federal government agencies, including DOE, have provided countless scientific and technological innovations that have formed the foundation of our Nation's prosperity. However, in the U.S., funds for energy R&D have declined both in government and the private sectors. Since 1978, private-sector spending has fallen by a third, and Federal spending is about one quarter in real terms. This decline has not gone without notice and is the basis of serious concern.

Recently, a panel created by the White House reported the lack of a coherent national energy research agenda, and a fear that the U.S. is slipping behind in the global race for the multi-billion dollar energy market, which is emerging mostly in the developing world. How this power is generated will have a huge impact on the environment and the world's economy. Clearly for the U.S., the current leader, there are abundant opportunities to be the best in a better future — a future that includes a prosperous economy, a cleaner environment, and a reliable and portable

supply of energy, both here at home and overseas. This is possible with wise investments in new technology and by continuing the joint public and private partnerships that have made the U.S. the current world leader.

The Advanced Turbines Systems Program is an example of our successful private-public R&D partnerships. It incorporates innovations in steam cooling, combustion, pollution controls, and materials that are well beyond the incremental improvements that even the largest companies can make on their own. It is providing our domestic developers with the opportunity to successfully compete in a high-risk global context with competitors from other countries.

I want now to take time to acknowledge some of the successful achievements by the ATS Program participants in the short 5-year span of the Program's existence. Some of the designs have been successfully incorporated into current models, such as the first 16 compressor stages of the Westinghouse 501G. A major milestone was achieved with the manufacture and shipment of their full-scale ATS test compressor. On October 2, the compressor passed the major test to verify key design innovations for achieving performance and efficiency targets. This compressor represents the largest, highest-pressure ratio, 60 hertz, industrial combustion turbine ever built. In addition, a major milestone in the development of advanced thermal barrier coatings was achieved. This will provide early verification data to mitigate future risks in field operation. Completion of single-crystal casting trials is scheduled for this month. These castings represent a critical step in the process of developing cooling technologies that will permit high-temperature operation of the ATS. Congratulations are in order for the Westinghouse team.

GE has made great strides in their development of their new H class ATS gas turbine. Their list of achievements in testing ATS components and systems has been remarkable. During the past year, GE has successfully completed heat transfer testing on full-scale, first-stage nozzle cascades. Test results show that steam cooling is as effective as predicted. They also completed the first phase of subscale compressor testing. They have improved their low-emissions combustor designs. They completed reduced-pressure, combustion-lab testing and they commissioned a full-scale combustion test. GE completed field testing on thermal barrier coatings (TBCs) for improved life span and developed a new robotic TBC process. GE developed non-destructive evaluation methods for single crystal parts and initiated product casting of engine blades and nozzles. Clearly, the GE team is making great strides in closing the gap between present-day turbine technology and future ATS machines.

From its inception, the Advanced Gas Turbine Systems Research (AGTSR) Program was structured with a combination of participants who could be appropriately characterized as a Dream Team. The prolific technology-based research activities have blossomed under the mantel of the AGTSR university consortium. The success of this endeavor is in large part because of the dedicated efforts of the people at the South Carolina Energy Research and Development Center.

Time does not permit mentioning all the important contributions of the participants in AGTSR program. However, I do want to acknowledge a few of the most noteworthy contributions that have already been adopted by commercial manufacturers. Solar Turbines and GE have successfully tested a novel fiber-optic probe measurement system for the fuel-air ratio of gas turbines that was developed by a university participant. A unique open-air combustion

chemical-vapor deposition process for producing thermal barrier coatings has been developed that is applicable to all ATS turbines. A computer code has been developed by another university to optimize turbo machinery design in advanced gas turbines. The code is being used to design compressors at Solar Turbines. And a control technique for eliminating combustion instability in gas turbine combustors has been successfully demonstrated on a combustor system by a university participant in collaboration with Westinghouse Science and Technology Center. Other highly productive efforts that I would like to quickly mention include work in the materials development program, the humid-air turbine combustion studies, and the conceptual design of product development work for industrial gas turbines.

In conclusion, the ATS program has made substantial progress in pushing the envelope of efficiency and environmental performance. Progress has been excellent in achieving the program goals and also in contributing to other long range R&D programs. All the ATS program participants are to be commended for their achievements. And we look forward to celebrating their continuing success.

Thank you.