April 15, 2011

Dr. Stephen Koonin and the DOE-QTR Team
Under Secretary for Science
US Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Subject: DOE Quadrennial Technology Review Framing Document
A need for Fossil Energy R&DD Support

Dear Dr. Koonin and DOE-QTR Team:

Thank you very much for the opportunity to review and comment on the March 14th, 2011 Request for Information and on the framing document developed to stimulate conversation and collaboration in the development of Department of Energy's Quadrennial Technology Review process. As a contractor supporting the Department of Energy, Department of Defense and many other Federal, State and Commercial clients, URS is honored to have the opportunity to present comments for consideration in the development of DOE's QTR process. We believe that the QTR process is a major step forward in developing a balanced and focused plan for needs-based research in the Department of Energy.

In DOE's Energy Quadrennial Technology Review (QTR), input is requested on the focus and makeup of DOE funded energy RD&D moving forward in time. The QTR at several points addresses the need for a balanced allocation of resources for energy technology development. We believe such a balanced development is critical to support a transition to a sustainable energy future.

We believe we must be 'transition stewards' directing energy use from our reserves of limited stored energy to a sustainable energy mix. We believe that DOE's rapid transition to renewable energy must be coupled by continued, targeted investment in fossil energy RD&D, with recognition of the critical role of fossil technology in a practical transition to a sustainable energy future. DOE's projected RD&D investments, represented in the President's budget request and subsequent dialogues with Congress, should be reconsidered and refined to accurately reflect the the value of fossil energy carbon management technology, the role of commercial companies in the development of technologies, and the potential market for technology innovations. We encourage the Department to engage the stakeholders in such a process to ensure that the transition to an environmentally friendly and sustainable energy future also allows DOE to be a responsible 'transition steward,' such that current energy security, affordability and availability are not jeopardized in the process of transition.

The dynamic nature of markets, technology advancements, and the public policy debate in recent years point to a limited capability to effectively target an RD&D agenda based on anticipated

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markets, fuel price projections, or socially defined research agendas. Yet DOE's proposed budget, emphasizing an accelerated move to a renewable energy mix, is based on assumptions that may expose our energy policy to unnecessary risks by limiting or removing R&D investments from potentially key contributors to long term energy solutions supported by Fossil Energy RD&D.

Targeted funding should be preserved for Fossil Energy RD&D to avoid the situation where valuable technology developments are permanently lost, go overseas, or must be recaptured later when the perceived value of the research changes. An example of this is the development of stationary high-temperature fuel cells, currently under development by DOE's Office of Fossil Energy, which operate on practical, *permanent fuels* like waste gases, biogas, and methane that will always exist on this planet and will be part of our fuel future. Development of these technologies represents a significant investment in clean energy – an investment that would be lost without continued funding. In America's quest to compete and win in the future and to create energy independence such an outcome must be avoided.

There are many examples where our quest for energy independence and competition for the future of America is hampered by insufficient attention to fossil energy RD&D. As late as 2008, the importance of shale gas as a domestic energy resource was not factored into estimates of natural gas cost, nor was the importance of natural gas recognized as a short term contributor to greenhouse gas reduction. DOE's current projections appear to inadequately address the immense size and potential importance of developing shale gas resources such as Marcellus to gas address near term air emissions and carbon management objectives. Fossil Energy RD&D to support full development of shale resources should be considered a key feature of plans resulting from the DOE QTR.

Another example of the need for increased attention to fossil energy RD&D is demonstrated by the need to fairly address the assumed cost of carbon capture technologies. Current assumptions fail to consider the potential for breakthrough power generation technologies such as chemical looping. Chemical looping technology produces the same thermal efficiency as typical circulating fluidized bed boilers for use in production of steam or electricity. However, a nearly pure carbon dioxide stream is produced without any energy penalty. Improving the potential for such a breakthrough with a strong Fossil Energy RD&D effort will make a significant contribution to our nation's environmentally-conscious and domestically-centered energy future.

Without a substantial investment of additional Fossil Energy RD&D, significant opportunities for progress in environmental management and energy security may not be realized. If shale gas plays are limited by the potential for unaddressed environmental damage, or the value of chemical looping for near term carbon management is not properly demonstrated, key contributions to a sustainable, affordable and abundant energy solution may be put at risk – and the potential for low natural gas prices due to development of the abundant Marcellus may not materialize and we might lose coal technologies that can be both efficient and environmentally

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friendly for a longer time during our energy transition. In the face of such uncertainty, research in Fossil Energy areas should be continued.

In light of the volatility of current predictions and the potential for game-changing technologies and trends to influence the value of energy technology investments, we advocate that a Real Options approach be used to manage investments in energy technology RD&D. In the Real Options approach, DOE would manage investments based on maintaining opportunities and the flexibility to respond to changing conditions and technology breakthroughs in a timely fashion. Using such an approach DOE would prioritize RD&D investments around 1) keeping the US's technology options open and 2) making investments that US commercial businesses cannot make. The discipline of a Real Options approach would, we think, better ensure the value of RD&D investments for maintaining US competitiveness and our credibility to influence world markets. Such an approach would likely result in a significantly greater RD&D investment in fossil energy technologies than those in current projected budgets. Such an approach incorporated into the DOE QTR process would be sensitive to current projections and social drivers, but also reflect the transient nature of such projections and the need to plan for many possible futures.

In closing, URS has experience with the Quadrennial Defense Review process that has been undertaken by the Department of Defense and believes there is great value in the DOE QTR process. We welcome and we strongly support the efforts of the Department of Energy to develop consistent, science based energy policy guidelines and funding priorities that transcend multi-year time horizons. We have put forth recommendations we believe are important for consideration in the development of the DOE QTR process. We believe that our recommendations support the recommendations made by the President's Council of Advisors on Science and Technology (PCAST) in their Report to the President on Accelerating the Pace of Change in Energy Technologies Through an Integrated Federal Energy Policy. We are pleased that Professor Edward S. Rubin's work was considered in the development of this report. URS works closely with Dr. Rubin in his Energy work as part of the NETL's Regional University Alliance, a powerful collaboration of five major R&D universities, NETL, and URS. We believe implementation of DOE's QTR process is an important step that will improve support for DOE energy development objectives across the laboratory system. Thank you for the opportunity to comment and for the leadership you provide to this great nation.

Sincerely,

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