# Response by SuperPower, Inc.

A. Accountability. What constitutes accountability for the Federally-supported research enterprise? How can performers best demonstrate results or return on Federal research investments? Please suggest mechanisms whereby research managers can more transparently demonstrate responsible use of public resources.

Accountability should be defined in terms that are quantitative and, therefore, measurable. Some conclusions about accountability can be made based on performance on the research program while others will require a longer time frame. The following quantitative measures may be applied:

Pre-award

- Is the research effort something an enterprise would do on its own or is the technical/financial risk too high? Federal support should be provided for the latter.
- Are the research objectives realistic given the schedule and budget?
- Is the organization proposing the research capable (personnel and facilities) or doing it?

During/immediately after program

- How successful was the enterprise in meeting the research objectives? Not at all, partially, mostly or totally?
- How much intellectual property was developed? Patent disclosures/awards are the most measurable of these but this should also include trade secrets and know-how.
- Were the results encouraging enough that additional Federal or private funds were granted?

Long term

- Did the research lead to products which the enterprise commercialized or had commercialized? The number of small business innovation research (SBIR) phase III successes is a measure of this.
- What additional revenue was generated as a result of this research and what payments of Federal and State taxes?
- How much additional employment did this research lead to?
- Did this research result in a leading position for United States industry or recouping the lead from a foreign country?
- Is the research applicable to both the commercial and government needs?

An excellent example of accountability is provided by cost shared programs, such as the DOE's Superconductivity Partnership Initiative (SPI) or the National Institute of Standards and Technology's (NIST's) Advanced Technology Program - that is those programs where the government provides some of the funds and private industry the balance, usually 50% each. This tends to make private industry more accountable since it is their money that is being invested as well as the governments'. To be successful a detailed scope of work with time specific milestones is a necessity, along with regular reporting and the willingness to pull the plug if milestones are missed. DOE has recently adopted Program Readiness Reviews for its' SPI programs which is a major step in the right direction of avoiding money wasted on programs that are in trouble. Relative to transparency, use of a peer review process is excellent because it introduces objectivity into the review process and the results, while not publicly available, can be used by government to gauge the effectiveness of the research endeavor.

B. Inconsistency of policies and practices among Federal agencies. Can you identify specific Federal policies and practices that if simplified would improve the efficiency and cost effectiveness of the research enterprise? Can the impact of inconsistent policies and practices among Federal agencies on the research environment be quantified? Among the variations in policies and practices, which practices appear to be the best? Why?

One of the inconsistencies in Federal policies has been the distinction made between basic and applied research. The old paradigm of basic research (usually considered another term for science) leading to applied research leading to development is not correct.

The point is that the distinction should be (and actually is) between Science - curiosity driven research - and Technology (use driven research). Not between Basic and Applied - which are ill defined terms at best. This is important because Technology research must contain a basic component - where new technology is created - or the greatest opportunities are missed. Basic technology research often requires the same scientific disciplines and research facilities as basic scientific research, but wouldn't get supported by most federal science offices.

It is very difficult to get federal funding for basic technology research for a couple of reasons: policy makers haven't heard of it, and more importantly, think this type of research should be done under federal science funding. This seems the case at DOE - where manages almost all of federal government energy funding. We need continued federal support of science - but we also have to solve the problem of there not being a place for basic technology research. This is particularly true in the energy area to solve our national energy problems.

A key difference between science and technology is that technology research is almost always multidisciplinary, making strong management of research teams essential.

Another inconsistency is the definition of “small business” as used for Federal government agency SBIR programs. The Small Business Administration has established standards on an industry by industry basis. For example, one SBA standard for “small” is less than 750 employees. Various Federal agencies such as DOE and DOD use there own: 500 employees. There should be one standard that applies to all SBIR programs. SuperPower believes this standard should be 750 employees.

C. Inconsistency of policies and practices among universities. Can you identify specific university policies and practices that if simplified would improve the efficiency and cost effectiveness of the research enterprise?

The cost effectiveness of a research enterprise would be improved if the patent policies of universities were more favorable to commercialization by industry. The Bayh/Dole Act grants universities the rights to intellectual property for federally funded programs but does not restrict what universities do with it. Some universities and states, however, have policies that, in effect, prevent collaboration with industry.

In our experience there are universities who insist not only on owning the intellectual property but also require industry to pay them for an exclusive license, even when they are being completely funded by industry. The net result is this condition is too onerous for industry and the research doesn't get done. This is an actual example that happened to SuperPower when we sought to collaborate with the University of Kansas. We do not know if this policy was the university's or imposed upon it by the state of Kansas. In New York there is a state law, according to the University at Albany, that prevents the state universities from ceding the rights to intellectual property to industry.

In other instances royalty payments or licensing fees are initially too high discouraging industry evaluation. A policy whereby initial payments to the university are lower during the merit evaluation (through prototype demonstration) and increase only if production is reached would encourage commercialization.

D. State and Institutional requirements. What is the prevalence and impact of state and institutional requirements that are added to Federal requirements for research funding?

SuperPower, located in New York, has conducted a number of research initiatives which have been partially funded by the New York State Research and Development Authority (NYSERDA). NYSERDA's procedures and requirements are complementary to those of the Federal government. For example, U.S. government overhead and G&A rates are used and U.S. Defense Contract Audit Agency (DCAA) audits are accepted. NYSERDA has also accepted Federal government agency reports, statements of works and milestones in lieu of its own requirements in some cases. This reduces the administrative burden for industry and allows more funds to be spent on research. One of the most beneficial aspects of DOE and NYSERDA policy is with respect to cost shared programs. That is, those programs where industry and the government both provide funds. For programs where both a Federal government agency and NYSERDA are contributing, Federal funds are considered to be part of industry cost share by NYSERDA and State funds are considered to be part of industry cost share by the Federal government. This enables industry in New York to conduct research programs that would be too expensive with only a single funding source. Other states, such as California, may have similar policies

SuperPower has also entered into research programs with the Electric Power Research Institute (EPRI) and, again, found acceptance of Federal government rates and audits. In summary, based on SuperPower's experience, States and institutional organizations make an effort to apply Federal requirements to their research programs. This reduces both industry and institutional administrative burden.

E. Regulatory requirements. Is there a more efficient approach to meeting the intent of the current suite of administrative requirements and regulations? Please provide examples.

There is no doubt that the regulatory requirements of the Federal government are a deterrent to many in industry. SuperPower has sought to enter into partnerships with other companies that have refused to do so because Federal funds were going to be utilized and they did not want to deal with

requirements which they consider burdensome or have no experience with. Confidentiality prevents us from identifying these companies.

SuperPower over the years has established partnerships for programs with several companies that share two things in common: 1) partial Federal funding is involved so Federal regulations must be complied with, and 2) no knowledge or experience of these regulations. Those partnerships, which are in the public domain, are with Waukesha Electric Systems – high temperature superconducting (HTS) transformer, Sumitomo Electric Industries (Japan) and The BOC Group – HTS cable and Nexans SuperConductors (Germany) – HTS fault current limiter. In all cases conforming to government regulations was a negative which had to be overcome. In order to do so we offered our expertise in this area – primarily to develop U.S. government rates but also to interpret requirements/ownership of intellectual property, reports, confidentiality, etc.

Although the government must be protected, the requirements at first glance can appear overwhelming. Typically an Federal Agreement will directly list a number of requirements and also reference many more from the Federal Acquisition Regulations (FAR), leaving it to the contractor to sort through all of the referenced items. Often one FAR article references another so the list grows. One suggestion would be to include all requirements/regulations in the body of the Agreement. This will lead to a bigger document but is all inclusive and takes away the recipients concern of what happens when the referenced FAR articles are amended during the course of the Agreement?

Although government regulations can be daunting to the uninformed new user, once one knows the rules, they are really not that difficult to comply with. Since SuperPower is experienced in these requirements it is not difficult for us to comply. For a novice the rules could lead to a missed opportunity. Hence the government ought to provide more guidance in such cases and seek to make the rules more user friendly.

Another change that could be made is in the area of patents. The Contractor should be granted ownership of the patents, subject to march in rights and other provisions that protect the interests of the government if the Contractor doesn't pursue the invention, rather than have to petition the government for ownership. In SuperPower's experience, we have received contracts from the Air Force citing FAR52.227-12 "Patent Rights – Retention by the Contractor" which already confers patent ownership to SuperPower. In others, awarded by the DOE, FAR 52.227-13 "Acquisition by the Government" is cited requiring us to submit a waiver request to have ownership. This is an additional administrative burden.

F. Research support. How can public funding mechanisms and policies encourage or discourage innovative approaches to research? Does the current process for research funding encourage or discourage innovative research? How do support mechanisms influence the mix of investigators supported (e.g., principal investigators, research scientists, postdoctoral scholars, graduate students, or technicians)? How can changes in the conduct of science and engineering necessitate modified funding models? Are data available to help decide these questions?

The comments made in the answer to B. relative to basic and applied research also apply here. The removal of the distinction between basic and applied research will encourage innovation by removing administrative walls.

Providing more monetary support for specific research programs will encourage innovation. Many government contracts today require 50% cost share by the Contractor. While this insures that the Contractor is seriously committed to the research, it does not recognize varying levels of risk. Perhaps, the amount of government support could be varied between 50% and 100% based on level of risk, potential benefit to the U.S. or other combination of criteria? This could be addressed perhaps by including a separate set of "stretch" goals beyond the basic program, such that if the goals are in fact met a higher level of funding (say more than 50% cost share) would be possible. It would also be helpful for the government to recognize that there is a high degree of cost uncertainty for innovation. Perhaps funding increases could be easily granted within some predetermined limits provided progress has been made, continued research is deemed desirable and funds are available?

A major discouragement arises from the delay encountered between proposal submission and award. In our experience, the government (DOD, DOE and NIST) rarely, if ever, meets the published award date. This is particularly difficult for small companies but is burdensome to all. Companies have budgets and are evaluated, both internally and by their shareholders if publicly owned, and delays in awards can have a major impact. Few companies are willing to begin research programs being partially funded by the government until the award is received. Another discouraging factor is the specialized accounting procedures and number of reports required.

With respect to the mix of investigators, current policies heavily favor higher levels of education. The experience, including the degree level, of the personnel performing the research is almost always a criterion for granting an award.

There is some data available for evaluation. In particular, it should be a matter of public record to compile data on promised vs. actual contract award dates. Others are more in the subjective realm such as how do policies influence the mix of investigators?

> G. Multidisciplinary/collaborative research. Are any funding organizations, either inside or outside of government, employing funding mechanisms or strategies that are particularly effective in encouraging multidisciplinary work, collaborative activities, and other innovative approaches? Are there any data available relevant to these questions?

SuperPower believes that there are funding organizations that are effective in encouraging multidisciplinary work and collaborations. The DOE SPI which entails the design, development and demonstration of HTS devices entail multiple disciplines such as material science, mechanical and electrical engineering, computer science, physics, cryogenics, superconductivity, manufacturing and quality assurance. This same program requires collaborations through requiring teams consisting of superconductor companies, device manufacturers and utilities or other end users. The NIST Advanced Technology Program also does this in the area of collaborations by encouraging “joint ventures” formed for the purpose of conducting the program. Data on this is available via the listings of awards made by these two agencies.

H. Research Infrastructure. What information is available to examine policies at the Federal, State, local or institutional level that affect research infrastructure and the costs of building, maintaining and/or operating the research infrastructure' What factors influence performers' investments in research infrastructure? What data are available to demonstrate that? What information is available on the mix of sources used to finance research infrastructure?

In our experience, Federal programs do not allow the construction of research facilities to be an allowable program cost. Capital equipment for research is an allowable cost but is sometimes limited to a maximum percent of the overall program budget. Operating the equipment for the purposes of performing research on the program is also an allowable cost. The cost of maintaining the equipment would be covered through labor overhead calculated according to government (DCAA) requirements. In New York State, NYSERDA follows Federal requirements in determining what costs are allowable and how they are allocated. Locally, there are mechanisms such as “Economic Development Zones”. If a company is located in such a zone, financial assistance is provided for infrastructure, job training, electricity rates and, possibly, capital equipment.

SuperPower considers these factors when deciding whether to perform a specific research program or not. For example a capital equipment item may be too expensive for us alone but if there is a Federal contribution it becomes tenable. In our field, research equipment is very expensive and this is important. We do not believe there is data on research infrastructure investment that is readily obtainable.

I. Information Technology. How has information technology impacted the efficiency, performance, or costs of research management? Are there data to demonstrate any effect?

Information technology has probably had a tremendous impact on research in general. Learning what others are doing in a particular field or topic is readily obtainable on the Internet. It is believed that this has led to a reduction in the number of hours doing technical due diligence research but there is no data to confirm this. Also it is probable that the cost of reporting and compliance is reduced because of the productivity inherent in automation. Software tools make it possible to also improve program management, tracking schedule and cost to budget.

J. Technology transfer optimization. Are data available to examine whether intellectual property and patent agreements have changed relationships among universities, industry, and the government?

SuperPower has now, or in the past, had a number of agreements and collaborations with:

- Universities - Rensselaer Polytechnic Institute, University at Albany, University at Buffalo and University of Florida,
- Industry - DuPont, The BOC Group, Nexans, Sumitomo Electric Industries and Waukesha Electric Systems,
- Government - Air Force and Naval Research Laboratories; Argonne, Los Alamos and Oak Ridge National Laboratories; and NYSERDA, and
- Industry trade groups – Electric Power Research Institute (EPRI), National Electric Energy Testing, Research and Applications Center.

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In any collaboration, intellectual property rights are always a major focus. Generally, the Federal government laboratories and NYSERDA are very flexible in allowing industry to retain rights. For industry the formula is generally sole and background intellectual property remains with the party who conceived and developed them and jointly developed intellectual property is shared. In the case of universities and EPRI there can be conflicting views on who should have the rights to intellectual property that may inhibit joint development or even prevent it. In those cases where the government is providing funding, it is possible to influence the relationship among parties. For example, government policy can serve to modify the university licensing process so that U.S. industry and commercialization is promoted rather than providing near term licensing fees to universities. The latter can discourage industry involvement and, hence, commercialization which ultimately will benefit industry, the university and the government.

In summary, it is fair to say that intellectual property has a major impact on relationships. Quantitative data probably does not exist.