Initial Thoughts on Public Private Partnerships and Consortium Models for IFE

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Public-Private partnerships will play an important role in IFE R&D and the eventual commercialization of IFE. Although prior IFE related science and technology R&D have been nearly all government sponsored, signficant private investments in IFE startups have started over the last several years and could grow, following the trend of escalating private investments in MFE that are now in the multibillion-dollar scale.

Given the current private and public landscape, the still low technology readiness level (TRL) of many of the envisioned required IFE technologies, and the fact that much of the difficult-to-impossible to replicate capabilities needed to advance many areas of IFE science and technologies reside currently in government funded labs and industry designed to support the US ICF program, it is important for any revitalized US IFE program to help the community develop appropriate public-private partnership models. The model needs to support the role of US government labs as entities that can help bridge low TRL gaps for industry and ensure foundational IFE advancements enabled by leveraging the existing ICF infrastructure with joint public-private funding can be shared broadly with the community, in a manner consistent with US laws and policy, in order to increase the speed of overall IFE development. At the same time, the partnership model needs to ensure companies are incentivized to participate and contribute. Lastly, the model needs to be able to efficiently accommodate multi-party participants ranging from academia to national labs to start-ups and larger companies.

As a start, we can consider and study consortium-based models, some of which have been successful at facilitating public-private partnerships broadly and satisfying the requirements above. A notable broad example is SEMATECH [1-3] which was formed as a non-profit and initially sustained with joint matching funds from DARPA and more than 10 US based semiconductor companies. The consortium, staffed by employees from the member companies on a rotating basis, successfully contracted and worked with companies and partners to develop common, critical technologies needed to regain US competitiveness in the semiconductor industry and help set industry wide goals. A related example with direct ties to the national laboratories is the Intel initiated EUV LLC and its partnership via CRADA with the Virtual National Laboratory (VNL, consisting of LBL-LLNL-SNL) that successfully established the technology basis for EUV lithography and transitioned it to the wider semiconductor industry [4]. EUV LLC, as a virtual company, served successfully as the interface between semiconductor suppliers, tools maker, and the VNL, and led and funded the $270M+ effort between 1997 and 2003. LBL, LLNL, and SNL conducted the majority of the R&D and Engineering, including the construction of a complete and integrated alpha level EUV tool known as the Engineering Test Stand. EUV LLC had significant support and funding from its members, including major chipmakers such as Intel and AMD. Through the VNL, the EUV LLC was able to quickly leverage significant and unique expertise as well as experimental infrastructure at the three national labs in technical areas like lasers and EUV optics that the semiconductor industry did not have existing in-depth capabilities.

A more recent example is DOE's Consortium for the Advanced Simulation for Light Water Reactors (CASL) [5-7], a DOE Energy Innovation Hub formed in 2010. CASL is led by Oak Ridge and made up of multiple academia, national labs, and industry members, with the goal of developing next generation, coupled multi-physics simulation capabilities for light water reactors that could be commonly used across the industry for design, operations, and safety challenges. The consortium is funded by DOE with Oak Ridge as the lead, but Industrial members share 50% of the cost of CASL operations through contribution of technical experts at reduced rates, codes, data, or tools and other services [6]; industrial members receive multiple benefits, including continual access to consortium capabilities and expertise applied to relevant test problems. In 2020, CASL reached a signficant milestone in licensing and deploying the Virtual Environment for Reactor Applications (VERA) simulation capability to the nuclear industry. Another recent example is the formation of the Accelerating Therapeutics for Opportunities in Medicine (ATOM) consortium in 2017 with GSK, LLNL, FNL for Cancer Research, and UCSF as founding members and funding support under the 21st Century Cures Act [8]. A core part of ATOM is the development and deployment of an open-source computational design platform for novel drug discovery, with industry members contributing via a combination of funding, technical staff, and/or data and in turn garnering trained staff capable of using the platform as well as new molecule designs from test problems. Originally formed under a multi-party CRADA, the consortium is moving to being organized under a single non-profit, the ATOM Research Alliance (ARA), which will streamline the process for adding new partnerships, contracts, and overall business operations including IP management. In both CASL and ATOM, a key contribution of the national laboratories to these consortiums is their integrated strength in advanced and large-scale simulation, modeling, and data analytics in the domains of interest.

Although details of the four consortiums differ, they all have the common theme and mission of working to develop foundational technologies for their field, with the consortium members helping to determine areas of highest priority. They are also led typically by a single entity that conduct and execute the business of the consortium (under various oversight arrangements), and in three of the four cases, this entity is a non-profit. These features potentially streamline the ability of the consortium to receive and commit research funding from multiple public and private sources to its members and other groups, as well as execute new contracts and partnerships with appropriate IP considerations.

More thoughts and discussions are needed to determine what an appropriate IFE consortium might look like and the approach's advantages and disadvantages, accounting for the fact that IFE is still a nascent industry compared to the ones in the examples above. One potential benefit of a consortium approach for IFE, assuming it would have as its members the major Labs with substantial existing capabilities enabled by prior USG investments, is that it might be possible to setup an arrangement that allows emerging IFE startups access to these existing capabilities in a more consistent manner, compared with each Lab conducting separate 1:1 agreements and partnerships with individual startups. Additionally, in a consortium approach, public-private resources could be pooled to solve common, precompetitive, foundational technology gaps, allowing for individual companies to then build upon that foundation as their unique IFE offering. Many additional issues however, including IP management and considerations for domestic and foreign participation, will have to be addressed for a successful consortium structure. Nevertheless, given the potential benefits, the BRN committee should study the possibility of a consortium approach, in conjunction with other mechanisms like STTRs and programs such as INFUSE, to determine appropriate recommendations for enabling strong, community wide, public-private partnerships for IFE.

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