

iUtah EPSCoR External Advisory Board Report

September 25, 2012

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Summary:

The External Advisory Board is quite impressed with the quality of the iUtah team and the significant progress that has been made to date. This report highlights some of the key achievements to date. In addition, we make some recommendations for the iUtah group to consider as they move forward.

iUtah has a draft mission statement and overarching goals that reflect the objectives stated in the EPSCoR proposal. From a project management perspective they are finalizing an S&T Plan, creating a State Committee, adopting bylaws, creating a state director's office, and creating an iUtah office with necessary staff.

A main office is located in Logan where most administrative staff members are located. A second office housing the education, outreach, and diversity coordinator will be located in Salt Lake City at the University of Utah.

iUtah has a management team (MT) that represents the various project components. It was stated that the MT may meet on a monthly basis.

The panel and NSF requested that an education plan be prepared and several specific requirements were provided in the panel comments. iUtah's MT has begun to address many of the issues. One or more follow-up meetings of iUtah educators, scientists and leadership could easily complete a comprehensive education plan that addresses the panel suggestions.

Ecohydrology area. The area includes a strong group representing many disciplines and is moderately diverse. Graduate students have already been brought into the project for a one-year term. Recruiting is planned for bringing in new cohorts. The area has identified specific and reasonable objectives for year 1, as well as outputs (i.e., short-term outcomes). There is a close relationship (i.e., interdependencies) among the focal areas. The ecohydrology team has identified a number of challenges that will need to be addressed as they move forward (e.g., no funds for groundwater monitoring, personnel to maintain sites in years 2-5).

Social and Engineered Systems area. The area also includes a strong team and they have already attracted eight graduate students that are involved in year 1 activities. A social science faculty hire is underway. The team has identified overarching goals and year 1 activities that will enable the goals to be achieved; however details with respect to when, how, how many, where, etc. require more specificity. Bringing in focus groups to help specify research objectives and develop relationships during year 1 is a real strength of the program. Anticipated outputs appear reasonable and

possible challenges have been identified. Good progress has been made with respect to hiring staff and a new faculty member, as well as bringing students on-board.

The Coupled Human-Natural System. The team has identified reasonable overarching goals, activities, and outputs.

iUtah Facilities. Most of the five new facilities (GAMUT, GIRF, Modeling Center, Decision Theater and Data Federation) have statewide support from researchers, educators and decision-makers. Considerable thought has been given to sustainability of the facilities as they are being developed and the opportunities that will be created, and assessment of how each facility contributes to the overall iUTAH mission and specific research goals should be continued. Education and outreach potential are being planned for in the initial design and planning efforts. The facilities are located at four different institutions where strong partnerships already exist. The facilities team has identified reasonable goals and outputs, as well as challenges that must be overcome, especially with respect to achieving sustainability, maintenance, technical support, etc. The team has also identified a reasonable set of anticipated outcomes and impacts, although like all other focal areas more specificity should be expected as part of the strategic plan. There are tremendous opportunities to engage with community, church groups and others to promote water conservation and sustainability; iUtah has great contacts for facilitating engagement.

Cyberinfrastructure. iUtah has numerous resources that they are able to leverage including their Track 2 award and strong connections to CUAHSI. They plan to invest in a Modeling and Data Federation to enhance data and information infrastructure, and are expanding the staff and partners that will be part of the CI team. CI goals, objectives, and activities are reasonable for this stage of the project. Some future challenges are related to providing adequate CI support for the Decision Theater. The ongoing team-taught graduate course that is associated with all three major research universities is a big plus. Relevant challenges related to CI have been identified by the team, including managing researcher expectations, data heterogeneity, semantics, limited technical resources, model integration and coupling, and sustainability.

Diversity. The Team has identified goals and objectives that include hold diversity training, increase URM participation, incorporate cultural understanding into iUtah, hold regional workshops on multi-cultural understanding of science, hold place-based education activities, and support strategic recruitment. Challenges have been identified including funding limitations, and creating a welcoming environment to attract URM. Desirable outcomes and impacts have been identified, but lack specificity.

External Engagement. The external engagement team has done a good job of designing program activities and identifying high-level outputs for each activity. A great team is involved and significant leveraging is involved.

Workforce Development. The team's goal is to engage industry in iUtah and build research capacity and economic development. The team is comprised of strong participants that have a proven track record. A major challenge and opportunity lies in reaching out to PUI and industry partners. Integration of research and education is recognized as the biggest challenge. The team has articulated goals, objectives, and activities (focusing on several programs including iUtah-WEST Fellows, Summer Institutes, Collaborative REUs, and an Industry Internship Program). Strategic recruitment of students will be key to workforce development success, especially the REU program. It will likely be necessary to develop a flexible program so that URM students can participate for shorter time periods if necessary.

Recommendations:

Diversity. The State Committee is weak in diversity at present; every effort should be made to increase racial, ethnic and gender diversity. This can be accomplished through strategic recruitment of URMs and females from business and industry, the legislature, smaller schools, and government. In addition, it will be important to engage as many URMs as possible at all levels so that there is a critical mass of role models and mentors. This will require significant strategic planning so that iUtah can optimize limited resources. Priorities for mentoring (especially women students), and developing a cohort of minority students (not just one or two in isolation) using the successful model of ESA's SEEDS would help create a top-notch process to inspire the next generation of Utah's scientists from this experience.

iUtah Administrative Infrastructure Support. iUtah is actively exploring opportunities to support the EPSCoR administrative framework from State funds. iUtah is well behind other states in building its office and supporting appropriate staffing. The EAB views significant state and university contributions as being critical to project success. In particular, the State of Utah, Utah State University and the University of Utah should support an adequate administrative staff and the establishment of EPSCoR office and living space in Salt Lake City to facilitate interactions with the University of Utah as well as governmental agencies, businesses, and other stakeholders that reside there.

iUtah Communication. The EAB recommends that iUtah invest in a robust videoconferencing system such as GoToMeeting or others that offer similar capabilities. GoToMeeting, for example, enables you to have multiple VTC session leaders so that various focal areas could run simultaneous virtual meetings.

Face-to-face meetings will be critical, so the EPSCoR leadership may wish to consider having an apartment in Salt Lake City so that there is significant team interaction and proximity to meetings with the university, legislature and others.

At this stage of the project, communication is vital. The EAB recommends that iUtah establish a set meeting schedule for the MT and all focal area teams so that communication becomes integral to the project. Expectations should be set early in the project for all participants. The emerging generation of students is very invested in technology and social media – these outlets are essential for dissemination of this project to diverse stakeholders. In addition, the

communication (as well as broader impacts) will benefit greatly from some low-hanging fruit that could include: (1) linking to other national water projects; (2) creating a water blog for student comments and data compilations, including citizen science activities such as photos of water activities; (3) creating online sound-bytes that policy-makers will utilize, such as a PIE-CHART that represents average water usage and the components of what is used, perhaps with a view to decreasing this usage as a metric of grant success; and (4) possibly linking to major multi-media science education hubs such as the Daily Planet which is North Carolina's STEM education center.

Research Objectives, Outcomes and Impacts. iUtah has made good progress in identifying year 1 objectives and outcomes. As part of the strategic planning effort, iUtah will need to be much more specific in identifying short- and long-term outcomes. Ideally, a Gantt chart will be created for all focal areas so that milestones and timelines are clearly articulated. It will be especially important to take a long-term perspective and identify specific outcomes that will be achievable by year 5 as well as longer-term impacts (7-10 years) that are envisioned. Specific outcomes and applications to foster water conservation and policy-making would enhance the value of all efforts in this proposal. One important impact goal for Utah residents should be for this grant to educate stakeholders beyond the boundaries of the state – some data-sharing about water in other arid states or countries, some application such as Earthwatch's \$50M initiative to educate all HSBC bank employees about water conservation, or other partner programs that would enhance the value of this project and magnify the education components.

Data Sharing Policy. The iUtah data sharing policy should be communicated with all participants as soon as possible and revisited periodically. It is important to set expectations early in the life of the project so that data, metadata, models and software are broadly available. Additional attention will, of course, need to be paid to human subject data (i.e., IRB policies and procedures, etc.).

Sampling Program and Reference Sites. Consideration should be given to identifying reference sites that would be included in the sampling program where possible. This will be important for establishing context for the sampling results from the mountain-urban transects, which are also mountain-desert transects. Linking the geophysical sampling to socio-political units (e.g. parcels and neighborhoods) will be a challenge that requires substantial consideration. Building a social science data infrastructure that can be seamlessly compared to the bio-physical data infrastructure should be a top priority.

Decision Theater and other facilities. The success of the decision theatre and environment situation rooms may depend upon the extent that specialists in cognitive behavior and learning are engaged in the design of the infrastructure. This may help iUtah avoid mistakes made by other universities that have built theatres that no one came to. Alternatively, there may be better options in the future for allocation of these funds. Likewise, several members of the External Advisory Board questioned the need for and value of the computer lab, which does not appear to

rise to the level of EPSCoR-appropriate. All facilities should be assessed to determine whether EPSCoR funding would be used to provide unique opportunities in the state to build research infrastructure and enhance STEM education in Utah consistent with the stated goals of the project. When a facility fails to meet these criteria, the Project Director should contact the appropriate NSF Program Director with a plan for reallocating funds to areas that will improve research competitiveness and STEM education in Utah.

Workforce Development. Current outputs/outcomes may be overly ambitious and should be revised to include metrics that iUtah can reasonably be expected to effect.

External Engagement. The EAB suggests that you consider what constitutes a citizen science program versus a hands-on education program. Also, you may wish to consider how you might leverage existing national citizen science programs as opposed to starting new programs from scratch.

Assessment and Evaluation: Plans for assessment and evaluation of all aspects of the program are required for the Track-1 proposal. The Utah team should prepare to include these plans in the Strategic Planning meeting and in the Strategic Plan, including in the milestones.