

THE IN-SITU RESOURCE UTILIZATION PROJECT UNDER THE PRESIDENT'S NEW BUDGET.

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The newly proposed United States Space Policy calls for increased investment in technologies that will enable human exploration of the solar system. The In-Situ Resource Utilization (ISRU) stands to benefit from this increased investment. It is one of the technologies that NASA was specifically directed to pursue by the Office of Management and Budget when the budget was released on February 1st.

For the last few years, NASA has been investing in ISRU through Exploration Technology Development Program (ETDP). Under Constellation, ISRU has made significant strides in the area of oxygen production from lunar regolith. ISRU is no longer a laboratory experiment. It has been taken in the field to be tested at lunar analogs and integrated with many other technologies. Unfortunately progress was always constrained by funding under ETDP as budget problems within the Agency and within Constellation bled money away from the technology program. This also caused the project to become more and more of an in-house activity as we tried to maintain our core competencies.

The new technology program proposed by the President will be quite different from the current program. There will be increase focus on external participation and multiple sources of funding. While there is much angst being expressed over the lack of a launch vehicle program within NASA, perhaps deservedly so, the lack of a launch vehicle program actually offers some hope that technology budgets will remain stable for a few years and perhaps even grow.

The new technology development structure within NASA will have several programs that could potentially fund ISRU activities. One of the Programs, Enabling Technology Development and Demonstration (ETDD), will be the home of the ISRU Domain. There is an additional program called the Space Technology Program that is managed by the Office of the Chief Technologist that could also fund ISRU technology development. This program is intended to fund technologies that are cross cutting and game changing. The majority of the development under this program will be awarded competitively allowing greater opportunity for industry and academia to contribute to NASA's development efforts. In addition to these two technology development programs, there are now two flight programs Exploration Robotics Precursors and Flag-

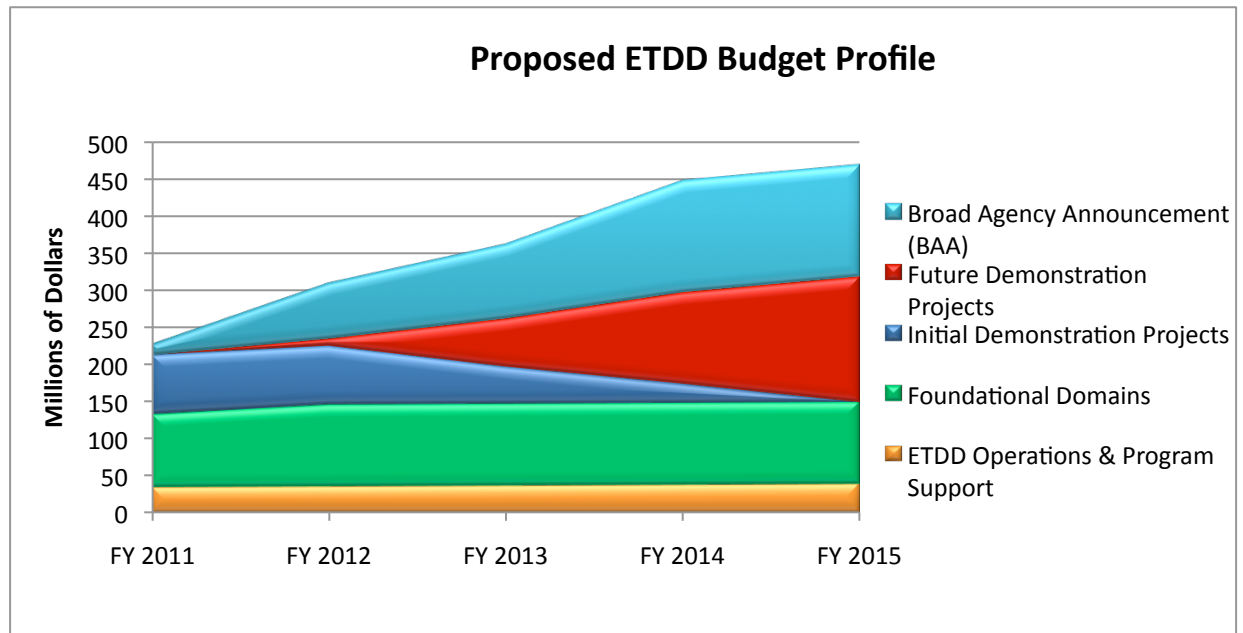
ship Technology Demonstrations that will provide opportunities for ISRU to finally be tested in Space.

As mentioned earlier, the "home" for ISRU within NASA will be in the ETDD program. ETDD will provide Domain funding to allow NASA to maintain its core technical expertise. The Domain will provide the technical leadership; establishing the technology development strategy and perform the system integration and development activities for ISRU. The ETDD program will also have two additional elements, Demonstrations and Competitive Development. Each Demonstration Project is framed around answering a key question derived from architectural studies. Demonstration Project Managers, who are separate from the Domain Managers, competitively select technologies to demonstrate solutions to those key questions. It is expected that technologies from several Foundational Technology Domains will be chosen for inclusion in the Demonstrations. One of the first demonstration projects that will begin in FY11 is a lunar volatiles ground truth mission in partnership with the Exploration Robotics Precursor Program, notionally targeted for the middle of this decade. The starting point for this development activity will be the RESOLVE project, pictured below, that has been a partnership between KSC, JSC and GRC over the last few years.



The significant portion of the technology development under the ETDD program will be conducted through competitive Broad Area Announcements that will cover all of the ETDD technology domains. The competitions between NASA technologists and external providers will be conducted separately. However, for the external competitions partnerships will be encouraged between the external providers and a NASA Center. The budget for the ETDD program is somewhat

constrained initially, but is slated to grow over the next five years. As the budget grows the competitively awarded portion of the funding will grow to at least 50% or greater.



Over the next five to ten years the ISRU Domain will focus its energies on the flight opportunities that are emerging from the Flagship, Robotic Precursor and International programs. There are several missions to the moon that are in the planning stages, so the project will try to follow up on the lunar volatiles mission with an oxygen production mission. The Mars mission opportunity in 2018 provides the ability to deliver a much larger payload to the surface above and beyond normal launch windows. We will target our efforts to place a fuel and oxygen production system on this Lander to demonstrate a key capability called for by the Mars Design Reference Mission.

In conclusion, the President's budget proposal provides a renewed focus on technology development. A significant part of the technology development portfolio will focus upon technologies that impact human exploration beyond Low Earth Orbit. ISRU is clearly defined as in the budget as one of the key technologies needed for deep space exploration and will receive greater focus and funding than ISRU ever had under the Constellation Program.