What is NASA Ta 3?

May 2015 Draft 2015 NASA Technology Roadmaps DRAFT TA 3: Space Power and Energy Storage Foreword NASA is leading the way with a balanced program of space exploration, aeronautics, and science research.

What is NASA's Space Technology Roadmap?

NASA Space Technology Roadmaps and Priorities: Restoring NASA's Technological Edge and Paving the Way for a New Era in Space. Washington, DC: The National Academies Press. doi: 10.17226/13354. The draft roadmap for technology area (TA) 03, Space Power and Energy Storage, is divided into four level 2 technology subareas: 1

What is a space power and energy storage technology roadmap?

Introduction The purpose of this document is to describe the state of the art in space power and energy storage technologies and formulate a technology roadmap that can guide NASA's developments to assure the timely development and delivery of innovative and enabling power and energy storage systems for future space missions.

What is technology area 3?

Executive Summary This is Technology Area (TA) 3: Space Power and Energy Storage,one of the 16 sections of the 2015 NASA Technology Roadmaps. The Roadmaps are a set of documents that consider a wide range of needed technologies and development pathways for the next 20 years (2015-2035).

What technology areas are covered in Ta 3.4?

TA 3.4: Cross Cutting Technology TA 3.4 Cross Cutting Technology areas are discussed in the following technology roadmaps: 3 .4 .1 Analytical Tools Analytical Tools has been addressed within TA 11 Modeling, Simulation, Information Technology and Processing.

What technologies can be used in space applications?

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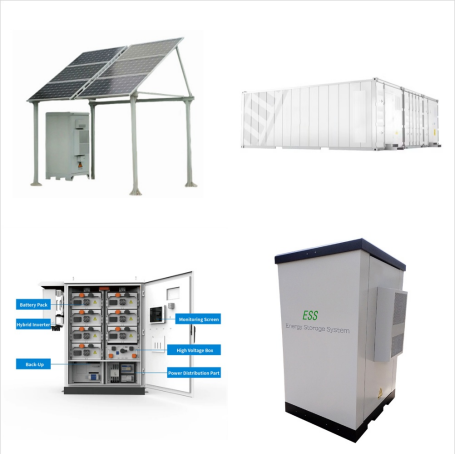
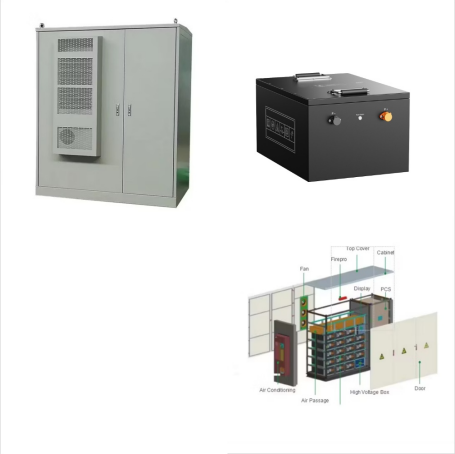
Two other approaches may also prove feasible for space applications: (1) electric and magnetic field storage and (2) thermal storage(especially for surface power applications). Accordingly,the structure for this roadmap has been modified by adding two new level 3 technologies: o 3.2.4.



NASA Technology Roadmaps TA 10: Nanotechnology avionics, autonomy, information technology, radiation, and space weather span across multiple sections. The introduction provides a description of the crosscutting technologies, and a list of the 3. TA 10 .2: Energy Storage, Power Generation, and Power Distribution .



NASA Technology Taxonomy is part of an evolution that began with the original roadmaps and Technology Area Breakdown Structure (TABS) drafted in 2010, followed by updates in 2012 and 2015 . The 2020 Taxonomy is an update to the 2015 TABS . The taxonomy provides a structure for articulating NASA's technology portfolio, which is key to

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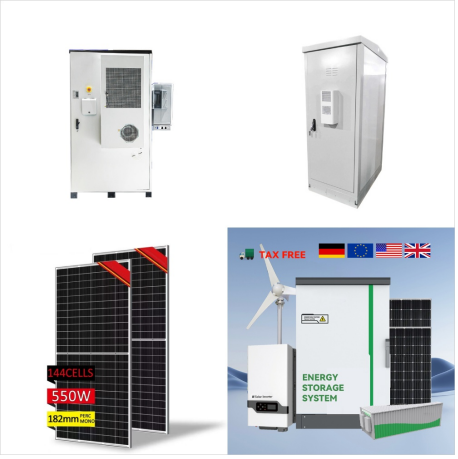
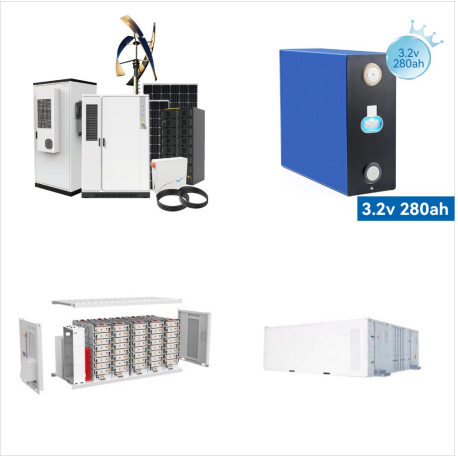
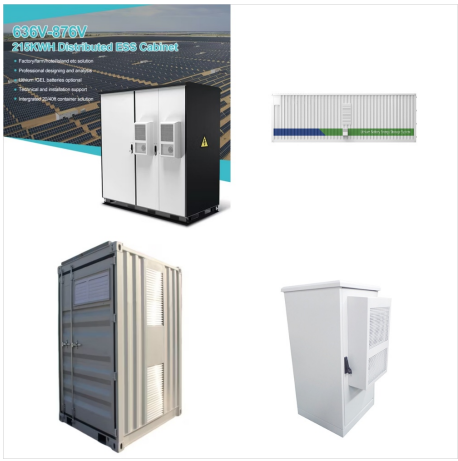


3.0.0 Space Power and Energy Storage 3.1.0 Power Generation Space Nuclear Power Systems H8.02 Advanced Photovoltaic Systems Z1.01 Innovative Energy Harvesting Technology Development T3.01 3.2.0 Energy Storage Advanced Space Battery Technology Z1.02 3.3.0 Power Management and Distribution Power Electronics and Management, and Energy ???



NASA's Office of the Chief Technologist (OCT) has begun to rebuild the advanced space technology program in the agency with plans laid out in 14 draft technology roadmaps. It has been years since NASA has had a vigorous, broad-based program in advanced space technology development and its technology base has been largely depleted.



NASA Technology Roadmaps are comprised of 16 sections: The Introduction, Crosscutting Technologies, and Index; and 15 distinct Technology Area (TA) roadmaps. Crosscutting technology areas, such as, but not limited to, avionics, autonomy, information technology, radiation, and space weather span across multiple sections.

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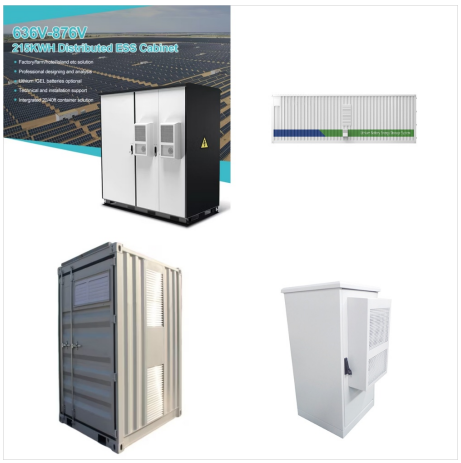
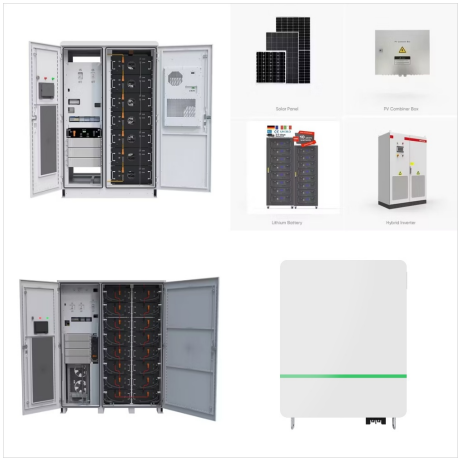
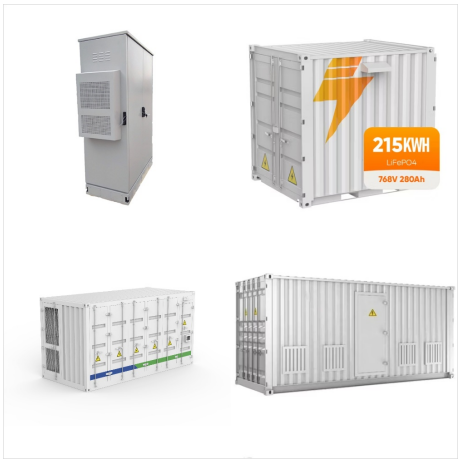


These roadmaps were the subject of a comprehensive external review by the National Academies of Sciences, Engineering, and Medicine. 1 That review was documented in the 2012 National Research Council (NRC) report NASA Space Technology Roadmaps and Priorities: Restoring NASA's Technological Edge and Paving the Way for a New Era in Space. 2 As



Editor's Note: The 2015 NASA Technology Roadmaps have been replaced with the 2020 NASA Technology Taxonomy and the NASA Strategic Technology Integration Framework. The 2015 NASA Technology Roadmaps will be archived and remain accessible via their current Internet address as well as via the new 2020 NASA Technology Taxonomy ???



Space Power and Energy Storage High Efficiency Space Power Systems Fuel Cells and Electrolyzers H8.01 Ultra High Specific Energy Batteries H8.02 Space Nuclear Power Systems H8.03 Advanced Photovoltaic Systems H8.04 Spacecraft and Platform Subsystem Power Generation and Conversion S3.02 Power Electronics and Management, and Energy Storage ???

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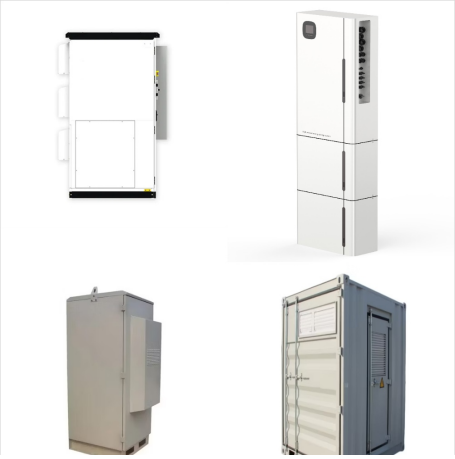
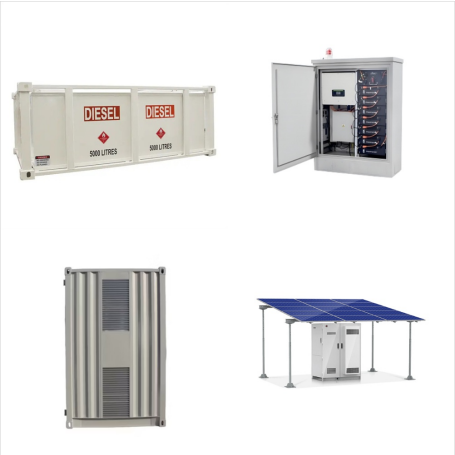
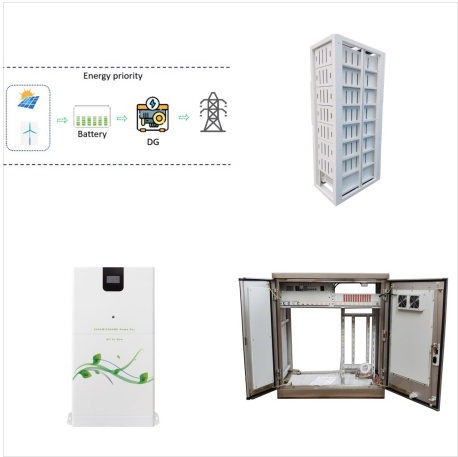


These roadmaps establish time sequencing and interdependencies of advanced space technology research and development over the next 5 to 30 years for the following 14 technology areas (Tas): ??? TA01. Launch Propulsion Systems ??? TA02. In-Space Propulsion Technologies ??? TA03. Space Power and Energy Storage ??? TA04.



As described in the NASA Space Power and Energy Storage Roadmap-Technology Area (TA) 03, space qualified high voltage/high temperature power electronics are directly aligned with science and exploration missions including missions using electric propulsion, robotic surface missions to Venus and Europa, Mars polar and lunar polar science missions, crewed exploration vehicles, ???



3 NRC, 2012, NASA Space Technology Roadmaps and Priorities: Restoring NASA's Technological Edge and Paving the Way for a New Era in Space, The National Academies Press, TA 3, Space Power and Energy Storage; TA 4, Robotics and Autonomous Systems; TA 5, Communications, Navigation, and Orbital Debris Tracking and Characterization Systems

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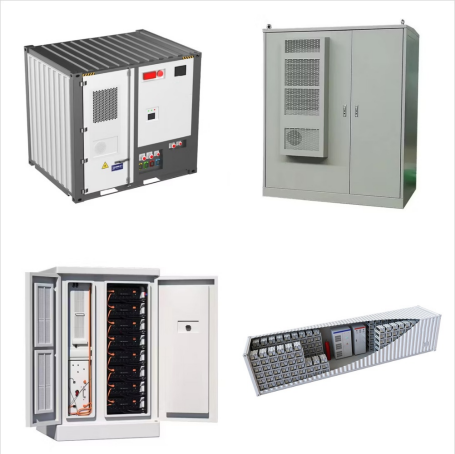
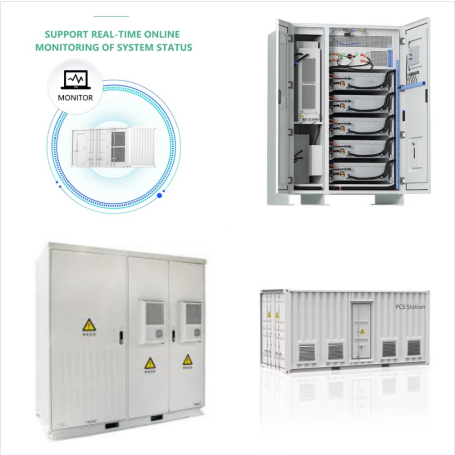
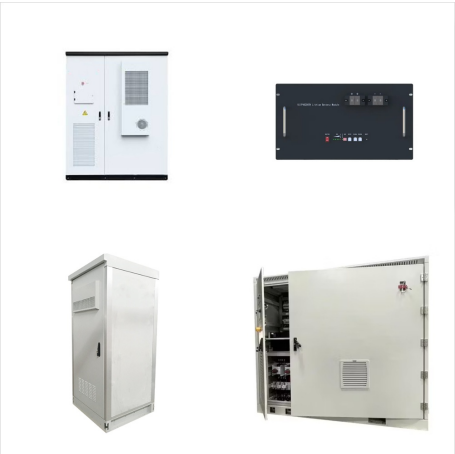


An Interim Report on NASA's Draft Space Technology Roadmaps. Washington, DC: The National Academies Press. doi: 10.17226/13228. The reader is referred to the Technology Area 3, Space Power and Energy Storage Systems. Similarly, with regard to technologies 2.4.1, 2.4.3, and 2.4.4, roadmap TA02 refers readers to roadmaps TA04, TA12, and TA14



2.3.1 Beamed Energy Propulsion 2.3.2 Electric Sail Propulsion 2.3.3 Fusion Propulsion 2.3.4 High Energy Density Materials 2.3.5 Antimatter Propulsion 2.3.6 Advanced Fission 2.3.7 Breakthrough Propulsion 2.4 Supporting Technologies 2.4.1 Engine health monitoring and safety 2.4.2 Propellant Storage & Transfer



This document summarizes NASA's 2015 Technology Roadmap for Space Power and Energy Storage. It outlines goals to develop more efficient, lighter, and higher power space power systems over the next 20 years through improvements in ???

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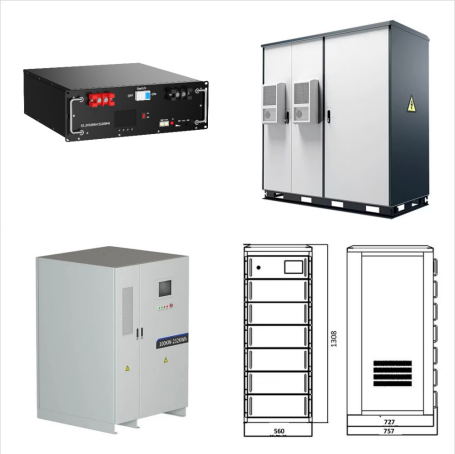

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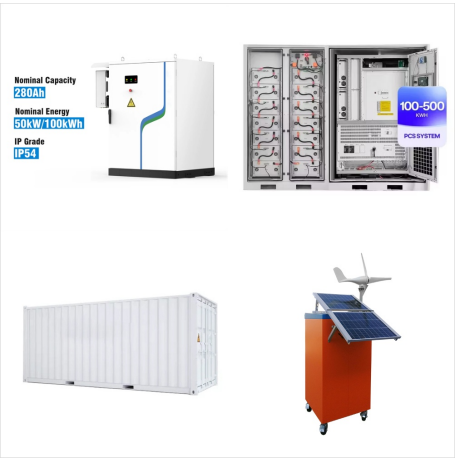
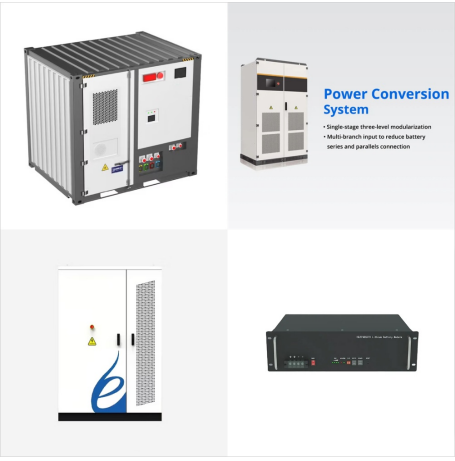


Two high-priority technologies were identified from TA-01. In both cases high-priority status was identified because of the wide range of applications that they offered for NASA's missions. TA03 Space Power and Energy Storage. TA03 is divided into four technology areas: power generation, energy storage, power management and distribution



6. NASA's Technology Roadmap areas consist of 14 technology areas. The focus of this continuing Technology Estimating effort included four Technology Areas (TA): TA3 Space Power and Energy Storage, TA4 Robotics, TA8 Instruments, and TA12 Materials, to confine the research to the most abundant data pool.

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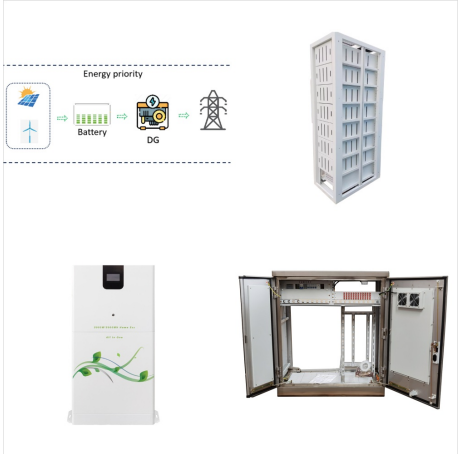
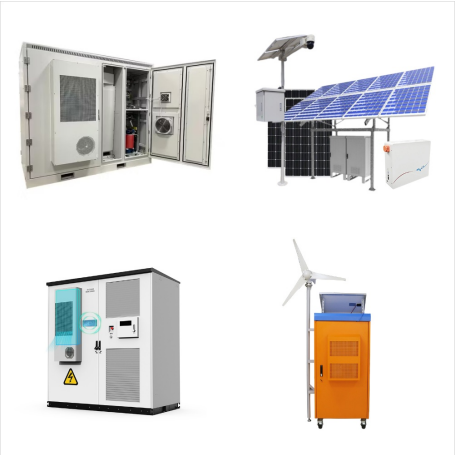
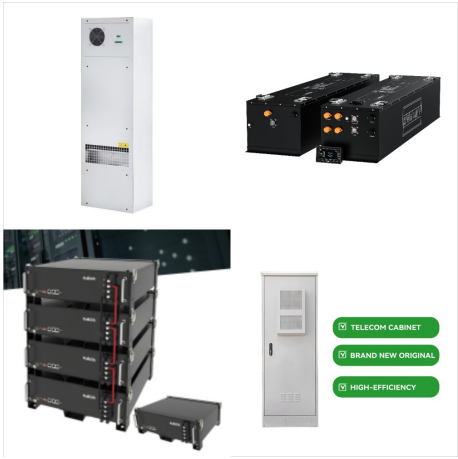


NASA has developed a set of 14 draft roadmaps to guide the development of space technologies under the leadership of the NASA Office of the Chief Technologist (OCT). Each of these roadmaps focuses on a particular technology area (TA). The roadmaps are intended to foster the development of advanced technologies and concepts that address NASA's needs ???



J. S. McNatt - NASA Space Technology Mission Directorate 15 NASA Baselined "Envisioned Future Priorities (EFP)" - 2023 EFP A-E formatted as "SuperGaps" in TX03 roadmap Mobile Fission Surface Power Reliable, Rad-Hard Power Conversion and Cable Transmission System Solar Power Long Life, Grid-Scale Secondary Energy Storage Wireless Power



14 Space Technology Areas (TA).The 14 teams werefocused on strategically identified areas where significant technology and where substantial enhancements in NASA mission capabilities are needed.Together, the fourteen roadmaps represent NASA's integrated Space Technology Roadmap. Once the TA roadmaps were drafted by conducted.

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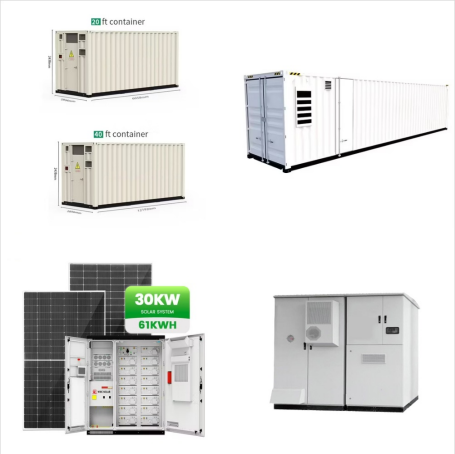
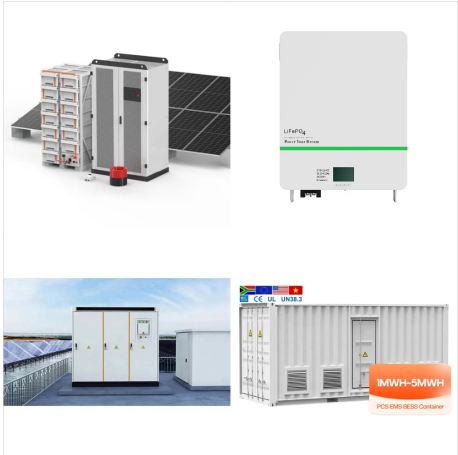
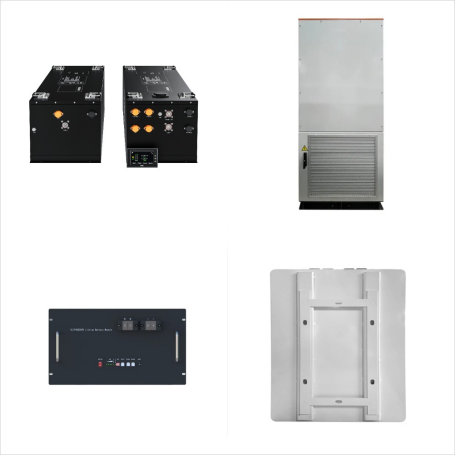


Aero-Space Technology Area Roadmap (A-STAR) July 2010, NASA Office of Chief Technologist (OCT) initiated an activity to create and maintain a NASA integrated roadmap for 15 key technology areas which recommend an overall technology investment strategy and prioritize NASA's technology programs to meet NASA's strategic goals.



TA03 ??? sPAce PoweR & eneRgy sToRAge ??? Heat Rejection & Energy Storage theRmAl PRotection SyStemS ??? Entry/AscentTPS ??? PlumeShielding(Convective& STR ??? TaBS Technology aRea BReakdown STRUcTURe Space Technology Roadmaps. Created Date: 11/30/2010 4:00:04 PM



NASA Technology Roadmaps TA 14: Thermal Management Systems TA 14 - 5 and handling include systems or components that do not require power or energy to operate or perform the desired function. In general, the objective is to maximize the passive cooling or insulating capabilities 14.2.3 Heat Rejection and Energy Storage: Heat

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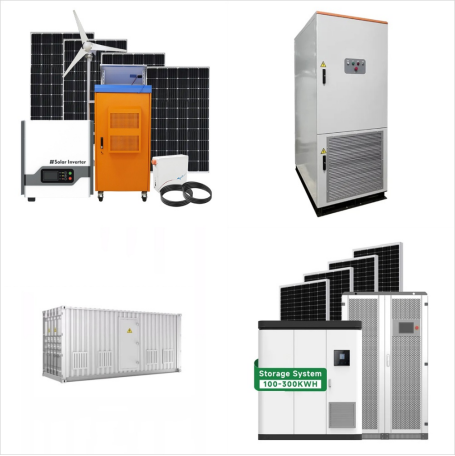
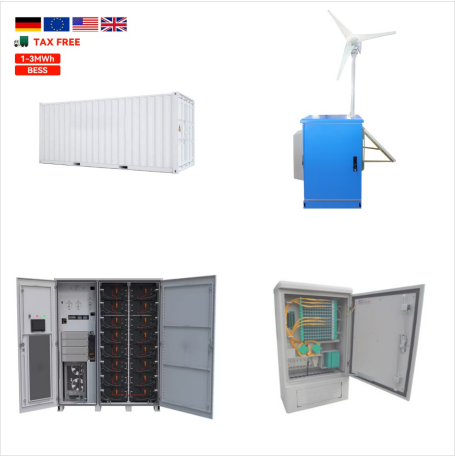
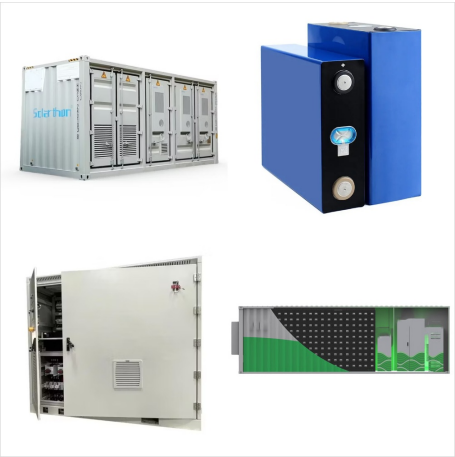


NASA recently released the draft 2015 Space Technology Roadmaps, which identify promising new technologies that could advance agency missions. The roadmaps are designed to guide technology development across all four mission directorates at NASA. As such, they organize the agency's entire technology portfolio. A key purpose of the roadmaps is to ???



According to the National Research Council's NASA Space Technology Roadmaps and Priorities, there is a need to increase available power and eliminate the constraint of power availability for space missions. The selected proposals will help improve energy storage with reliable power systems that can survive the wide range of NASA missions



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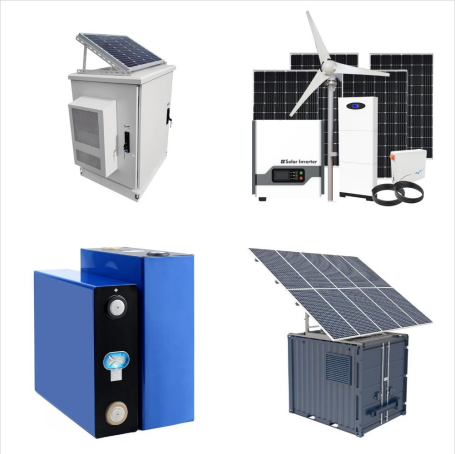

Background The National Nanotechnology Initiative was founded in 2001 NASA was one of the founding agencies NASA nanotechnology funding peaked around 2004 at ~$60M, current investment is $19M ???includes $9M in SBIR/STTR Office of Chief Technologist strongly interested in revitalizing program 7 FY10, M$ 2. Nanomaterials 3. Nanoscale Devices and