

FAA OFFICE OF AIRPORTS FY2023 SUPPLEMENTAL DISCRETIONARY GRANT PROGRAM PROCUREMENT AND INSTALLATION OF SOLAR PHOTOVOLTAIC ARRAYS AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT PROJECT NARRATIVE

In November 2023, the Maryland Aviation Administration (MAA) prepared a Solar Siting and Feasibility Study (the Study) that outlined a solar energy generation roadmap to maximize the generation of clean energy at Baltimore/Washington International Thurgood Marshall Airport (BWI or the Airport).

The State of Maryland’s drive to combat the climate crisis comes from a desire to further protect the people and the fragile environment of the Chesapeake Bay watershed from the adverse effects of a warming climate. Climate change is already happening in Maryland with observed impacts including sea-level rise,

increases in water temperature, heavier rains, more frequent heat waves and drought, and adverse impacts on tourism. In 2007, the Maryland Commission on Climate Change was established to advise the Governor and the Maryland General Assembly on strategies for reducing greenhouse gas (GHG) emissions. In the following years, several acts were passed establishing GHG reduction targets that were successfully met. The latest target (and most ambitious in the country) was passed into law under the Climate Solutions Now Act which calls for a 60% emissions reduction target by 2031 and “net zero” emissions by 2045. MAA is actively developing and improving actions that reduce GHG emissions while also adapting to the current and future effects, risks, and hazards of climate change.

This application requests \$20 million of fiscal year (FY) 2023 supplemental discretionary grant funding from the Federal Aviation Administration’s (FAA) Office of Airports, Airport Improvement Program (AIP) to continue MAA’s commitment to solar power generation and begin implementing the solar initiatives prioritized in the Study (the Project).

SECTION 1: ELIGIBILITY

The Project is offered in response to FAA’s Airports Climate Challenge initiative in support of the current administration’s goals to achieve net-zero GHG emissions economy-wide by 2050. The Project meets the eligibility criteria of C.3.a.3 (iii) *Energy Supply, Redundancy and Microgrids* contained in the Notice of Funding Opportunity (NoFO). As BWI is a large hub airport, MAA is eligible for 75% AIP funding as described in the AIP Handbook. The Airport is located in Anne Arundel County, an area designated by the United States Environmental Protection Agency’s (EPA) National Ambient Air Quality Standards (NAAQS) as (1) nonattainment for 2008 and 2015 8-hour ozone, precursors of which are oxides of nitrogen (NO_x) and volatile organic compounds (VOC), as well as 2010 sulfur dioxide (SO₂), and (2) is designated a maintenance area for 1997 particulate matter with a diameter of 2.5 microns or less (PM_{2.5}). While the Energy Supply, Redundancy and Microgrids criteria does not require projects to be in nonattainment areas, the emission reductions from the Project will benefit an area that is in nonattainment of the NAAQS described in the Clean Air Act.

The Energy Supply Redundancy and Microgrid (“Microgrid”) Program funding, as specified in 49 USC 47102 (3)(p), is allowed to be used for activities associated with the acquisition or construction of equipment that will

Figure 1: Example of Solar Array



Source: Maryland Aviation Administration, 2024

supply energy to the Airport. Specifically, 49 USC 47102 (3)(p) specifies that the Secretary of Transportation may fund “an on-airport project to improve the reliability and efficiency of the airport’s power supply and to prevent power disruptions to the airfield, passenger terminal, and any other airport facilities, including the acquisition and installation of electrical generators, separation of the airport’s main power supply from its redundant power supply, and the construction or modification of airport facilities to install a microgrid (as defined in section 641 of the United States Energy Storage Competitiveness Act of 2007 (42 U.S.C. 17231).”

Priority Project Category

The Project is eligible for the Emissions and Energy (EE) Priority Project Category, as it is intended to be funded under the Microgrid Program. MAA has completed the planning for a solar facility and the assessment of energy requirements and usage and is thus eligible to apply for a grant under 49 USC 47102 (3) (p). While any public-use airport that is eligible to receive AIP funds is also eligible for the Microgrid Program, FAA’s selection criteria has historically prioritized airports that are in nonattainment or maintenance of the NAAQS for one or more criteria pollutants. This makes initiations of the Project an important step towards improving local health. The Project will result in the generation of renewable power that will be used within the boundaries of the Airport and will comply with all requirements contained within 49 USC 47102 (3)(p) and the corresponding Technical Guidance.

SECTION 2: PROJECT DESCRIPTION

Project Purpose and Scope

The Study describes and analyzes the logistical, financial, and long-term planning feasibility of solar power generation at numerous sites within the Airport boundaries. In conjunction with our efforts to eliminate carbon emissions being studied in the FAA-funded BWI Decarbonization Plan, MAA is interested in building two or more solar photovoltaic (PV) arrays by utilizing an innovative grant request. Our grant request includes (1) expediting our decarbonization actions by respectfully requesting the maximum allowable grant award from FAA’s FY 2023 supplemental discretionary grant program, (2) providing matching funds that meet or exceed the 25% local match requirement of AIP, and (3) utilizing a design/build contracting mechanism to motivate the winning contractor to build one or more solar arrays that maximize the energy production of any solar PV array that is ultimately built, regardless of footprint, configuration, manufacturer, or equipment specifications utilized. The Project is expected to include the installation of stationary solar panels above parking spaces in the Employee and Express lots on the north side of the Airport. A third site has been identified (the roof of the Daily Garage) where additional solar PV panels could be installed if feasible within the approximately \$26.7 million project budget.

This application refers to the three potential project sites as:

- Site 1: Employee Parking Lot
- Site 2: Express Parking Lot
- Site 3: Roof of the Daily Garage (potential third site depending on bids received during contractor procurement)

All three sites, which are described and illustrated in the Project Location subsection, were selected based on their proximity to electrical infrastructure connections and are expected to feed the Airport’s energy supply through the North Substation. At full buildout, Sites 1 and 2 are each expected to support three megawatts (MW) of solar PV panels producing 8,400 megawatt-hours (MWh) of clean energy that will be used at the Airport through the North Substation.

The Study evaluated 61 sites and prioritized 11 of those sites for the installation of solar PV arrays. While reducing the carbon footprint of the Airport is a high priority for MAA, it is recognized that a full implementation of the solar plan would exceed the allowable funding in NoFO and must be completed in

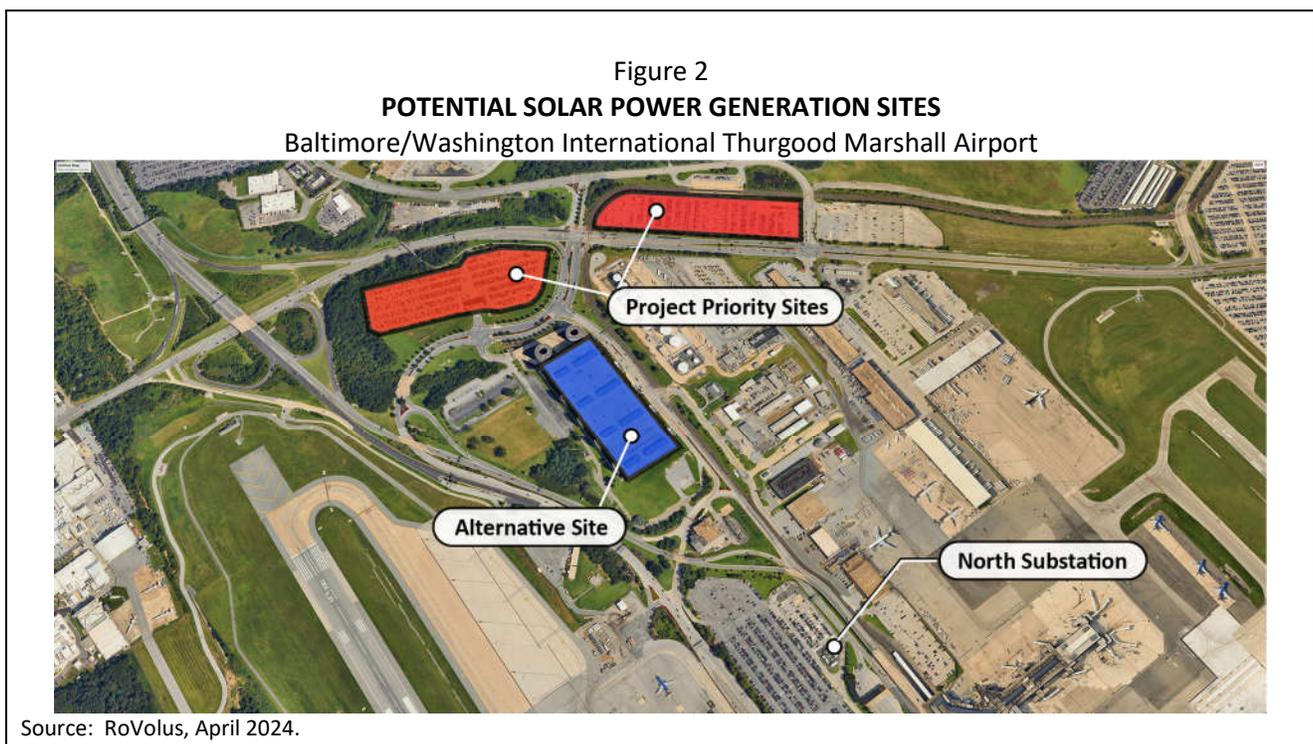
phases. Fortunately, the installation of solar PV arrays is a flexible project that can be scaled to the funding available. Thus, MAA is seeking the maximum allowable grant amount, with the intent to build out as much of the BWI solar plan as is possible with the available funding. MAA intends to use a design/build contracting mechanism to maximize the solar power production, building on the highest priority site first, then the second highest priority site, until the entire grant award is fully utilized.

With the aforementioned methodology, our engineers confidently estimate that a total of six MW of solar PV panels can be installed over the two primary sites. The secondary site, the Daily Garage, provides space for an additional two MW with any remaining grant funds. During the design/build proposal process, potential contractors will be required to provide a committed power installation amount, and an estimate of funds used on (1) electrical infrastructure needed to connect the new solar arrays with the closest substation (the North Substation), (2) installation of a solar PV array on parking canopies over the Employee Lot, (3) installation of a solar PV array on parking canopies over the Express Lot, and (4) any additional parking canopies with solar PV panels that are expected for installation on the roof of the Daily Garage.

MAA is requesting \$20 million in grant funding for FY 2023 to partially cover the design and construction of the solar PV arrays. MAA expects the Project will cost a total of \$26.7 million, including local matching funds provided by MAA.

Location of Project

The solar PV panels will be permanently located at the Airport, installed on parking canopies over the Employee Parking Lot and the Express Parking Lot on the north side of the Airport. These are described in the Study as Sites #13 and #14. Additionally, an alternative site, the Daily Garage, has been identified for the installation of solar parking arrays in the event there are grant funds in excess of those needed to cover the two primary sites. These sites were selected for their proximity to the North Substation, where connections to the grid and Airport power distribution will take place. The location of the two primary sites, an alternative site, and the North Substation, are shown in Figure 2.



Projected Energy Production

The objective of the Project is to (1) decrease the Airport's climate footprint by displacing a portion of the energy currently being purchased from traditional sources, by generating zero-emissions, renewable energy onsite, (2) improve energy resilience by providing redundancy and reducing the amount of energy that must be transmitted from traditional power plants that are vulnerable to security risks, natural disasters, and human errors, (3) reduce operation costs for passengers, tenants, and business partners, and (4) increase electrical capacity to the Airport's campus for future electrification.

First year electricity generation was estimated at approximately 1,400 MWh per MW of solar PV panels. This results in a yield of 8,400 MWh in the first year of production, assuming Sites 1 and 2 are fully built out and meet or exceed expectations of three MW each. Over a 20-year useful life of the solar PV array, it is estimated that approximately 168,000 MWh of clean power would be produced on-site from six MW of solar PV panels.

Electricity generation was modeled with PVWatts, a subcomponent of the National Renewable Energy Laboratory's System Advisor Model. PVWatts inputs include: (1) location and climate (specific geographic and historic weather data assembled by the National Solar Radiation Database and provided as default values in PVWatts), (2) array tracking and orientation (measures the orientation of the array surface with respect to incoming solar radiation), (3) system derate factor (measures the electrical conversion efficiency, or electrical loss that occurs during the conversion of DC electricity to AC electricity), (4) shading (measures the interference with incoming solar radiation that occurs due to nearby objects such as building, trees, etc.), and (5) array capacity. The proposed solar PV arrays were modeled as a single component (module and inverter).

Alignment with Administration Priorities

The Project is broadly compatible with several priorities of the current Presidential administration, including:

- Executive Order (EO) 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*, which advocates for better accounting of the social costs and impacts of gases associated with climate change, including carbon, nitrous oxide, and methane. Projects to replace conventionally-generated electricity with carbon free electricity directly reduce airport carbon emissions, which results in a corresponding reduction of social costs on affected communities.
- EO 13985, *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government*, which advocates for the Federal government to adopt improved practices that will encourage more fair treatment and better accounting of potential impacts in historically underserved communities. The Project supports the goals of this EO by reducing Airport-related climate change impacts to neighboring communities via the generation of renewable energy and the corresponding GHG reductions.
- EO 14008, *Tackling the Climate Crisis at Home and Abroad*, which sets out a series of tasks intended to reduce current and future climate-related impacts. These tasks include the development of sustainable infrastructure (Sec. 213) which, in the service of ensuring Federal infrastructure investments reduce climate pollution, considers the effects of GHG emissions and climate change in these decisions. The Project would result in the reduction of climate pollution by significantly reducing GHG and local emissions associated with the generation of power at traditional power plants and aligns well with the goals of this EO.

SECTION 4: COST ESTIMATE

MAA anticipates funding 75% of the Project's cost through the requested AIP discretionary funds. MAA is committed to providing the 25% required local match, which could be made available from state funds, airport revenues, or Passenger Facility Charges.

Table 1 summarizes the grant request for the Project. MAA is requesting FAA to provide FY 2023 AIP funds in the amount of \$20 million, for a total project cost of approximately \$26.7 million. The proposed cost-share is consistent with FAA AIP guidelines. Cost estimates are not expected to change throughout the proposal/bid cycle, due to our recommended approach to design/build proposals that would resize the Project to target the grant request amount and local matching funds.

Table 1: Preliminary Funding Estimate for the Solar Photovoltaic Array(s)

Cost Element	Estimated Cost
Transmission, Connection, and Infrastructure Upgrade Needs	\$10,057,000
Solar PV array over Employee Lot	\$8,304,833
Solar PV array over Express Lot	\$8,304,833
TOTAL COST	\$26,666,666
25% local share	6,666,666
Formal grant request	\$20,000,000

Source: RoVolus, April 2024.

SECTION 5: EMISSION REDUCTIONS

EPA’s eGRID model was used to determine emission factors for location-specific grid power production in the eGRID Subregion that includes the Airport. Emission factors are provided in units of pounds per Megawatt-hour (lbs/MWh) for carbon dioxide (CO₂), oxides of nitrogen (NO_x), and SO₂. Emission factors and emission reductions are shown in Table 2.

The useful life of a solar PV Array is assumed to be 20 years, with a maintenance cost to replace the inverter equipment incurred at the 10-year point.

Table 2: Emission Factors and Emission Reduction Estimates

	CO ₂	NO _x	SO ₂
Emission Factors (lbs/MWh)	672.8	0.296	0.337
Emission Reductions First Year (tons)	2,800	1.2	1.4
Emission Reductions 20-year useful life (tons)	57,000	25	28

Note: Numbers may not add due to rounding

Source: RoVolus, April 2024.

SECTION 6: OTHER SUSTAINABILITY BENEFITS

Solar energy is a renewable source of power that it is a sustainable alternative to the resource constraints of fossil fuels. Additionally, solar energy has an important role in reducing GHG emissions and mitigating climate change, which is critical to protecting humans, wildlife, and ecosystems. The use of solar energy generated onsite will (1) reduce the impacts of local air pollutants near power plants in Maryland, (2) improve the financial sustainability of MAA, (3) increase the resiliency of the National Airspace System (NAS), (4) support American workers through FAA’s Buy America Provisions, (5) reduce MAA’s dependence on fossil fuels, and (6) support energy independence and decrease the negative externalities of the global energy trade.

SECTION 7: PROPOSED SCHEDULE

MAA intends to pursue a design/build procurement mechanism to (1) ensure the “apparent winning proposal” can be selected prior to the grant execution deadline of May 31, 2025, and (2) reduce costs and delays associated with the preparation of engineering design documents needed for design/bid/build procurement strategies.

Issuance of notice to proceed would be issued no later than 30 days following execution of the grant agreement. Given that the parking lot sites are currently being fully utilized, construction is expected to take place in stages to minimize inconveniences to passengers and employees. MAA expects the construction phase to take place over a 9-month period.

MAA will ensure, via contractual language, that the winning contractor completes all installation and connection activities by May 31, 2027.

Table 3 shows each proposed milestone associated with the Project, including both pre-and post-grant execution activities. Items to be completed prior to grant execution are notated with an asterisk.

Table 3: Proposed Schedule

Schedule Element/Milestone	Estimated Start Date	Estimated Finish Date
Development of Requests for Proposals*	July 2024	December 2024
RFP Release/Due/Selection Dates*	January 2025	March 2025
Grant Execution Selection of Successful	April 2025	May 2025
Project Design	June 2025	December 2025
Design Approval	January 2026	March 2026
Materials Procurement	January 2026	September 2026
Solar PV Installation Site 1	May 2026	August 2026
Solar PV Installation Site 2	August 2026	December 2026
Grant Closeout	January 2027	May 2027

Source: RoVolus, April 2024.

SECTION 8: REGULATORY REVIEWS

Regulatory reviews and approvals will be required to construct the parking canopies, solar PV arrays, electric transmission lines, and infrastructure connections, including:

- Airport Layout Plan update may be required,
- Form FAA 7460-1 - Notice Of Proposed Construction or Alteration, including an assurance there is no potential for ocular impact to the Air Traffic Control tower cab, and
- National Environmental Policy Act (NEPA) review is expected to be addressed with an Environmental Assessment as described in FAA Order 1050.1F.

SECTION 9: FINANCIAL PLAN

The requested grant funding and local matching funds are expected to cover the capital cost of designing, purchasing, and installing the solar PV arrays, as well as associated electrical upgrades required to transmit the solar power to the North Substation. It requires a 25% local match to support the FAA grant and MAA will use local funds to provide that match.

SECTION 10: PROJECT FLEXIBILITY

The scope and potential cost of the Project has been developed based on the most current information available. However, neither a request for information on equipment and vendors, nor any formal construction bids have been solicited for this work. In the current environment of price instability in some sectors, it is possible that the total cost of equipment and/or installation could be higher or lower than anticipated. As a result, the Project has been designed to be scalable to match actual bids and/or available funding. However, given the cost to connect solar panels to the North Substation, a significant reduction in the grant amount requested could result in a disproportionate reduction in power generation. It could also result in a delay in meeting Federal, state, local, and agency goals concerning climate change and sustainability.