

Notice of Intent No. DE-FOA-0003247**Notice of Intent to Issue
Funding Opportunity Announcement No. DE-FOA-0003248**

The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Vehicle Technologies Office, a Funding Opportunity Announcement (FOA) entitled “FY2024 Vehicle Technologies Office Research & Development Funding Opportunity Announcement”.

This FOA supports building a clean and equitable energy economy and addressing the climate crisis as a top priority of the Biden Administration. This anticipated FOA will advance the Biden Administration’s goals to achieve carbon pollution-free electricity by 2035 and to “deliver an equitable, clean energy future, and put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050 to the benefit of all Americans.” The Department of Energy is committed to pushing the frontiers of science and engineering, catalyzing clean energy jobs through research, development, demonstration, and deployment (RDD&D), and ensuring environmental justice and inclusion of underserved communities.

The RDD&D activities to be funded under this FOA will support the government-wide approach to the climate crisis by driving the innovation that can lead to the deployment of clean energy technologies, which are critical for climate protection. Specifically, this FOA will advance RDD&D in several areas critical to achieving net-zero greenhouse gas (GHG) emissions by 2050, including: development of innovative battery chemistries, reducing GHG emissions in off-road vehicles, improving transportation efficiency via connected vehicles, domestic production of electric steels and improved cybersecurity for electric vehicle charging.

As part of the whole-of-government approach to advance equity across the Federal Government, it is the policy of the Biden Administration that:

The Federal Government should pursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Affirmatively advancing equity, civil rights, racial justice, and equal opportunity is the responsibility of the whole of our government. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies (agencies) must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity.

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By advancing equity across the Federal Government, we can create opportunities for the improvement of communities that have been historically underserved, which benefits everyone.

As part of this approach, this anticipated FOA will encourage the participation of underserved communities and underrepresented groups. Applicants are highly encouraged to include individuals from groups historically underrepresented in STEM on their project teams.

It is anticipated that the FOA may include the following Areas of Interest:

Area of Interest 1: Next Generation Phosphate-Based Cathodes

This area of interest targets the development of Phosphate-based cathode material that surpasses the performance of state-of-the-art Lithium Iron Phosphate (LiFePO_4) cathode active material. LiFePO_4 is widely used in commercial applications, including Electric Vehicles, due to its long cycle and calendar life as well as safety performance. However, LiFePO_4 's energy density is limited due to its low voltage plateau. The primary objective of this area of interest is to increase the energy density of battery cells containing phosphate-based cathodes through research and development at the material and cell level.

Additionally, the proposed material should strive to show powder and electrode coating scalability, processability and reproducibility for manufacturing. While improvements to the cathode material are desired, the cost target of the next generation phosphate material should be comparable to industrial grade LiFePO_4 . The proposed R&D plan should resolve challenges such as obtaining higher energy density at material level compared to LiFePO_4 , good slurry quality, good electrode quality, high electrode loadings, enhanced electrode packing density and higher cell level energy density. Electrolyte stability should be addressed but not studied as a main focal point of the proposed work. The final cell deliverable should be at least 2Ah constructed with the proposed phosphate material combined with a graphite anode. The cells will need to exhibit automotive performance requirements such as stable cycle and calendar life, fast charging capabilities, and operation over a wide temperature window.

Area of Interest 2: Na-ion Battery Seedling Projects for Electric Vehicle Applications

Li-ion batteries dominate the rechargeable battery market but concerns over the supply and cost of lithium necessitate the search for alternative battery chemistries that do not rely on the use of lithium. Na-ion batteries are the leading technology to alleviate the electric vehicle market of lithium resource concerns. This area of interest looks to advance the state of the art for Na-ion batteries by addressing three key aspects: new cathode materials that avoid critical raw materials (i.e., nickel, cobalt, lithium) and address the slopping and step voltage-profile features, advanced anode materials that have well understood sodiation mechanisms, and

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electrolytes that address the poor solid electrolyte interphase (SEI) forming capabilities of many current Na-ion electrolytes. Consideration should be given to using materials that will have minimal supply chain concerns. All projects should be able to provide a final deliverable of a 1 Ah Na-ion full cell providing ≥ 160 Wh/kg and 1,000 cycles with 80% capacity retention.

Area of Interest 3: Low-GHG Concepts for Off-Road Vehicles

Off-road vehicles are a substantial source of greenhouse gases (GHG) and criteria emissions, including nitrogen oxides and fine particulate matter that contribute to poor air quality. These vehicles have unique requirements for durability, power/torque density, daily run times, and operation in remote and harsh locations.

The objective of this area of interest is to research, develop and demonstrate innovative technologies capable of significantly decreasing energy use, GHG and harmful criteria emissions, and total cost of ownership of off-road vehicles used in agriculture, construction, mining, forestry, ports, warehouses, etc. Proposed technologies should reduce emissions through increased utilization of low-carbon liquid or gaseous fuels including hydrogen, renewable natural gas or renewable propane, and by partial or full vehicle electrification while maintaining similar durability to current vehicles. Awarded projects will also demonstrate improvements in over-all vehicle efficiency such as reductions in fluid power systems throttling losses and/or increased use of vehicle automation. Required deliverables include total cost of ownership calculations and vehicle demonstration in representative drive cycles. Applicant teams must include a vehicle/equipment Original Equipment Manufacturers (OEM) and/or Tier 1 suppliers.

Area of Interest 4: Saving Energy with Connectivity

The objective of this area of interest is to develop and deploy approaches using vehicle-to-everything (V2X) high-speed, low latency communication to improve the efficiency and convenience of the mobility-system. Projects could include but are not limited to eco-driving along connected corridors, transit priority, intermodal optimization, or freight priority.

For proper deployment of systems which will rely on critical V2X information, a complete understanding of the required message sets (basic safety message and new information sets) is essential to provide an appropriate communication system foundation. These message sets will inform both vehicles and traffic management and will be used for future analysis and system planning/optimization (SPATs, alternative routing, etc.).

Applications may include simulation and hardware testing of complex V2X communications interactions, band width and latency requirements in various settings and culminate in the deployment of hardware in settings controlled by state and local governments (not only on

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proving grounds), serving as a model for deployment by other Metropolitan Planning Organization (MPOs). Research must leverage current and past connected vehicle work with recognition of current standards and/or specifications in progress.

Applicant teams must include a local or state agency, or other entity (e.g., university) with the ability to approve an on-road demonstration of the technology. Partnerships with Original Equipment Manufacturers (OEMs) and standardization development organizations (SDOs) are encouraged. Solutions need to be interoperable across platforms, so they have the potential to be scaled. Applications must include a real-world early deployment. Deployments should be cybersecure.

Area of Interest 5: Domestically Produced E-steels

The US transportation sector is in the midst of a technology revolution where light-duty vehicles are rapidly transitioning to electrified powertrains. Although most of the vehicles are produced in the US many of the powertrain components rely on imports and foreign supply chains. Traction motors and components for traction motors fall into this category. Laminates for traction motors and transformers rely on electric steels or E-steels. E-steels impact the efficiency of electric vehicle traction motors and thus developing high-performance E-steels that can be used in today's manufacturing processes is an important opportunity.

The objective of this topic is to develop new high-performance E-steels that can be produced and manufactured using domestic resources. Awarded projects will develop e-steels with improved ductility and magnetic properties while maintaining cost parity. R&D plans should include laminate production at a thickness relevant for traction motors with minimal losses. This opportunity seeks to support teams which are fully integrated from basic material production through traction motor manufacture that can develop cost competitive high-performance traction motors in the United States for the US transportation industry.

Area of Interest 6: Cybersecurity for Smart and Secure Electric Vehicle Charging

Electric vehicles (EVs) can provide a wide range of grid services since most of the time EVs are parked they are not charging, offering flexibility in the timing and the level of charging. The rapidly increasing numbers of EVs in the US may soon lead to a new market for businesses to aggregate large numbers of EVs and bid grid services to the electricity sector. However, ensuring aggregation is done in a cybersecure way is critical to the operations of both the transportation and electricity sectors. Additionally, there is a significant need for the development and deployment of tools that can be used to assess the cybersecurity posture and compliance with standards and protocols of EVs, electric vehicle supply equipment (EVSE), and charging systems.

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The objective of this Area of Interest is to address these pressing cybersecurity issues through research, develop and demonstration of systems, technologies, and tools necessary for the cybersecure aggregation of EVs and charging infrastructure to provide widescale, cybersecure grid services, and to develop and validate a suite of tools and associated procedures to comprehensively assess EV/EVSE/charging system compliance with relevant standards and protocols and cybersecurity posture. Applicant teams are encouraged to include utilities, EVSE and vehicle OEMs.

Additional Information: EERE envisions awarding multiple financial assistance awards in the form of cooperative agreements. The estimated period of performance for each award will be approximately 24 to 36 months.

This Notice is issued so that interested parties are aware of the EERE's intention to issue this FOA in the near term. All the information contained in this Notice is subject to change. EERE will not respond to questions concerning this Notice. If or when the FOA is released, EERE will provide an avenue for potential Applicants to submit questions.

EERE plans to issue the FOA on or about January or February 2024 via the EERE eXCHANGE website <https://eere-eXCHANGE.energy.gov/>. If Applicants wish to receive official notifications and information from EERE regarding this FOA, they should register in EERE eXCHANGE. When the FOA is released, applications will be accepted only through EERE eXCHANGE.

In anticipation of the FOA being released, Applicants are advised to complete the following steps, which are **required** for application submission:

- Register and create an account in EERE eXCHANGE at <https://eere-eXCHANGE.energy.gov/>. This account will allow the user to apply to any open EERE FOAs that are currently in EERE eXCHANGE.

Beginning on July 29, 2022*, eXCHANGE will be updated to integrate with Login.gov. As of September 29, 2022*, potential applicants will be required to have a Login.gov account to access EERE eXCHANGE. As part of the eXCHANGE registration process, new users will be directed to create an account in [Login.gov](https://login.gov/). Please note that the email address associated with Login.gov must match the email address associated with the eXCHANGE account. For more information, refer to the Exchange Multi-Factor Authentication (MFA) Quick Guide in the [Manuals section](#) of eXCHANGE.

It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Questions

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related to the registration process and use of the EERE Exchange website should be submitted to: EERE-eXCHANGESupport@hq.doe.gov

- Register with the System for Award Management (SAM) at <https://www.sam.gov>. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually. Upon registration, SAM will automatically assign a Unique Entity ID (UEI).
- Register in FedConnect at <https://www.fedconnect.net/>. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf
- Register in Grants.gov to receive automatic updates when Amendments to a FOA are posted. However, please note that applications will not be accepted through Grants.gov. <http://www.grants.gov/>. All applications must be submitted through EERE eXCHANGE.

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