Appendix A

Context
The U.S. transportation sector accounts for 70% of U.S. petroleum consumption. On-road vehicles, including passenger cars, SUVs, pickups, and medium and heavy duty trucks, account for about 85% of the petroleum used for transportation. Substantial gains in fleet average fuel economy were realized during the first half of this decade, made possible by fuel-saving and emissions-reducing technologies that had attractive payback periods. Lightweighting, advanced transmissions, turbocharging with downsizing, hybridization, electrification, cylinder deactivation, and advanced engine and powertrain controls were among the most common technologies, delivering efficiency improvements from 2 to 40%. However, sustained domestic extraction of oil in recent years has kept oil prices relatively low and helped insulate U.S. consumers from extreme oil price volatility.

Together, these trends have resulted both positive and negative impacts on the economy, environment, and consumer choice in vehicle purchases. Notably, more than 50% of new light duty vehicle sales since 2016 have been in the light truck and SUV segments, which consume disproportionate volumes of fuel on a per mile basis. Rapid growth in online purchases and eCommerce is contributing to increased fuel usage by urban delivery trucks and couriers. At the same time, the price of lithium ion batteries have plummeted five-fold since 2010, making electric vehicles (EVs) much more affordable. An estimated 360,000 EVs are now registered in the U.S.; half are in California, and some 14,000 are in Georgia. There are now more than 50 unique EV models, made by nearly every major automaker. US federal policy provides tax incentives between $3500 and $7500 for qualifying new EV purchases, and many states provide additional tax credits. In many cases, the absence of these credits renders a purchase decision uneconomic compared to a hybrid or conventional alternative. The availability and capacity of national charging sites has kept pace in many EV markets, surpassing 22,000 public and private stations with nearly 50,000 individual plugs in 2018. Fast-charging, though still expensive and less efficient, is now being introduced in selected markets, unlocking key benefits that include convenience and longer range.

Nevertheless, EVs comprise less than 1% of the U.S. LDV fleet. New EV sales in the US have slowed, while leading automakers like Tesla and Chevrolet have exceeded their Federal (tax credit) allotment cap. EVs still face significant hurdles to widespread adoption. Interestingly, many significant hurdles seem to lie not with individual technologies, but at the intersection of component technologies with vehicle sub-systems, or at the intersection of vehicle systems with transportation networks, or at the convergence of the electric grid with the transportation sector.

The southeast has many exciting opportunities to lead in electrification of transportation, and help maximize future benefits that may results, such as decarbonization and economic development. Georgia Tech already has deep strengths in related areas, including electrochemistry, transportation, power electronics, and electric machines. In addition, relationships exist with key partners (e.g., utilities, logistics companies, automotive OEMs, EPRI, ORNL, regional/national NGOs, etc.), but there are significant opportunities to expand these. Proposals that therefore directly engage key external stakeholders are strongly encouraged.
Appendix B

Example Key Performance Indicators
This RFP solicits proposals from the Georgia Tech community in key areas related to these intersections and this convergence. Its objective is to facilitate development of a regional ecosystem that is developing novel solutions to overcome one or more barriers to deployment currently confronted by electric vehicles. Key barriers may be overcome by enabling one or more of the following benefits compared to conventional internal combustion technologies or hybrid vehicles:

- Improved performance (vehicle system, powertrain, electric motor, system impacts, etc.)
- Improved battery efficiency
- Improved battery life or state of health (SOH) detection
- Reduced battery cost (via lower cost materials, manufacturing, operation, controls)
- Reduced net energy consumption and net emissions (CO2, NOx, PM, other pollutants), Lifecycle basis
- Reduced total cost of ownership and operation
- Improved safety

Examples of Convergent Approaches
Cross-cutting research that links the component/vehicle/system research related to the science and engineering with business, policy, and economics relevant to electric vehicles is strongly encouraged. Even as EV research evolves and diffuses rapidly, solutions of a purely technological nature are unlikely to result in maximum impacts by themselves. Instead, it is expected that experts across the Georgia Tech enterprise can collaborate to accelerate the pace of discovery and problem solving, for example by developing shared vocabulary, identifying and framing key issues, defining critical R&D problems at these intersection of technological innovation, and the business, economic and policy implications that arise as a result of these intersections (e.g. interoperability, communication, metering, optimal control, etc.).

Proposals that include teams consisting of members from different colleges are highly encouraged, such as those that link mechanical, electrical and chemical engineering, as well as materials science, and computing expertise with energy system discipline expertise. Additional funds can be made available as described below, for teams that explicitly include economic, business, or policy research activities within the proposed scope of work. In addition, we would welcome creative teaming ideas that link proposals and leverage resources with PI’s and funds from other external organizations, such as national labs, think tanks, or regional universities.
Appendix C

Example Areas of Interest:
This RFP provides great latitude to proposing teams in terms of research topics, sub-topics and overall focus. All submissions that comply with the proposal guidelines and are responsive to the objectives and review criteria will be reviewed. However, there are a few specific areas of interest, including key intersections (as mentioned), that are particularly encouraged. In all cases, proposals may include technological research activities, economic/policy research activities, or a combination. The following representative examples of potential areas of interest and example sub-topics are provided for consideration. Again, while these are of interest to SEI, other topics and sub-topics may be proposed.

1. EV System Integration or Optimization:
   Analysis, studies or experiments that consider the combination of multiple technologies or approaches that can be integrated at the system-, vehicle-, charging-station-, or transportation network-level. Such innovations must deliver one or more of the suggested performance benefits listed above, or provide benefits that are scalable to the network, or defined by the proposing team. Improvements must be self-defined, yet quantifiable and measurable.
   a. Smart charging algorithms, platforms and hardware
   b. Interoperability among charging stations or other infrastructure
   c. Communications (e.g., vehicle to vehicle, vehicle to infrastructure, vehicle to grid, vehicle to X)
   d. Integration with microgrids, distributed/renewable energy resources, or power electronics
   e. Integration with stationary secondary battery (including the possibility of a second-use vehicle battery that is no longer usable as a vehicle battery. Secondary battery could be used as a means of recharging, or as a grid resource.)
   f. driver advisory apps or other web/cloud connected software or controls

2. EVs and the Electric Grid at Scale
   Analysis, studies or experiments that consider macro-level challenges related to the electric grid, including capacity building for increased demand, transmission and distribution factors, location and time of charging for high EV penetration scenarios (i.e., 10x growth in EVs, 20% increase in electricity consumption, etc.)
   a. Location and time of use charging considerations, to inform grid/resource planning, to minimize variable cost, investment, CO2, etc.
   b. system architecture and controls
   c. charging approaches to meet multiple criteria (e.g., Demand response, fleet readiness,

3. EVs for Fleet use, Medium Duty or Transit applications
   Analysis, studies or experiments for electric vehicle applications specific to fleet operations, demanding duty-cycles, or medium duty trucks.
   a. EV innovations uniquely suited for ride-hailing and taxi services/drivers
   b. EV innovations that provide substantial benefits in carpooling, or ride-sharing
   c. EV innovations that enable benefits in other fleet usage
   d. EV innovations specific to medium duty delivery truck applications
   e. EV innovations for transit (buses)
4. EVs for GT campus demonstrators
   a. Georgia Tech campus fleet (e.g., EVs to replace campus policy, delivery, facilities, vehicles, and the study thereof)
   b. Investigations involving EV owners among GT faculty/staff/student and their commutes or other EV community (e.g., City of Atlanta, smart cities)
   c. Any of the preceding AOIs that consider a campus demonstration as a part of the effort

5. EV Component/Vehicle Innovations
   Analysis, studies or experiments that consider components, sub-systems or vehicle innovations that result in one or more of the suggested performance benefits listed above. Improvements must be self-defined, yet quantifiable and measurable.
   a. batteries, on-board energy storage
   b. electric machines (motor/gen), powertrain, hybrid architectures
   c. on-board controls, sensors, metering
   d. infrastructure components (e.g., chargers, power electronics, controls)

6. EV Policy and Economics Analyses
   Analysis or studies that consider social, policy, regulatory or economic factors that can help maximize the benefits of electric transportation and inform better decision-making toward broader uptake of EV technologies.
   a. educational, awareness and outreach needs of technologies and their use
   b. policies related to charging, infrastructure, interoperability or other barriers
   c. assessments of utility and/or automotive OEM programs to incentivize EV purchases
   d. holistic benefit and cost assessments (private-party or social perspectives) of EVs and EV infrastructure to educate, inform and direct future research for policy-making and public awareness

Note: Due to funding constraints, proposals that fall outside of the energy-related mission of the Strategic Energy Institute, such as autonomous vehicle research as an example, are generally discouraged. Applicants are encouraged to contact Rich Simmons to clarify topic alignment or specific questions related to this funding opportunity.
Appendix D Proposal Preparation Template & Guidelines

Proposal Preparation Guidelines
Proposal Submission Guide

Total funding allocated will vary depending on the number of proposals received and the relevance of the work proposed as it pertains to the promotion of SEI’s three program goals. Note also that no overhead will be charged on Program funds, however, you do need to incorporate fringe and graduate student tuition costs into your proposed budget.

All proposals must include the following:

- **SEI RFP Application Cover Sheet** (include summary/abstract)

- **Project Description** (three page maximum, 12-point font) must include:
  - Key innovation (2 sentences)
  - Project overview (about 2-3 paragraphs):
    - purpose,
    - discussion of barriers,
    - key benefits,
    - alignment with the program goals
    - evidence of how the funds will meet a need that is currently unmet
  - Team:
    - Key investigators
    - Key partnerships and teaming
    - Please briefly discuss team integration, especially how multiple disciplines are required to study and deliver this innovation
  - Strategy & Targets:
    - Discuss plan for accomplishing proposed work (including proposed personnel activities)
    - Please discuss proposed project categories (TF, EESP, or BOTH), and key activities within sub-topic areas and collaborative effort
    - Quantitative targets, including self-defined metrics, measurement approach, and baseline reference (table of key performance indicators)
  - Deliverables and Schedule:
    - Tangible outcomes from the project. Note: Examples of deliverables could include written summary of workshop, report, whitepaper, written testimony presented, transcript, policy brief, social media outlets, etc.
    - Explanation of how these deliverables will advance the objectives of this RFP.
    - Schedule
  - Leveraging:
    - If applicable, other opportunities for how these funds will enable leveraging of other resources, and/or how these funds help facilitate regional innovation or ecosystem objectives.

- **Project Budget Sheet and budget justification**
Appendix E Templates for Application Cover Sheet and Budget Justification

Please feel free to use the following pages as templates for the required cover sheet and budget forms.
Strategic Energy Institute Request for Proposals
The Convergence of Electricity and Transportation

Application Cover Sheet
“Convergence in Electricity and Transportation”

Project Title:

Proposed Time Frame (in years and/or months):

Contact Phone Number and Email:

Principal Investigator(s):

Academic Unit or Department:

Other Investigator(s):

FY20 SEI Program Funds (total dollars) Requested:

Summary of Proposed Effort (100 words maximum):
**Budget Sheet**

**PI Name:**

**Proposal Title:**

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<tbody>
<tr>
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<td>Funding Category</td>
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<td>II.</td>
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* **These are foundation funds.** This means that no overhead is charged. All other charges, such as fringe and tuition are charged.

**Estimated funding schedule by period, FY20-21**

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As appropriate, please feel free to provide additional budget justification or other budgetary information here or with additional attachments.