



# Improving Disaster Response

## Bus Exportable Power Systems (BEPS)

### **Problem: Access to power after a natural disaster is critical, but often limited.**

Disasters - like a hurricane or earthquake - can wreak havoc by leaving communities, businesses, schools and hospitals in the dark for days. Even without a disaster, electric power service interruptions occur one to two times a year for every individual electric utility customer in the United States, completely independent of any major event. Restoring power takes time and alternate power sources, like generators, can be limited. Even when generators are available, they can be slow to obtain, fail to work due to a lack of preventative maintenance, or can be difficult to deliver due to disruptions in the transportation network.

### **Solution: Convert transit buses into mobile generators.**

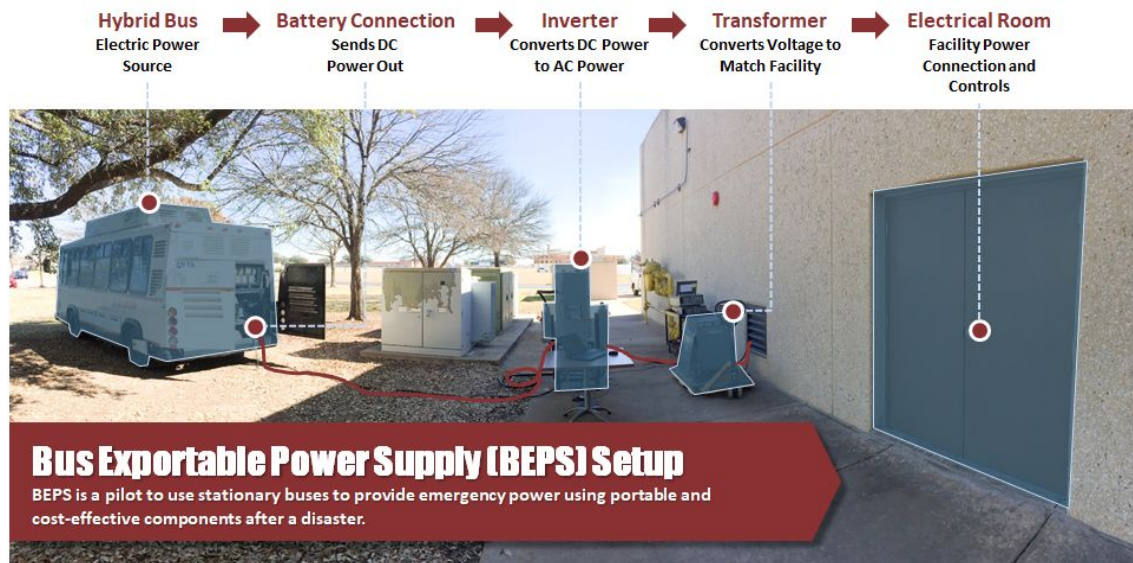
Hybrid buses can provide communities with a powerful, mobile, well-maintained, and cost-effective alternative to the traditional generator. By adding basic power electronics equipment, referred to here as a Bus Exportable Power System (BEPS), hybrid buses can be transformed into mobile generators and provide a backup power source as needed.

BEPS buses have many benefits, including:

- **Availability** - many communities own hybrid buses, which already contain all the key elements required for mobile power generation, including an ample fuel tank, a diesel or fuel cell engine, and a generator, there are more than 8,300 hybrid buses across 178 transit agencies in the U.S.
- **Fast Response** - local communities can use the buses to provide quicker access to power while awaiting state and federal assistance
- **Versatility** - the buses can provide transport and/or evacuations during the day and power generation at night
- **Reliability** - unlike generators which may sit idle for long periods of time without maintenance, buses are used regularly and follow an established maintenance schedule
- **Clean and Quiet** - hybrid buses have emissions controls and mufflers that make them cleaner and quieter than traditional generators

### **How does BEPS work?**

In 2018, CTE partnered with the University of Texas to successfully provide back-up power to a shelter through the system in the image below. The addition of BEPS equipment to a diesel-electric hybrid bus transforms the bus into a mobile generator through an additional component attached to the internal computer and battery that facilitates the export of power that would have otherwise been used to move the bus.



### What are the barriers to adoption?

CTE partnered with Hagerty Consulting to assemble a panel of experts to assess the challenges and recommendations for BEPS use. This included representatives from transit agencies, emergency management agencies, private sector partners, the American Red Cross, National Guard, and US Army Corps of Engineers.

In addition to the benefits listed above, the panel identified some challenges that are unique to a BEPS-equipped bus, including the lack of incentives for transit agencies to assume the cost and responsibility of procuring, maintaining and controlling the equipment, competing interests for using the bus after an emergency, and the lack of commercial availability of the BEPS system. However, these challenges can be overcome with proper planning, coordination and policies.

### Recommendations

The following recommendations would help accelerate product development and incentivize adoption.

- Congress should expand existing funding programs from FEMA and FTA to cover BEPS. BEPS should qualify for funding through the same programs that currently fund the procurement and deployment of traditional emergency generators. New funding programs should focus on proactive or resilient funding streams for bus exportable power technologies.
- Congress should encourage the development of industry standards that include how the bus is connected to the facility and/or other auxiliary system(s), user interface and operation, and specifications for the optional provision of BEPS equipment.
- FTA should support an exportable power system design and demonstration project that includes multiple major transit bus manufacturers. Transit agencies are more likely to be interested if the systems are offered by the bus manufacturers instead of third-party organizations.
- FTA should exclude buses equipped with exportable power from spare ratio calculations.