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PROJECT NO. 57236

PROJECT TO DEVELOP THE TEXAS BACKUP POWER PACKAGE PROGRAM	§ § §	**PUBLIC UTILITY COMMISSION OF TEXAS**

COMMENTS OF TEXAS ELECTRIC SCHOOL BUS PROJECT

The Texas Electric School Bus Project (TESBP) greatly appreciates the opportunity to provide comments on the Texas Backup Power Package (TBPP) program. TESBP, and our members, strongly advocate for the integration of Electric School Buses (ESBs) as a cost-effective, flexible, and scalable solution to bolster backup power capabilities for critical facilities across Texas.

The Patrick Engineering final report establishes a framework; however, targeted refinements are crucial for successful implementation. This document addresses key technical, operational, and economic concerns—from feasibility and ownership models to cost barriers and interconnection challenges. By implementing these comprehensive recommendations, the TBPP can become a transformational resilience solution for Texas communities.

<u>Questions</u>

1. Impact of TBPP Specifications on Critical Facilities

1A. How could TBPP specifications affect critical facilities' ability to apply, install, or utilize TBPPs?

- **Opportunity**: ESBs can serve as mobile energy storage under Vehicle-to-Grid (V2G) and Vehicle-to-Building (V2B) technology.
- **Challenge**: The current TBPP design only (partially) covers infrastructure for bidirectional charging, not the procurement of ESBs themselves. This limits incentives for school districts that have yet to adopt ESBs.
- **48-hour Operational Barrier**: Maintaining 48 hours of power typically requires multiple ESBs on-site, each with a high state of charge. ESBs should be paired with stationary batteries and solar PV to extend operating capacity. ESBs can cycle in and out of service to maintain continuous power. Establish a policy requiring designated ESBs to maintain ≥80% state of charge for emergency readiness.

Recommendations:

1. **Expand Funding Incentives**
   - Provide direct funding for ESB (or ESB battery) procurement, mirroring stationary storage incentive models, alongside charging infrastructure. School districts face high upfront costs; ensuring bus purchase support will accelerate participation and availability.
2. **Alternative Sizing Solutions**
   - Allow modular system sizes to fit smaller or space-constrained facilities. A "one-size-fits-all" package risks excluding many facilities.

3. **Hybrid Backup Systems**
   - Encourage pairing ESBs with permanent battery storage to extend runtimes. Ensures that the 48-hour requirement can be met even if ESBs are deployed intermittently.
4. **Resilience-as-a-Service (RaaS) Model**
   - Public-private partnerships can lower upfront costs through subscription-based ESB backup services.

1B. How should specifications be modified to ensure packages can serve most critical facilities?

- **Tiered Funding Model**:
  - Adopt a sliding-scale approach where facilities (or communities) with existing ESB fleets receive different support levels compared to those that need initial ESB procurement.
- **Emergency Deployment Strategy**:
  - Create a ***formal protocol*** to allocate ESBs to high-priority sites in an emergency.
  - **Opportunity:** Implement a real-time fleet management system (in coordination with utilities) to dispatch ESBs where and when they are most needed.

2. Vendors and Implementation Challenges

2A. Factors Affecting Vendor Participation

- Limited Availability of bidirectional chargers compatible with ESBs with the ability to "island".
- Interoperability Issues among different bus manufacturers and charging systems.
- Skill Gaps: Many vendors lack experience in managing ESB-based microgrids.

2B. Program Design to Maximize Vendor Participation

1. **Standardized Technical Specifications**
   - Establish clear, uniform standards to guarantee interoperability across manufacturers and chargers to reduce market fragmentation and vendor confusion.
2. **Vendor Certification Programs**
   - Develop a specialized certification for ESB-centric microgrid solutions to ensure reliability and foster a pool of qualified service providers.
3. **Collaborative Ecosystem**
   - Encourage partnerships among school bus manufacturers, utilities, microgrid developers, and tech providers**.**

4. **Regional ESB Testing Centers**
   - State-supported facilities to verify charging interoperability before deployment.
5. **Bulk Procurement Models**
   - TBPP guidelines should encourage statewide ESB and charger bulk purchasing agreements.

Technical Feasibility: Proposed 10 kWh Backup Battery Package for a Critical Facility

Hypothetical Critical Facility: Oakville Fire Station

- **Location**: Rural Oakville, TX
- **Function**: Emergency response, medical aid, and severe weather shelter
- **Load**: 8 kW continuous demand
- **Backup Goal**: 10 kWh stationary battery + ESBs for 48-hour operation

System Components

1. **Battery Energy Storage System (BESS)** – 10 kWh capacity
2. **Bidirectional Inverter/Charger** – **ESB-ready** for V2G
3. **Photovoltaic Solar Panels** – 5 kW capacity
4. **Automatic Transfer Switch (ATS)** – Smooth grid disconnection/reconnection
5. **Monitoring System** – Real-time tracking of power flow and state of charge
6. **Electric School Buses (ESBs)** – Two ESBs with 150 kWh each, for extended outages

Deployment Protocols

1. **Pre-Outage Planning**
   - Maintain ESBs at **≥80%** state of charge.
   - Coordinate with local utility for load forecasting and bus scheduling.
2. **During a Grid Outage**
   - **Phase 1 (0-6 hours)**: BESS covers immediate load.
   - **Phase 2 (6-24 hours)**: Deploy first ESB (150 kWh).
   - **Phase 3 (24-48+ hours)**: Deploy second ESB, ensuring continuous operation.
3. **Post-Outage Recovery**
   - **Gradual** recharge using solar and grid power.
   - **Return** ESBs to school routes once grid reliability is restored.

Additional Innovations

- **Floating Fleet Approach**: Consider rotating multiple ESBs through the system to ensure continuous power without recharging the ESB batteries.
- **Mobile Microgrid Units**: Equip ESBs with portable distribution panels or mini inverters to power on-site emergency medical or communications equipment independently from the main building.
- **Multi-District ESB Agreements:** Schools within a region can pool resources for emergency backup solutions.
- **Real-Time ESB Tracking:** Utilizing smart fleet dispatch and telematics to redirect buses to high-priority locations.

The Resilience-as-a-Service (RaaS) Model

- **Core Concept**: A third-party provider supplies ESBs for both daily transportation and backup power.
- **Subscription-Based**: Facilities pay a predictable monthly fee, reducing capital expenditures.
- **Maintenance & Performance**: The RaaS provider is fully accountable for operational reliability.
- **Scalability**: Public-private partnerships expand the reach of ESB-based backup solutions.

Expanded RaaS Opportunities

- **Regional Aggregation**: A single provider or consortium manages ESBs across multiple school districts or regions, increasing resource-sharing capabilities and enabling bulk purchasing discounts.
- **Performance Guarantees**: RaaS providers could offer service-level agreements (SLAs) that ensure a minimum backup duration, further reducing risk for critical facility operators.
- **Utility Demand Response Partnerships:** ESBs can participate in grid services (peak shaving, emergency reserves).

Conclusion and Recommendations

TESBP strongly believes that enhancing the TBPP with ESB integration will deliver significant advantages for Texas's critical infrastructure. Our key recommendations include:

1. **Expand TBPP Funding**
    - Cover ESB battery procurement and bidirectional charging infrastructure, ensuring equitable access for all school districts.
2. **Develop Certification Processes**
    - Create ESB-focused vendor accreditation to standardize installations and boost vendor confidence.
3. **Implement Standardized Interconnection Requirements**
    - Streamline utility approvals to accelerate project timelines and minimize risk.
4. **Promote Resilience-as-a-Service**
    - Reduce upfront costs for school districts, encourage partnerships, and optimize resource usage through centralized management of ESB fleets.
5. **Ensure Robust Deployment Protocols**
    - Mandate that ESBs remain charged and readily available, with real-time monitoring to guarantee 48-hour backup capacity.

Further Solutions

- **Grid-Interactive Fleet Aggregation**: Partner with utility demand response programs to make ESBs available for peak shaving and frequency regulation, potentially generating revenue to offset TBPP costs.
- **Microgrid-in-a-Box**: Develop modular, containerized solutions that include chargers, inverters, and monitoring equipment—easy to deploy at remote facilities.
- **Multi-Use Financing Mechanisms**: Allow carbon credit or clean energy credit revenues (where applicable) to further lower the cost of ESBs and accelerate payback periods.

By enacting these strategic and forward-thinking measures, the TBPP will maximize its resilience impact statewide. TESBP appreciates the opportunity to contribute to this critical initiative and stands ready to collaborate with other stakeholders to ensure clean, reliable, and affordable backup power for all Texans.

Respectfully submitted,

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Executive Summary

The Texas Electric School Bus Project (TESBP) strongly supports integrating Electric School Buses (ESBs) into the Texas Backup Power Package (TBPP) to bolster resilience for critical facilities. ESBs function as *mobile energy storage* through Vehicle-to-Grid (V2G) and Vehicle-to-Building (V2B) technology, offering *flexible* and *cost-effective* backup power solutions. By pairing ESBs with stationary batteries and renewable generation, facilities can maintain essential operations during prolonged outages.

Key Challenges and Solutions

1. **High Upfront Costs**
   - *Solution*: Expand TBPP funding to cover both ESB procurement and bidirectional charging infrastructure. This approach eliminates a major barrier for school districts lacking the resources to adopt ESBs.
2. **Interconnection and Technical Barriers**
   - *Solution*: Establish uniform standards for charging systems and create an ESB-focused vendor certification. These measures ensure interoperability, streamline utility approvals, and foster a reliable pool of service providers.
3. **48-Hour Requirement**
   - *Solution*: Implement *hybrid backup* strategies that combine ESBs with stationary batteries or solar arrays, guaranteeing extended runtimes and reliable power for critical facilities.
4. **Vendor and Operational Complexity**
   - *Solution*: Introduce a *Resilience-as-a-Service (RaaS)* model in which third-party providers own and maintain ESBs. This subscription-based structure offloads capital costs and ensures high service quality.

Feasibility Example

In a hypothetical Oakville Fire Station scenario, a 10 kWh battery, 5 kW solar installation, and two ESBs (each with 150 kWh capacity) easily sustain the facility for 48 hours. ESBs remain at ≥80% state of charge pre-outage, then phase in as stationary batteries deplete—an approach suitable for *both* urban and rural settings.

Conclusion

By adopting these recommendations, the TBPP can *revolutionize* backup power across Texas. ESBs strengthen critical infrastructure and enhance community resilience.