Resilient Transit Electrification

Case Study: Martha’s Vineyard Transit Authority

David Roberts
About VEIC

• Mission-driven nonprofit
• 30+ years reducing economic & environmental costs of energy
• Over 300 staff; offices in Vermont, Ohio, Washington DC & NY
• “Think and do tank”
  • Energy efficiency
  • Renewable energy
  • Clean transportation
• Clients
  • Transit agencies
  • Utilities
  • States
  • Regulators / Consumer Advocates
  • Foundations / Environmental Organizations
About Martha’s Vineyard Transit Authority

- Peak Summer service
- 12 year-round routes + 2 more in summer
- Operating budget $5.8M
- Capital budget $3M
- 32 vehicles in the fleet, 70% of which need to be replaced before 2022
**Question:** Is there a fuel that can better serve the VTA’s operational needs?

**Answer:** Yes, it’s electric! But....
The Solution:
An electrified transit fleet fueled by a renewable energy micro-grid
Micro Grid Benefits

• Redundant electric charging system
  • Allows charging when the grid is down
  • Reduces electrical demand charges
• Supports fast charging systems to avoid extreme draws of energy off the grid
Project Phases

Planning and engagement
Fundraising
Fleet electrification
Charging and microgrid at facility
On-route charging and microgrids
VTA Equipment

- 6 BYD buses delivered in 2018
  - 6 more arrive this summer
  - $750k per 35 foot bus
  - $550k per 30 foot bus
  - ~150 mile range
- Depot chargers, solar, generator, and storage at main garage.
- Inductive en route charging planned at several strategic locations on the island.
## Other Project Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost Information</th>
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<tbody>
<tr>
<td>Depot Charging</td>
<td>Depot EVSE included with bus</td>
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<tr>
<td></td>
<td>$200k for engineering and installation for up to 32 buses</td>
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<td></td>
<td>$90k for portable emergency charging with generator</td>
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<td>En Route Wireless Charging</td>
<td>$60-90k for bus-mounted units</td>
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<td></td>
<td>$300k for in-ground units</td>
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<tr>
<td></td>
<td>Engineering and installation up to $150k per site</td>
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<tr>
<td>Solar PV</td>
<td>20 year Power Purchase Agreement (PPA)</td>
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<td>$0.0068/kWh → $112k annual savings</td>
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<tr>
<td>Energy Storage</td>
<td>$1 million for installed system at 500kW, 1.44 MWh</td>
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<tr>
<td>Microgrid</td>
<td>$325k for hardware, software and 5 years of support</td>
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<tr>
<td>Generator</td>
<td>$175k for backup diesel generator at main garage</td>
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VTA Experience to Date

• Bus fuel savings are now $0.28/mile
• Savings will increase to $0.39/mile when storage is installed and peak demand reduced
• 6 buses are averaging 2,400 miles/month
• Energy savings at $8,000 per bus in first year
• Will increase to $11,250 per bus in future years
• Not able to quantify maintenance savings yet
• Range decreases 35-50% in coldest conditions
Lessons Learned (so far)

- Need strong operations from which to grow
- Build a team you trust
- Engage stakeholders early
- Electrical infrastructure requires process and long build times – coordination w/utility is needed
- Look at traditional and non-traditional funding sources
Thank you!

For more information:

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