

DRAFT OF COMMITTEE REPORT
DISCUSSED IN MEETING OF OCTOBER 20, 2020,
AND CONTINUED ON OCTOBER 23, 2022

VTA CHURCH STREET REVIEW COMMITTEE
TOWN OF EDGARTOWN
REPORT
October 20, 2020

This committee strongly supports the installation of three inductive bus chargers under Church Street in Edgartown. The inductive charger project has no cost to the town, will have an overall positive impact on the attractiveness of Church Street, and is essential to achieving all-electric bus service for Martha's Vineyard.

SHORT SUMMARY OF CRITICAL POINTS:

Why is the Martha's Vineyard Transit Authority (VTA) going all-electric? An all-electric fleet of buses will eliminate the air pollution and noise pollution caused by diesel buses, which will benefit everybody on Martha's Vineyard. An all-electric fleet of buses will also result in reduced maintenance and fuel costs.

Why are inductive chargers needed? Electric buses currently do not have batteries that can power them for a full day without re-charging. On-route inductive charging for 7-10 minutes at the natural end point of a bus route, several times during the day, allows an electric bus to run for the whole day. Inductive bus chargers are installed under the street and charge a bus wirelessly when the bus is stopped over the charger. If the VTA is to be all-electric in the foreseeable future, the buses must have on-route inductive charging.

Why are inductive chargers needed on Church Street in Edgartown? The Church Street Visitor Center is now, and has been for many years, the primary bus stop for four bus routes. Inductive chargers at Church Street will enable all four of these bus routes to be all-electric.

What are the effects on Church Street? There will be no change to the lengths of the buses on Church Street, the number of buses on Church Street, or the amount of time each bus spends there. The inductive chargers, themselves, will be unobtrusive, appearing as three flat rectangular plates set flush with the pavement in the bus stop lane and with minimal markings on the street. There will be two large electrical equipment cabinets in front of the Visitor Center, screened with fencing and/or decorated with informational graphics which will be more specifically approved by the Edgartown Historic District Commission before installation.

Two (or possibly three) Norway maples that are in poor condition will be removed, and three new trees will be planted. The large linden tree and the large sycamore tree will remain.

The street will be widened by 2' for a distance of 55' immediately opposite the Visitor Center.

42 The project scope includes a much needed renovation of the waiting area in front of the Visitor
 43 Center, including a covered shelter, new seating, and new signage to help visitors navigate
 44 downtown, in addition to the removal of most of the utility poles on Church Street and the
 45 installation of eight old-fashioned street lanterns.

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47 SHORT LIST OF QUESTIONS AND ANSWERS:

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	<u>Question</u>	<u>Short Answer</u>
1	What was this committee asked to do?	This committee was asked to take a fresh look at whether inductive chargers should be installed on Church Street to facilitate all-electric VTA bus service. The committee was specifically charged not to look at whether there should be changes to the VTA schedules, routes, or numbers or sizes of buses.
2	How many trees will be removed from Church Street?	Only one tree (a Norway maple which is in poor condition) will be removed because of the inductive chargers. The project also includes the removal of two other trees (also Norway maples which are in poor condition), one that is too close to the Visitor Center building and one that partially blocks the street, and the addition of three new trees. The large linden tree and the large sycamore tree will remain as is.
3	How much will Church Street be widened?	Less than half of the width of the grass strip across from the Visitor Center will be paved for only one-third of its length. The new paving will be 2' x 55' and is unrelated to the inductive chargers.
4	How will the Visitor Center look different?	There will be two new metal electrical cabinets in front of the Visitor Center. These will be decorated with informational graphics and maps, which are badly needed outside the Visitor Center, and/or possibly screened with movable fencing. Also, the two large areas of bare earth in front of the Visitor Center where passengers wait will be replaced with low-maintenance paving stones and granite topped walls for seating. Along the sidewalk, three utility poles will be taken out, and eight old-fashioned street lanterns will be put in.
5	How much noise will the inductive charger equipment make?	The cooling fans in the two electrical cabinets in front of the Visitor Center will make a whirring noise when a charger is actually charging. A diesel bus makes about four times as much noise.
6	Will the sizes of the buses change?	The lengths of the buses are not expected to change. The lengths are determined by the variations in passenger loads, which are mostly seasonal, not whether the buses are charged inductively. The widths of the buses are determined by the manufacturers. The inductive chargers are needed no matter what sizes of buses are used.
7	Could a location for the chargers other than Church Street work?	No. Church Street is the primary bus stop, with a scheduled 7-10 minute stop, for four bus routes, so there must be inductive chargers on Church Street if the VTA is to be all-electric in the foreseeable future. Putting the chargers at the Dark Woods park and ride is impractical for reasons summarized at the end of this report.

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IMAGES OF THE VISITOR CENTER BEFORE AND AFTER THE PROJECT:



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The above photo was taken in early October 2020. The trees at the left and in the center would remain as is.



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Edgartown, Massachusetts

63
64 Artist's rendering of the Visitor Center improvements as approved by the Historic District
65 Commission. Note the electrical cabinets (at the right edge and the left edge of the image) and a
66 new tree at the far right.

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BACKGROUND:

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72 Since 2017, with the approval and/or support of the Edgartown Historic District Commission, the
73 Edgartown Board of Trade, the Edgartown Energy Committee, the Edgartown Board of Selectmen,
74 the Boards of Selectmen of the other five Martha's Vineyard towns, the Vineyard Trust (formerly
75 the Preservation Trust), and the Martha's Vineyard Commission, the VTA has been steadily
76 working to implement a plan to become all-electric.

77
78 The Church Street part of the VTA plan took shape, in part, based on the discussions of a
79 stakeholder group convened by the Edgartown Board of Selectmen at the request of the VTA. The
80 stakeholder group consisted of a member of the Edgartown planning board, a member of the
81 Edgartown Historic District Commission, a member of the Edgartown beautification committee, a
82 representative of the 19 Church Street property, Doris Ward (who lives immediately across Church
83 Street from the Visitor Center and is also a member of this committee), a landscape architect, the
84 Edgartown town administrator, the superintendent of the highway department, the superintendents
85 of the water and wastewater departments, and the chair of the Edgartown energy committee.

86

87 In 2018, the VTA began acquiring electric buses to replace diesel buses as the diesel buses
88 reached the end of their useful lives. The VTA now has 12 electric buses out of a total of 32 buses.
89 In the summer of 2021, the VTA will have 16 electric buses. The VTA's plan is to phase out its
90 remaining diesel buses and have an all-electric fleet of buses by 2027.

91
92 The benefits of an all-electric fleet are numerous, including reduced air and noise pollution that will
93 result in quality of life improvement for everyone in Edgartown and elsewhere on Martha's
94 Vineyard. The conversion is also expected to have economic benefits resulting from reduced
95 maintenance and fuel costs for the VTA.

96
97 The VTA fleet of buses will not be all-electric by 2027 without on-route inductive chargers. On-
98 route inductive charging allows electric buses to safely augment their batteries while stopped to
99 drop off and pick up passengers. The small on-route supplement of power, repeated throughout
100 the day, is enough to extend the service time of the bus for the whole day. Without inductive
101 charging, the VTA will have to switch out buses mid-day for other buses, either diesel or electric,
102 which would significantly increase the number of buses needed to provide the current levels of
103 service. Switching out buses would also require additional drivers and labor hours. On-route
104 inductive charging allows the VTA to extend the range of electric buses in a cost effective and
105 efficient manner.

106
107 The reason why Church Street was selected as a site for the installation of on-route inductive
108 chargers is because it serves four bus routes, each of which has a scheduled stop of 7-10 minutes
109 at this location. No alternative location for the chargers would be as effective in providing on-route
110 charging for the VTA bus system because there is no other location with scheduled 7-10 minute
111 stops for these four bus routes.

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113 In 2020, a citizen petition resulted in the inclusion of Article 10 in the Warrant for the Special Town
114 Meeting of June 13, 2020. This article asked, "Shall the installation of an electric-inducing bus-
115 charging Terminal on Church Street, by the regional Vineyard Transit Authority (VTA), in the heart
116 of the Edgartown Historic District, be reconsidered?" The vote was 96 - 83 in favor of the
117 reconsideration, and the Board of Selectmen formed this committee to undertake the
118 reconsideration. The Board of Selectmen specifically charged this committee not to look at
119 locations other than Church Street or changes to the VTA schedules, routes, or numbers or sizes
120 of buses.

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122 The committee met by Zoom on July 30, August 20, August 25, September 8, September 29,
123 October 5, October 13, and October 20 and had a site visit to Church Street on September 9. The
124 committee listened to multiple presentations, questions, and answers in reviewing the history and
125 details of the proposed project.

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127 The committee consisted of the following participants:

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- Keith Chatinover, Dukes County Commissioner and Edgartown Historic District resident
- Jane Chittick, Edgartown Historic District resident (resigned on September 7, 2020)
- Angie Gompert, VTA Administrator (non-voting participant)
- Julia Livingston, Edgartown village resident (Committee Vice Chair and Clerk)
- Sara Piazza, Edgartown Historic District resident (resigned on September 7, 2020)
- Mark Snider, Appointed Edgartown Representative to the VTA Board and Edgartown resident
- Alan Strahler, Edgartown Energy Committee Chair and Edgartown resident (Committee Chair)
- Bill Veno, MVC Planner and Edgartown resident
- Doris Ward, Church Street resident immediately across from the Visitor Center

DISCUSSION:

A. THE NEED FOR THE INDUCTIVE CHARGERS

The distance a fully charged electric bus can travel is not sufficient for the long hours and miles of VTA routes. The VTA currently has 20 diesel buses and 12 electric buses. Four of the electric buses are 30' x 96" with an effective range of approximately 130 miles, and eight of the electric buses are 35' x 102" with an effective range of approximately 160 miles. In order to run for a full day, a bus in the VTA system needs to go 300 - 350 miles. The difference between the 300 - 350 mile needed range and the 130 - 160 mile current range of the electric buses is the basic problem the VTA needs to solve in order to go all-electric. Several possible solutions have been considered, as described in the following paragraphs.

1. Possible solutions that would not require on-route charging. This committee discussed three possible solutions that would not require the installation of on-route chargers or any other construction on Church Street, as follows:

a. Taking the electric buses out of service for several hours when their batteries get low during the day and charging them at the airport VTA headquarters. In an all-electric system, covering the gap in service while buses with spent batteries recharge, would require the VTA to add 24 - 32 additional electric buses, for a total of 56 - 64 buses, as opposed to the 32 the VTA currently has. This possible solution to the problem is not being pursued because the capital and operating costs of the extra buses would be unacceptable.

b. Using "hybrid" buses, instead of electric buses, until all-electric buses have better batteries with longer ranges. A hybrid bus has a full diesel system in addition to an electric system. Our committee heard that diesel only works well in places where the buses run at speeds over 45 mph for extended periods, generating enough heat to clean the particulate filters, which does not happen on Martha's Vineyard. Diesel maintenance is

169 costly, for either pure or hybrid diesel, and the substantial maintenance cost savings from
170 the conversion to an all-electric system would not be realized with hybrid buses. Also, the
171 noise and fumes associated with diesel operation would remain. For these reasons, hybrid
172 buses are not being pursued by the VTA.

173
174 c. Waiting for better batteries. In order to wait until bus batteries and/or other
175 technologies have improved to the point that all sizes of buses needed by the VTA would
176 have a range of 300 - 350 miles without recharging during the day, the VTA would need to
177 continue operating with diesel buses. This possible solution to the problem is not being
178 pursued at this time because there is no way to know how long this will take, if it is ever
179 achieved.

180
181 2. Two different kinds of on-route charging. As noted above, on-route charging allows
182 electric buses to safely augment their batteries, while stopped to drop off and pick up passengers,
183 with small supplements of power, repeated throughout the day. This committee discussed two
184 kinds of on-route charging, as follows:

185
186 a. Conductive chargers. This possible solution is not being pursued because
187 conductive chargers require 500 kW of electricity, as opposed to the 150 kW of the
188 proposed inductive chargers, and because conductive chargers are installed on cranes and
189 charge the buses from overhead. Conductive chargers are very visible and industrial
190 looking. This kind of charger would not be compatible with the look of the Edgartown
191 Historic District or any other location along the Martha's Vineyard bus routes.

192
193 b. Inductive chargers. Inductive chargers involve an electric coil under the street
194 and an electric coil on the underside of each bus. When the coil attached to the underside
195 of the bus is directly above the coil under the street, the driver pushes a button on the
196 dashboard, and the charge flows into the bus battery wirelessly. The VTA conducted a
197 Request for Proposals (RFP) process for inductive chargers. Two companies submitted
198 proposals, and a company called Momentum Dynamics received the higher scores from all
199 reviewers and was selected to provide inductive chargers for Martha's Vineyard.

200
201 Experience in Wenatchee, Washington with Momentum Dynamics Inductive Chargers:

202 Ed Archer, the maintenance director for the Link transportation system in Wenatchee,
203 Washington, told our committee that, without on-route inductive charging, an electric bus can run
204 about 8 hours, but with on-route inductive charging it can run for a full, uninterrupted 14-16 hour
205 day. The Link system's electric buses charge for 5 minutes every hour or half hour during their
206 natural "dwell time" when they are letting off and taking on passengers. Ed sends out a bus in the
207 morning with a 100% charge, and at the end of the day the charge is at 64%. The bus gains about

208 1% toward a full charge for every minute it is in place above an inductive charger. Ed said the Link
209 system’s experience with the “generation 1” Momentum Dynamics inductive charger installed in
210 February 2018 was very successful, so the Link system is now installing three “generation 2”
211 Momentum Dynamics inductive chargers. He said the “generation 1” charger transformed how
212 they were able to function because they could keep an electric bus in service for 24 hours a day,
213 seven days a week. He said that, if you don’t have on-route charging, you will need one or two
214 additional buses for each route, which is expensive. He said the chargers are unobtrusive, with
215 only a 4 x 7 electrical cabinet nearby and no footprint in the street. He said there is very little
216 maintenance. The coolant needs to be checked every 6 months, and Momentum Dynamics
217 monitors the system remotely. A few times a year, a circuit breaker needs to be reset. Once, his
218 system needed a new fan, and it arrived and was installed within 24 hours. Ed said Momentum
219 Dynamics was very reliable and very responsive. He said it was some of the best service he’s ever
220 seen in transit.

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222 B. CHANGES ON CHURCH STREET NECESSITATED BY THE INDUCTIVE CHARGERS

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224 The three in-ground charger coils installed under the street in the bus stop lane on Church Street
225 will be served by two electrical cabinets located near the front corners of the Visitor Center
226 property. Additional electrical cabinets, for an Eversource transformer and switching equipment
227 and a battery that will feed the inductive chargers, will be placed at the back of the parking area on
228 the north side of the Visitor Center.

229

230 1. Inductive charger electrical cabinets. The three inductive chargers proposed by the VTA
231 for Church Street require two electrical cabinets (one is 89”l x 36”w x 72”h and the other is 66”l x
232 36”w x 71”h). The larger (300 kW) cabinet is located near the the northwest corner of the property
233 at the edge of the parking lot and will serve two of the inductive chargers. The smaller (150 kW)
234 cabinet is located near the southwest corner of the property and will serve the third inductive
235 charger. At the Historic District Commission meeting on October 3, 2019, it was noted that these
236 metal cabinets are the most unsightly part of the project, but that they could be wrapped with
237 graphics printed on vinyl that could be attractive and of interest to bus riders. The cabinets could
238 also be screened with fencing. There will be cooling fans in these cabinets, and they will make a
239 whirring noise when buses are actually in place and being charged. The sound level is reported to
240 be 70 dBA, a sonic level that various sources compare to air conditioners, modern vacuum
241 cleaners, and office conversation. A diesel bus pulling away from the curb makes a sound that is
242 four times louder. Members of this committee said these cabinets could be regarded as an
243 opportunity to provide useful information to visitors who now have to ask someone, for example,
244 which way to walk to get to Main Street. The Historic District Commission’s Certificate of
245 Appropriateness for the Church Street inductive charger project is explicitly conditioned on the

246 cabinet “wrap” being approved by the Historic District Commission before it is installed. This
247 committee agrees that these two cabinets will have a visual impact on Church Street, but on
248 balance they are acceptable given the health, environmental, noise, cost, and other advantages of
249 an all-electric bus system.

250
251 2. The inductive chargers. The three charger coils will be installed under Church Street in
252 the bus stop lane. The only visible element will be three rectangular metal plates, each measuring
253 62” x 33” set flush into the roadway pavement in the bus stop lane, with minimal markings on the
254 street. The visual impact of these plates will be similar to that of manhole covers. Snow plowing
255 and street sweeping will be unaffected, and there will be no impediment to bicycle or pedestrian
256 traffic.

257
258 3. Removal of utility poles. The installation of the inductive chargers will require the water
259 line under Church Street to be moved 12 feet to the west. The existing water pipe is 100 years old,
260 so the project includes replacing it with new pipe, which would appear to be a useful upgrade.
261 The inductive charger project also requires increased electric power on Church Street, and,
262 because the street will be opened for the relocation of the water line, the project includes putting
263 the electric power lines underground and removing three utility poles on Church Street, leaving
264 only the utility pole nearest to Main Street. Instead of the streetlights now on the three utility poles,
265 eight old-fashioned street lanterns, matching the style of those on Main Street and elsewhere in
266 the Edgartown Historic District, will be added. The new lanterns will light the whole length of
267 Church Street, which is not the case currently with the existing streetlights. Also, six of the new
268 lanterns will be placed outside of the sidewalk. This will improve the ADA accessibility along
269 Church Street and in front of the Visitor Center, making the street more historic in character, not
270 less, and making the walk from the Visitor Center to Main Street or Pease’s Point Way safer for all.

271
272 4. Other electrical equipment. A battery will be installed in a cabinet at the back of the
273 parking lot next to the Visitor Center. This will allow the VTA to store and supply electricity for the
274 chargers, bought at off-peak hours when the electricity is less expensive. Also, to replace the
275 equipment now on the three utility poles being removed as described above, Eversource will install
276 a transformer and switching equipment in cabinets at the back of the parking lot next to the Visitor
277 Center. None of the equipment at the back of the parking lot will be visible from the street. It will
278 be screened with moveable plantings. No parking spaces for town employees will be lost. One
279 VTA parking space will be lost.

280
281 5. Removal and replacement of a Norway maple on the Visitor Center property. A Norway
282 maple near the southwest corner of the Visitor Center property needs to be removed to make
283 room for one of the new electrical cabinets. An arborist from Beetlebung Tree Care LLC found that
284 this tree is in poor condition: the tree canopy is thinned and has some die back; the roots are
285 restricted, compacted, and girdling; there is moderate decay in a 2’ long trunk defect; and

286 branches are resting on electrical, phone, and cable lines. A new tree to be chosen by the
287 Edgartown tree warden will be planted slightly further back on the Visitor Center property.

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289 C. CHANGES ON CHURCH STREET NOT NECESSITATED BY THE INDUCTIVE CHARGERS

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291 The proposed project includes other changes on Church Street that are not necessitated by the
292 inductive chargers, but are included in the project to improve the function and appearance of the
293 bus stop area and the Visitor Center.

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295 1. Widening of the paved area of Church Street by 2' along a 55' strip. Widening the
296 pavement by approximately 2' along a 55' strip on the west side of the street opposite the Visitor
297 Center will make it easier and safer for parked buses to pull out and around each other. The
298 widening begins at the 26 Church Street driveway and ends at a point opposite the Visitor Center
299 parking lot. The strip of grass along the west side of the pavement is about 5' wide and 180' long.
300 The widening is less than half of that width and less than a third of that length. A strip of grass
301 about 3' x 55' will thus remain opposite the Visitor Center, and the remaining strip of grass of
302 about 5' x 120' will be untouched.

303

304 2. Removal of a Norway maple across the street from the Visitor Center. This tree removal
305 will make it easier and safer for parked buses to pull out and pass each other on Church Street.
306 The arborist from Beetlebung Tree Care LLC found that this tree is in poor condition: it has multiple
307 structural defects, multiple trunk and branch wounds, an extensive trunk wound from a large
308 branch that recently broke off on the side away from Church Street, and the roots are girdling and
309 heaving and breaking up the asphalt curb and surrounding ground. The large branches and
310 sections of the trunk that have grown over the street show damage from multiple collisions of
311 trucks and other tall vehicles, including buses. Two new trees to be chosen by the Vineyard Trust
312 (formerly the Preservation Trust) will be planted slightly further back from Church Street on the
313 Vineyard Trust property. The Vineyard Trust supports the inductive charger project and has given
314 permission for the planting of these two new trees.

315

316 3. Optional removal of a Norway maple at the northwest corner of the Visitor Center
317 building. The removal of this tree was suggested by the arborist who evaluated the other two
318 Norway maples. He said this tree is not in good health and is too close to the Visitor Center
319 building.

320

321 4. Linden tree and London plane tree (sycamore) to remain at Visitor Center. It should be
322 noted that the two large shade trees at the Church Street Visitor Center that are not Norway
323 maples (a linden and a London plane tree, otherwise known as a sycamore) will remain as is.

324

325 5. Renovation of Visitor Center waiting area. The project includes funding for a complete
326 overhaul of the Church Street Visitor Center waiting area, including a covered shelter, new seating,

327 new informational signs, new landscaping, and improved stormwater management. There will be
328 30% more seating than is now provided, and the entire area will have bricks and other paving
329 stones. In addition, as described above, three utility poles will be removed from the Church Street
330 sidewalk and eight old-fashioned street lanterns will be installed. At the Historic District
331 Commission meeting on December 5, 2019, it was noted that the designers struck a pretty good
332 balance with the overall design, taking into account that the Visitor Center building is not historic,
333 dating from the 1980's, the site gets extensive public use, and there is an obvious need for
334 updating. This committee agrees and feels that the historic and visual benefits to the Edgartown
335 downtown area are significant.

336

337 D. WHY CHURCH STREET?

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339 Because the water table at the Vineyard Haven Steamship Authority bus stop is too high for the
340 installation of underground inductive chargers, there is simply no place on Martha's Vineyard
341 where inductive chargers can serve as many bus routes as Church Street.

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343 1. Inductive chargers on Church Street will enable routes 1, 8, 11 and 13 to be fully
344 electric. Church Street is now, and has been for many years, an end point for several bus routes
345 (routes 1, 8, and 13, in addition to route 3-5-6 discussed below). In addition, route 11 will be able
346 to charge at Church Street because the route 8 buses can become route 11 buses, and vice versa,
347 so that both can charge at Church Street. Inductive chargers at Church Street will enable all of
348 these bus routes to be all-electric. No other location on Martha's Vineyard is an end point for as
349 many bus routes. Note that passengers are likely to feel frustrated and inconvenienced by an
350 extended "dwell time" for charging at a stop which is a "through stop" with fewer passengers
351 getting off and on, while a longer "dwell time" will not inconvenience passengers at a stop which is
352 an "end stop" with more passengers getting off and on. In other words, at Church Street, the
353 buses will be charging in between runs, and there will be no delay experienced by passengers. If
354 there are not going to be inductive chargers on Church Street, then bus routes 1, 8 and 11 (and
355 possibly 13, depending on whether there is an inductive charger at Oak Bluffs) will have diesel
356 buses for part of each day, after the electric buses have depleted their batteries

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358 2. Inductive chargers on Church Street will enable route 3-5-6 to be fully electric. After
359 stopping at Church Street, the 6 bus proceeds via the airport to West Tisbury, where it becomes
360 the 5 bus to Aquinnah and back to West Tisbury. It then heads to Vineyard Haven as the 3 bus,
361 returns to West Tisbury, and then becomes the 6 to the airport and Edgartown. The buses on this
362 long route will likely charge at two inductive chargers to be installed in West Tisbury, but they will
363 also need to charge in Edgartown because the "dwell time" in West Tisbury is only a few minutes
364 and is somewhat unpredictable in duration because of Vineyard Haven traffic, while the "dwell
365 time" in Edgartown is 7-10 minutes and is more predictable. As noted above, passengers are
366 likely to feel frustrated and inconvenienced by an extended "dwell time" for charging at a stop
367 which is more of a "through stop" with fewer passengers getting off and on, while a longer "dwell

368 time” will not inconvenience passengers at a stop which is more of an “end stop” with more
369 passengers getting off and on. For the 3-5-6 route, Church Street is more of an “end stop” in this
370 sense than West Tisbury. If there are not going to be inductive chargers on Church Street, then
371 the 3-5-6 bus route, in addition to bus routes 1, 8 and 11 (and possibly 13, depending on whether
372 there is an inductive charger at Oak Bluffs) will have diesel buses for part of each day, after the
373 electric buses have depleted their batteries.

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376 E. MOMENTUM DYNAMICS EQUIPMENT

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378 1. Inductive chargers are safe. Momentum Dynamics charging systems include all the
379 elements needed for safe operation:¹ detection of objects under the bus in the charging zone,
380 sensing of misalignment of the bus and charger coil, measured exposure to magnetic and electric
381 fields, and an on-board vehicle system to sense and control the charging. The magnetic field that
382 escapes from under the bus during charging is minimal and is within the relevant established
383 international standards.² The chargers have received UL (Underwriters Laboratories) certification.
384 Also, inductive vehicle charging uses a very different frequency from inductive chargers for mobile
385 phones, medical devices, and other consumer products.³ This means these small appliances can
386 be safely operated on or around the buses and inductive charging equipment.

387

388 2. Momentum Dynamics chargers are reliable. Momentum Dynamics monitors every
389 charger remotely. Their system alerts users of any problems by text and email and dispatches a
390 repair technician when needed. A member of our committee contacted maintenance supervisors at
391 three bus systems using Momentum Dynamics chargers. In Howard County, MD, a charger
392 serving 3 electric buses functioned without issue for 3+ years, then needed one repair. In
393 Chattanooga, TN, a charger was used for 3+ years with 4 electric buses, and the report was that it
394 “worked great” with “excellent tech support.” In Wenatchee, WA, Ed Archer (see section A.2.b
395 above) reported a charger in operation since February 2018 serving 3 electric buses with no
396 significant issues. Ed Archer remarked that the Momentum Dynamics service was very good, the
397 best he had seen in his experience in transit.

398

399 3. The useful life of the inductive chargers for purposes of financial accounting has been
400 set at 12 years by experienced accountants. The technology is relatively new, so this 12 year
401 useful life may or may not prove to be correct, but inductive chargers do not have many moving
402 parts (only fans and switches and only in the above-ground cabinets where they are relatively easy

¹ Bablo, J., K. Boyce, and H. Jiang, 2014, *The unique safety concerns of wireless charging*, IEEE Transportation Electrification eNewsletter, September/October 2014, 3 pp.

² Mohamed, A. A. S., A. Meintz, P. Schrafel, A. Calabro, 2018, *In-vehicle assessment of human exposure to EMFs from 25-kW WPT system based on near-field analysis*, National Renewable Energy Laboratory, NREL/CP-5400-71710, 8 pp.

³ Zhang, Z., H. Pang, A. Georgiadis, and C. Cecati, 2019, *Wireless power – An overview*, IEEE Transactions on Industrial Electronics, vol. 66, no. 2, pp. 1044-1068.

403 to replace), so their useful life could be longer. A committee member reported that mini-buses
404 with inductive charging from a different manufacturer, not Momentum Dynamics, were used in
405 Genoa and Turin, Italy, for 15 years.

406

407 F. COSTS

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409 1. All of the costs of the proposed Church Street project will be funded by federal and
410 state grants. The sole financial aspect of the Church Street project for the Martha's Vineyard
411 towns will be the benefit of the reduced operating costs, both in maintenance costs and fuel costs,
412 realized over time as the bus fleet transitions to a fully electric fleet.

413

414 2. Possible Impacts of a delay in the project. The construction of the project has been
415 planned for the winter of 2020-2021. Delaying the project will result in increased costs to the VTA
416 which are difficult to estimate.

417

418 a. If the project were delayed one year, until the winter of 2021-2022, the VTA
419 operating costs would be increased. At a minimum, the VTA would need to delay the
420 retirement of the four diesel buses it planned to retire in 2021 so that they could be used,
421 with the other VTA diesel buses, to cover the times when the electric buses with spent
422 batteries are charging at the airport. This would mean that the bus fleet in 2021 would
423 have 16 electric buses and 20 diesel buses, for a total of 36 buses, instead of the currently
424 budgeted 32. This increase in the number of buses would require additional maintenance
425 and labor costs.

426

427 b. If the project were delayed one year, the capital costs of the project would
428 probably not be materially increased, but the VTA will need to ask the Federal Transit
429 Administration (FTA) to move various costs from earlier grants to later grants and vice versa
430 in order not to lose the funding for the project. Currently, it is not known whether these
431 adjustments will be permitted by the FTA.

432

433 c. A delay of longer than a year (or a failure of the Church Street inductive chargers
434 to ever be installed) would require the VTA to buy new diesel buses, and stop buying new
435 electric buses, starting in 2022. It would also likely require the VTA to have a fleet larger
436 than 36 buses in future years, in order to have enough diesel buses to substitute in for
437 electric buses with spent batteries when VTA ridership levels recover from their COVID-19
438 levels. As noted above, increased numbers of buses will mean increased labor costs, and
439 increased diesel buses will mean increased maintenance and fuel costs, in addition to the
440 continued noise and air pollution caused by the diesel buses.

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442 G. MATTERS OUTSIDE THE CHARGE GIVEN TO THIS COMMITTEE

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444 As noted at the outset of this report, this committee was specifically charged not to consider
445 locations for inductive chargers other than Church Street or changes to the VTA schedules, routes,
446 or numbers or sizes of buses. In practice, however, it proved impossible to avoid discussion of
447 these issues, and it may be helpful to summarize those discussions in this report.
448

449 1. The sizes of the buses. Substantial concern was expressed in our committee meetings
450 that the installation of inductive chargers would force the continued and increased use of longer
451 and/or wider buses. In fact, this is not the case. Passenger loads and efficiencies determine the
452 bus lengths, while the manufacturers determine the bus widths. The inductive chargers are
453 needed no matter what sizes of buses are used. Smaller electric buses have smaller batteries, so
454 smaller electric buses need on-route charging more frequently during the day than larger buses.
455 Right now, all of the VTA's 30' buses (diesel and electric) are 96" wide. Some of the VTA's 35' and
456 40' buses (diesel and electric) are 96" wide and some are 102" wide. In general, the transit bus
457 manufacturing industry is now only making buses that are 102" wide, and it should be noted that
458 102" wide buses are more comfortable for passengers, especially passengers using electric
459 mobility devices and especially in times that require social distancing. As of now, the only transit
460 bus manufacturer that makes a 96" wide bus is the manufacturer (BYD) whose buses are
461 compatible with the Momentum Dynamics inductive chargers. BYD is the bus manufacturer from
462 which the VTA has been acquiring and is continuing to acquire its electric buses. These 96" wide
463 buses are 30' long, and they are electric, not diesel. If the VTA were to buy new 30' diesel buses
464 now, only 102" wide buses would be available, while new 30' electric buses are still available from
465 BYD at 96" wide. Ed Archer of the Link system in Wenatchee, Washington, believes there are
466 smaller electric buses in China, and a committee member reported that mini-buses with inductive
467 charging were used in Genoa and Turin, Italy, for 15 years. Ed Archer said he has heard through
468 the grapevine that smaller, truck-based buses (called "cutaways") compatible with Momentum
469 Dynamics inductive chargers are likely to be available in the United States soon. The VTA needs to
470 have a mix of different sizes of buses for efficiency in responding to the variations, mostly
471 seasonal, in passenger loads. If the VTA uses larger buses, it will be for reasons other than the
472 existence of inductive chargers. This committee was told that, at present, the VTA has no plans to
473 change any routes or schedules or to increase the sizes or numbers of buses stopping on Church
474 Street.
475

476 2. Inductive charging at Oak Bluffs. It was suggested in our committee meetings that
477 inductive chargers should be installed at Oak Bluffs, instead of on Church Street in Edgartown.
478 This committee believes this suggestion should not be pursued because Oak Bluffs is a "through
479 stop," not an "end stop" for the route 13 buses, which means less time for charging is available.
480 Riders would be frustrated and inconvenienced if a 7-10 minute wait for charging at Oak Bluffs had
481 to be built into this route. Also, an inductive charger at Oak Bluffs would not solve the on-route
482 charging need for routes 1, 3-5-6, 8, and 11. An Oak Bluffs charger would be inefficient because,
483 although it could serve routes 7, 9 and 13, inductive chargers on Church Street would serve more
484 routes.

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3. Combining routes 1 and 13. It was suggested in our committee meetings that routes 1 and 13 might be combined to run in a loop with inductive chargers in Oak Bluffs, instead of at Church Street. This committee believes this suggestion should not be pursued because (a) it would not solve the problem for the 3-5-6, 8 and 11 buses and (b) in the summer there are more buses on route 13 than route 1 and the reverse is true in the winter. To run these two routes as a loop would require more buses in the fleet and more wasteful extra trips on the quieter legs of the combined route.

4. Inductive charging at the Edgartown park and ride. Our committee meetings included the suggestion that an Edgartown “end stop” should be established at a location outside the Historic District, possibly at the park and ride on Dark Woods Road, and inductive chargers should be installed at this new “end stop,” instead of on Church Street. This committee believes this suggestion should not be pursued for the following reasons:

a. The Dark Woods park and ride is not where the bus passengers want to go. They want to go to the downtown area. The distance from the Dark Woods park and ride to the Church Street Visitor Center is 9/10 of a mile. This change would not be good for the downtown business community because employees and visitors alike would be significantly inconvenienced by the need to transfer at Dark Woods from large buses to smaller buses, or walk the extra 9/10 of a mile. This would delay the passengers and make traveling into Edgartown by bus significantly more frustrating and inconvenient.

b. This change would require very substantial changes to the VTA’s routes, schedules, and numbers and types of buses, including but not limited to (i) an increased number of “cutaways” or other small buses to shuttle passengers from the new “end stop” into the downtown area and (ii) rerouting the Up-Island (3-5-6) bus and the Katama (8) bus, which currently do not go past the Dark Woods park and ride.

c. If 11 large buses per hour now arrive at Church Street, transferring the passengers at Dark Woods to equivalent passenger capacity on smaller shuttle buses would require some significant number of additional smaller buses, along with additional drivers for these additional buses. These additional buses would add to the traffic congestion in the downtown area. Also, the additional buses and drivers would increase the VTA operating costs.

d. The traffic at the triangle would be much worse because larger and more numerous buses (all the 1, 3-5-6, 8, 11, and 13 buses, including the increased numbers of shuttle buses going downtown) would need to turn across traffic to get in and out of Dark Woods Road.

526 e. The bus shelter at the Dark Woods park and ride would need to be substantially
527 enlarged and improved. It would need to have restrooms for use by the passengers and
528 bus drivers who now use the restrooms at the Church Street Visitor Center.

529
530 f. The current routes and schedules enable the VTA to operate the entire system
531 with only 32 buses. It was reported to this committee that a Massachusetts Department of
532 Transportation consultant looked at the VTA routes and schedules in 2015 and again in
533 2020 and found them to be very efficient. This may mean that there would not be federal
534 and state grants available for the capital costs (acquiring additional shuttle buses and
535 building a new passenger shelter with restrooms) of this very different, less efficient, and
536 more expensive project.

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538 H. APPROVAL

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540 For the reasons expressed above, this committee strongly and unanimously supports the project
541 to install three inductive bus chargers at Church Street in Edgartown, as proposed by the VTA and
542 previously approved and/or supported by the Edgartown Historic District Commission, the
543 Edgartown Board of Trade, the Edgartown Energy Committee, the Edgartown Board of Selectmen,
544 the Boards of Selectmen of the other five Martha’s Vineyard towns, the Vineyard Trust (formerly
545 the Preservation Trust), and the Martha’s Vineyard Commission.

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547 Respectfully submitted:

Keith Chatinover Julia Livingston Mark Snider	Alan Strahler Bill Veno Doris Ward
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