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the WAVE
Nantucket Regional Transit Authority

NRTA Year-Round Bus Service Study

Phase II Report: Fare Policy Review and Development of Innovative Funding Options

Nantucket Regional Transit Authority

December 2016

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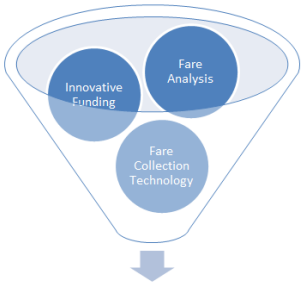
EXECUTIVE SUMMARY

The purpose of Phase I of the Nantucket Year-Round Bus Service Study was to evaluate the feasibility of providing condensed bus service in the off-season and to develop recommendations if the service was found to be feasible. Currently fixed route bus service is provided seasonally from mid-May through early October. Based on public outreach and quantitative study, high demand for year-round transit service was identified through the study effort for a wide variety of trip purposes. Transit service options were developed and a **preferred year-round transit service alternative focused on the downtown and mid-island areas** was selected by the study advisory committee.



Phase I of the NRTA Year-Round Bus Service Study was completed on June 30, 2016. The results of the study and the preferred year-round transit service alternative were presented to the NRTA Advisory Board on April 13, 2016 and again on June 22, 2016. During the June meeting, the NRTA Advisory Board suggested that a fare increase could be used to pay for some of the additional funds needed for pay for year-round bus service. Funding options, integration with other aspects of the transportation network, and fare collection technology were other topics of discussion at the June meeting and subsequent conversations with the study advisory committee. To that end, the focus of Phase II of the study is on **innovative funding options, fare analysis, and fare collection technology**, to support the implementation of year-round bus service.

Local Outreach

Throughout the course of Phase II, the study team presented fare and funding research and options to the NRTA Advisory Board and the Nantucket Planning and Economic Development Commission. Both authorities provided guidance on the type of funding options and fare changes that would be appropriate within the political and cultural climate on Nantucket; all of which was taken into consideration when developing recommendations.

Recommendations for each aspect of Phase II of the study are presented below.

Innovative Funding Options

Innovative funding options that are currently allowed by state law and Nantucket can pursue now are managed parking and advertising. Increasing the embarkation fee or sales tax require state legislative action but could generate significant revenues for funding year-round bus service on Nantucket.

Innovative Funding Option	Potential Revenue
Allowed, consider now	
Managed Parking	$9,000 - $525,000
Advertising	$500-$2,000
Require state legislative action, consider longer-term	
Increased Embarkation Fee	$33,000-$239,000
Sales tax	$85,000- $1.6M

Fare Policy Analysis

The fare policy analysis, which reviewed different fare policy options, options for developing a multi-year fare increase policy, and developed fare increase methodologies, resulted in the following recommendations based on feedback from the NRTA Advisory Board:

- Continue using the current fare policy
- Increase fares in conjunction with the implementation of year-round service
- Implement a 10-year fare increase policy where fares are increased in a prescribed fashion twice during the policy period (once when year-round service is added and again in 5 years, then the policy is evaluated again 5 years later)

Fare Collection Technology Analysis

Fare collection methodologies and technology were identified, described, and evaluated for applicability for NRTA based on current operating characteristics and potential year-round service. The following recommendations were developed as a result of this analysis:

- The most appropriate fare collection technology for NRTA is mobile ticketing with visual validation
- NRTA should look to partner with other RTAs and/or the Steamship Authority to implement a regional approach to mobile ticketing
- Explore fare capping with advanced technology when planning for implementation of new fare collection technology
- When the current fareboxes have reached their useful life and need to be replaced, NRTA should consider replacing them with models that have scanning capabilities

Next Steps

Based on the input from the NRTA Advisory Board, a phased approach to implementing year-round service was developed. The phased approach includes starting by implementing a core level of a service to prove the concept of year-round service, then recommends expansions based on performance until the level of service associated with the Preferred Alternative is reached. The phased approach to implementing year-round service and additional service options are presented in Phase III, contained within a separate report.

INTRODUCTION

The purpose of Phase I of the Nantucket Year-Round Bus Service Study was to evaluate the feasibility of providing condensed bus service in the off-season and to develop recommendations if the service was found to be feasible. Based on public outreach and quantitative study, high demand for year-round transit service was identified through the study effort for a wide variety of trip purposes. Transit service options were developed and a preferred alternative was selected by the study advisory committee. The preferred alternative included year-round service focused on the downtown and mid-island areas of the community. Both cost savings options and potential future service enhancements were developed as part of the preferred alternative. The development of the preferred alternative and a year-round transit service plan completed Phase I of the study.

Year-Round Bus Service Study Purpose:
Evaluate the feasibility of providing condensed bus service in the off-season and develop year-round service recommendations. High demand for year-round service was identified.

Phase I of the NRTA Year-Round Bus Service Study was completed on June 30, 2016. The results of the study and the preferred alternative were presented to the NRTA Advisory Board on April 13, 2016 and again on June 22, 2016. During the June meeting, the NRTA Advisory Board suggested that a fare increase could be used to pay for some of the additional funds needed for pay for year-round bus service. Funding options, integration with other aspects of the transportation network, and fare collection technology were other topics of discussion at the June meeting and subsequent conversations with the study advisory committee. To that end, the focus of Phase II of the study is innovative funding options, fare analysis, and fare collection technology to support the implementation of year-round bus service. The results of Phase II are presented in this report.

Phase II
1. Innovative funding options
2. Fare analysis
3. Fare collection technology

Through the course of the work on Phase II and further interaction with the NRTA Advisory Board, a Phase III was also identified. Phase III includes the development of a phased implementation plan building from a core level of service to the preferred alternative level of service over time based on the performance of the service. Phase III also includes other service options including weekday-only and commuter service. The results of Phase III are presented in a separate report.

PREFERRED ALTERNATIVE

For reference, the preferred alternative from Phase I of the Year-Round Bus Service Study included the following elements, ordered by priority:

1. Year-round bus service in the downtown and mid-island areas
    - Service on the Mid Island and Miacomet Routes
    - Service on a new route to serve a dense residential area: Old South Road/Nobadeer Farm Road
    - Possible re-routing of downtown routes
2. 7-day, weekday & Saturday, and weekday only service options
3. Potential service on the Sconset via Old South Road Route including service to Tom Nevers Road at Milestone Road

4. Potential extension of service on the Madaket Route to Columbus Day (from Labor Day)

Figure 1: Preferred Alternative from Phase I of the Year-Round Bus Service Study

The annual operating costs for the preferred alternative were estimated to be $848,000. This figure does not include any of the revenue that would be produced from fare collection. Daily ridership for the preferred alternative was projected to be 610 riders per day (132,000 annually).

Local Outreach

Throughout the course of Phase II, the study team presented research and options to the NRTA Advisory Board and the Nantucket Planning and Economic Development Commission. Both authorities provided guidance on the type of funding options and fare changes that would be appropriate within the political and cultural climate on Nantucket. The presentation used for interaction with both authorities is included as Appendix D to this report.

Innovative Funding Options

Transit service in Massachusetts within the Regional Transit Authorities (RTA) is funded through federal subsidy from the Federal Transit Administration (FTA), state transit funds from the Commonwealth, and from a local assessment from each town within an RTA. Advertising on buses, in shelters, and on transit guides is also used to support the provision of transit service. In some cases private funds from local partners are used to provide transit service, but otherwise these are the primary sources of transit funding in the state.

There are several types of funding options used to operate transit services beyond the traditional formula and discretionary transit funds from the FTA, state transit funds, and the local assessment.

Parking Revenue	
Taxes	Sales tax Gas Tax Mortgage recording tax Hospitality tax
Advertising	
Fees	Hospitality fee Car rental fee Embarkation fee Vehicle registration fee
Partnerships with private organizations	
Collaboration with non-profit organizations	
Fares	

As of August 2016[1], parking fees can be used to fund transit service through the designation of a parking benefit district as a result of the passing of the Municipal Modernization Bill[2]. However, currently in Massachusetts, state legislative action would be required for any taxes or fees to be used to fund transit services through either a Regional Ballot Initiative[3] or a Home Rule Petition[4,5].

Examples of each of these funding mechanisms are discussed in the following section with the exception of fares, which are discussed in detail in the following chapter.

National Review of Innovative Funding Options/Local Match Generation

Each state funds (or does not fund) transit services differently. State legislation is the primary driver in determining how local funds can be generated to support transit service provision. Historically funds generated locally were primarily generated in order to provide local match to receive federal funds. However, in recent years as federal and state transit funds have been reduced, funds are being generated locally to support new/expanded services in addition to fulfilling local match requirements. A national review of innovative funding options was conducted as part of this study. Many of these methods would require state legislative change in Massachusetts in order for them to be adopted, but they are not out of the realm of possibility, particularly in light of the recent legislative efforts described in the previous section. Therefore, innovative funding options used across the country are described in this section, divided into the following categories: taxes, fees, advertising, and other funding strategies.

In recent years federal and state transit funds have been reduced and funds are being generated locally to support new/expanded services in addition to fulfilling local match requirements

To provide national context of alternative funding sources utilized by small transit systems around the country, the following are general findings from TCRP Report 129 – Local and Regional Funding Mechanisms for Public Transportation[6]:

- Sales taxes are a major revenue source
- Local general funds play a large role in small systems
- Fares and other earned income (concessions, advertising, lease revenue, etc.) are the largest source of operating funds from local areas
- Property taxes for transit are generally used in small systems

The Regional Transportation Ballot Initiative in Massachusetts (Bill S.1474) would give a city or town the authority to impose any tax surcharge including payroll, sales, property or vehicle excise tax in order to raise revenue for transportation-related purposes.

[1] Boston Herald. *Gov. Charlie Baker signs municipal modernization bill*. http://www.bostonherald.com/news/local_politics/2016/08/gov_charlie_baker_signs_municipal_modernization_bill. August 9, 2016.

[2] Commonwealth of Massachusetts. *An Act Modernizing Municipal Finance and Government*: *Sections 26 and 22A1/2*. https://malegislature.gov/Laws/SessionLaws/Acts/2016/Chapter218. 2016.

[3] Commonwealth of Massachusetts. *Bill S.1474: An Act relative to regional transportation ballot initiatives.* https://malegislature.gov/Bills/189/Senate/S1474. 2015-2016.

[4] Commonwealth of Massachusetts, Department of Revenue. *The Home Rule Amendment.* https://malegislature.gov/Laws/GeneralLaws/PartI/TitleVII/Chapter43b.

[5] Commonwealth of Massachusetts, Department of Revenue. *What is Home Rule?* http://www.mass.gov/dor/docs/dls/mdmstuf/technical-assistance/best-practices/homerule.pdf.

[6] Transit Cooperative Research Program (TCRP*). TCRP Report 129 – Local and Regional Funding Mechanisms for Public Transportation*. http://www.trb.org/Publications/Blurbs/160356.aspx. 2009.

Taxes

Taxes generated specifically for transit service come from a variety of sources: sales tax, property tax, income tax, employer/payroll taxes, vehicle lease tax, realty transfer tax, corporate franchise tax, room/occupancy tax, utility (including gas) tax, etc. Equally variable is the authority by which the taxes are assessed. In Massachusetts the authority is at the state level currently but if the Regional Ballot Initiative passes the authority would be given to regions/districts to apply a tax surcharge (payroll, sales, property or vehicle excise) to raise revenue for transportation-related purposes only[7]. This section focuses primarily on the tax mechanisms included in the Regional Ballot Initiative.

Sales Tax

Sales tax is the most commonly used tax to support transit services for capital spending and operating expenses, particularly at the state level.

- At the local and regional level, sales taxes can be enacted for transit (if the authority is given).
- Nationally, the additional local/regional sales tax assessed for transit ranges from 0.25% to 1%[8].
- 'Use' taxes and 'excise' taxes are also types of sales taxes. 'Use' taxes are either applied to transactions not subject to sales tax or in combination with sales tax. Examples are lease or rental transactions and can be structured in a way to tax services used by higher-income consumers to reduce the burden on lower-income consumers[9].

Implementing a 0.25% retail sales tax in Nantucket could pay for 90% of the cost to implement year-round service

Sales tax is a reasonably stable source of revenue to support transit, particularly in a tourist community such as Nantucket. 'Use' taxes on services would also be a reasonably stable funding source in a tourist community, particularly as the economy becomes increasingly service-based. Sales taxes are currently used in Park City, UT, another tourist community, to support transit. In the following section an example of the amount of revenue that could be generated by adding a new local sales tax to support transit service in Nantucket is presented.

Payroll Tax

Payroll taxes are usually imposed directly on employers with the transit service area for the amount of gross payroll paid to employees. Typically employer taxes are administered by the state revenue agency on behalf of the transit agency or municipality authorized to assess the tax (similar to how the embarkation fee is currently distributed through the Massachusetts Department of Revenue). Authorizing legislation is generally accompanied with regulations and guidelines for which types of wages and payments are subject to the payroll tax. Payroll taxes are currently used by the state of Oregon to fund the mass transit districts. The program is managed through the Department of Revenue.

[7] Commonwealth of Massachusetts. *Bill S.1474: An Act relative to regional transportation ballot initiatives.* https://malegislature.gov/Bills/189/Senate/S1474. 2015-2016.

[8] Transit Cooperative Research Program (TCRP). *TCRP Report 129 – Local and Regional Funding Mechanisms for Public Transportation*. http://www.trb.org/Publications/Blurbs/160356.aspx. 2009.

[9] Arizona PIRG Education Fund. *Why and How to Fund Public Transportation*. 2009.

Property Tax

Property taxes are the primary source of local tax collection used to operate local government. For Nantucket, the median annual real estate taxes paid in 2005-2009 was $2,681 as compared to the state average of $3,307 and the national average of $1,805[10]. For fiscal year 2016, the mill rate in Nantucket (amount per $1,000 in value) for properties is: $3.36 for residential properties, $3.22 for open space, $5.93 for commercial properties and $5.93 for personal property[11]. Also for fiscal year 2016, the projected revenue from real estate and personal property taxes is estimated to be $72 million[12].

The use of property tax revenue is generally left to the discretion of the municipality so using this source of revenue to support transit service does not always require special authority. The Town can use a portion of existing property tax revenue to support transit service. However, a 'special assessment' or 'local improvement levy' is sometimes used to add an additional tax onto the property tax to support a specific benefit or local public improvement, such as the expansion of transit service. This type of additional property tax would be possible if the Regional Ballot Initiative were to be passed.

Vehicle Excise Tax

Vehicle-based taxes make particularly good sense to fund transportation for two reasons:

1. **They can be used to fund transit**
2. **They discourage individual auto usage and encourage transit usage**

Nantucket currently imposes a vehicle excise tax and boat excise tax. The revenue from the vehicle excise tax in fiscal year 2016 is projected to be $1.9 million. For the boat excise tax the revenue is projected to be $34,000. An additional percentage tax added to the vehicle excise tax could be used to support transit service if the Regional Ballot Initiative were to be passed.

Other Taxes

Other examples of taxes that can be used to fund public transportation include real estate transfer tax, corporate franchise tax, fuel tax and hospitality tax. In New Jersey, public transportation for seniors and persons with disabilities has been funded by a casino revenue tax since 1984[13].

Real estate transfer taxes are taxes levied onto property sales transactions. They can be levied on residential, commercial, industrial or a combination of classes of property depending on state legislation. Depending on state legislation, sometimes it is the seller's responsibility to pay the transfer tax and sometimes it is the buyer's responsibility to pay the transfer tax.

A corporate franchise tax is levied on the profit and taxable assets of a business. It is a tax that corporations pay in advance for doing business in a state. The tax can be targeted to certain industries

[10] Tax Foundation. *Property Tax Data by County: 2005-2009 Five-Year Average*. http://interactive.taxfoundation.org/propertytax/. 2009.

[11] Town of Nantucket Tax Collector. http://www.nantucket-ma.gov/224/Tax-Collector. 2016.

[12] Town of Nantucket. FY2016 Budget Projection. http://www.nantucket-ma.gov/DocumentCenter/Home/View/8577. 2016

[13] Texas Department of Transportation. Part I A Study of Sources Used for Local Revenue for Transit. https://ftp.dot.state.tx.us/pub/txdot-info/ptn/matching-funds-resource-guide.pdf. 2013.

and activities. For example, in the New York metropolitan region, a corporate franchise fee is imposed on transportation and transmissions companies and the revenue is used to support transit[14].

Fuel or gas taxes are used to fund transit service in some states. Fuel taxes tend to reduce single occupancy vehicle travel and increase transit and other alternate mode usage[15]. A special/additional fuel tax can be added on to existing fuel taxes to fund transit services by the requisite legislative authority.

Room or occupancy taxes can be applied to lodging at hotels, motels, campgrounds, rooming houses, RV parks, etc. to support transit services. Room or occupancy taxes can be collected at the state level and reallocated to municipalities or collected and retained by local municipalities where state authority is provided. **Nantucket currently imposes a rooms (hospitality) tax at the maximum state-allowed rate to support the operation of the Town government. Revenue from this source is projected to be $2.55 million in fiscal year 2016. With a change to state legislation, an additional room tax or fee could be imposed specifically to fund transit service.**

Fees

Fees can be used to support transit services in a similar fashion to taxes. The authority to impose fees is also given at the discretion of the state. Fees used to support transit service include: vehicle fees (title, registration, tags, and inspection), car rental fee, vehicle lease fee, parking fee, mortgage recording fee, business license fee, utility fee, room/occupancy fee, embarkation fee, etc. The embarkation fee is discussed in the following section specifically on funding strategies in Nantucket.

Vehicle Fees

Like vehicle-based taxes, **vehicle-based fees provide revenue to support transit service and discourage individual vehicle usage while encouraging transit usage and other alternate modes of travel.** Vehicle fees can be charged based on vehicle value, weight and/or age. The fees can be charged via several options based on the issuance of titles, licenses, registration or inspection. The authority to impose and collect vehicle fees is sometimes provided to local governments as a 'local option.' The revenue from these types of options are usually used for the administration/collection of fees, enforcement, or put into the general fund. Only a portion is generally used to fund public transportation. Vehicle fees are used to fund transit service operated by Advance Transit in White River Junction, Vermont through the Vermont Agency of Transportation[16].

[14] Transit Cooperative Research Program (TCRP). *TCRP Report 129 – Local and Regional Funding Mechanisms for Public Transportation*. http://www.trb.org/Publications/Blurbs/160356.aspx. 2009.

[15] Victoria Transport Policy Institute. Local Funding Options for Public Transportation. http://www.vtpi.org/tranfund.pdf. 2016

[16] Vermont Agency of Transportation. Vermont Transportation Funding Options. http://legislature.vermont.gov/assets/Legislative-Reports/Sec-10-Funding-Study-Report-final.pdf. 2016.

Fees on vehicle leases can also be used to fund public transportation. When a consumer leases a vehicle, fees are included in every lease payment. Lease taxes or lease fees are basically like a sales tax applied to the amount of each monthly lease payment.

Hospitality Fees

Fees can also be imposed on rental cars and hotel rooms that are used to support transit. **The consumer pays a nominal transit/transportation fee with all of the other fees paid when renting a car or staying in a hotel room. These fees are generally time-based so that, for example, short-term visitors are assessed the fees while year-round or seasonal residents are not.** These types of fees are generally remitted to the state with the other taxes and fees collected (including sales or use taxes) and then distributed to the transit agencies. The rate of the fees is generally in the range of 1-2% of rental/room base fee[17].

Pennsylvania, for example, established a 'Public Transportation Assistance (PTA) Fund in 1991 that is funded by a fee imposed on rental cars. The PTA Fund revenue is dedicated to funding for mass transportation. The rental car fee is $2 per day[18].

In Arlington, Texas a special district (the Arlington Entertainment Area Management District) was created to fund a trolley service for guests staying in member hotels to visit recreation and tourist destinations within the district. It was created in 1995 as a municipal management district and is a political subdivision of the state. Hotel properties within the district are assessed a fee of $1.90 per occupied room per night (excluding long stays – those of 30 days or longer) to support the transit service. The hotels pass along the fee to guests as an additional entertainment district fee.

Mortgage Recording Fee

A mortgage recording fee is similar to a realty transfer tax in that a fee is assessed when a new mortgage (due to the purchase of a property) is recorded. In western New York, for example, a mortgage recording fee is assessed at the county level for each county within a transportation authority that receives public transportation services. The county provides the revenue from the mortgage recording fee to the transportation authority to support transit service provision within that county and throughout the authority service area.

Advertising

Advertising on the inside and outside of buses and shelters, on transit guides, on tickets, and on the transit agency website is another way to generate income to support the provision of transit service. Most transit agencies now use advertising as a source of local revenue. NRTA currently generates income from advertising on the inside of the buses.

Because of the level of effort required to solicit and maintain advertisements, the majority of transit agencies contract advertising and the management of the advertising program to a private media and

[17] Transit Cooperative Research Program (TCRP). *TCRP Report 129 – Local and Regional Funding Mechanisms for Public Transportation*. http://www.trb.org/Publications/Blurbs/160356.aspx. 2009.

[18] Pennsylvania Department of Revenue. Public Transportation Assistance Fund Taxes and Fees. https://revenue-pa.custhelp.com/app/answers/detail/a_id/661/~/public-transportation-assistance-fund-(pta-)-taxes-and-fees. 2003.

advertising company[19]. Revenues are realized from regular individual or multi-year advertising contracts and agreements or from specific time-based or specific event-based provisions. Despite the level of effort required to setup and maintain and advertising program, revenue from advertising is generally only a small portion of revenue (0.1%-3%[20]). Nantucket could generate an additional $500- $2,000 annually in advertisement revenue if service were to operate year round[21].

Other Funding Strategies

Other sources of funding include: partnership with local employers and human service agencies including contracts or purchase-of-service revenue, as well as partnerships with community agencies. **NRTA currently has partnerships and agreements with all of these types of organizations.**

Under Section 5310 of the Federal Transit Administration FAST Act[22], human service agencies can apply through the state for funds to purchase transit service from a transit service provider such as NRTA or fund other transportation-related services such as travel training. Human service agencies also purchase bus passes for their clients, which helps make transit service more affordable for the lower income population.

Innovative Funding Options for NRTA an Potential Revenues

Long-term Funding Options for NRTA
- Managed Parking
- Embarkation Fee
- Fees/Taxes

Based on feedback provided by the NRTA Advisory Board and the Nantucket Planning and Economic Development Commission, increasing fares is the preferred method for generating operating funds to extend service year-round. Understanding that **increasing fares cannot fully support the service in a sustainable long-term fashion**, managed parking in the downtown core and vicinity and at designated lots, increasing the embarkation fee, and instituting a sales tax are all methods identified that could be used to fund year-round transit service (two of these methods require state legislative action to be possible) and developed in further detail to understand order-of-magnitude what each method could generate in revenue to support transit service. All methods described in this section were estimated conservatively to provide a reasonable depiction of possible revenue.

Managed Parking

The discussion of instituting managed parking on Nantucket is not new. A parking study was completed in 2010-2011 Commissioned by ReMain[23]. Managed parking could be instituted in a variety of manners using a variety of policies. Some examples with potential revenue are presented in Table 1. More details on the parking options are included on the following page.

[19] Transit Cooperative Research Program (TCRP*). TCRP Report 129 – Local and Regional Funding Mechanisms for Public Transportation*. http://www.trb.org/Publications/Blurbs/160356.aspx. 2009.

[20] Ibid.

[21] Based on current advertisement revenue and potential increases in service

[22] Federal Transit Administration. Enhanced Mobility of Seniors & Individuals with Disabilities – Section 5310. https://www.transit.dot.gov/funding/grants/enhanced-mobility-seniors-individuals-disabilities-section-5310. 2016.

[23] Nelson/Nygaard. *Summary of Parking Management Program*. 2011

Table 1: Managed Parking Options and Potential Revenue

Option	Parking Policy Description	Number of Vehicles/Other Assumptions	Potential Seasonal Revenue	Potential Year-Round Revenue
1	Fees for parking in the core only	$1-$2 range, Memorial Day to Labor Day only	$320,000-$640,000	
2	Fees for parking in the outer core	$1-$2 range, Memorial Day to Labor Day only	$9,000-$18,000	
3	Monthly passes for people who work in the downtown area	$40-$55/month range, Memorial Day to Labor Day only	$30,000-$40,000	
4	Downtown parking stickers for vehicles coming off ferries	Non-resident, resident commercial, non-resident seasonal property owner rates; assume Steamship Authority manages it and splits the revenue with Town		$500,000
5	"Embarkation fee" for personal vehicles	42,108 vehicles, $5 fee		$210,000
6	"Embarkation fee" for commercial vehicles	14,794 vehicles, $10 fee		$150,000
7	Visitor parking permit	Administered by Town, 10,289 cars	$110,000	
8	Core parking sticker	21,000 vehicles, $25 fee	$325,000	$525,000
9	Commercial plate sticker			$80,000
10	Parking lot fee	200 vehicles, 100 days, $17.50/day		$280,000

Sources of Data: Nantucket Planning Office, Steamship Authority 2015 Annual Report

Options 1-3 Key Points:

- Enforced Memorial Day to Labor Day
- Enforced 7 days a week 8 AM to 7 PM

Options 1-3 would be enforced between Memorial Day and Labor Day only. Rates are generally based on the example of Provincetown, MA. Enforcement hours were assumed to be the same hours as parking times are currently enforced on Nantucket during the summer months (7 days per week, 8 AM to 7 PM). Rates are based on a range from no more than $1 to 2$ for the maximum amount of time to park. Number of spaces was based on the 2010 parking report and was estimated at 276 for the core and 712 in the outer core. Utilization was also estimated based on the 2010 report and was assumed to be 85% in the core and 50% in the outer core. To estimate the potential revenue from monthly passes, it was assumed that 249 passes (35% of outer core parking spaces) would be purchased at prices ranging from $40 to $55 per month.

Option 4 would be enforced year round and vehicles coming off the ferry would have the option of purchasing a parking pass/sticker for Nantucket similar to the model used in Hyannis by the SSA. This would allow them to park in the outer core for free. This Option assumes that the SSA would administer the program and the revenue would be shared with the Town (50/50). The source of vehicle information is the *2015 Annual Report* from the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority (SSA). In 2015, SSA carried 33,348 cars from Hyannis to Nantucket. This excludes pickup trucks, minivans, vans, etc., so there are more personal vehicles being carried across. To estimate the total number, the total number of vehicles under 20' in length carried was 84,215 (both directions, so a total of 42,108 vehicles were brought into Nantucket). In 2015, SSA carried 14,794 trucks (including trucks, trailers, buses, campers, etc.) into Nantucket. February was used as an example month of primarily year-round resident travel to estimate the percentage of resident vs. non-resident vehicles. The rates used were: $175 for non-residents, $90 for resident commercial, and $65 for non-resident seasonal property owner. Assumptions include 25% utilization for non-residents and resident commercial vehicles and 75% for non-resident seasonal property owners. Potential revenue is $993,202.

Option 4 Key Points:
- Enforced year-round
- Administered by the SSA
- Revenue split 50/50 between town and SSA

Options 5 and 6 would enforce implement an embarkation fee year-round on vehicles landing in Nantucket. The fee would be automatically applied when reservations for vehicle passage are made. This would require a Home Rule Petition by Nantucket to implement. Source of vehicle information is the *2015 Annual Report* from the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority (SSA). To estimate the total number, the total number of vehicles under 20' in length carried was 84,215 (both directions, so a total of 42,108 vehicles were brought into Nantucket). In 2015, SSA carried 14,794 trucks (including trucks, trailers, buses, campers, etc.) into Nantucket.

Options 5-6 Key Points:
- Enforced year-round
- Fee automatically applied to ferry vehicle reservation
- Requires change in legislation or home rule petition to implement

Option 7 assumes that the Town offers season-long downtown parking permits to personal vehicles coming off the ferries. Vehicles could park in the outer zone 2 hour spots.

Options 8-10 were estimated by the Nantucket Planning Office.

Embarkation Fee

In Massachusetts, the current legislation on the assessment of the embarkation fee is very specific: $0.50 per fee-paying passenger and it cannot be assessed to commuters or students[24]. If the legislation were to be modified, allowing an increase in the embarkation fee and/or the approval to assess a fee to commuter passes to pay for transit service connecting to ferry terminals, Table 2 shows the order-of-magnitude revenue that could be generated. In 2015, the Steamship Authority, through the Massachusetts Department of Revenue, distributed $122,752 to the Town of Nantucket in embarkation fees[25]. The fees collected are dispersed to the Town in which the passenger departed, so it was assumed

[24] Commonwealth of Massachusetts. *TIR 04-18: Ferry Service Embarkation Fees.* http://www.mass.gov/dor/businesses/help-and-resources/legal-library/tirs/tirs-by-years/2004-releases/tir-04-18-ferry-service-embarkation-fees.html. 2004.

[25] Woods Hole, Martha's Vineyard and Nantucket Steamship Authority. *2015 Annual Report*. https://www.steamshipauthority.com/writable/versioned_downloadable_forms/path/2015_ssa_annual_report.pdf. 2016

that half[26] of the passenger trips are those departing from Nantucket[27]. In 2015, passenger trips between Hyannis and Nantucket on the Steamship Authority numbered 644,787 (for both the traditional ferry and the fast ferry) and in 2013, passenger trips between Hyannis and Nantucket were estimated to number 440,635 on Hy-Line[28].

Table 2: Embarkation Fee

Type of Fee	Annual Passenger Trips	Fee Trips (76%)	Commuter/ Student Trips (24%)	Potential Revenue
	1,085,422	814,067	271,356	
Passenger trips departing Nantucket	542,711	412,460	130,251	
Additional $0.50 fee (no fee to commuters or students)				**$206,000**
$0.25 fee on commuter/student trips				**$33,000**
Potential Total with both fees				**$239,000**

Sources of Data: Steamship Authority 2015 Annual Report, Hy-Line Cruises 2013 Letter to Steamship Authority, Boston Region Metropolitan Planning Organization Central Transportation Planning Staff (CTSP)

Taxes and Fees

As described in the national review, in other states various taxes and fees can be used to fund transit services: sales tax, hospitality tax, mortgage recording tax, hotel fees, car rental fees, etc. To give some order-of-magnitude estimates if the state legislature were to approve local authority to apply taxes and fees to fund transit service and the Town were to approve the assessment of any taxes or fees to fund transit service, Table 3 provides economic revenue statistics for the Town if a 0.25% or 0.50% tax or fee were to be applied to certain categories of revenue. All of these statistics are annual (year-round) figures.

For example, based on the 2012 Economic Census by the US Census Bureau, if a 0.5% sales tax was applied to retail purchases, $1.6 million in revenue could be realized annually to fund transit service. Even half that amount (0.25% sales tax on retail purchases) would pay for the extension of year-round transit service.

[26] Ibid. Number of passenger trips departing Nantucket in 2015 was 324,637, a 7% increase over 2014.

[27] This amount is from the Steamship Authority only and does not include the amount generated by Hy-Line passenger trips.

[28] Boston Region Metropolitan Organization Central Transportation Planning Staff. *Revised Draft Inventory of Ferry Boat and Other Passenger Water Transportation Services in Massachusetts as of 2013*. https://www.massdot.state.ma.us/Portals/17/docs/ferry/meetingFive/7-25-13%20Ferry%20Inventory%202013%20rev%200716%20th.pdf. 2013. and

Hy-Line Cruises. Letter to Woods Hole, Martha's Vineyard and Nantucket Steamship Authority requesting permission to build a new high-speed ferry for Nantucket service. https://www.steamshipauthority.com/writable/files/hy-lines_license_request_-_2014-03-21_copy1.pdf. 2014.

Table 3: Town of Nantucket Sales by Sector

Economic Sector	2012 Economic Census Value of Sales	Potential Revenue from 0.25% Tax or Fee	Potential Revenue from 0.5% Tax or Fee
Retail Trade	$318 million	$795,000	$1.6 million
Real estate and rental and leasing	$60 million	$150,000	$300,000
Arts, entertainment and recreation[29]	$17 million	$42,500	$85,000
Accommodation and food services	$119 million	$297,500	$595,000

Source of Data: US Census Bureau, *2012 Economic Census of the US*.

While the other economic categories presented in Table 3 are broad and may contain different sources of revenue than would be utilized to assess a tax or fee, they give an idea of the types and amounts of revenues being generated by certain sectors of the economy.

Recommendations for Innovative Funding Options

Based on the feedback received from the NRTA Advisory Board and the Nantucket Planning and Economic Development Commission, the following are recommendations for pursuing nontraditional funding options:

1. Institute a managed parking program
2. Pursue a change in state legislation to allow for an increase in the embarkation fee to be used for transit service serving the ferry terminals
3. Continue to advocate for and pursue the regional ballot initiative to get local authority assess taxes and/or fees to support transit service
4. Discuss a larger advertising campaign on buses, in shelters, on the website, and in transit guides
5. Continue to partner with local agencies and organizations

Fare policy and potential fare revenue are discussed in the following chapter.

[29] Only those subject to federal sales tax

FARE POLICY ANALYSIS

NRTA is considering providing service throughout the year. This service enhancement will increase the cost of operating the system while operating during periods when the demand for transportation is lower than during the peak summer season. **Changing fares along with a service increase is usually more palatable to the general public then a fare change at any other time**; therefore it is an appropriate time to examine changes to the fare policy.

This chapter provides a description of the current fare policy and an analysis of potential changes to the fare policy to accommodate transit service increases operated by NRTA. Now is the appropriate time to evaluate the fare policy as NRTA is considering providing year-round service instead of only seasonal service and NRTA has not changed fares since 2008. This document evaluates the current fare policy, presents alternative fare policies, and recommends a fare policy for NRTA adoption.

Current Fare Policy

The current fare policy is a simple fare policy, as shown on Table 4. Short distance routes have a base cash fare of $1.00 and longer distance routes have a base cash fare of $2.00 (routes are listed in Table 4). Half fare is offered to seniors, individuals with disabilities, and veterans and active military personnel. Besides cash fare a series of unlimited ride passes are offered. The fares are presented below in Table 4. Change is not given onboard buses; passengers who pay fares with larger bills are given a stored value card that can be used on future trips. Short-term passes are available for purchase onboard buses while seasonal passes are available for purchase only from NRTA.

Table 4: Fares and Passes

Fare Type	Fare
Adult - Mid Island Loop, Miacomet Loop, Jetties Beach Route	$1.00
Adult – Sconset Routes, Madaket Route, Surfside Beach Route and Airport Route	$2.00
Seniors 65 & Older	Half Fare
Individuals with Disability	Half Fare
Veterans and Active Military Personnel	Half Fare
6 & under	Free
Short Term Passes	
1-day	$7
3-day	$12
7-day	$20
Season Passes	
Season	$90
Commuter (business purchased)	$80
Student	$50/$80
Disabled	$50
Veteran and Active Military Personnel	$50
31-day	$50

Identification of Issues

Issues:

- **Farebox recovery will be less in the off-season than in the peak season**
- **70% of current passengers pay with cash, which increases the dwell time**
- **Only a limited number of outlets sell passes**

NRTA has a very simple, easy to use fare structure. **Farebox recovery for the current service is very healthy at almost 33%.** For a system that is classified as rural, that is a very good farebox recovery[30]. That being said, part of the reason why farebox recovery is very high is because service only operates during the peak tourism season. As service extends year-round, operating during the off-season when there are fewer people visiting Nantucket, such a high farebox recovery cannot be expected.

One issue identified with the current service is that buses are dwelling for a long time at bus stops, which is related to fare payment. This is because of the high number of cash passengers, which takes a long time to process. The long dwell times may also be related to purchasing fare passes onboard buses. Table 5 presents the fare payment characteristics and shows that over 70% of the passenger boardings are paid with cash fares while only 29% of boardings utilize passes.

Table 5: May Through August 2016 Fare Payment Characteristics

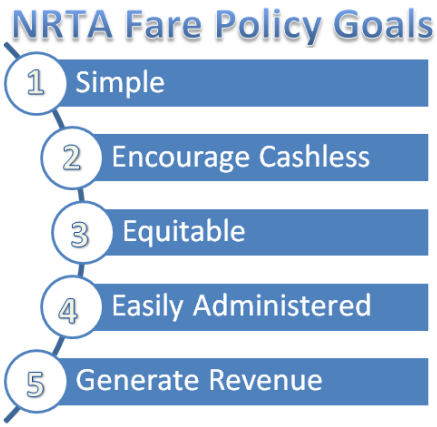
	Fare Type	May	June	July	August	Total	Percent
Cash	Adult	4,748	27,483	60,932	62,755	155,918	62.74%
	Senior or Half	245	2,549	4,463	5,032	12,289	4.94%
	Child	163	823	2,218	2,131	5,335	2.15%
	Lodge	90	128	417	641	1,276	0.51%
	Museum	3	16	93	89	201	0.08%
	Quarter Fare	7	28	82	82	199	0.08%
	VTS	68	352	449	427	1,296	0.52%
	Handicap 1/2	4	18	38	29	89	0.04%
	Vet/Active Military	3	49	80	34	166	0.07%
	Cash Total	5,331	31,446	68,772	71,220	176,769	71.13%
Pass	1 Day Pass	87	581	1,011	1,472	3,151	1.27%
	3 Day Pass	88	723	1,049	1,466	3,326	1.34%
	7 Day Pass	24	1,467	2,987	2,205	6,683	2.69%
	Emergency	28	108	183	189	508	0.20%
	Commute	628	7,844	12,617	12,055	33,144	13.34%
	Student	132	2,023	4,525	4,238	10,918	4.39%
	Senior	87	819	1,174	1,261	3,341	1.34%
	Season	28	1,749	3,319	3,683	8,779	3.53%
	30 Day	0	38	256	421	715	0.29%
	Disabled	40	183	333	307	863	0.35%
	Veteran	0	112	126	82	320	0.13%
	Pass Total	1,142	15,647	27,580	27,379	71,748	28.87%
Grand Total		6,473	47,093	96,352	98,599	248,517	

[30] Average farebox recovery for rural systems nationwide is 8% (from the *2014 Rural Transit Fact Book*).

There are a limited number of locations where passes are available for purchase. Short term passes; which are the one-day, three-day, and seven-day passes; are only available for purchase onboard buses. This exacerbates the issue with long dwell time due to fare payment. Seasonal passes are only available for purchase at NRTA's administration building.

Goals for the Fare Policy

In order to develop a comprehensive fare policy for NRTA it is necessary to establish the goals and objectives of the fare policy. These goals and objectives provide the foundation for the fare policy and are the analysis criteria for the fare policy recommendations. This section provides a description of proposed goals and objectives for the NRTA fare policy analysis.



The first goal would be to **maintain a simple fare policy.** The current fare policy is easy for the customer to understand and also simple to administer and enforce. Fares are easy to collect and it is easy to disseminate information for the agency as a whole. A policy that makes collecting this information easy should be a part of the proposed fare policy regardless of technology type.

Another goal would be to **encourage cashless fares**. One issue identified with current fare collection is long dwell times at bus stops. This is related to passengers having to deposit cash fares. NRTA provides one, three, seven-day passes, and a season pass. These passes allow for unlimited rides on any bus route on the island. This allows for a discount that is based on the number of trips on which the passenger uses the pass. Factors that encourage passengers to use pre-paid fare media are cost/level of discount and availability of fares. Currently, passes are only available for purchase from bus operators or at the NRTA offices. A goal should be to increase the opportunities for passengers to purchase passes. Another goal should be to increase the number of pass types to include other stored value cards and unlimited ride passes, such as an annual pass.

Another goal is that the fare policy should be **equitable.** An equitable fare policy properly balances short and long distance travel throughout the service area. Currently fares are based on the route, with routes that travel a longer distance having a higher fare. The result is that if someone wants to travel a short distance on a longer distance route, they must pay a higher fare[31]. This goal can be contradictory to the first goal (simple fare policy) as an equitable fare policy typically would have multiple fare types charged on one route, while a simple fare policy would have fewer fare types.

Ease of administration is a very important goal for fare policy, especially for NRTA. A more complex fare system requires additional administrative resources to manage. This is because a more complex fare system needs to be explained to the public, may require additional pass types, has impacts to revenue and ridership calculations, and has enforcement issues. Since NRTA has a very small administrative staff, adding complexity to the fare system will require additional resources devoted to fare policy that may overburden current staff and may even require additional staff.

[31] Although the current policy does allow for passengers traveling shorter distances to alert the driver to where they are alighting and if it before a certain point, they are allowed to pay the shorter distance fare.

Finally, the purpose of charging passengers a fare for using the service is to **collect revenue to offset the cost of providing service.** The ideal fare policy would maximize the amount of revenue collected and not result in passengers being unable to use the service due to high user cost. In other words, a fare that is too low would not be effective in collecting sufficient farebox revenue, while a fare that is too high would discourage users, thereby lowering the amount of money collected from the farebox. The ideal fare policy would have a reasonable base fare and pass/stored value cards that allow for passengers to buy fares in bulk.

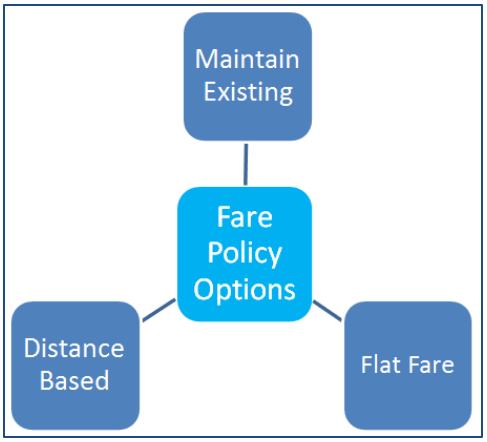
FINDING THE RIGHT BALANCE

Fares Too Low = Insufficient revenue

Fares Too High = Lower ridership

Fare Policy Alternatives and Analysis

Three possible fare policy alternatives are presented in this section for the NRTA system. The first alternative is to maintain the current fare policy, fare media, and fare levels. The remaining alternatives represent changes to the current fare policy based on either having a single flat fare or a distance based fare. A description and analysis of the fare policy alternatives are presented below.



Current Fare Policy

Maintaining the current fare policy, as described in the first section of this report, is the baseline alternative fare policy. This fare policy would **maintain the flat fare structure that is based on long and short distance routes.** This would include having the same fare types and fare levels. Fares would be collected as they are collected today. The fare policy would be as presented in Table 4. Even though there are two different route types that charge different fares, the current fare structure is simple. Multiple unlimited ride pass types are available for purchase so it does encourage cashless travel. The current fare policy is not equitable as passengers traveling a short distance on a longer distance route do have to pay higher fares (with some exceptions). The current fare structure does result in a high farebox recovery as it does charge longer distance passengers a higher fare; therefore it does attempt to maximize revenue.

Flat Fare Policy

The flat fare policy is the first alternative fare policy. The hallmark of this fare policy is that a **flat fare for all services is offered regardless of distance traveled.** This creates a very simple fare policy for users since only one fare level is charged. A simple fare policy is easy to enforce; however it is not an equitable policy nor does it maximize revenue /minimize subsidy needed as passengers traveling a short distance pay the same amount as passengers traveling a long distance. The continued existence of passes does encourage cashless travel. Table 6 presents a sample flat fare policy for the NRTA system (fare levels for illustrative purposes only).

Table 6: Sample Flat Fare Policy

Fare Type	Fare
All Routes Adult Cash Fare	$1.00
Seniors 65 & Older Cash	Half Fare
Individuals with Disability Cash	Half Fare
Veterans and Active Military Personnel Cash	Half Fare
6 & under Cash	Free
Short Term Passes	
1-day	$7
3-day	$12
7-day	$20
Season Passes	
Season	$90
Commuter (business purchased)	$80
Student	$50/$80
Disabled	$50
Veteran and Active Military Personnel	$50
31-day	$50

Distance Based Fare Policy

The second alternative fare policy would be a distance based fare policy**.** The key distinction of this fare policy is that instead of a single fare charged regardless of how far a passenger travels, **charges vary based on distance traveled.**

The distinction between this fare policy and the current fare policy is that it would apply to all routes. This fare policy can be implemented in one of two ways: either by determining how many miles a passenger travels and calculating the fare based on miles, or the simpler way is to map out fare zones where passengers are charged a surcharge when they cross a fare zone boundary.

The issue with a fare zone system is that a short distance trip that crosses a fare zone is subject to a higher fare. Some agencies address the short distance multiple fare zone trips by not charging a higher fare unless two zone boundaries are crossed. The distance based fare policy is not a simple fare policy. Because it would have the same passes that NRTA has today, it does encourage cashless fares. It is equitable because it charges passengers based on distance traveled and is applied to every route, which also meets the goal of increasing revenue. Table 7 presents a sample distance based fare policy (fare levels for illustrative purposes only). For the purpose of this table three fare zones are used as an example (see Figure 2).

Figure 2: Example of Zonal Based Fare for Nantucket

Table 7: Sample Distance Based Fare Policy

Fare Type	Zone 1	Zone 2	Zone 3
All Routes Adult Cash Fare	$1.00	$1.50	$2.00
Seniors 65 & Older Cash	Half Fare	Half Fare	Half Fare
Individuals with Disability Cash	Half Fare	Half Fare	Half Fare
Veterans and Active Military Personnel Cash	Half Fare	Half Fare	Half Fare
6 & under Cash	Free	Free	Free
Short Term Passes			
1-day	$5	$6	$7
3-day	$8	$10	$12
7-day	$15	$18	$20
Season Passes			
Season	$70	$80	$90
Commuter (business purchased)	$60	$70	$80
Student	$50/$80	$50/$80	$50/$80
Disabled	$30	$35	$40
Veteran and Active Military Personnel	$30	$35	$40
31-day	$30	$40	$50

Comparative Analysis

A comparative fare analysis is presented in Table 8. None of the fare alternatives meet all of the fare policy goals. This table shows that the current fare policy and the distance based fare policy meet three of the four fare policy goals. A flat fare policy meets two of the four goals. It should be noted again that the fare levels presented in Table 6 and Table 7 are for illustrative purposes only.

Table 8: Fare Alternatives Comparative Analysis

Fare Policy Goal	Current	Flat Fare	Distance Based Fare
Simple fares	Yes	Yes	No
Encourage cashless fares	Yes	Yes	Yes
Equitable	No	No	Yes
East of Administration	Yes	Yes	No
Maximize revenue and minimize subsidy	Yes	No	Yes

Other Fare Elements

The fare elements discussed in this section are enhancements to the fare policy that would further meet the goals of the overall fare policy. Many of these items are based on the review of current fares. The individual fare elements are described below:

- Transfer policy – Currently NRTA does not have a transfer policy. A formal transfer policy would encourage longer distance travel. A transfer policy can be based on:
  - Full fare transfers
  - A transfer surcharge
  - Free transfers

- **Stored value cards** – Currently NRTA provides stored value cards as change for passengers that have large bills. These stored value cards do not provide a discount on trips, nor are they available to purchase.
- **Off-season pass** – Currently there is a seasonal pass. As service expands to year-round, NRTA should consider providing an off-season pass and an annual pass. These passes, like the seasonal pass, would be tied to the calendar.

Multi-Year Fare Changes

Since the fares have not changed since 2008 consideration of a fare change at this point does make sense. Also, **passengers are more receptive to fare changes when they are associated with a service improvement.**

In order to manage growth and ensure that fares change at a consistent timeframe a schedule for multi-year fare changes should be established. Table 9 presents a 10-year analysis of ridership and fare revenue impacts for three fare change scenarios:

- small changes every other year
- a roughly 50% fare change every five years
- doubling the fare roughly every 10 years

NRTA last raised fares more than 8 years ago

This is compared to maintaining the current fare levels applied to both the current ridership and projected ridership associated with the implementation of year-round service, represented in the current fare columns.

Two assumptions were used in the analysis:

1. Ridership would increase at a rate of 3% per year, which is consistent with the trend of ridership growth that NRTA has been experiencing.
2. While areas that have relatively high incomes tend to have a high elasticity[32] of demand for fares, a low elasticity of demand, -10%, was applied due to the resort nature of the service, which impacts ridership projections.

A comparison of the fare and revenue impacts for each analyzed scenario is presented in Table 9. A detailed description of each scenario follows the table.

The current fare for seasonal service and for year-round service represents a baseline condition for the analysis. The assumption of the current fare for seasonal service only is modified by the 3% ridership growth and associated additional fare revenue. The four scenarios include projections for both ridership and revenue.

[32] The amount of effect a service or fare change is projected to have on ridership over a certain period of time. Elasticity is a measure of sensitivity of demand relative to a variable of change (a fare increase in this case). A positive elasticity projects an increase in demand (ridership), and a negative elasticity projects a decrease in demand (ridership). Average elasticities based on specific type of changes in specific types of environments from nationwide examples are used to estimate projected changes in ridership.

Table 9: Comparison of Total Ridership and Revenue Associated with Potential Fare Change Sample Scenarios

	Seasonal Service		Year-Round Service							
	Current Fare Policy		Current Fare Policy		Fare Changes Every Other Year		Fare Changes Every 5 Years		Fare Changes Every 10 Years	
	Total Ridership*	Total Revenue	Total Ridership	Total Revenue	Total Ridership	Total Revenue	Total Ridership	Total Revenue	Total Ridership	Total Revenue
Year 1	296,285	$405,000	432,618	$592,687	428,517	$644,327	411,713	$844,011	381,950	$1,149,671
Year 2	305,174	$418,088	445,597	$610,467	441,373	$663,657	424,064	$869,331	393,409	$1,184,161
Year 3	314,329	$430,630	458,964	$628,781	435,774	$744,589	436,786	$895,411	405,211	$1,219,686
Year 4	323,759	$443,549	472,733	$647,645	448,847	$766,927	449,890	$922,274	417,367	$1,256,276
Year 5	333,471	$456,856	486,915	$667,074	440,760	$903,730	437,217	$1,193,602	429,889	$1,293,964
Year 6	343,476	$470,561	501,523	$687,086	453,983	$930,842	450,333	$1,229,410	442,785	$1,332,783
Year 7	353,780	$484,678	516,569	$707,699	496,311	$1,017,631	463,843	$1,266,292	456,069	$1,372,767
Year 8	364,393	$499,219	532,066	$728,930	488,734	$1,169,111	477,758	$1,304,281	469,751	$1,413,950
Year 9	375,325	$514,195	548,028	$750,798	503,396	$1,204,184	492,091	$1,343,409	483,843	$1,456,368
Year 10	386,585	$529,621	564,468	$773,322	496,728	$1,357,982	481,276	$1,645,964	452,628	$2,720,292
10 Year Change	**30.48%**	**30.77%**	**30.48%**	**30.48%**	**15.92%**	**110.76%**	**16.90%**	**95.02%**	**18.50%**	**136.61%**

1. Year Round Service – Current Fare Policy

This scenario represents maintaining the existing fare policy but extending service to year round. There would be no increase to fares. The impacts are:

- For year-round service with the current fare, the projection of additional riders is based on the findings from Phase I of the Year Round Bus Service Study and projected to grow by 3% per year.
- Adding year-round bus service in year 1 will generate $592,687 in fare revenue compared to the projected $405,000 which is an increase of $187,687.
- By year 10 the difference in fare revenue grows to $243,701.

Additional fare Revenue Year 1 = $187,687

2. Year Round Service – Fare Changes Every Other Year

The first fare change scenario is to have **small fare changes, roughly 10%, every other year**. The 3% ridership growth per year would be applied, as well as the fare elasticity for each year that a fare change is implemented. Fare changes would be implemented in years 1, 3, 5, 7, and 9. The impacts are:

- In year 1 NRTA would collect $644,327 in fare revenue and by year 10 NRTA would collect $1,357,982 in fare revenue.
- The year 1 fare revenue increase is $239,327 more than not operating year-round service and $51,641 more than not having a fare change associated with the addition of year-round service.
- By year 10 the fare revenue difference is $808,361 over not operating year-round service and $584,661 more than not having a fare change associated with the addition of year-round service.

Additional fare Revenue Year 1 = $239,327

3. Year Round Service – Fare Changes Every 5 Years

The scenario where **fares are changed every five years has fares being raised by 50% in years 1, 5, and 10**. The 3% ridership growth per year would be applied, as well as the fare elasticity for each year that a fare change is implemented.

- In year 1 $998,387 is raised in fare revenue which grows to $1,947,024 in year 10.
- This represents an increase in year 1 fare revenue of $580,299 over not operating year-round service and $297,293 over not having a fare change associated with the addition of year-round service.
- By year 10 the fare impacts are that this fare option increases fare revenue by $1,401,515 compared to not operating year-round service and $1,032,256 for not changing fares when implementing year-round service.

Additional fare Revenue Year 1 = $580,299

4. Year Round Service – Fare Changes Every 10 Years

The scenario where **fares are changed every 10 years has fares doubling in year 1 and year 10**. The 3% ridership growth per year would be applied, as well as the fare elasticity for each year that a fare change is implemented.

- This scenario results in fare revenue increasing to $1,359,955 in year 1 and $3,217,855 by year 10.
- In year 1 this represents a fare revenue increase of $941,867 compared to not operating year-round service and $658,861 over not having a fare change associated with operating year-round service.
- By year 10 the revenue change is $2,672,345 more than not operating year-round service and $2,303,086 more than not having a fare policy change associated with operating year-round service.

Additional fare Revenue Year 1 = $941,867

Recommended Fare Policy

The recommended fare policy and fare level change is presented in this section. The findings of this analysis, combined with the consultation with the study advisory committee and the NRTA Advisory Board led to the development of these recommendations. The recommended fare policy does not match any of the scenarios presented in Table 9; rather it combines certain elements to create a distinct fare policy. In terms of fare policy, **the current fare and transfer policy should remain as it is today. While the fare policy is to remain unchanged, some fare level changes are recommended.**

Over the 10 years that this study analyzed there would be three fare changes:

- In year 1, the fare will change by 100%,
- In year 5, the fare will change by 50%, and
- In year 10, the fare will change by 50%.

This will establish a pattern of fare changes every five years. Table 10 presents the fare levels for each year a fare change is implemented.

Table 10: Recommended Fare Levels over 10 Years

Fares	Current	Year 1 Change	Year 5 Change	Year 10 Change
All Routes Adult Cash Fare	$1.00/$2.00	$2.00/$4.00	$3.00/$5.50	$4.50/$8.00
Seniors 65 & Older Cash	Half Fare	Half Fare	Half Fare	Half Fare
Individuals with Disability Cash	Half Fare	Half Fare	Half Fare	Half Fare
Veterans and Active Military Personnel Cash	Half Fare	Half Fare	Half Fare	Half Fare
6 & under Cash	Free	Free	Free	Free
Short Term Passes				
1-day	$7	$10	$14	$20
3-day	$12	$20	$28	$40
7-day	$20	$30	$44	$60
Season Passes				
Season	$90	$150.00	$225.00	$325.00
Commuter (business purchased)	$80	$140.00	$200.00	$300.00
Student	$50/$80	$140.00	$200.00	$300.00
Disabled	$50	$75.00	$110.00	$162.50
Veteran and Active Military Personnel	$50	$75.00	$110.00	$162.50
31-day	$50	$95.00	$135.00	$200.00

The ridership and revenue impacts of the fare level changes are presented in Table 11. Since these are based on actual fare structure which differ from the generalized scenarios analyzed, these are more refined than what was previously presented in Table 9.

Projections are based on maintaining the current fare payment characteristics and applying the elasticities and background growth to each fare type. **A -25% elasticity was used for the recommended fare policy which is more consistent with rural areas throughout the country. This provides a more conservative estimate for ridership and fare revenue for year-round service.** Also, the ridership and revenue figures are based on a recommendation that is a variation of the scenarios presented in Table 9. Table 13 shows the difference based on the current projections, without year-round service, and the proposed fare payment levels.

This table shows that raising fares and adding year-round service increases revenue by $562,243 in year 1 based on refinements to fares by fare type. By year 10, the difference in revenue is $1,264,396.

Table 11: Ridership and Revenue Impacts of the Recommended Fare Policy

	Current Service		Proposed Year-Round Service		Difference	
	Ridership	Revenue	Ridership	Revenue	**Ridership**	**Revenue**
Year 1	309,793	$429,576	346,376	$903,122	**36,583**	**$473,546**
Year 2	319,087	$442,463	382,382	$997,001	**63,295**	**$554,538**
Year 3	328,660	$455,737	412,215	$1,074,786	**83,555**	**$619,049**
Year 4	338,520	$469,409	424,581	$1,107,030	**86,062**	**$637,620**
Year 5	348,675	$483,491	437,319	$1,140,241	**88,643**	**$656,749**
Year 6	359,135	$497,996	450,438	$1,431,891	**91,303**	**$933,895**
Year 7	369,910	$512,936	433,374	$1,474,848	**63,465**	**$961,912**
Year 8	381,007	$528,324	446,376	$1,519,093	**65,369**	**$990,769**
Year 9	392,437	$544,174	459,767	$1,564,666	**67,330**	**$1,020,492**
Year 10	404,210	$560,499	473,560	$1,611,606	**69,350**	**$1,051,107**

FARE COLLECTION TECHNOLOGY OPTIONS

Within the past decade advances in technology have resulted in an increasing number of transit fare collection options. These options include contactless smart cards (CSC), open payments with bank-issued credit cards, mobile payments, and wearables. This chapter reviews the benefits to advanced fare collection technology, an overview of how each works, surveys among transit providers regarding their experiences with advanced fare collection technology, and interviews with vendors of the technology. A review of each system that has deployed advanced electronic fare technology shows that robust marketing campaigns and branding were vital to promoting the use of the technology. Many systems even created promotional and instructional videos.

Figure 3: Map of Providers with Advanced Fare Technology

Benefits of Advanced Fare Collection Technology

There are a wide range of benefits for both operators and passengers associated with advanced fare technology. Operational benefits are: decreased dwell time, dynamic fares, improved data collection, fare integration, improved revenue accountability, and cost savings[33,34,35]. For passengers the benefits include: choices amongst purchasing fares, convenience, balance protection, potential reduced fares and no longer needing to carry cash.

Operational Benefits

- **Decreased dwell** time results from faster boardings with advanced fare technology which can speed up service and keep routes with tight schedules on time.
- Advanced fare technology allows for **dynamic fare structures.** Agencies can charge distance based fares, by requiring passengers to tap on and off the bus with their fare media.
- Advanced fare technology automatically counts the passenger type. This coupled with geo-locating the farebox can provide **improved data collection**. Providers can use this data to monitor trip patterns, conduct strategic planning, perform travel modeling, adjust schedules and set fare structures.

Operational Benefits

- Decreased dwell time/improved schedule adherance
- Dynamic Fares
- Improved data collection
- Fare integration
- Improved Revneue Accountabilty
- Cost savings

Passenger Benefits

- Choices amongst purchasing fares
- Convience
- Balance protection
- Potential reduced fares
- Do not need to carry cash

[33] Source: http://transitleadership.org/docs/TLS-WP-Fare-Collection-and-Fare-Policy.pdf

[34] TCRP Report 177: Preliminary Strategic Analysis of Next Generation Fare Payment Systems for Public Transportation 2015

[35] TCRP Report 10C – Chapter 6: http://www.tcrponline.org/PDFDocuments/TCRP%20RPT%2010-C.pdf

- Electronic fares can lead toward a regional **fare integration** which allows for a single smart card or mobile application to be used by multiple transit operators. The TAP card in Los Angeles County is an example of regional fare integration: the smart card can be used on 24 different transit systems in the county. Nationwide there are 12 fare integration programs covering 107 transit agencies.

- Collecting cash fares requires a labor intensive counting process. **Improved revenue accountability** and security is a result of the ability to track transactions and the mishandling of fares.

- While there is a significant capital cost associated with upgrading any fare system, advanced fare technology can result in a **lower operating cost**. Washington DC found that the cost associated with collecting cash fares was twice the cost of collecting advanced fare technology fares ($0.10 vs $0.05 for every dollar collected)[36]. Magnetic strip readers and conventional fareboxes require more maintenance than advanced fare technology collection since they are mechanical with more moving parts.

Passenger Benefits

- **Convenience** occurs when passengers longer need exact change and providers do not need to issue change cards. The need to **no longer have to carry cash** is an additional passenger benefit

- Passengers can manage their account online and link a debit or credit card to their account. By managing their account online passengers are given **balance protection**, if the card is lost or stolen a new card (for a fee) can be issued and the balance from the account applied.

- **Reduced fares** arise when systems provide discounted fares as an incentive for paying the fare with certain fares. A survey of 153 providers in the United States that use advanced fare technology found that 10% offered a reduced fare as an incentive to use it.

Technologies

Three technologies will be explored for this study: contactless smart cards, contactless enabled bank cards or open payment systems and mobile payments. Each description includes: an overview of the technology, the deployment of the technology in the US, the compatibility with existing NRTA fare collection technology, and the procs and cons to each.

[36] Source: http://transitleadership.org/docs/TLS-WP-Fare-Collection-and-Fare-Policy.pdf

Contactless Smart Cards

Contactless smart cards are hard plastic cards, roughly the size of a credit card, enabled with a microchip or radio frequency identification (RFID) technology that allows the user to simply tap the card on a reader[37]. Special smart card readers are required on board each vehicle in order to process fares. The readers can be installed at one or all vehicle entrances and can be integrated with the mechanical farebox or as standalone units. All smart card technology conforms to ISO/IE standards. To upgrade to allow the use of contactless smart cards, NRTA would need to procure new mechanical fareboxes. The GFI Genfare Odyssey fareboxes installed in 2002 most likely do not have the correct controller box that would enable NRTA to upgrade the fareboxes[38]. An alternative would be a standalone unit in addition to the existing farebox such as the Genfare Fast Fare-e[39] or procuring new fareboxes. The Fast Fare-e can communicate with the existing farebox. Any upgrade to the farebox would require adding on a cloud-based host system[40].

Figure 4: Contactless Smart Card Example

The London Underground was the first system to install contactless smart cards in 1991. In the United States the first contactless smart card was piloted in 1995 by the Washington Metropolitan Area Transit Authority (WMATA) and fully deployed by 1999. To date 128 transit providers in the US use or are in the process of deploying the technology (Figure 5). Many systems have partnered in deploying the technology; nationwide there are 31 different smart card systems deployed.

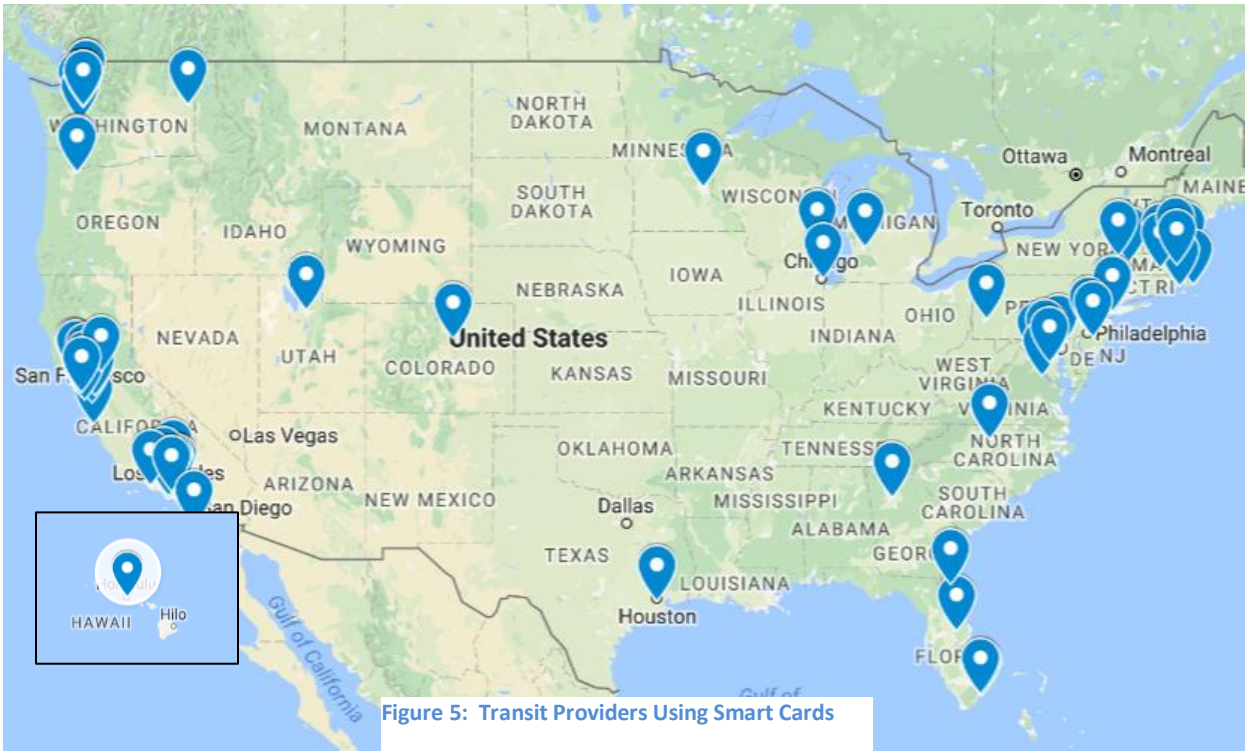


Figure 5: Transit Providers Using Smart Cards

[40] Genfare estimates the cost for the cloud based host system to be $250,000 plus $2,000 to $4,000 a month to host the back end of the office cloud.

Table 12: Pros and Cons of Smart Cards

Smart Card Benefits	Smart Card Cons
1. Cards are durable 2. Closed system allows for enhanced data collection 3. Reloadable 4. Balance protection 5. Dynamic fare structure 6. Decreased farebox maintenance 7. Faster boarding time 8. Improved schedule adherence 9. High life cycle, cards can last up to 10 years 10. Incentives for technology use	1. Higher capital cost (TVM, fareboxes, readers) 2. Back end system needed to manage accounts (closed system) 3. Higher per unit cost for card, typically passed on to the passenger (average is $2.00) 4. Open systems do not have enhanced data collection

There are two types of contactless smart cards: open and closed. Closed systems can be either account-based or card-based[41] but in both cases the transit system has its own fare media and accounting network for the card. Users must load funds onto the card and it can only be used for that network. An open system allows for the direct payment from a credit card. A debit/credit card can be linked to a smart card and funds are automatically withdrawn from the account with each transaction. Most systems in the United States are closed systems.

The unique benefits of a smart card include account management, automatic loading, card registration, and fare capping. Individuals can register a card, create an account, and load values onto the card. Automatic loading can be set up to automatically load values onto the cards from a bank account when the balance reaches a certain level. Cards can be registered with the provider, which provides balance protection if the card is lost. Fare capping can be instituted and is common in Europe. Fare capping guarantees that an individual will not pay more than the lowest fare for any period of time. For example, if a day pass is $7 and each individual trip is $2, if a passenger uses their smart card (and fare capping is instituted) four or more times in one day the maximum that they would pay is $7 the cost of a one-day pass. If they take fewer than four trips then they are charged the price of the individual trips. This gives the passenger the benefit of purchasing a longer term pass without having to pay for it all at once.

The capital cost for smart card technology is higher than registering fareboxes. In addition to fareboxes, backend systems are needed for managing the data and for passengers to manage their account. On board communication equipment is also needed to transfer the fare collection information back to the central processing unit. Unlike the magnetic stripe technology, where passengers can purchase passes on board, smart cards require ticket vending machines (TVMs) where cards can be purchased and value added. The per unit cost for smart cards are higher than magnetic stripe cards but the life cycle cost is lower because a smart card is reloadable and can be reused. Often the cost is passed onto the passengers. In the United States the cost of a card to the passenger ranges from $0 to $5.00; 10% are free and the average cost is $2.00.

[41] Card based systems – the stored value resides on the card. Account based system – the stored value resides in the back office database. From: http://www.apta.com/mc/fctt/previous/2011fare/program/Presentations/Account%20Based%20Systems_A%20road%20to%20open%20Payments.pdf

Contactless Enabled Bank Cards

Contactless enabled bank cards (open payment systems) work similarly to contactless smart cards but instead of a closed loop card that can be used at only one vendor, a debit or credit card is used. The cards are equipped with RFID chips and the user taps the card onto the reader when boarding. The reader then sends a request to authorize the transaction to the merchant (transit agency) which forwards it to a financial institution (the bank that issued the card). The financial institution performs a series of checks and either authorizes or denies the transaction[42] (Figure 6[43]). To be able to accept contactless enabled bank cards, NRTA would need to upgrade the fareboxes with a controller box that allows for use of the technology or procure new fareboxes or standalone units.

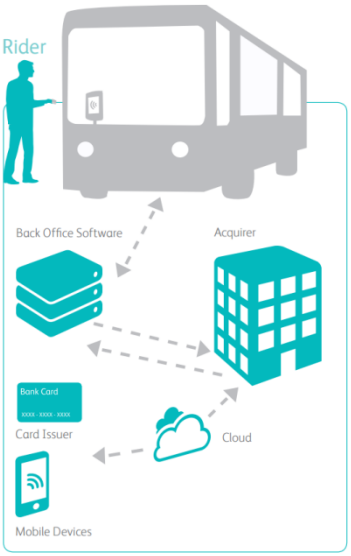


Figure 6: Transit Open Payment System Process Diagram

The first open payment system in the United States was piloted by the New York MTA in 2006 at 30 subway stations along the Lexington Line[44] in partnership with MasterCard and Citibank. The pilot was deemed a success and a second pilot was instituted in 2010 and expanded to MTA buses, NJ Transit buses, and turnstiles at the New York Port Authority ferries and the Port Authority Trans Hudson train system[45]. This time all cards that were contactless enabled were accepted. NJ transit installed the technology on a handful of routes; it is still installed and active today. The second pilot was also deemed a success and in 2013 MTA announced that they will eventually migrate to open source payments. In the spring of 2016 the MTA issued an RFP for a contactless open bank card payment system.

Since the initial pilot by the MTA, three systems have deployed the technology, three are currently in the process of installing it, and two did a demonstration project. The Utah Transit Authority (UTA) was the first in the US to fully deploy open payment systems in conjunction with contactless smart cards followed by New Jersey Transit in 2010 and Chicago Transit Authority in 2013. In addition to accepting contactless bank cards two of the providers with the technology also accept payment using mobile bank cards with NFC technology, Android Pay, Apply Pay, Samsung Pay and Google Wallet. The Southeastern Pennsylvania Transportation Authority (SEPTA), Tri-county Metropolitan Transportation District of Oregon (TriMET) and the Dallas Area Rapid Transit (DART) are in the process of installing, testing and deploying the technology. The Washington Metropolitan Area Transit Authority (WMATA) decided not to implement it due to lack of interest and cost overruns. Port Authority Transit Corporation (PATCO) considered the pilot program but since the processing costs were high did not continue the program.

[42] http://www.smartcardalliance.org/resources/pdf/Open_Payments_WP_110811.pdf

[43] Figure from https://www.xerox.com/downloads/services/infographic/public-transport-open-payments.pdf

[44] http://www.smartcardalliance.org/resources/pdf/Open_Payments_WP_110811.pdf

[45] https://www.firstdata.com/downloads/thought-leadership/transit-payment-systems_wp.pdf

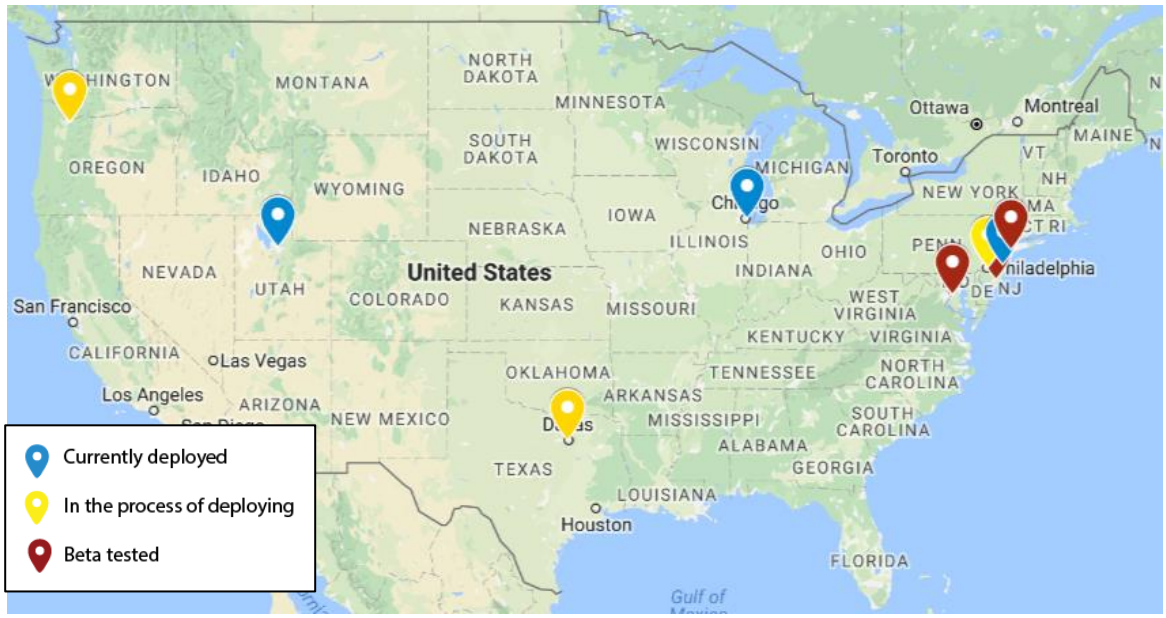


Figure 7: Transit Providers Who Have Used Contactless Enabled Credit Cards

The advantages to open fares are: direct fare payment enables the transit agency to capitalize on the expertise of financial institutions and payments industry, reduced queuing at stations, interoperability, ease of use for visitors, and reduced capital costs compared to contactless smart cards. In an open payment system the fares are processed by a third party financial system reducing the transit provider's role in processing fares. By removing this task there is an increase in operational efficiency because the transit agency no longer needs to procure, encode, secure and distribute proprietary cards[46]. Users no longer need to carry a specific card for transit and can use the same bank card to purchase their transit fare and coffee. This is a large benefit in areas where a high percentage of the passengers are tourists or short-term users. The UTA tested their open payment system on the ski routes for this reason. By reducing or eliminating smart cards the capital cost for ticket vending machines and procuring cards is reduced.

The challenges to open fares are: market penetration, unbanked populations, fares cannot be processed in real time efficiently, micro payments, and additional equipment may be needed to process the fares. Contactless credit cards did not catch on as much as originally thought in the US, and as of 2013 only 2% of retailers offered contactless payment. In the United Kingdom the technology is much more widespread and in 2016 92.1 million contactless cards were issued[47] compared to 17 million cards issued since 2005 in the United States[48]. There is an equity concern regarding unbanked populations, those who do not have a credit card or bank account, who are unable to take advantage of the technology. According to the FDIC 8.2% of the population is unbanked. Open payments are typically not processed in real-time due to the transaction speed. Without-real time payments there is no way to determine if a card is valid but the transit provider can keep a list of denied transactions and prevent those cards from being used. With each fare transaction, a payment must be made to the network bank/financial network processing the transaction. Transit agencies could potentially lose a small percentage of fare revenue to transaction fees.

[46] https://www.xerox.com/downloads/services/white-paper/open-payment-fare-systems.pdf

[47] http://www.theukcardsassociation.org.uk/contactless_contactless_statistics/

[48] according to the Smart Card Alliance

Table 13: Pros and Cons of Open Payments

Open Payments Benefits	Open Payments Cons
1. One card system 2. Easy for visitors 3. Capitalize on financial institutions/payment industry expertise 4. No TVM needed 5. No cost associated with card manufacturers 6. Decreased farebox maintenance 7. Faster boarding time 8. Improved schedule adherence, decreased dwell time 9. Incentives for technology use	1. Capital equipment for fare processing engine 2. Contactless cards have not caught on in the US 3. Lack of real-time processing 4. Unbanked populations 5. Fees for micro payment 6. Open systems do not have enhanced data collection

Mobile Payments

With mobile payments the smartphones operate as a smart card and can store multiple passes and fare types. The user downloads the application onto their phone, creates an account, selects a transit pass/fare, enters in payment information, the phone processes the payment in real-time using cellular or wireless communications and the pass is produced on their phone. Mobile payment technology is relatively new in the US[49] but is growing quickly with the widespread use of the smartphone. According to the Pew Research Center, 68% of adults in the US have a smartphone as of 2015[50]. Mobile fare payments were first introduced in 2012 by the NY Waterway Ferry system then by the Massachusetts Bay Transportation Authority (MBTA) for use on the commuter rail and ferry. The tri-county Metropolitan District of Oregon (TriMet) was the first to deploy mobile ticketing system-wide in 2013. Today there are 36 transit providers in the US offering fare mobile payments and 10 more in development (Figure 8).

[49] The modern touchscreen smartphone was first released in 2007

[50] http://www.pewinternet.org/2015/10/29/technology-device-ownership-2015/

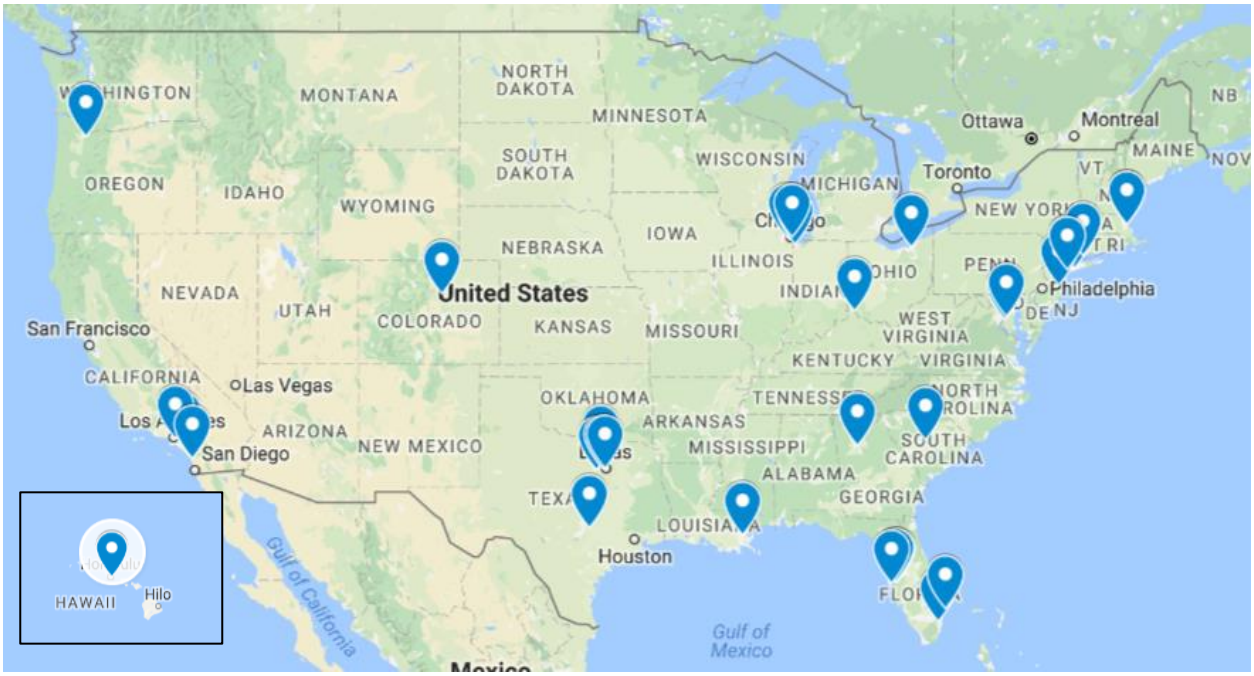


Figure 8: Providers Who Use Mobile Payments

There are three types of mobile payment technology. Visual validation is the first and simplest form. The passenger activates the ticket and shows it to the operator who validates through visual inspection that it is an active ticket. Many of the mobile technology providers have built in security features such as animation, color schemes and tactile detection so that the operator can simply glance at the ticket. Visual validation does not require additional onboard equipment, or real time communication between the vehicle and a back end accounting system, which makes visual validation the least expensive electronic fare technology to implement. The operator uses the existing farebox to manually count passengers. The major drawback to visual validation is the lack of data collection on how the mobile tickets are being used[51]. The NRTA could implement visual validation mobile payments without having to install new or additional farebox equipment. In the US the majority of transit systems with mobile technology use visual validation.

Figure 9: Security Feature for TriMET Visual Validation. The Screen Changes Color When Touched

[51] http://www.dot.state.fl.us/transit/Pages/FinalReportMobileFarePayment20160331.pdf

The second type of mobile payment technology is utilizing 2D barcode scanner technology and QR codes to pay fares. The passenger places their phone, with the screen on and barcode up, under the scanner which validates the ticket[52]. This removes the operator from the process but requires the installation of scanning devices on-board. As with smart cards, to implement this technology NRTA would need to upgrade the fareboxes with a controller box that accepts the technology, or procure new fareboxes or standalone units. Barcode scanning is considered to take slightly longer to process each transaction as opposed to visual validation because it does require communication between the phone, scanner and back end system but it does collect significantly more data. In the US 10 systems use barcode scanners for mobile technology, many use it in conjunction with visual validation.

Figure 10: Capital Metro Mobile Barcode Scanner

Figure 11: Mobile NFC Technology Deployed in Russia

The third mobile payment type is proximity validation using either Near Field Communication[53] (NFC) or Bluetooth Low-Energy (BLE)[54]. With NFC technology the passenger taps their phone on the reader when boarding, similar to a smart card. It is quicker than scanning technology and collects the same data. For NFC to work phones must have the technology; Android and Apple phones only began installing it in 2014. NFC for specific transit agency mobile payment apps is not used in the US because developers are unable to accommodate IPhone users; Apple has locked the technology. Providers such as the Chicago Transit Authority, who have open payment systems, can accept NFC using Apple Pay or Android Pay. BLE is an emerging technology and can be detected up to 10 meters away. Users would no longer need to take the device out of their pocket and data could be collected for boardings and alightings. This technology for transit is still in development and yet to be deployed by a transit agency worldwide but is being tested by Unwire in Denmark.

The benefits and cons to mobile technology can depend on the type of technology deployed but all three do not require procuring ticket vending machines or manufacturing and distributing cards. Mobile technology provides balance protection, has the potential to integrate with other applications, allows a single user to purchase multiple tickets/passes on one device, produces faster boarding times than magnetic stripe or cash and has broad customer accessibility. The disadvantages to mobile technology are most are closed systems and require back end systems to manage the accounts/applications, barcode scanners and NFC require investments in onboard equipment, the transit system must have cell coverage across all of their system, if the battery dies on a phone the payment method is no longer valid, foreign phones may not always get service or work, and not all of the population has a smart phone.

[52] Developers have created encrypted 2d technology to prevent fraud through still images of barcodes.

[53] NFC is a wireless communication technology that allows devices which are a few centimeters apart to exchange data. BLE is similar to blue tooth technology but is energy efficient and always running in the background resulting in instant detection.

[54] http://nmotion2015.com/wp-content/uploads/2015/12/nMotion-Fare-Technology_151120_FINAL.pdf

Table 14: Pros and Cons of Mobile Payment

Mobile Payment Benefits	Mobile Payment Cons
1. No cost with manufacturing cards 2. No TVM 3. No additional on board equipment needed with visual validation 4. Ability to integrate with other Apps 5. Balance protection 6. Multiple tickets and passes in a single purchase 7. Decreased farebox maintenance 8. Faster boarding time 9. Improved schedule adherence, decreased dwell time 10. Incentives for technology use 11. Broad customer accessibility	1. Back end system needed to manage accounts/app (closed system) 2. Barcode or NFC tickets require a more costly reader that a smart card reader 3. Requires 100% cell phone coverage of system 4. If the phone battery runs out, the mobile ticket is unusable 5. Foreign phones may not work/get service 6. Not all people own a cell phone

Peer Survey

A peer survey was conducted by reaching out to 86 providers with advanced fare payment technologies; 17 providers responded. The providers were sent a link to a survey with 12 questions regarding their experience with the technology. The results of the survey are presented below.

1. What is the name of your transit agency?

In order to understand the geographical distribution of the respondents the name of the transit agency was required. Figure 12 displays the geographical distribution of responses. As mentioned above, 17 of the 86 providers, almost 20%, contacted responded to the survey. A complete list of responders can be found in Appendix B.

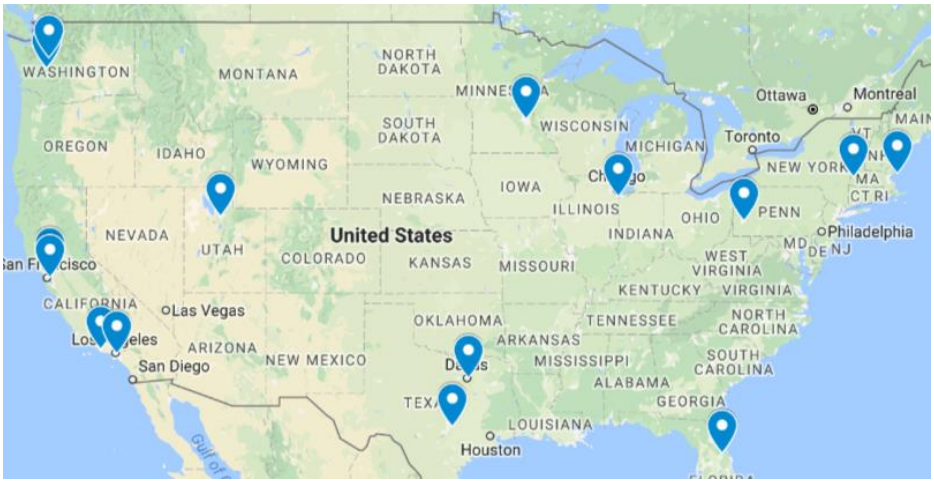


Figure 12: Map of Survey Respondents

2. What fare technologies do you currently accept?

Respondents were asked which type of fare technology they currently utilize and were allowed to select more than one response. Almost all (94.1%) indicated that they had Contactless Smart Cards (Figure

13**Error! Reference source not found.**). The least common technology was contactless enabled credit cards; only two providers use this technology. Responses in the "other" category included magnetic stripe cards, limited use smart cards (paper one time tickets with RFID chips), and visual passes for mobile tickets for those transferring from another system.

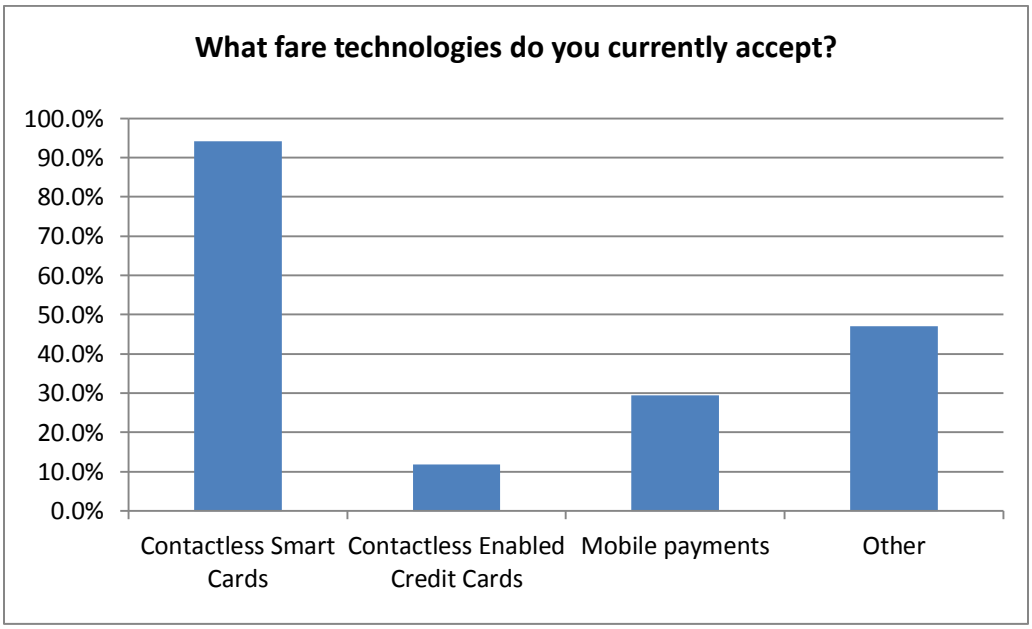


Figure 13: Fare Technology Utilization

3. What prompted your agency to invest in advanced fare technology?

To understand the catalyst behind implementing advanced fare payment technologies the providers were asked what prompted them to invest in the technology. Eight main themes were found among the responses (Table 15). The most common reason for implementing advanced fare technology was a regional initiative to create one seamless fare media amongst multiple providers. Many providers also implemented it to improve the customer experience by providing choices amongst how the fare can be paid, convenience, and adding a "coolness" factor to transit in hopes of increasing ridership.

Theme	Number of Respondents
1. Regional initiative	9
2. Desire to keep pace with technology	2
3. New transit system	1
4. Collect better data	4
5. Better the customer experience	6
6. Improve accountability/security	3
7. Reduce cash handling	3
8. Attract new riders	1

Table 15: Why Providers Implemented Fare Technology

4. What was the timeline between when your agency began thinking about implementing advanced fare technology and when it was deployed?

The timeline between when the agencies first began discussing implementing advanced fare technologies and when the technology was implemented varied greatly between a little under a year to up to 12 years. The average was five years. Those that implemented smart cards as part of a regional system found that it took longer to deploy the technology. This is due to the coordination involved, multiple parties, and installation of new capital equipment. Those that were not implementing smart cards as a regional initiative but individually were able to do so within 1-3 years. Systems that added mobile payments as an option in their existing fare media library were able to do so within a year. This included an RFP, competitive bid process, and beta testing period.

5. Approximately how long did it take to install the technology? How long did you test it for?

Installation and testing of the technology for many of the providers took between two and three years for contactless smart cards. For those that were part of a regional initiative and not one of the first to transition to the new technology the process was much quicker because the testing and programing on the vendor's side was complete. In some instances the on board/station equipment was installed relatively quickly (less than 6 months) but the back-office technology is continually being developed. As the technology is becoming more and more widespread the installation and testing time is decreasing. Providers suggested that standard smart card implementation should take no longer than a year. With mobile payments that used visual validation there was little to no installation time needed.

6. Have there been any unforeseen issues with the technology? If yes, please describe them.

Ten themes of unforeseen issues emerged with the technology. The most common issue found was with proprietary software and hardware related to contactless smart cards. Respondents indicated that they had difficulty integrating the fare payment system into their other systems (back end management, AVL systems, reconciliation, and others). Systems that were proprietary became difficult to repair because parts were hard to get, they could not be purchased through regular channels. In some instances the fare collection systems became obsolete as new systems by the vendor were introduced and upgrades were pricey. This made procuring parts and maintaining the fare collection systems even harder. The largest unforeseen issues related to customers were the complaints regarding the lag time between loading a smart card online and the balance on their card increasing. Respondents reported 24-72 hours of lag time. To counteract this issue, many providers installed numerous ticket vending machines that allowed for the cards to be updated in real time. For three respondents the smart card technology did not originally meet the

Theme	Number of Respondents
1. Proprietary System/Equipment Repairs and Parts	7
2. High Clearinghouse Costs	1
3. Lag Time for Purchases	3
4. Pricey to Update	2
5. Fraud	1
6. Mobile Technology is Constantly Evolving	2
7. Issues with Vendors	2
8. Lack of Universal Adoption of Contactless Bank Cards	1
9. Challenges With Real Time Communications/Cellular Coverage	2
10. Technology Did Not Originally Meet Requirements	3

Table 16: Unforeseen Issues With Technology

provider's needs and was expensive to customize or in the case of SolTrans (the Clipper Card) was not able to be customized due to the technology's limitations[55].

Fewer issues were reported with mobile technology. The biggest issues were lack of cellular coverage in certain areas, which renders the technology unusable, and the constant evolution of phones. Mobile technology is constantly evolving resulting in the need for several upgrades and new releases of the mobile application.

7. What have been the greatest benefits to your agency after deploying the technology?

Theme	Number of Respondents
1. Improved data collection has led to better planning	5
2. Increases customer satisfaction	6
3. Interoperability	3
4. Simplifying on-board equipment	2
5. Reduced cash handling	3
6. Increased efficiency in fare collection	1
7. Improved boarding speeds	3
8. Decreased slippage and theft	1

Table 17: Technology Benefits Reported by Providers

Eight benefits to advanced fare technology were identified by the respondents. Increased customer satisfaction was the top benefit reported; this came primarily from those with a contactless smart card system. The second largest benefit identified was improved data collection. This was identified by those implementing any or all of the three technology types (smart card, mobile, open bank card). The data allows informed service planning, resolution of customer service issues, and improved marketing. UTA, which uses tap on and tap off smart card technology has used the data to drive negotiations with third party partners that contribute funding. By transitioning to electronic fare payments providers were able to reduce the amount of time spent manually counting money. AC Transit reported that the operators liked not having to deal with cash; it decreased the dwell time.

8. What has the public's response been to the technology?

Overall the public's response to the technology was positive. Sixty-five percent of respondents indicated overwhelming positive response from the public, 29% a neutral response and six percent a negative response. Those that reported a neutral response stated both positive and negative responses from the public. The negative responses included lack of adoption by riders, lag time for loading value online, lack of retail locations, and the replacement of damaged cards. Several respondents stated that a robust public education and marketing campaign is very important. One respondent indicated a negative public response; the public was very reluctant to adopt the technology.

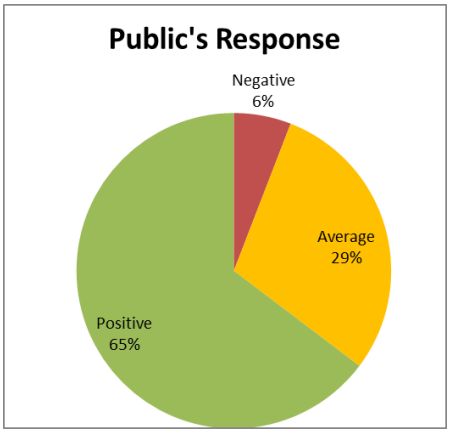


Figure 14: Public Response to Technology

[55] Soltrans charges a different fare for different routes and the technology (ERG Group) was programmed for standard fares only. Two respondents cited the number one issue was with the vendor. They reported vendor delays, unresponsiveness and other difficulties. Both respondents have smart card technology designed and installed by ERG Group (now Vix Transportation).

9. What percent of your ridership uses the technology to pay fares?

Agencies reported between 13% and 80% of riders using the advanced fare technology to pay fares, with the average being 49.5% of passengers using the technology. The top three respondents were: the Port Authority of Allegheny County (83%), Berkshire Regional Transit Authority (BRTA) (80%) and Los Angeles County Metropolitan Transportation Authority (LACMTA) (76%), all three offer a contactless smart card. There does not appear to be a 'standard profile' amongst the top three: the systems vary in size, modes of travel and service area. LACMTA and BRTA are part of consortiums that allow the card to be used by multiple systems. LACMTA has an established system implemented in 2007, BRTA was the last to adopt the Charlie card in 2014, and the Port Authority of Allegheny County launched their system in 2012.

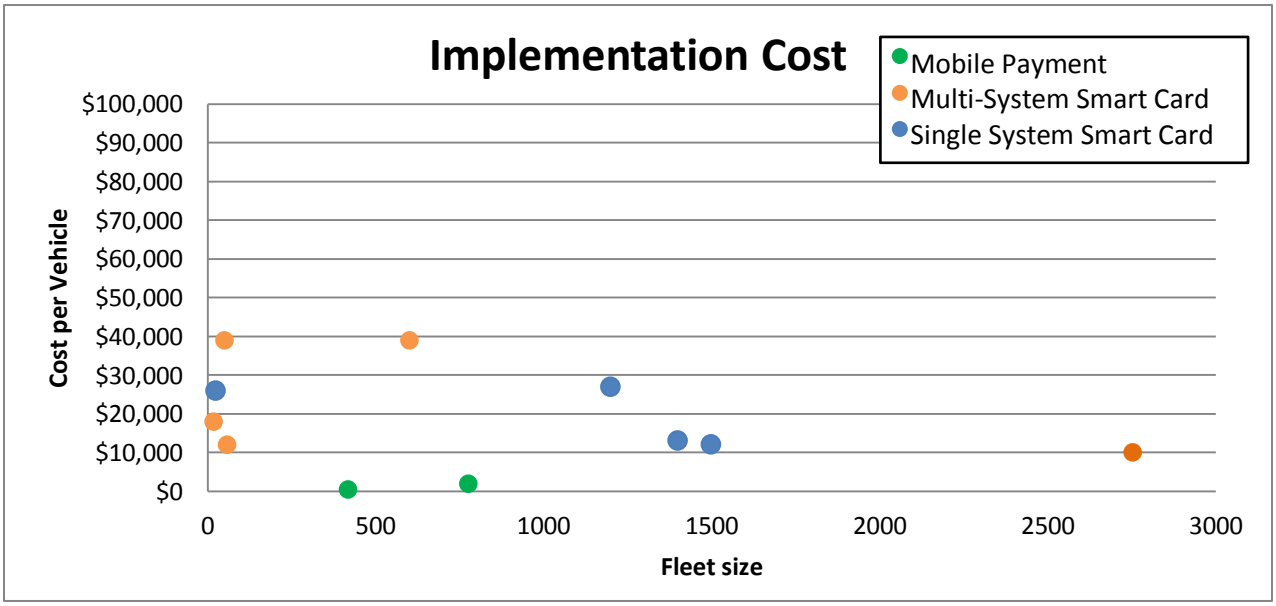
The bottom three respondents were Dallas Area Rapid Transit (DART) (20%), Western Contra Costa Transit Authority (WCCTA) (15%), and Maryland Transit Authority (MTA) (13%). DART has mobile payments, the other two have smart cards. Again, there does not appear to be a standard profile among the bottom three: the systems vary in size, modes of travel, service area, length of time the technology has been in service, and technology provider.

10. What was the overall capital cost to implement the technology and on how many vehicles?

The capital cost varied greatly amongst the respondents. Figure 13 shows the cost per vehicle based on the fleet size[56]. The cost per vehicle for contactless smart cards ranged from $10,000 to $91,000 but was typically less than $40,000. The cost per unit was typically higher when multiple systems were involved. This may be because each system has a unique fare structure and requirements so the technology must be adjusted slightly for each resulting in a cost increase. With the exception of the outlier (tap card at $91,000 per vehicle) the cost typically was lower with a larger fleet. This is because some of the costs are fixed and not dependent on fleet size. Implementing mobile payment technology is significantly less than smart cards. The two respondents who provided the cost for the mobile technology both use visual validation.

[56] Systems which only operate rail were omitted from the table. The data shown may be providers which operate other modes in addition to bus and the cost could not be separated out.

Figure 15: Capital Cost per Vehicle



11. Have there been any cost savings associated with implementing the technology?

Thirty-five percent indicated that there have been cost savings as a result of implementing the technology. The savings are associated with the reduction of fraud, reduction in staff to count cash, less fare collection costs, and fewer road calls regarding broken fareboxes. The Port Authority of Allegheny County was able to close their cash counting room and contract with Brinks to collect, count and deposit the cash. The majority (50%) stated there was no cost savings. One system, UTA, which has all three technologies, stated that their electronic fare collection system had a higher cost than other modes of collecting fares. Twelve percent were unware if the technology has resulted in cost savings.

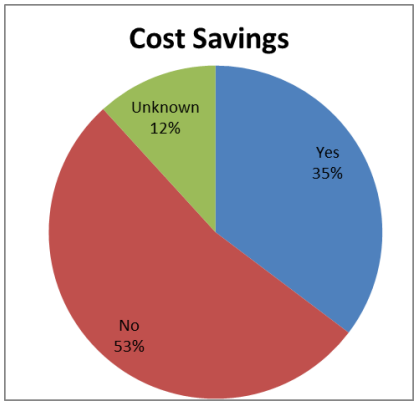


Figure 16: Cost Savings

12. What advice would you give to others looking to implement the technology?

The advice provided can be categorized into four categories. The following list provides a summary of the advice provided by the respondents in the survey:

Equipment/Vendor

- Use an account-based system with open source hardware
- Do not try to make the system too complicated
- Use vendors that are mature, accountable, transparent and agile
- Test both the hardware and software functions

RFP/Contract

- Establish a specific contract regarding the agencies needs and build in flexibility for the future
- Build into the contract technology and security upgrades
- Require that APIs be integrated with other systems

- Use performance based contracts

Outreach

- Provide marketing and outreach material to educate the public on the new technology
- Involve all stakeholders from the beginning

Policy

- Implement a simplistic fare policy
- Incentivize passengers to switch to the new fare technology
- Plan for the post implementation phase (maintenance and support, change control, disaster recovery, reporting/analytics, system performance monitoring)

Vendor Review

In order to better understand the technology itself, interviews were held with developers of mobile payment platforms[57]. Developers were asked about their mobile payment app's ability to be integrated into the existing NRTA fare network, technology capabilities, security features, real time bus app, fare reconciliation, and e-fares. Phone interviews were held with five developers (vendors) of mobile payment technology, all five have successfully deployed their technology in one or more transit systems in the United States. The five vendors interviewed were: Bytemark, CooCoo, Moovel, Xerox, and Unwire. Table 18 shows the number of transit systems that use each technology in the US as well as when it was first launched in the United States.

Table 18: Mobile Technology Deployment

	Bytemark	CooCoo	Moovel[58]	Xerox	Unwire
Number of US transit systems using the software[59]	11	6	15	1	4
Initial US launch date	2012	2013	2013	2013	2013

The key findings across the interviews can be divided into three categories. The following list provides a summary of those findings:

RFP/Contract

- Put reporting requirements into the RFP so that the developer can create report modules that can easily be run in the back office by the provider. If it can be measured it can be reported upon.
- Require the mobile technology integrate with Genfare.
- Phones are constantly evolving and the app will need to as well. Require at least one update a year as part of the contract.

[57] Interviews were not held with smart card farebox vendors as it is the assumption the current fareboxes would be used with possible upgrades.

[58] Formerly GlobeSherpa

[59] Or have a contract with the vendor and are in the process of deploying it.

Implementation and Fare Policy

- Many systems begin with visual validation and then migrate to barcode scanning. Visual validation allows the transit provider to implement mobile ticketing quicker and at a lower cost because there is no need for on board equipment. As the farebox equipment reaches its useful life it is replaced with technology that can accommodate barcode scanning.
- The mobile ticketing application will become the face of the transit agency.
- It is feasible to do distance based payments using a tap on and tap off feature with mobile payments but this drastically increases the cost to implement the technology and transit agencies and vendors have found passengers often forget to tap off if the exit is not gate controlled. Many of the vendors interviewed recommended not implementing a tap on and tap off system.
- All of the applications have a feature that allows one person to purchase and activate multiple tickets at once.
- No vendors have employed their technology exclusively on a system as small as NRTA. Small systems are usually part of a regional initiative.
- Providers have found it fairly simple to train operators on what to look for with visual validation.
- Due to NRTA's size, most vendors recommended visual validation.
- While fare capping can be done with mobile payments it is typically done only through smart cards. It is possible but would be difficult to implement.

Technology and Security

- Require that mobile applications with visual validation have multiple security fields to prevent fraudulent tickets.
- Trip planners such as Transloc can be integrated into the payment app, the easiest solution is to provide a link between the two apps. The user would be required to have both apps downloaded on their phone but could access both using one app. Many vendors have also developed their own trip planner which can be part of the mobile application. These trip planners typically rely on GTFS.
- No vendors currently have the ability to implement NFC due to the restriction with IOS. If Apple were to allow developers access to the NFC technology then many of the vendors would pursue NFC for mobile payments.
- The processing speed for mobile technology is faster than magnetic stripes and cash but providers reported a significant learning curve with passengers. Until the passengers are trained to have their phone out, ticket activated and ready to show the operator there is no improvement in boarding time.

Appendix C to this report provides a summary of the responses to questions asked during the vendor interviews.

Fare Collection Technology Recommendations

Based on the review of currently available fare collection technology, and keeping in mind the current NRTA fareboxes and operational and reporting requirements, the most appropriate fare collection technology for NRTA would be **mobile payments using visual validation**.

Implementing smart cards or open payments would require that NRTA replace fareboxes because they are more than ten years old and the controller box is most likely not capable of being retrofitted with the newer version of the Odyssey farebox. In addition to the capital cost of procuring the new fareboxes, it would require a cloud-based host system ($250,000) and at least two ticket vending machines to dispense smart cards. When the NRTA fareboxes have reached their useful life and need to be replaced, they should be replaced with ones that have barcode and NFC or BLE technology incorporated into the farebox and transition to barcode scanning on phones.

Mobile payments using visual validation does not require any additional equipment. NRTA should look to partner with other RTAs and/or the Steamship Authority to implement a regional approach to mobile ticketing. The Pioneer Valley Regional Transit Authority is exploring mobile ticketing and the Steamship Authority just instituted it. Based on the national review of fare collection technology conducted for this study, no transit system as small as NRTA has deployed mobile ticketing without being part of a regional system.

Mobile fare technology allows multiple passes to be purchased on a single phone. This can greatly increase boarding speeds of large groups as only one ticket needs to be shown. With proper marketing and advertisement about the mobile technology, a large portion of the riders could pay their fare using their phone. To encourage the use of mobile payments, an incentive should be offered such as a discounted fare. **If possible NRTA should implement fare capping so that low income individuals can take advantage of the passes.** Fare capping is used worldwide in the United Kingdom, Ireland, Australia and New Zealand. In the United States the Santa Clara Valley Transportation Authority does fare capping on day passes. CTTransit will be implementing fare capping in 2017 in conjunction with the rollout of their new smart card system for 1, 3, 5, 7 and 31-day passes. Currently fare capping is limited to smart card technology but it is anticipated that it will accommodate mobile payments shortly.

Appendix A – Peer Analysis Tables

Contactless Smart Card

Agency	City/Region	Name of Card	Open/Closed	Vendor/Te	Year Launched	Modes	Discounte	Card cost t
24 systems throughout LA County	Los Angeles County, CA	TAP	Closed	Cubic	2007	Bus and Ra	Varies	$2.00
Capital District Transportation Authority	Albany, NY	Navigator	Closed	Genfare	2015	Bus	Yes	$0.00
Chicago Transit Authority with Pace and Metra	Chicago, IL	Ventra	Open	Cubic	2013	Bus, Rail, C	No	$5.00
Greensboro Transit Authority	Greensboro, NC	GO Pass	Closed	N/A	2014	Bus	Yes	$1.00
Hillsborough Area Regional Transit Authoirity and 7 others	Central Florida	TBD	Closed	INIT	2017	Bus Rail	N/A	N/A
Honolulu Authority for Rapid Transportation	Honolulu, HI	TBD	TBD	INIT	contract awarded in April 2016	Bus, Rail	TBD	TBD
Jacksonville Transportation Authority	Jacksonville, FL	Star Card	Closed	Genfare	2012	Bus	No	$2.00
Maryland Transit Administration	Maryland	Charm Card	Closed		2010	Bus, Rail	No	$2.50
Massachusetts Bay Transportation Authority and 10 regional transit authorities	Boston, MA	Charlie Card	Closed	Sheidt & Ba	2006	Bus, Rail	Yes	$0.00
Metro Transit	Minneapolis, MN	Go to Card	Closed	Cubic	2002	Bus, Rail	Yes	$0.00
Metropolitan Atlanta Rapid Transit Authority	Atlanta, GA	Breeze	Closed	Cubic	2006	Bus, Rail	Yes	$2.00
Metropolitan Transit Authority of Harris County	Houston, TX	Q Card	Closed	Affiliated Cor	2007	Bus, Rail	No	$0.00
Miami-Dade Transit	Miami, FL	EASY Card	Closed	Cubic	2009	Bus, Rail	No	$2.00
Milwaukee County Transit System	Milwaukee, WI	M-CARD	Closed	Sheidt & Ba	2014	Bus	Yes	$2.00
Port Authority of Allegheny County	Pittsburg, PA	Connect Card	Closed	N/A	2012	Bus, Rail	No	$0.00
Port Authority of New York and New Jersey	New York, NY	SmartLink	Closed	Cubic	2007	Rail	No	$5.00
Port Authority Transit Corporation	Philadelphia, PA & Southern	Freedom	Closed	Cubic	2008	Rail	No	$5.00
Regional Transportation District	Denver, CO	MyRide	Closed	Xerox	2016	Bus, Rail	Yes	$0.00
Sacremento Regional Transit and 8 area providers	Sacremento, CA	Connect Card	Closed	INIT	2016, currently being beta tested	Bus, Rail	No	$0.00
San Diego Metropolitan Transit System and 4 area providers	San Diego, CA	Compass Card	Closed	Cubic	2008	Bus, Rail	No	$2.00
San Francisco Municipal Transportation Agency and 20 others in the area	San Francisco, CA And surrou	Clipper	Closed	ERG Group/	launched in 2002 as TransLInk rebranded in 2010	Bus, Rail, C	No	$3.00
Seattle Metropolitan Area and 7 area providers	Seattle, WA	Orca Card	Closed	ERG Trans	2009	Bus, Rail, F	No	$5.00
South Florida Regional Transportation Authroity	South Florida	EASY Card	Closed	Cubic	2010	Commuter	No	$2.00
Southeastern Pennsylvania Transportation Authority	Philadelphia, PA	SEPTA Key CARD	Open	Xerox	Currently rolling out	Bus, Rail	Yes	$4.95
Spokane Transit Authority	Spokane, WA	Go Smartcard	Closed	Genfare	2009	Bus, Paratr	No	$2.00
SunRail and Lynx	Orlando, FL	Sun Card	Closed	Xerox	2014	Commuter	No	$0.00
The Rapid	Grand Rapid, MI	TBD	Closed	INIT	contract awarded in April 2016		TBD	TBD
TriMet, Portland Streetcar, C-TRAn	Portland, OR	Hop fastpass	Closed	INIT	2017 planned roll out	Bus, Rail, C	No	$3.00
Utah Transit Authority	Salt Lake City, UT	UTA Farepay	Open	InComm	2009	Bus, Rail	Yes	$3.00
Ventura County Transportation Commission and 6 area providers	Ventura County, CA	Go Ventura	Closed	Motorola	launched contactless in 1999 and ended in 2015	Bus, Rail	N/A	N/A
Washington Metropolitan Area Transit Authority and 10 area transit providers	Washington DC	Smartrip	Closed	Cubic, then	1999	Bus, Rail	No	$2.00

Contactless Enabled Credit Card

Agency	City/Region	Vendor	Year Launched	Modes	Card types
Utah Transit Authority	Salt Lake City, UT	Vix Technology	2008	Bus, Rail, C	Visa, Mastercard, Discover, American Express
New Jersey Transit	New Jersey	Xerox	2010	Bus, AirTra	American Express, Discover, Mastercard, VISA, Google Wallet
Chicago Transit Authority	Chicago	Cubic	2013	Bus, Rail, C	Android Pay, Samsung Pay, Apple Pay, American Express, MasterCard, Discover, Visa
Southeastern Pennsylvania Transportation Authority	Philadelphia, PA	Xerox	2016	Bus, Rail, C	Visa, Mastercard, Discover, American Express
Washington Metropolitan Area Transit Authority	Washington, DC	Accenture	2015 demonstration project, lack of interest and cost overrun led to it being canceled	Rail	Visa, Mastercard, Discover, American Express
Tri-County Metropolitan Transportation District of Oregon	Portland, OR	INIT	2017	bus, rail, cc	Android Pay, Samsung Pay, Apple Pay, American Express, MasterCard, Discover, Visa
Dallas Area Rapid Transit	Dallas, TX	Vix technology	2017	Bus, Rail, C	Visa, Mastercard, Discover, American Express
MTA	New York, NY	MAsterCard Worldwide	2010 Demonstration projec	Rail	Master Cards
Port Authority Transit Corporation	Philadelphia, PA & Sc	Cubic	pilot 2011-2012	Rail	Visa, Mastercard, Discover, American Express, and Google Wallet

Mobile Payments

Agency	City/Region	Name of Application	Validation Process	Vendor	Year Launched	Modes	Discounted Fare
Amtrak	Nationwide		Barcode scanned	AT&T	2012	Rail	No
Bridj	Boston, MA	Bridj	Visual	Proprietary	2014	Commuter	No
Broward County Transit and Palm Transit	South Florida	TBD	TBD	CooCoo	2017	Bus	N/A
Colorado Department of Transportation	Denver, CO	Bustang	visual	CooCoo	2015	Commuter	No
Capital District Transportation Authority	Albany, NY	Navigator	Barcode Scanned	CooCoo (Genfare)	2016	Bus	Yes
Capital Metropolitan Transportation Authority	Austin, TX	CapMetro	Barcode Scanned	Bytemark	2014	Bus, Comm	No
Chicago Transit Authority with Pace and Metra	Chicago, IL	Metra Mobile Tickets	Visual but moving towa	GlobeSherpa (with cubic)	2015	Rail	No
Dallas Area Rapid Transit	Dallas, TX	GoPass	Visual	Unwire	2013	Bus, Light F	No
Dallas Area Rapid Transit System upgrade	Dallas, TX	TBD	Barcode Scanned	GlobeSherpa (with cubic)	2017	Bus, Light F	N/A
Denton County Transportation Authority	Denton, TX	GoPass	Visual	Unwire	2013	Rail, Bus	No
Fort Worth Transportation Authority	Fort Worth, TX	GoPass	Visual	Unwire	2013	Bus, Rail	No
Greater Cleveland Regional Transit Authority	Cleveland, OH	RTA CLE	Visual	Passport Inc	2016	Rail, Bus	No
Hillsborough Area Regional Transit Authoirity and 7 others	Central Florida	TBD	TBD	Bytemark	2017	Bus, Rail	N/A
Honolulu Authority for Rapid Transportation	Honolulu, HI	TBD	TBD	GlobeSherpa	contract awarded in April 201		N/A
Jacksonville Transportation Authority	Jacksonville, FL	MyJTA	Visual	Passport Inc		Bus	No
Los Angeles Department of Transportation	Los Angeles, CA	LA Mobile	Visual	GlobeSherpa	2015	Bus, Comm	No
Massachusetts Bay Transportation Authority	Boston, MA	mTicket	Barcode scanned	Masabi	2012	Commuter	No
Massachusetts Department of Transportation Bus Plus	Boston, MA	Bus Plus+	Visual	Bytemark	2015	Commuter	No
MetroLink	Los Angeles, CA	MetroLink Mobile Ticketin	Visual	Masabi	2016	Commuter rail	
Metro-North Rail Road	New York, NY	MTA eTIX	Visual	Masabi	2016	Commuter	No
Metropolitan Transit Authority of Harris County	Houston, TX	Metro Q	Visual	GlobeSherpa	2016	Bus, Rail	No
Nassau Inter County Express Bus	Nassau County, NY	gomobile	Barcode scanned	Masabi	2014	Bus	No
New Jersey Transit	New Jersey	MyTix	Barcode scanned	Xerox	2013	Bus, Rail, Li	No
New Orleans Regional Transit Authority	New Orleans,	GoMobile	Visual	Masabi	2015	Bus	No
New York Waterways	New York City, NY	NY Waterways	Visual	Bytemark	2012	Ferry, Bus	No
North County Transit District	San Diego, CA	COASTER	Barcode Scanned	CooCoo (Genfare)	2013	Commuter	No
Northern Indiana Commuter Transportation District	Northern Indiana	South Shore Line	Visual	Bytemark	2014	Commuter	No
Porterville Transit	Porterville, CA	Porterville Transit	Visual	CooCoo	2016	Bus	No
Portland Street Car	Portland, OR	Portland Street Car	Visual	GlodeSherpa	2014	Rail	No
Sacremento Regional Transit	Sacremento, CA	RideSacRT	Visual	GlobeSherpa	2016	Bus, Rail	No
San Diego Metropolitan Transit System	San Diego, CA	mTicket	Visual	Masabi	2013	special ser	No
San Francisco Municipal Transportation Agency	San Francisco, CA	Muni Mobile	Visual	GlobeSherpa	2015	bus, rail, ca	No
Southeast Ohio Regional Transit Auhotity	Cincinnati, OH	Cincy EZRide	Visual	Passport Inc	2016	Bus, Rail	No
The Comet	Columbia, SC	Catch the COMET	Visual	Passport	2014	Bus	No
The Rapid	Grand Rapid, MI	TBD	TBD	Globesherpa	contract awarded	Bus	N/A
Tri-County Metropolitan Transportation District of Oregon	Portland, OR	TriMet Tickets	Barcode Scanned	GlobeSherpa	2013	Commuter	No
Trinity Railway Express	Fort Worth, TX	GoPass	Visual	Unwire	2013	Commuter	No
Virginia Railway Express	Alexandria, VA	VRE Mobile	Visual	GlobeSherpa	2015	Commuter	No
Washington Metropolitan Area Transit Authority	Washington DC	Smartrip	Barcode scanned	Accenture	2015 demonstrati	Commuter	No

Appendix B – Fare Technology Survey Responses

1. What is the name of your transit agency?

Pierce Transit
VCTC Intercity Transit
Florida Department of Transportation - SunRail Commuter rail Project with regional bus service partners (LYNX and Votran).
King County Metro
Los Angeles County Metropolitan Transportation Authority (LACMTA).
Dallas Area Rapid Transit
Metro Transit, Minnesota
Maryland Transit Administration
Western Contra Costa Transit Authority
Utah Transit Authority
SolTrans
AC Transit
Capital Metro, Austin, TX
Port Authority of Allegheny County
Pace Suburban Bus
Berkshire Regional Transit Authority
Cape Ann Transportation Authority

2. What fare technologies do you currently accept?

	Contactless Smart Cards	Contactless Enabled Credit Cards	Mobile payments	Other (please specify)
Pierce Transit	X			
VCTC Intercity Transit	X		X	VCTC accepts visual passes of Amtrak mobile tickets and Metrolink mobile tickets
Florida Department of Transportation	X			
King County Metro	X			
LACMTA	X			
Dallas Area Rapid Transit			X	Note: We are in the process of implementing a contactless smart card - summer 2017 target.
Metro Transit, Minnesota	X			
Maryland Transit Administration	X			Magnetic Strip Tickets, Cash, Tokens, Flash Passes
Western Contra Costa Transit Authority	X			
Utah Transit Authority	X	X	X	
SolTrans	X			Paper magnetic striped passes
AC Transit	X			Magnetic strip cards and cash
Capital Metro, Austin, TX	X		X	magnetic cards
Port Authority of Allegheny County	X			Limited Use Smart Card (Paper one time use tickets with RFID chips)
Pace Suburban Bus	X	X	X	
Berkshire Regional Transit Authority	X			
Cape Ann Transportation Authority	X			Charlie Cards (smart cards), cash

3. What prompted your agency to invest in advanced fare technology?

It was a regional initiative with 6 partner Transit's and the WA State Ferries
VCTC Intercity is seeking to implement a regional Smartcard and looking into the possibility of replacing a contactless smart card system with a mobile ticket. Our Commission is interested in keeping pace with changing technology.
New commuter rail system with regional bus partners.
There are 7 partners in the ORCA system. We were sharing a regional set of passes to enhance regional mobility and manually apportioning revenue. ORCA was set up to implement a more accurate system to accommodate regional fare media
The convenience of one seamless fare media among 24 Los Angeles County transit agencies. Ability to collect better data to help improve the customer experience, etc.
Reduce cash handling. Improve customer experience. Add a "coolness" factor to transit.
Increased flexibility of smartcards, increased security, better data, better customer experience
Wanted a modern system that was compatible with other transit agencies in the region.
It was a regional initiative, managed by our MPO.
We believe that our electronic fare collection system makes it more convenient for patrons to ride transit. Also, we value the rich ridership data that we get as patrons tap on and tap off bus and rail services. This data is far superior to mere boarding counts.
The contactless Clipper cards are through Cubic systems and the project was funded by the MTC (Metropolitan Transportation Commission) http://clipper.mtc.ca.gov/
A Regional fare collection program required mandatory implementation of smart cards for all transit properties in region.
attracting new riders with better technology options for greater convenience and ease of use.
We needed to replace our fareboxes. We also partnered with 5 regional agencies to used stored value between the 6 of us.
Needed better data, more secure fare system with less slippage.
Interoperability with other agencies across the state, customer convenience, and to reduce cash handling costs at the RTA.
interoperability with the MBTA and other RTAs in Mass

4. What was the timeline between when your agency began thinking about implementing advanced fare technology and it was deployed?

12 years
1 year maintenance contract with Aegir/Cubic in preparation of taking down smartcard system - April 2014 Aegir smartcard takedown complete - April 2015 Transition to GFI Odyssey farebox system - April 2015 to December 2015 Internal Staff research of smartcard non-GFI and GFI options - ongoing since April 2015
Due to construction of the new commuter rail it was first sent to bid in 2010 and went live in May 2014.
About 10 years
Considering - 1998. Deployment - 2002.
A little under a year
About 6 years from proof-of-concept to full implementation, which included requirements gathering/design, procurement/RFP, contract award, and implementation.
Planning began in 2001, equipment installation began in 2004, full roll-out of smart card technology took place in 2010
In our region, this implementation has been a decades long process. We were seriously brought into the conversation about five years prior to implementation on our system.
Our CTO began brewing the concept of an account-based open payments system in 2007. We did a partial deployment of this concept in 2008; we piloted the technology on our ski service.
We waited for years for the Clipper technology to get to us, as it was covering transit of all kinds (ferry, heavy rail, bus) for agencies within nine bay area counties. As a smaller, outlying agency, we were one of the last to get it.
About 5 years.
Mobile Ticketing is the advanced fare technology I'll reference. We did a pilot to gain insight on viability for customers (6 months) while doing and RFI, then we did a competitive procurement (about 7 months).
We signed our agreement in March 2009. We started public use of the cards in 2013. Portions of our system is still being implemented.
The original RFP was developed in late 2010, the contract was awarded in 12/11, with the notice to proceed issued on 1/16/2012. The system was deployed on 9/9/2013.
4-5 years. This was a consortium purchase and we were the last to implement.
a few years

5. Approximately how long did it take to install the technology? How long did you test it for?

2 years
It took a relative 3 months to install the GFI Odyssey system but we are still contemplating moving to the GFI MiFare system which would allow for contactless smartcards
Installation of the technology itself took very little time once the station finishes were complete, but the back-office and the technology development is still continuing today. We started with a partial system because the vendor had not finished the software development by the federally mandated date to begin service.
Our Beta test was in 2005, we went live in 2009. installation and testing was done over a 4 year period
Testing - Approximately 6 months. Installation - Approximately 2 years.
Practically no installation - as we use an outside vendor (and customers use their own phone)
About two years to install and test, with both happening concurrently at different stages. A good year at least of testing, but our system was relatively new at the time and testing should no longer take a year with a standard smartcard implementation.
Three years to install the technology and testing was on-going throughout the full roll-out
Programming and testing on the vendor's side was the longest part of the process (probably 18 months). Actual equipment installation stretched over 6 months. Testing before "go live" date was probably one month.
It took about 9 months to implement this technology for our ski service. Then we pilot tested for the next 6 months. We then launched system-wide in Jan 2009. Looking back, our system-wide launch was a bit premature making for a somewhat bumpy start. We have been enhancing and maturing the system for nearly eight years.
The actual install of equipment was between one and two months, but had already been tested through other agencies.
The smart card system has been expanding throughout the region for about 10 years.
We launched within 6 months of NTP
We started installing the fareboxes in 2010, had a rework period on the initial group of fareboxes and finished the install in 2011. The TVMs followed. We had many rounds of testing, one with employees, then student groups, a public pilot with hand selected riders, then rolled out to the public with Annuals, Monthlies, Weeklies then stored value. The TVMs were then loaded with the limited use tickets for public purchase. Testing was on going from the initial install until mid-2013.
All of the equipment was installed in 2013, so it took less than 9 months. We tested from 11/12 (final software acceptance in the vendor lab) until deployment (and afterwards).
6 months including ticket vending machine in the lobby area, sales outlet terminals, and farebox swap out. The farebox transition occurred over a weekend. We tested approximately 8 months after implementation.
unknown

6. Have there been any unforeseen issues with the technology? If yes please describe.

Costs high for the clearinghouse, Vendor difficult to deal with, proprietary system and parts. Card based system, so it does not update purchases for up to 24 hours.
n/a
Many unforeseen issues with the number one issue of matching up trips properly for the smart card and limited use ticket trips.
yes of course by the time it was deployed it was old, and being old it is very pricey to update.
Inability to integrate with other fare collection systems (i.e. Bikeshare, parking, etc.).
Many. Phone company software upgrades. Occasional outages. Fraudulent copies of our mobile ticket.
Some unforeseen challenges in getting technology to meet requirements. In the end most requirements were accomplished and some had to be negotiated out of the contract.
Original smart card chip (Cubic Go-Card) became obsolete. RF transfers from Fareboxes to Garage Computers use obsolete technology (Proxim) and will require upgrades to WiFi. Farebox utilizes a proprietary logic board that recently became obsolete and will require upgrades.
Vendor delays (and considerable expense) in implementing any needed programming changes. Limitations of functionality in vendor's system (anything not standard to their way of doing things comes at great expense). Unavailability of hardware (which is a problem because a vehicle can't be placed in revenue service before equipment is installed). Single vendor unresponsiveness.
We had anticipated great adoption of contactless open payments by banks and merchants. This did not happen. For this, and other reasons, we decided to rollout a prepaid, reloadable, closed-loop, contactless smart-card in Oct 2013. We have seen slow and steady growth with this new product. We underestimated the challenge of real-time communications between the bus validators and our back office systems.
Running local programs with different faresets (25 cents between certain hours on certain routes) does not work as Clipper fares are programmed for standard fares. Also for express bus service that has a local component, there isn't a way to distinguish between a local and an express fare.
There are continual complaints about the number of locations to get smart cards and to load value on smart cards.
some issues with the variety of mobile devices and versions of operating systems, but it's not insurmountable. You just have to clearly communicate to customers what will be supported.
There has been many. equipment issues, product use and loading times, action item list creations and limited use smart card loading. All have been overcome, but took time to find and correct. Then there was the learning curve of customers to understand how to use the equipment.
More issues with Cellular data service than we expected. But nothing major.
Yes, reports were not similar to previous versions. Difficult to obtain replacement parts. As the product purchased belongs to MBTA, we did not have complete control with product formatting, cannot transfer small remaining balance between cards, error cards cannot be deleted, voided, or refunded from the system.
not with the technology, but with the hardware--more repairs than originally thought

7. What have been the greatest benefits to your agency after deploying the technology?

Analytics are very good, We've learned what not to do in the future. High customer satisfaction.
ease of transfers for riders moving throughout several operating systems in the county.
Not there yet. We are still in development even though we have been using the system for 2 years.
Customers like much of the system. Having very accurate travel information is useful for planning and for customer service issue resolution. We were able to integrate all of our systems on board into one device to simplify for the operators. The apportionment system works quite well.
Fraud reduction, more, better and accurate data, seamless fare collection across 24 municipal transit agencies, increased customer convenience, etc.
Reduced cash handling. Improved customer experience. Added a "coolness" factor to transit. Ability to partner with local venues & events.
efficiencies in fare collection and distribution, and a completely different customer experience due to the technology advantages of a smart card system.
Improved data with regards to ridership and revenue.
Acceptance by public. Seamless transfers between different agencies having the same technology installed.
The rich ridership data has been the greatest benefit to the organization. The data enables marketing and service planning to make better business decisions. We have been able to have data-driven business negotiations with our 3rd party partners that fully or partially subsidize transit for their constituents.
Faster boarding, less storage, ordering of inventory, accounting for inventory. Space, efficiency and time saver.
The operators like not having to deal with cash, and the dwell time for smart card users is significantly lower than cash customers.
We hope we've increased ridership but don't have a way to measure, but we've won several local, state and national awards.
It cuts down on boarding time, provides a lot of rider data and were able to remove a large amount of manual operator counting in our system.
Better data, better information about our riders and where fares are used (we have data down to individual boardings at individual stops). We have better yield, better control of fare products (less slippage and less theft). We also have greater control over beginning and expiration dates of specific products. We have better customer service, as customers can add funds to their cards/accounts through the mobile app.
Customer convenience, ability to offer unlimited ride passes as well as stored value on the same card.
interoperability

8. What has the public's response been to the technology?

They love it!
Generally a 7 out of 10 star satisfaction rate. Riders appreciate the ability to transfer but replacement of lost or damaged GFI passes has been problematic.
The public response has been fair, education is very important especially with an open system. We are progressing to a regional system that will include commuter rail and bus service using the same smart card technology. Currently today the customers may purchase transfer tickets from the bus to the commuter rail and vice versa. Within 6 months the customer will be able to use the same prepaid balance on the smart card to ride both the commuter rail and the bus without having to purchase transfer tickets. We believe this will increase customer satisfaction.
Mostly positive, but using a card-based system means there is a lag of 24 - 48 hours in loading value online until you get the information on the card. That is the #1 customer complaint.
Like the convenience of using one card throughout numerous agencies, no need to carry cash, TAP benefits (i.e. reduced fares, balance protection, autoloads, etc.).
Very positive!
Very positive
Public has been slow to adopt smart cards, but very comfortable with magnetic tickets.
Generally, very positive.
The public response has been great! Half of our riders pay their fares electronically today. At first, we wondered if patrons would adopt the desired tap on / tap off behavior, especially on our un-gated proof of payment rail system. About 92% of our rail riders are tapping on before they ride, and about 75-80% of those riders will tap off. This gives us great ridership data about how patrons actually use our services.
Slow turnaround, less use in senior/disabled population. Commuters jumped on board rather quickly.
Mixed ... customers who use the smart cards generally appear to be satisfied with the ease of use of the system, but customer often complain about not enough retail locations. Also, there is a segment of the ridership that continues to use cash.
Customer adoption has been high.
Or customers have wanted the technology for a while and were mostly satisfied with how it worked. We were able to isolate the issues we had from effecting the customer's use.
After a bit of a rocky start, it has been very positive, especially to our integrated mobile app. The media and a small but vocal group were critical, but a vast majority of customers like the change.
Receptive
Positive for those that use the MBTA and CATA

9. What percent of your ridership uses the technology to pay fares?

Our Agency has the lowest usage for all the partners - 30% tops. Others are in the 80%+ range
n/a
Currently 49% of our customers use Smart cards with either a pass or prepaid dollars and 51% of our customers use a limited use ticket good for only the day of purchase that also tap on validators like the smart cards.
about 64%. Some of our partners that only allow transfers if you pay with the ORCA card have 80 - 90 % usage
Approximately 77-75% of classified LACMTA fares are on TAP.
20%
Almost 60% of customers pay with a smartcard.
100% of ridership uses fare collection equipment installed on buses and at rail stations. Only 13% of ridership utilize the smart card.
We are still in the initial year of the project, but currently, about 15% of passengers use the technology. This rate is higher on commuter routes.
About 50% of our ridership uses our electronic fare collection system.
Unsure - would be a good question to direct to our Finance & Administrative Manager, Kristina Botsford, kristina@soltransride.com
About 55%.
It's hard to say because none of the other systems are account based.
we have 83% of riders using the card, 17% using cash. We expect this to change with the implementation of a new fare policy starting January 1, 2017. Cash use will be more expensive and transfers can only be purchased when using a smart card.
At Pace, 80% (before was 60% cash). At CTA, our partner, 95% use the technology, up from 80% before. All told, over 1.5 million unlinked trips are taken each day with our new fare system. Roughly 30% of commuter rail riders use the mobile app to pay for fares just nine months after the app was introduced.
80% of our customers use the technology.
unknown-most still pay with cash because there is no way to load the Charlie Cards locally (they have to get to the MBTA to load $)

10. What was the overall capital cost to implement the technology and on how many vehicles?

I don't have that available at this time - all our fixed route vehicles (140)
n/a
Over $7,000,000 for the commuter rail equipment, web and back-office. We currently have 12 commuter rail stations that have 4 vending machines, and 6 card and ticket validators each. We have another 5 stations under construction with hopes to go on-line in 2018. The regional bus partners (Votran and LYNX) have additional expenses for the vending machines and validating equipment.
I believe the regional project was about $27 million for the 7 agencies. KCM is about 2/3 of the total system.
Approximate cost $98K/ initial contract award. Approximate cost $250M/ based on current change orders. Systemwide devices for rail+bus system: TVMs – 455 SAVs – 315 ADA Fare Gate Aisles – 73 Turnstile Fare Gate Aisles - 249
Minimal. We use an outside vendor (and customers use their own phone)
$18 million at 17 rail stations (TVMs) and 1,400 buses. These figures are from 2002.
Implemented on 800 buses, 172 Ticket Vending Machines, 171 Metro Faregates.
This is incalculable, since docking stations, communications hardware, automatic download equipment, Wi-Fi connections and antennas, etc. were installed by our region. The cost to simply install the equipment on a single vehicle is in the $8K to $10K range (per vehicle), exclusive of card reader, driver console, and other hardware.
Our initial cost to implement the technology was about $5 million. But as mentioned already, we have been enhancing and maturing the technology ever since we launched the the system in Jan 2009. So the overall cost to date is probably more like $15-20 million. We have equipped 550 buses and 100 rail platforms with electronic card validators; probably more than 1500 devices installed.
We have about 50 buses in our fleet. Costs questions would go to MTC.
The regional MPO implemented the fare collection system, so I would not know the cost. For AC Transit, there is about 600 buses with this smart card fare collection system. For the region, there is probably over 2000 buses.
Cost for mobile app was about $200K plus monthly hosting cost and transaction fee. Onboard scanners were only put on a small part of the fleet and on the others we use visual validation. The cost of the OBVs was $500K.
Our final cost for the complete system was $32,000,000 for 1200 fareboxes for buses and the light rail, 62 TVMs, 120 sales office terminals, 85 validators, 20 handheld readers, 6 garage vaulting and probing equipment and various web portals.
Unsure of the overall cost.
$650,000 for about 25 vehicles, 1 ticket machine and 3 sales terminals.
~$300k

11. Have there been any cost savings associated with implementing the technology?

No
n/a
No, this is a new system and new program.
I do not think so, although that was the initial plan.
The cost savings is mainly associated with the reduction of paper fares vs. current smart-card technology and fraud reduction.
Some. We reduced cash & paper ticket handling staff by 2.
Not really. I wouldn't look at the system as a cost savings driver, but more a convenience driver, both for the agency and the customer.
None to speak of.
None tangible yet.
No, not really. This electronic fare collection system carries a higher cost of collection than other modes of fare collection. And because we still use TVMs and cash fareboxes and everything else, we still incur those associated costs.
I believe so. I'm not the person in our agency that would have details about all the costs, but I do work with the fare media. The bus efficiencies for our customers on express routes, and less time spent by staff managing monthly distributions and annual ordering, auditing and rotating stock is a significant time saver as far as labor is concerned. We still sell paper passes.
Less cash means that there is less cash collection costs.
Not that we've been able to measure but we see a reduction in online ticket sales and farebox sales which reduce cash handling and inventory management activities.
There were many changes to our operating procedures, one such item was closing our cash room and contracting Brinks to collect, count and deposit cash.
Yes. Fewer people in the fare process, and fewer road calls regarding broken fareboxes.
unknown at this time. Customers time to board a bus has been reduced, maintenance on the fareboxes has been reduced, and cash handling time has been reduced.
not that I'm aware of, most of our customers still pay cash

12. What advice would you give to others looking to implement the technology?

Look for an account based system, open source hardware
n/a
Do not have a very complicated fare policy and the best control for fare evasion is to have tight controls in the back office and using a closed station concept. Also, it is very important to use an experienced company for customer education. Many customers still do not understand why they need to tap on and off.
Wow, this little box is not enough - that is a very big question. I guess two things: 1 - have as specific a contract as possible with the vendor(s) as possible when you get to the operating stage - ideal is to have a vendor that approaches the contract as a partnership rather than purely generating revenue. And build in as much flexibility as possible - agency changes, such as shrinking or growing, adding different types of service or customers or tools can be very expensive to add to the system after the fact. Third be sure to build into the contract technology and security upgrades that most certainly will be needed.
Involve all stakeholders since the very beginning to get everyone's feedback/needs, design, etc. Technology to work with open systems/ commercial off the shelf software. Request for APIs to integrate with other systems (should be a requirement).
Join forces with others who have already implemented. APTA has a separate committee and there is an organization called Smart Card Alliance.
Don't try and make the system requirements too complicated. Look at what other agencies have done and leverage what worked well, and learn from their mistakes.
In order to ensure a successful customer adoption of new system, you must ensure there are incentives for them to switch from traditional fare media to new fare collection technologies or force them to switch by eliminating traditional fare media. Also, it is imperative that operations personnel are fully trained on how to utilize the new technology.
Make sure technology is open source to extent possible, and hardware is not proprietary. (Think about the investment in a single system, and possible obsolescence through quickly emerging new payment systems.
Avoid excessive customization. Be sure you craft performance-based contracts with technology providers. Be very careful to choose technology vendors that are mature, accountable, transparent, and agile. Don't rely too much on what you think the industry will do - things outside your control. Don't forget to plan well for post implementation phase of the technology; you need to think about maintenance and support, change control, disaster recovery, reporting/analytics, system performance monitoring, etc. -- make sure that you have thought through how this technology impacts business operations (Customer Service, Accounting, Rail Inspection, Bus Operations, etc.).
Our agency is happy with the program. Angel Anderson, Program Assistant SolTrans (Solano County Transit) angel@soltransride.com
I would recommend a program where cash becomes increasingly more expensive, which would result in all passengers transitioning to a smart card program. AC Transit has a 10 cent differential, which has resulted in a transition of customers to the smart card. SF Muni just implemented a 25 cent differential. If a transit agency is going to be able to fully transition to a smart card system, then there will need to be a program to regularly increase the differential for cash fare payments.
Go with an experienced vendor; contact other agencies, decide the long term goal for your mobile app...do you just want ticketing or do you want to add other features...make sure your vendor has demonstrated success in each of those areas.

There are far too many to list here. The main item is to know what your agency needs and wants, verify the vendor can create it, test then test again. It is easy to take another agency's RFP and use it for your system, but it needs to fit all of the business needs. Throwing in extra stuff because it can be done creates more areas for errors to occur.
Go for it! Make sure you do your due diligence and business rules. The more time you spend doing business rules before, the less time you spend in confusion afterwards. Make sure the whole organization (where affected) is involved through the process, not just at the end.
Research the companies selling the products as technology changes very quickly.
test both the hardware and software functions

Appendix C – Vendor Interview Summary

	Bytemark	CooCoo	Moovel	Xerox	Unwire
1. How is the mobile payment site managed?	Through a payment gateway which can be fully hosted by Bytemark	It is built and customized exclusively for the transit agency	Historically built standalone applications and sites for providers but are looking towards creating a white label app with branded ticketing to reduce the cost for smaller transit agencies.	Through Xerox	Use a payment service provider (Cybersource). The webpage is branded for the transit system but hosted externally.
2. What forms of mobile payment technology do you offer?	Visual Validation, QR codes, working on BLE	Visual Validation, QR codes	Visual Validation, QR codes	Visual Validation, QR codes	Visual Validation, QR codes, working on BLE
3. What systems have you worked with that have Genfare fareboxes?	Austin, on their fixed route visual validation is used, on the BRT routes electronic barcode scanners are installed next to the farebox.	CooCoo now works solely with Genfare for bus mobile payment deployment. The two have partnered with mobile ticketing in Albany, NY and Bustang in Colorado with several more under development	Have not integrated with a Genfare system yet	Have not integrated with a Genfare system yet	Dallas
4. Can the app be integrated into the NRTA real time planning app?	Yes, a deep link	They could integrate Transloc into the mobile payment application. Currently no providers with CooCoo also have Transloc.	Yes but Transloc would have to allow access to their app. It would work best with a link between the two applications.	Offer own app called Smart Traveler Plus that could be integrated	Can integrate trip planning data if it has GTFS
5. What security features do you have to prevent fraudulent tickets?	2D barcode encryption, touch activation, animation	Encourages on-board scanners. Visual validation has animation and a countdown clock	Unique QR codes, countdown timer, animation, touch activated	Color codes and color bands that are uniquely sequenced for the day and countdown timers	Flashing screen, countdown timer
6. Can you integrate your accounting system into the current NRTA system so that NRTA to pull fare data from just one location?	Yes	Yes, through a wi-fi probe of both fareboxes in the garage	Yes	Yes	Yes but it would have to mirror the Genfare system with API server to server connections so that the back ends match
7. What is the monthly cost to maintain the e-side of fare payment?	The customer portal website is included in the price if it is just linking to the back office. If an alternative method is chosen there is a monthly hosting fee.	There is a monthly hosting cost to maintain the application; it is approximately $1,500 to $3,000 a month	$3,000 to $4,000 a month but are exploring ways to reduce the cost through issuing batch tickets	Yes, there is a monthly hosting fee	Yes, it is a couple thousand a month

Appendix D – Phase II Presentation to NRTA Advisory Board and NP & EDC

WANT TO RIDE the WAVE YEAR-ROUND?

NRTA Year-Round Bus Service Study

Phase 2 – Fare Policy Review and Development of Innovative Funding Options

September 21, 2016

Photos by Susan Richards, SR Concepts

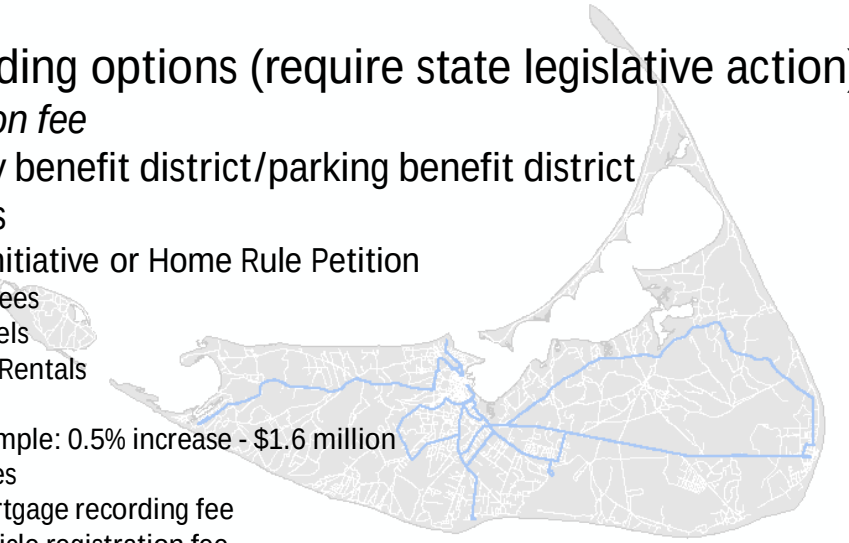
Agenda

- Phase II
  - Innovative Funding Options
  - Fare/Fare Media Analysis
  - Fare Technology Analysis
- Next Steps

INNOVATIVE FUNDING OPTIONS

Innovative Funding Options

- *Implement managed parking*
  - *On-street within downtown core and vicinity*
  - *Town parking lots (2 Fairgrounds, 37 Washington Street)*
- *Increase fares*
- Other innovative funding options (require state legislative action)
  - *Increase embarkation fee*
  - Institute community benefit district/parking benefit district
  - Apply taxes and fees
    - Regional Ballot Initiative or Home Rule Petition
      - Hospitality fees
        - Hotels
        - Car Rentals
      - Sales tax
        - Example: 0.5% increase - $1.6 million
      - Property fees
        - Mortgage recording fee
        - Vehicle registration fee
      - Gas tax
- Other sources of revenue/funding mechanisms
  - Long-term partnerships
  - Collaboration with non-profits
  - Employer incentives



Managed Parking – Example Potential Revenue

- Assumptions: enforced Memorial Day – Labor Day, 7 days per week, 8am-7pm, $1-$2 range
  - Potential annual revenue (core only): $320,000-$640,000
  - Potential annual revenue (outer core): $9,000-$18,000
  - Potential annual revenue (monthly passes): $30,000-$40,000
  - *Total potential annual revenue: $350,000-$700,000*

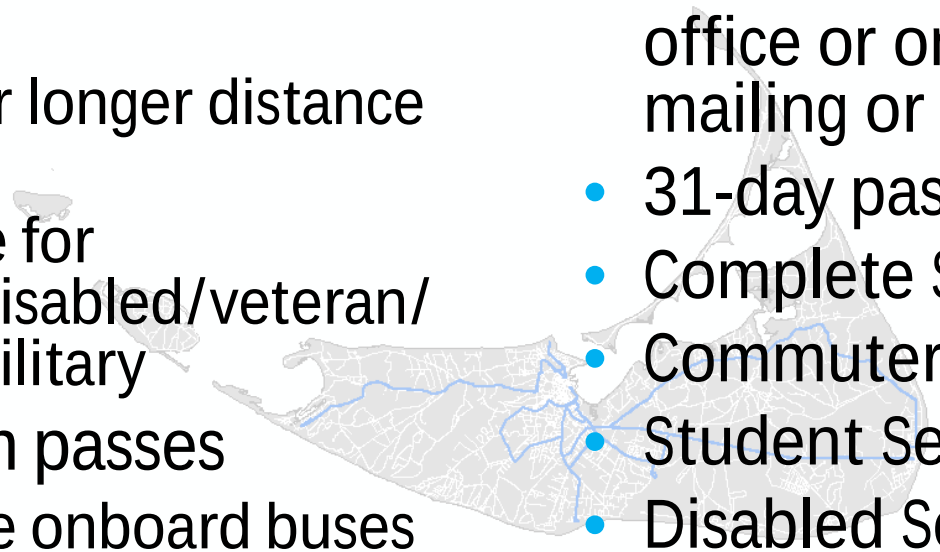
Embarkation Fee – Example Potential Revenue

- Assumptions: $0.50 additional fee, 473,284 annual trips, 75% fee trips and 25% commuter/student trips
  - No fee for commuters: $178, 539
  - Fee for commuters/students: $58,103
  - *Total potential annual revenue: $236,642*

FARE ANALYSIS

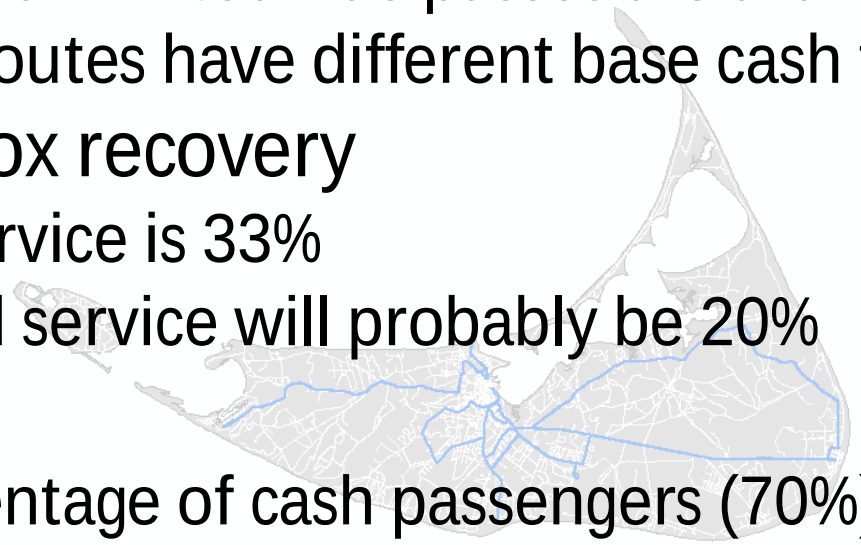
Fare Analysis – Current Fare Policy

- Cash fares
  - $1.00 for short distance routes
  - $2.00 for longer distance routes
  - Half-fare for senior/disabled/veteran/ active military
- Short-term passes
  - Purchase onboard buses from farebox
  - 1/3/7-Day Passes
- Long-term passes
  - Purchase from NRTA office or online for mailing or pick-up
  - 31-day pass
  - Complete Season Pass
  - Commuter Season Pass
  - Student Season Pass
  - Disabled Season Pass
  - Veteran/Active Military Season Pass



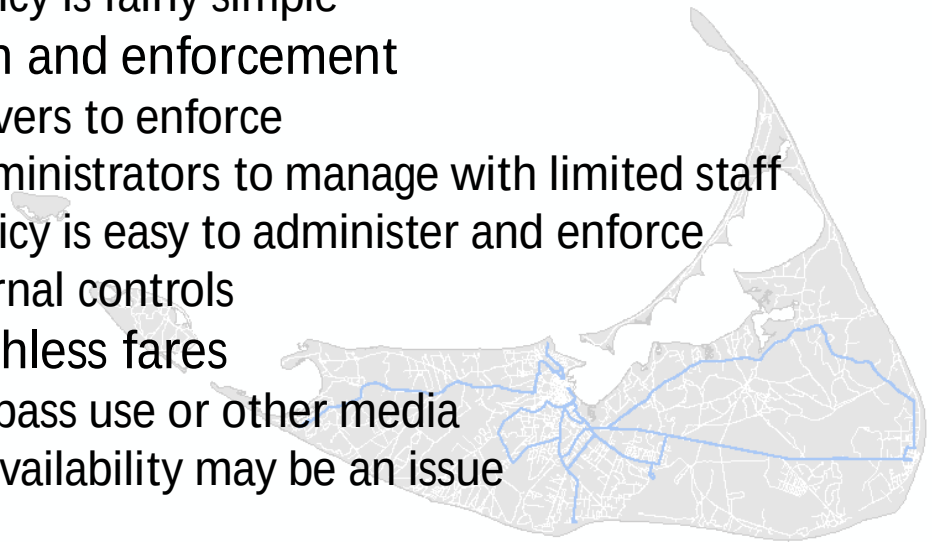
Fare Analysis – Fare Policy Background

- Current fare structure is simple
  - Numerous unlimited ride passes are available
  - Different routes have different base cash fares
- Good farebox recovery
  - Current service is 33%
  - Year round service will probably be 20%
- Dwell times
  - High percentage of cash passengers (70%)
  - Purchase of passes onboard buses
  - Fareboxes provide change through stored value cards



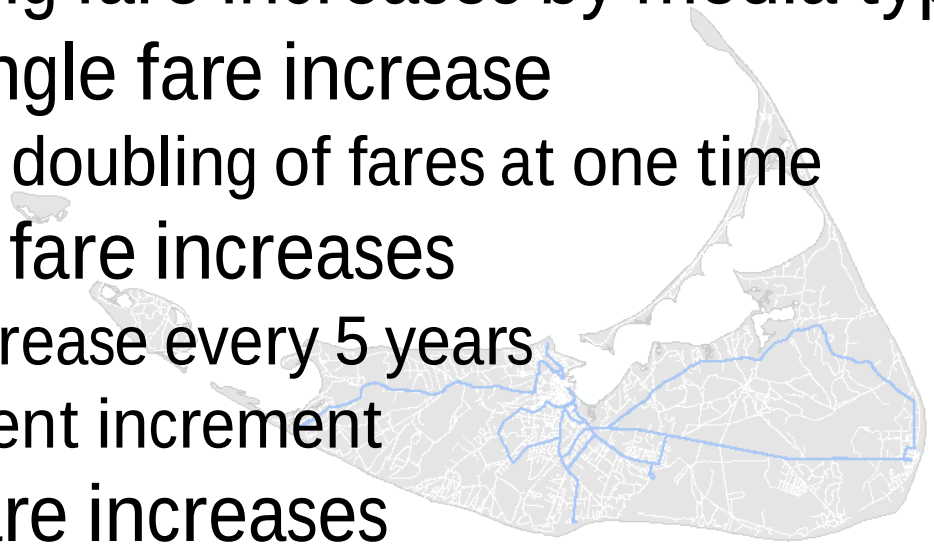
Fare Analysis – Fare Policy Goals

- Simple fare policy
  - Consistent base fares with easy increments
  - Current policy is fairly simple
- Administration and enforcement
  - Easy for drivers to enforce
  - Easy for administrators to manage with limited staff
  - Current policy is easy to administer and enforce
  - Strong internal controls
- Encourage cashless fares
  - Encourage pass use or other media
  - Increased availability may be an issue
- Equitable
  - Balanced fare policy between long and short distance travel
  - Accessible passes for frequent users
- Maximize revenue/minimize subsidy



Fare Analysis – Fare Increases (10-Year Timeframe)

- Alternating fare increases by media type
- 1 large single fare increase
  - A single doubling of fares at one time
- 2 smaller fare increases
  - Fare increase every 5 years
  - 50 percent increment
- 5 small fare increases
  - Increases every other year
  - First increase would be 10 cents, subsequent increases would be 25 cents



Sample Potential Revenue

	Seasonal Service		Year-Round Service							
	Current Fare*		Current Fare*		10% Increase/2 Years^		50% Increase/5 Year#		100% Increase/10 Year~	
	Ridership	Revenue	Ridership	Revenue	Ridership	Revenue	Ridership	Revenue	Ridership	Revenue
Year 1	296,285	$405,000	496,842	$680,674	492,133	$739,980	472,833	$969,308	438,653	$1,320,344
Year 2	305,174	$418,088	511,747	$701,094	506,897	$762,180	487,018	$998,387	451,812	$1,359,955
Year 3	314,329	$430,630	527,100	$722,127	500,467	$855,127	501,629	$1,028,339	465,367	$1,400,753
Year 4	323,759	$443,549	542,913	$743,790	515,481	$880,781	516,678	$1,059,189	479,327	$1,442,776
Year 5	333,471	$456,856	559,200	$766,104	506,193	$1,037,893	502,123	$1,370,797	493,707	$1,486,059
Year 6	343,476	$470,561	575,976	$789,087	521,378	$1,069,029	517,187	$1,411,921	508,519	$1,530,641
Year 7	353,780	$484,678	593,255	$812,760	569,990	$1,168,703	532,703	$1,454,278	523,774	$1,576,560
Year 8	364,393	$499,219	611,053	$837,143	561,288	$1,342,670	548,684	$1,497,907	539,487	$1,623,857
Year 9	375,325	$514,195	629,385	$862,257	578,127	$1,382,950	565,144	$1,542,844	555,672	$1,672,573
Year 10	386,585	$529,621	648,266	$888,125	570,470	$1,559,581	552,724	$1,890,315	519,822	$3,124,131
10 Year Change	30.48%	30.77%	30.48%	30.48%	15.92%	110.76%	16.90%	95.02%	18.50%	136.61%

Baseline information: 2015 calendar year seasonal service
Year-round information: 2015 calendar year seasonal service plus preferred alterative ridership projections

Assumptions:

- Ridership growth is 3% per year, average fare
- *Zero fare increase
- ^Fare increase every other year (year 1, 3, 5, 7, 9)
- #Larger fare increase every 5 years (year 1, 5, 10)
- ~Doubles fares in year 1 and again in year 10

FARE COLLECTION TECHNOLOGY

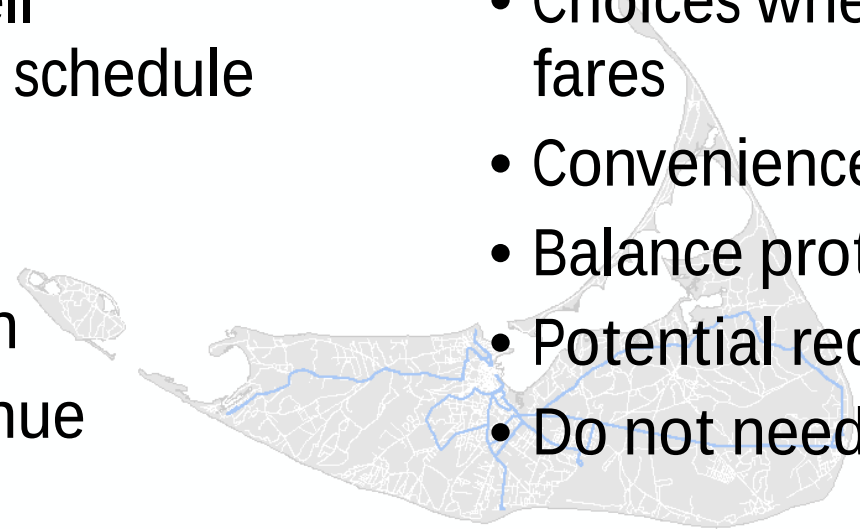
Fare Technology Benefits

Operational Benefits

- Decreased dwell time/improved schedule adherance
- Dynamic fares
- Fare integration
- Improved revenue accountability
- Improved data collection
- Cost savings

Passenger Benefits

- Choices when purchasing fares
- Convenience
- Balance protection
- Potential reduced fares
- Do not need to carry cash



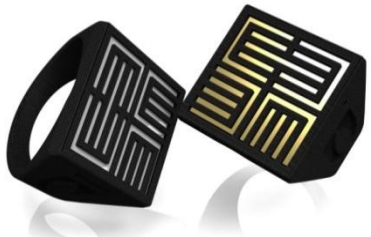
Fare Technology

Contactless Smart Cards

Contactless Bank Cards

Mobile Payments

Wearables



Vendor Review

Bytemark

moovel

CooCoo

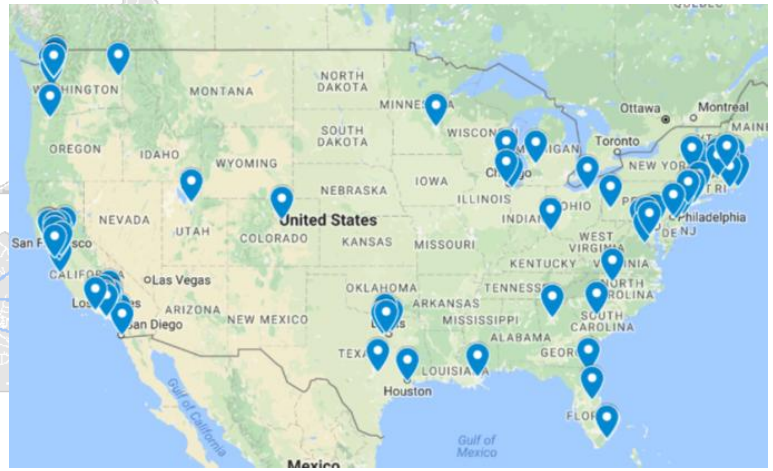
GENFARE

masabi

Peer Review

Peer Review

- Reached out to 86 providers with advanced fare payment technologies
  - 16 responses
  - All technology types
  - Those with mobile ticketing also had smart cards



Next Steps

- Present to NP & EDC on October 3
- Complete Phase II analysis
  - Funding – complete research/interviews on funding options preferred by BOS
  - Fare Analysis – fare increase schedule and estimate of impact
  - Fare Technology – complete interviews with peers

About AECOM

With nearly 100,000 employees — including architects, engineers, designers, planners, scientists and management and construction services professionals — serving clients in more than 150 countries around the world following the acquisition of URS, AECOM is a premier, fully integrated infrastructure and support services firm. AECOM is ranked as the #1 engineering design firm by revenue in *Engineering News-Record* magazine's annual industry rankings. The company is a leader in all of the key markets that it serves, including transportation, facilities, environmental, energy, oil and gas, water, high-rise buildings and government. AECOM provides a blend of global reach, local knowledge, innovation and technical excellence in delivering solutions that create, enhance and sustain the world's built, natural and social environments. A *Fortune 500* company, AECOM companies, including URS Corporation and Hunt Construction Group, had revenue of approximately $19.5 billion during the 12 months ended Sept. 30, 2014. More information on AECOM and its services can be found at www.aecom.com.

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