



## **Making Streetcars Happen:**

# **A Guide to the Implementation of Community Streetcar Systems**

**By**

**David A. Wilson**

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# **Executive Summary**

## **Introduction**

While 40 years ago the presence of streetcars conveyed an image of urban obsolescence, today streetcars are looked upon as a truly desirable form of local transportation in our central cities, providing a unique contribution of attractiveness and connectivity. Streetcars have been reintroduced in more than 20 cities around the nation and many more cities are actively considering implementing new streetcar systems.

No longer functioning as retail or manufacturing centers, central cities have capitalized on the continued presence of cultural attractions as well as a rich variety of 19<sup>th</sup> and early 20<sup>th</sup> century buildings available for adaptive reuse. Streetcars, namely electrically powered rail vehicles, usually operating in mixed traffic, have been reintroduced in various cities (see Table ES-1) to provide local connectivity in revitalizing city centers.

This paper will discuss the impact of streetcars in the early 20<sup>th</sup> century, why the streetcars fell out of favor, and the economic and physical changes in city centers that made their reintroduction appropriate.

It will describe the components involved in implementing streetcar systems, as well as the roles of groups and individuals in creating popular and political support. The paper will examine implementation and operating practices and costs as well as sources of funding to begin and sustain streetcar operations.

Streetcars are implemented for a variety of purposes. The major purposes will be considered, along with the streetcars' effectiveness in fulfilling those purposes. Three streetcar implementation projects will be considered more thoroughly in case study format. Finally, the paper will summarize the common elements that have characterized successful streetcar implementation efforts. Appendix 3 will synopsise the various streetcar systems that have been implemented to date.

## **Background – Evolution of streetcar systems**

Streetcars (originally horse-drawn) were introduced on America's streets in the 1830's. Commercial perfection of electric streetcar propulsion systems in 1888 resulted in streetcars' rise to dominance of urban transportation. During their decades of dominance, the streetcars provided not just a means of transportation, but were an entertainment form in their own right. "Joy riding" and/or other uses of streetcars for leisure time activities were commonplace.

Introduction of motor trucks, affordable automobiles and paved roads increasingly reduced the importance of streetcars in particular and mass transit in general in providing urban mobility. Except for a surge during World War II, streetcars experienced a 50 year decline that brought them to near extinction by 1970. The streetcar track that remained did so because of special circumstances, usually involving separation from street traffic for a portion of or the entire length of the routes.

**Table ES-1 New Streetcar Systems**

<b>City</b>	<b>Implemented</b>	<b>Purpose</b>	<b>Type</b>	<b>Route Miles</b>	<b>Status</b>
Astoria	1999	Attraction	Vintage	3.0	In Operation
Atlanta		Circulator	Modern	12.0	Proposed
Charlotte	1996	Attraction	Vintage	2.1	In Operation
Charlotte		Circulator	Modern	8.0	Proposed
Dallas	1989	Attraction	Vintage	3.6	In Operation
Denver	1989	Museum	Vintage	3.5	In Operation
Detroit	1976	Circulator	Vintage	2.9	Defunct
Fort Collins	1984	Museum	Vintage	1.5	In Operation
Fort Smith	1991	Museum	Vintage	0.3	In Operation
Galveston	1987	Circulator	Vintage	5.9	In Operation
Kenosha	2000	Attraction	Vintage	1.9	In Operation
Little Rock	2004	Circulator	Vintage	2.5	In Operation
Lowell	1984	Circulator	Vintage	1.0	In Operation
Memphis	1993	Circulator	Vintage	7.0	In Operation
Miami		Circulator	Modern	6.0	Proposed
New Orleans, LA	1825	Circulator	Vintage	16.0	In Operation
Philadelphia (Penn's Landing)	1975	Museum	Vintage	2.0	Defunct
Philadelphia (Girard Ave.)	2005	Circulator	Vintage	8.5	In Operation
Portland, OR (Vintage)	1991	Circulator	Vintage	2.0	In Operation
Portland (Modern)	2001	Circulator	Modern	2.5	In Operation
Richmond		Circulator	Vintage	1.5	Proposed
Salem, OR		Circulator	Modern	4.0	Proposed
Savannah, GA		Circulator	Vintage	3.0	Proposed
San Francisco	1983	Circulator	Vintage	4.4	In Operation
San Francisco	1880	Circulator	Cable	3.5	In Operation
San Pedro	2003	Attraction	Vintage	1.5	In Operation
San Jose	1988	Circulator	Vintage	4.5	In Operation
Seattle (Waterfront)	1992	Circulator	Vintage	1.9	In Operation
Seattle (South Lake Union)		Circulator	Modern	2.6	Proposed
Tacoma	2003	Circulator	Modern	1.6	In Operation
Tampa	2002	Circulator	Vintage	2.3	In Operation
Tucson	1992	Attraction	Vintage	1.1	In Operation
Yakima	2004	Museum	Vintage	5.0	In Operation

Cities such as Boston, Newark (New Jersey), Philadelphia, Pittsburgh, Shaker Heights (Ohio), and San Francisco operated streetcars in whole or in part separate from street traffic. Since 1970 those systems have been modernized and modified to deemphasize the “streetcar” aspect of their service offerings and emphasize the higher speed, higher volume carrying capacity. Those systems and new systems in San Diego and other cities have become known as “light rail” systems.

Despite their common technological origins light rail and streetcars have different characteristics and serve different purposes. Light rail systems are generally regional in nature, operating in the 10-30 mile range, with large, high capacity vehicles, with stations spaced ¼ mile or more (sometimes a lot more) apart. Streetcars in contrast have local focus, customarily operating in the 1 to 5 mile range and have smaller capacity cars. They usually operate in mixed street environments with automobile, bicycle and pedestrian traffic. Station spacing is generally short (1-4 blocks) reflecting the local nature of their operation.

## Background – Evolution of central cities

Departure of industry, changes in freight handling and storage methods, decline of central city retailing and other changes created the need for cities to reinvent themselves. Cities have taken on the role of regional cultural centers, entertainment centers, and locus for residential development in adaptively reused, former industrial or commercial buildings. The ambience of the old city centers comes from the walkable nature of the neighborhoods. Cities have adopted a strategy that seeks to attract cultural attractions such as entertainment districts, museums, sports venues, and waterfront promenades and arcades and link those in an environment with walkable ambience. Transportation solutions that provide that linkage must address several separate needs:

- Provide neighborhood circulation in a way that extends walkability of the district
- Respect the ambience of the neighborhood and not destroy it as did previous transportation solutions
- Connect the neighborhood with the region and with other cities
- Provide "surge" capacity for sports and other events commanding large attendance
- Provide continuity of visitor experience while performing the circulatory function
- Provide a transportation resource people are willing to use

Streetcars did those things early in the 20<sup>th</sup> century and have emerged as the technology that can do the same thing now.

## Purposes of streetcars

Streetcars are naturally suited to provide circulation within revitalized and rapidly evolving central cities. It was streetcars that were naturally suited to the dense built environment as it existed early in the 20<sup>th</sup> century. The streetcars provide transportation solutions in several ways.

- Circulation and linkage
- Economic development
- Community character and definition
- Organization of development
- Bring new people to transit

## New streetcars

Terminology used for transportation vehicles can be confusing as labels are not always used uniformly through the transportation communities. For that reason a description of current terminology and meanings is in order. The term "streetcar" is interchangeable with the word "trolley", referring to an electrically powered, self propelled vehicle operating on a fixed guideway track, usually in mixed traffic with automobiles, pedestrians or bicycles. Outside of North America they are called "trams." Streetcars are not the rubber tired buses with bodies configured with the vague appearance of streetcars from the late 19<sup>th</sup> century.

The streetcars as reintroduced on the streets of American cities can take three forms, namely **vintage**, **replica** or **modern** trolleys. **Vintage** trolleys refer to genuine historic cars built anytime from the late 19<sup>th</sup> century to the early 1950's. **Replica** trolleys are newly

manufactured streetcars with car body designs reflective of streetcar designs from early in the 20<sup>th</sup> century. **Modern** streetcars are just that, newly manufactured cars with a contemporary design.

The choice of which kind of streetcar that is right for any streetcar system implementation is driven by the primary purpose of the streetcar operation as well as operating conditions and the characteristics of the community through which they will operate. Other car and route configuration aspects also impact the decision.

Although streetcars have many common attributes and capabilities, such as the ability to operate on the same tracks and receive electricity from the same overhead wire, they have a variety of body styles and configurations. Proposed car configurations must be considered concurrently with operating configurations and physical design of the streetcar system.

Cars may be bi-directional or “double-ended”, obviating the need for turning loops at the ends of the routes but adding to the cost of the cars. They may be unit-directional or “single-ended”, a configuration appropriate for loop shaped routes.

Bi-directional or “double-end” cars have control equipment at both ends of the vehicle. Reversing direction is simply a matter of removal of the portable “brake-handle” and “reverse-key”, and lowering one trolley-pole and raising the other. The “changing-ends” procedure can be accomplished anywhere along the line where it is safe to do so, without the necessity of special track configurations. Most of the vintage cars operating on streetcar systems today use this configuration. Planners of streetcar systems must take into consideration initial operating configuration and subsequent system expansion as well as the possibility of two-way operation during emergency situations.

A variety of other car configuration issues must be considered. “Single-truck” or “double-truck” (meaning how many axles) influences flexibility, carrying capacity, acceleration and braking capability. The variety of car configurations in a given system will influence maintenance cost and necessary parts inventories.

## **Process components**

Each project that has been implemented has had specific identifiable components, each piece playing a crucial role in the initiation of streetcars. The development and sequencing of the components comprise the implementation process.

**Conception** – The process begins with individuals or small groups who either advocate streetcars in general or see a need that streetcars can fill. In other instances the idea originates with residents or civic leaders who have visited a city where streetcars are in operation.

**Core Group** – Small groups reach out informally to others who share the vision of streetcar implementation. The small groups engage in community education and customarily form a working group or “steering committee” to begin formalization of the implementation process. Specific roles are necessary, namely to advance the process politically and to see to the administration of the implementation process.



**Implementing Organization** – Effective organization is necessary to continue the initiation process. Early in the process it is important to formalize the core group relationship. This is customarily done by formation of a 501(c)(3) not-for-profit organization. Formal organization clarifies the activities of the group, provides legitimacy to the group, and provides a mechanism for acceptance of tax-deductible donations while more permanent funding sources are being explored

Vesting implementation with an existing city agency or with the transit system carries the risk that the project will get lost in the agency’s larger agenda or get tainted with conventional viewpoints about what should or shouldn’t be done. An independently organized agency is the desirable alternative.

**Project Vision and Planning** – Coincident with the formation of the implementing organization is beginning of the planning process. Any planning effort must consist of three parts:

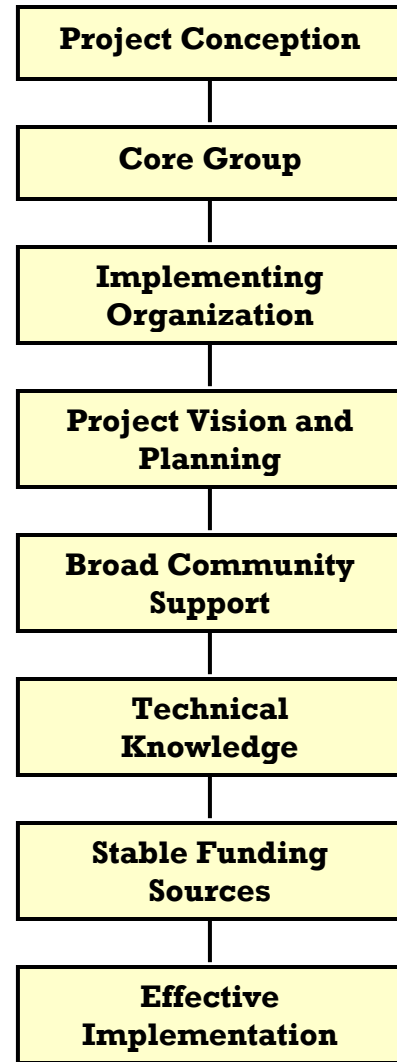
1. An assessment of present conditions, including unmet needs
2. Creation of a vision of the future that meets needs and establishes appropriate goals
3. Defining the process for getting from present condition to fulfillment of the vision

**Broad Community Support** – The building of broad community support is essential. It will facilitate and streamline the implementation process. Furthermore it lays the groundwork for community support in times of trouble. Support should be sought from as broad spectrum of society as possible but must especially target civic leaders in the public, private and not-for-profit sectors. Sensitivity to community wants and needs and community education are both vital in this process.

**Technical Knowledge** – Increasing degrees of technical knowledge are necessary throughout the implementation process. Early decisions regarding feasibility and scope are dependent on organizers understanding the nature of streetcar technology and operation. Building of support will require an ability to describe the proposed streetcar and its attributes. The appropriate time to retain the services of a consultant is early in the process, when the core group is carefully considering the need, the market and the purpose. Some consultants specialize in the commercial and institutional aspects of implementation, while others see to the engineering aspect of the projects. There is an old saying “the devil is in the details.” That is certainly true of streetcar implementation.

**Stable funding source** – Streetcars, like other forms of public transit, cannot cover their operating costs solely from internally generated revenue sources, i.e. farebox receipts, and

**Figure ES-1 Implementation Process Components**



other sources such as advertising or concessions. Stable funding sources must be identified therefore, for both implementation and ongoing operations. Appendix 2 provides a description of capital (implementation) and operating funding sources. Operating funding often presents a larger challenge since there is no “splash” or “hoop-la” associated with a new service. Operating funding is merely a dry line item in a budget.

**Execution** - The best planning is of little value if not executed or if executed poorly. Unexpected obstacles will be encountered. Care must be taken in planning. Care must be taken in implementing the plan.

**Operation of the streetcars**

**Table ES-2 Mean Distance Between Stops**

What kind of service is being proposed? The anticipated operating characteristics must be considered before making meaningful projections as to necessary funding and other resources. Some key operating characteristics are route configuration service span, service frequency, location and spacing of stops, how will the system be staffed, and what fare will be charged. It is difficult to generalize about desirable operating characteristics owing to both the tradeoffs between characteristics and the distinctive nature of individual streetcar system contexts. Some of the relevant operating characteristics worthy of consideration are stop configuration and spacing, service span and frequency and fare structure.

Mean Distances (feet) Between Stops		
City	System Length	Distance between stops
Denver	18,480	3,696
Fort Collins	7,920	2,640
Tacoma	8,448	2,112
Astoria	15,840	1,584
Galveston	31,152	1,483
Little Rock	13,200	1,320
Memphis	30,624	1,277
Seattle	9,768	1,221
Charlotte	11,088	1,109
Tampa	12,144	934
Portland (Modern)	13,200	776
Kenosha	10,032	627

**Table ES-3 Service Frequency (Minutes)**

City	Weekday	Saturday	Sunday
Charlotte	30	30	30
Dallas	15	25	25
Galveston	40	20	20
Kenosha	15	15	15
Galveston	40	20	20
Memphis	10	10	10
New Orleans	5-15	5-15	5-15
Portland (Modern)	14	14	14
San Francisco	8	8	8
Seattle	20-30	30	30
Tacoma	10	10	20
Tampa	15-20	15-20	15-20
<i>Service may vary slightly at different times during the day.</i>			

The locally focused nature of streetcar service dictates that stops will be closely spaced, with maximum ease of pedestrian access. Trade-offs in stop configuration will be necessary with respect to handicapped accessibility, context sensitive design and safety. Stop spacing will vary depending on the nature of the ridership. Tourist or museum oriented systems need fewer stops since the streetcar itself is as much an attraction as the activities at the various stops. Table ES-2 summarizes stop spacing practice on existing streetcar systems.

Service span, the number of hours the streetcar is operated each day, is dependent largely on the purpose the streetcar is intended to serve. In general for the circulator routes the weekend service will operate on a 16 hour service span, from early morning to late evening. Service often runs longer on Friday and Saturday evenings. Some systems end Sunday service at 6:00 p.m. Others operate longer into the evening. Circulator systems for whom journey to work trips are not a priority, service will start in late morning. Theme systems, whose focus is much more in the tourist and visitor market, customarily operate from late morning to early evening on weekdays, sometimes longer on weekends. The smaller theme systems frequently operate daily in the peak season but confine their operating hours to weekends during the non-peak season.

Service frequencies vary according to expected levels of ridership, purpose of streetcar operation, and budgetary and route configuration considerations. The circulator systems with high ridership levels generally operate the service most frequently. The systems catering to tourist and visitor trade operate less frequently. Service frequencies on present streetcar systems are summarized in Table ES-3.

**Table ES-4 Fare Structures**

<b>City</b>	<b>Full Fare</b>	<b>Reduced</b>	<b>Day Pass</b>	<b>Other</b>
Astoria	\$ 1.00		\$ 2.00	
Charlotte	\$ 1.00	\$ 0.50	\$ 3.00	
Dallas	Free			
Denver	\$ 3.00	\$ 1.00		
Galveston	\$ 0.60	\$ 0.30		
Kenosha	\$ 0.25	\$ 0.25		
Little Rock	\$ 0.50	\$ 0.25	\$ 2.00	
Memphis	\$ 1.00	\$ 0.50	\$ 3.50	
Portland (Modern) Line	\$ 1.50	\$ 0.70		inside the "Fare"
Cable Car	\$ 5.00	\$ 1.00	\$ 10.00	
San Jose	\$ 1.75	\$ 0.75	\$ 5.25	
San Pedro	\$ 1.00			
Seattle	\$ 5.00	\$ 2.50		
Tacoma	Free			
Tampa	\$ 2.00	\$ 1.00	\$ 4.00	
Tucson	\$ 1.00	\$ 0.50	\$ 2.50	
Yakima	\$ 6.00	\$ 4.00		Family Ticket \$15

Fare structures and amounts charged vary according to purpose of the streetcar and local conditions. In general, tourist operations charge more per ride while systems whose primary purpose is circulation charge less. Two systems offer their services wholly or in part without any boarding fee. Streetcar fare structures are summarized in Table ES-4 shown above.

Numerous other operational characteristics must be considered when implementing a streetcar system. Management of employee work schedules, car arrangements, operating speeds, and fare collection arrangements are just a few. Each characteristic represents a trade-off with other operating aspects and must be carefully considered implementing streetcar service.

## Capital and operating Costs

Different kinds of costs are generated during implementation and operation of the streetcar system. Implementation involves both capital and operating costs. Once implementation is complete, capital costs are finished until system expansion takes place or asset replacement is necessary.

## Capital and implementation Costs

Capital costs are generated in the design and construction of the streetcar system. Cars must be acquired, tracks and wires must be put in place, and a maintenance facility must be established. Costs per mile can vary hugely from one system to the next. Variations arise from purposes for streetcar project, the ability to use or adapt existing facilities, utility relocation expenses, need for major infrastructure revision, and methods of allocation of implementation expenses. Historic costs per mile for selected streetcar installations are summarized in Table ES-5.

**Table ES-5 Project Cost per Mile**

Systems such as Dallas and Kenosha enjoyed low implementation cost through use of existing infrastructure, “in-kind” donations of resources, and prudent management of design specifications and project scope. Higher cost per mile systems such as Tacoma were built to much higher standards, anticipating future use as a light rail system using heavier cars and a very short (few miles) route over which to spread the fixed up-front implementation costs and maintenance facility cost. Side by side comparisons in Table 5 do not adjust for inflation between the dates when the respective systems were opened.

<b>Cost per mile of streetcar installations</b>		
<b>City</b>	<b>Year</b>	<b>Cost per Mile (million)</b>
Dallas	1989	2.1
Kenosha	2000	2.9
Memphis (Riverfront)	1997	4.7
San Pedro	2003	4.7
Little Rock	2004	7.8
Memphis (Main St.)	1993	14.0
San Francisco "F" Line	2000	15.9
Charlotte	1996	19.0
Portland (Modern)	2001	22.8
Tampa	2002	23.0
Memphis (Medical Center)	2004	26.0
New Orleans (Canal St.)	2004	29.9
Tacoma	2003	56.3

Bridges and necessity for utility relocation will increase implementation cost substantially. “Starter” systems such as Tacoma’s or the original Memphis Main Street segment have borne disproportionately large cost components that were not present for incremental system extensions.

## Operating costs

Table ES-6 provides a comparison of streetcar system costs and measures of effectiveness. The table not only compares the streetcar systems with each other, but with other transit modes in the cities in which the streetcars operate. Not surprisingly, older larger systems with longer passenger journeys in established transit corridors such as in New Orleans

generate the lowest cost per passenger mile and passenger trip. Conversely, newer and more tourist oriented systems, such as Kenosha generate higher cost ratios.

- Economy of scale of fleet size. The larger bus system has a larger fleet over which to spread administrative and overhead cost.
- Not all maintenance is done at the streetcar maintenance facility. Necessity sometimes arises to truck a streetcar to a remote location for heavy or specialized maintenance.
- Higher spare parts ratio for smaller and more specialized streetcar fleet
- Smaller operator pool. Run assignments may not be as efficient as those on the larger bus system. Larger proportional pool of “extra-board” operators.
- Maintenance cost of track, power supply, and overhead contact wire system.

**Table ES-6 Streetcar and Bus Efficiency Measures - 2003**

City	Mode	Route Miles	Unlinked Passenger Trips	Passenger Miles	Annual O&M Cost (Thousands)	O & M Cost per Passenger Mile	O & M Cost per Passenger Trip
Galveston	Streetcar	5.9	54,335	67,875	\$ 96,840	\$ 1.43	\$ 1.78
	Bus		794,795	1,657,704	\$ 2,680,313	\$ 1.62	\$ 3.37
Kenosha	Streetcar	1.9	67,557	68,348	\$ 308,389	\$ 4.51	\$ 4.56
	Bus		1,601,445	5,931,860	\$ 5,173,010	\$ 0.87	\$ 3.23
Memphis	Streetcar	5.8	778,442	1,562,396	\$ 3,537,599	\$ 2.26	\$ 4.54
	Bus		10,692,573	61,166,849	\$ 39,862,939	\$ 0.65	\$ 3.73
New Orleans	Streetcar	16.0	6,340,217	13,475,205	\$ 9,472,948	\$ 0.70	\$ 1.49
	Bus		46,658,612	118,631,220	\$ 83,012,976	\$ 0.70	\$ 1.78
Seattle	Streetcar	1.9	403,590	410,245	\$ 1,421,503	\$ 3.47	\$ 3.52
	Bus		71,009,626	433,019,222	\$ 294,146,010	\$ 0.68	\$ 4.14
	Trolley Bus		23,679,298	42,467,497	\$ 42,331,347	\$ 1.00	\$ 1.79
Tampa	Streetcar	2.3	503,698	842,994	\$ 1,844,780	\$ 2.19	\$ 3.66
Tampa	Bus		9,185,410	43,832,969	\$ 30,445,904	\$ 0.69	\$ 3.31
Aggregate	Streetcar		8,147,839	16,427,063	\$ 16,682,059	\$ 1.02	\$ 2.05
	Bus and TB		116,963,147	588,076,101	\$ 414,639,523	\$ 0.71	\$ 3.55

Source: National Transportation Database

## Ridership

The most important aspect of the streetcar system is the riders. Without the riders there would be no reason for the streetcar system to be operated. How many people can be expected to rider the streetcar? Why do they ride the streetcar? Who are the riders? When do they ride the streetcar?

### Trip and rider characteristics

Many factors influence riders’ trip decisions and overall ridership levels. The primary factors are intensity and mix of land uses, travel time, frequency and span of service, fare, connectivity to a broader network, understanding the network, and comfort (while waiting for and while on the streetcar).

Who are the riders of the newly implemented streetcar systems? As with transit systems in general, ridership can be classified into transit-dependent and choice riders. The central city

streetcar systems add two other distinctions, the first being diverted riders vs. induced riders. Each has its importance as the streetcar carries out its desired purpose.

Ridership studies in the form of on-board passenger surveys have been conducted in Dallas and Memphis to gain a better understanding of the characteristics and motivations of present streetcar passengers. The Memphis study reported about half the riders rode the streetcar for transportation, the others for entertainment, that only a small proportion of streetcar riders are regular users of other transit modes and that a large proportion of riders spent money at local businesses before or after their rides. The study also analyzed seasonal and “days-of-week” variations in ridership

The surveys indicate that in contrast to more “conventional” transit services, streetcar users are overwhelmingly “choice” rather than transit dependent riders. Diverted riders may have been diverted from another transit service, from their automobile or from pedestrian or bicycle transportation. Other riders may be induced riders who would not have made the trip but for the presence of the streetcar. Yet another distinction is “joy riders vs. destination oriented riders. Thorough understanding of the nature of riders is important not just to accurately project future ridership, but to assess societal benefits resulting from implementation of the streetcar system.

### **Broader ridership base**

Analysis of rider characteristics reveals the apparent phenomenon that rail attracts more riders and more market segments than buses under similar conditions. “Before and after” comparisons of rail implementations, rider surveys and other evidence would appear to support this. Understanding of the service offering, visibility of the service, the ambience of the ride experience, and sociological considerations all appear to combine to make streetcar experience more attractive than that of the bus under comparable circumstances.

### **Welcoming riders to transit**

If, as surveys have shown, the majority of streetcar riders have not had experience with public transit, an opportunity exists for the transit industry to use the streetcar as a means of attracting new regular users. It is especially important that their streetcar experience be a good experience. The Dallas ridership survey profiled many riders as either transit-ignorant or transit-hostile and generally apprehensive or intimidated by their first time ride. They are afraid of getting lost or looking foolish because they don’t understand how things work. The purpose for ensuring the streetcar riders’ good experience goes beyond cultivating new individual riders. The profile of new riders as conventioners and tourists visiting cultural attractions implies a significant component of potentially influential people in their communities. Can their (hopefully) revised attitudes be useful in building community support for additional transit initiatives?

### **Ridership projections and counts**

Ridership projection for any new transit service is an inexact science. It would appear that ridership projection is often driven more by political considerations than by objective methodology. The streetcar lends itself even less well to objective methodology. Demand models and econometric projections do not take into account the “ambience” factor or the exact form the revitalizing central city will take. Yet, to qualify for federal money, particularly

New Starts or Small Starts money, where projects are objectively compared with other projects in a rigorous “side by side” evaluation process, some methodology must be used to produce a reasonably accurate projection. In general it is the accuracy with which the initiators established a stable funding system that ensures or jeopardizes the future of the streetcar system.

## **Effectiveness and “success” of streetcar projects**

By what measures can a streetcar project be judged “a success?” Have the streetcars accomplished all the things that were promised at the time of their initiation? How well? How can the streetcars effectiveness be measured? Are there other, unexpected benefits that the streetcars brought? Have the streetcars had negative impacts? What kinds?

The streetcar systems can be evaluated in several ways. The “metrics” of public transit service offerings are measured by objective standards so that side-by-side comparison can be made for purpose of funding and commitment of community resources. The second measure addresses the streetcars’ effectiveness in bringing about economic revitalization or other community objectives. A more qualitative measure is the fulfillment of political objectives. An overall measure of the “success” of a streetcar project is simply whether or not it continues to attract sufficient resources to assure continued survival.

### **Measures of effectiveness**

In an exhaustive review of literature and in numerous interviews with civic leaders I have concluded that very few quantitative benefit/cost measurements are in place. This largely results from the nature of the benefits the streetcars are expected to achieve and the fact that streetcar systems are implemented simultaneously with a variety of other activities.

To be sure there are evaluation criteria available, but they customarily address some component of the streetcars’ efficiency or effectiveness rather than the overall community benefit. Those criteria can be grouped into categories:

- Economic benefit
- Cost effectiveness
- Performance effectiveness
- Environmental benefit
- Political Effectiveness

Economic benefits from the streetcars occur in several interrelated ways. The first is to increase the level of transactional sales. Secondary benefits from increased transactional sales are the multiplier effect of money respent in the community and tax revenues generated by additional sales. These benefits may come from attraction of additional day visitors, overnight tourists, or conventioners. Benefits may also come from extension of the visits due to convenient accessibility to a greater number of attractions in the community.

Cost effectiveness can be considered either in terms of maximum benefit derived per dollar of implementation cost or efficiency with which the system is currently operated. Civic leaders’ focus on overall ridership as a measure suggests that the measurement of annual

ridership in relation to investment cost would be valuable. A comparative table of Implementation cost per rider is shown in Table ES-7 below.

**Table ES-7 Implementation Cost per Passenger Trip**

The wide variation in cost per annual rider must be interpreted carefully. Memphis and Tacoma each began new services in the past three years, where routes were built to light rail standards in anticipation of ongoing ridership gain. Also, implementation costs on the preceding chart are not indexed to account for increases in implementation cost over time. Implementation cost per rider does not take into account other land use or political benefits that may derive from the project, nor does it reflect how much extraneous construction activity was charged to the streetcar implementation.

Annual ridership per dollar of implementation cost			
City	Cost (\$)	Annual Ridership	Cost per Trip (\$)
Galveston	12,000,000	54,335	221
Tacoma	80,400,000	738,536	109
Little Rock	19,600,000	200,000	98
Memphis	109,300,000	1,132,378	97
Tampa	32,000,000	420,023	76
Kenosha	5,100,000	67,256	76
Portland (Modern)	56,900,000	1,960,000	29
Seattle (Waterfront)	10,100,000	403,590	25
Dallas	5,900,000	236,400	25
San Jose	1,900,000	143,332	13
San Francisco "F" Line	70,000,000	6,500,000	11
New Orleans (Riverfront)	5,400,000	1,642,500	3

Several measures are used to evaluate streetcar operations. Service efficiency can be measured by apportioning operations and maintenance cost by revenue vehicle mile or revenue vehicle hour. The service efficiency index measures how well the streetcar system is providing service in relation to its operating cost. Efficiency and effectiveness of various streetcar systems are compared in Tables ES-8 and ES-9, shown below.

**Table ES-8 Streetcar Service Efficiency Measures – 2003**

City	Route Miles	Annual Revenue Vehicle Miles	Annual Revenue Vehicle Hours	Annual O&M Cost (Thousands)	O & M Cost per Revenue Vehicle Mile	O & M Cost per Revenue Vehicle Hour
Galveston	5.9	8,252	1,426	\$ 96,840	\$ 11.74	\$ 67.91
Kenosha	1.9	20,272	2,896	\$ 308,389	\$ 15.21	\$ 106.49
Memphis	5.8	500,810	38,151	\$ 3,537,599	\$ 7.06	\$ 92.73
New Orleans	16.0	732,771	77,064	\$ 9,472,948	\$ 12.93	\$ 122.92
Seattle (Waterfront)	1.9	42,865	11,130	\$ 1,421,503	\$ 33.16	\$ 127.72
Tampa	2.3	80,220	17,329	\$ 1,844,780	\$ 23.00	\$ 106.46

Source: National Transportation Database



**Table ES-9 Streetcar Service Effectiveness Measures - 2003**

City	Route Miles	Annual Revenue Vehicle Miles	Annual Revenue Vehicle Hours	Unlinked Passenger Trips	Passenger Trips per Vehicle Revenue Mile	Passenger Trips per Vehicle Revenue Hour
Galveston	5.9	8,252	1,426	54,335	6.6	38.1
Kenosha	1.9	20,272	2,896	67,557	3.3	23.3
Memphis	5.8	500,810	38,151	778,442	1.6	20.4
New Orleans	16.0	732,771	77,064	6,340,217	8.7	82.3
Seattle (Waterfront)	1.9	42,865	11,130	403,590	9.4	36.3
Tampa	2.3	80,220	17,329	503,698	6.3	29.1

*Source: National Transportation Database*

Measurement of environmental benefits under the Federal Transportation Administration (FTA) New Starts program focuses on the streetcars’ positive impact on regional pollutant emissions. Table ES-10 reproduces the FTA summary of reduction of pollutants associated with the opening of the Medical Center extension of the Memphis streetcar system.

**Table ES-10 Environmental Measures**

Medical Center Extension - Memphis, Tennessee	
Criteria Pollutant	New Start vs. No-Build
Carbon Monoxide (CO)	13
Nitrogen Oxide (NOx)	2
Volatile Organic Compounds (VOC)	1
Carbon Dioxide (CO2)	177
Values reflect annual tons of emissions reductions	
<i>Source: FTA New Starts Annual Report, November 1999</i>	

With the passage of the SAFETEA-LU transportation funding authorization act in 2005, the New Starts program was amended to include a “Small Starts” program, into which streetcar project will fall. Because the streetcar projects provide a variety of benefits to the community beyond efficiency in providing transportation, the Small Starts program modifies the usual evaluation criteria. Under the new program the FTA must:

- “Determine the degree to which the project is consistent with local land use policies and is likely to achieve local developmental goals
- Determine the cost-effectiveness of the project at the time the service is initiated
- Determine the degree to which the project will have a positive effect on local economic development”<sup>1</sup>

Another measure of success is the willingness of civic officials to invest resources in expansion of existing streetcar systems. Nine communities have found their streetcar systems to have sufficient worth to warrant expansion of the systems using municipal funds. Three cities have undertaken two extensions. Four more cities are actively planning extensions to their systems.

## **Casualties**

Not all streetcar implementations have been successful. Streetcar systems in Detroit and Philadelphia, begun in 1976 and 1982 respectively, have ceased operation. Early in its history the Detroit Downtown Trolley achieved its sponsors' expectations by providing an effective connection between hotels and the convention center. Its early success even warranted a modest route extension. However in a continuing exploration of revitalization and connectivity strategies, the City of Detroit, with the help of a substantial Urban Mass Transit Administration grant, established an automated "people mover", covering substantially the same area as the streetcar. Connectivity needs in downtown Detroit are insufficient to warrant two separate circulation systems. Furthermore, neither the trolley, nor the people mover, nor other strategies have brought about the kind of revitalization necessary for downtown Detroit to return to the state of vibrancy desired by civic leaders. The streetcar system was subsequently removed.

Another "failed" streetcar effort was that of the Penn's Landing Trolley in Philadelphia. Initiated by well meaning streetcar enthusiasts, the system offered service along the redeveloping Delaware River waterfront. Implementers had not developed a broad base of community support. Frequent changes in waterfront development configuration resulted in constant and expensive changes to the streetcar operating infrastructure. The administrators of the system had neither the political influence to bring about operational permanence, nor could they muster the resources to continue to make the necessary infrastructure changes. The system was discontinued and the streetcars removed from the setting.

Other small, usually volunteer run, streetcar operations have failed to survive. With the sole exception of the Detroit system, all of the systems that have failed have been tourism based, pseudo-museum operations without providing meaningful transportation or circulation benefits to their respective communities.

Some streetcar systems have failed to meet the original objectives of the implementers. Kenosha's system, for example, was conceived as a circulatory system. It has not yet succeeded in that role. It has, however, provided enough other benefits to warrant continued operation and consideration for system expansion. Though that system did not achieve all of its original objectives, it has been a success in providing a positive value to its sponsors. A streetcar system can only be considered a failure if the benefits it provides are so small as to prevent it from attracting the resources it needs to continue in operation.

## **Elements of success**

Some 25 streetcar systems have been started since the mid-1970's. They were implemented for a variety of purposes, some by enthusiasts, some by municipalities, and one by the National Park Service. Nearly all are still in operation. Some have been extended and others have extensions planned. Objective measurement of the "success" of the systems has proved elusive. The streetcar systems that have been expanded, have enjoyed expanding ridership and impact on the community have common elements that have assured their ongoing popularity and community support.

- **Clearly defined purpose**– The clearly defined purpose, be it circulation, attraction of visitors, stimulation of development, interpretation of local history, or some other purpose is clearly understood by implementers. Successful systems are designed to achieve the purposes for which they were implemented.
- **Clearly defined market** - The clearly identified market assures that people will really use the system. Robust ridership is the key element in sustaining community support.
- **Multiple benefits** – Dependence on a single market, tourism for example, leaves a system vulnerable, first to low ridership in relation to operating cost, also to ups and downs of the economy. Streetcar systems with multiple purposes such as circulation and visitor attractions are viewed by civic leaders as necessities in the community.
- **Broad political/civic support** – Development of a broad supportive constituency from all parts of the community is vital to assembling the resources to start a streetcar system, to overcome objections of naysayers, and to assure the continued availability of future resources.
- **Strong leadership** – Implementation and continued operation of a streetcar system is fraught with huge challenges that require patience, determination, and effective mobilization of resources to meet them.
- **Adequate financing** – Promoters of successful systems identify the financing necessary for implementation and ongoing operations early in the initiation process. Successful streetcar systems draw upon a variety of financing sources, partly to lessen the amount required from any particular source, but also to “cushion” the impact of loss of any one particular component of the financing system
- **Expertise** – Streetcar system implementation involves dealing with voluminous arcane details, both in the technology and in the administrative context in which the streetcar system is implemented. Successful implementers are knowledgeable both about cities and about trolley cars.
- **Regional Connections** – People who ride the streetcar had to have come from somewhere. Interface with parking lots, transit systems, and highways are all important in assuring prospective riders have access to the system
- **Satisfactory rider experience** – Both the on-vehicle and “before and after” experiences must be satisfactory for riders. Robust ridership is made of repeat customers. Robust tourism is made of “word of mouth” advertising of the visitation experience.

With each of these characteristics a streetcar system should be able to meet the needs of the community and attract enough resources to continue operations long into the future.

## **The future**

Streetcar systems began as small installations with narrow purposes. Detroit’s system in 1976 sought to provide circulation in a revitalizing downtown. Seattle’s implementation in 1982 introduced the concept of the waterfront connector. Systems implemented in the 1980’s were often enthusiast inspired and/or pseudo-museum and tourist based in their purposes. Fort Collins, Lowell, Dallas, Denver and Fort Smith and Astoria all fell generally into this category. Two systems were implemented as adjuncts to the newly implemented light-rail systems, namely San Jose and the Portland Vintage trolley.

Memphis' start-up in 1993 heralded the arrival of the urban circulator system operating in mixed traffic. With the turn of the century came a flurry of new municipally sponsored circulator systems such as Kenosha (intended as a circulator), Portland (modern), Tampa, Tacoma, New Orleans (system expansion), and Little Rock. Streetcar design and purpose evolved even within that group. Portland and Tacoma forsook the nostalgia factor of the vintage streetcars and introduced modern vehicle design. New Orleans reinstated streetcar service on a route that had been discontinued as late as 1964. As new systems are planned, the design and purposes of proposed streetcars continue to evolve.

Streetcars have been a part of the American scene for 175 years. Once dominant as providers of local urban mobility, they declined but have been reintroduced in revitalized central cities. Only time will tell whether the streetcars will once again achieve dominance in urban circulation or what form they will take.

## I. Why streetcars?

No so long ago the clang! clang! of the trolley car was a symbol of obsolescence in American cities. Now streetcars have become an effective tool in the redefining and revitalization of formerly moribund downtown areas. Why is that? Was it not but a generation ago that civic leaders pressured the transit systems to replace the streetcars with modern and flexible buses? How is it that streetcars have been reintroduced in so many cities, and that so many more cities are considering how streetcars can play a circulatory role in their revitalizing central cores?



**Figure 1 Vintage streetcar – Memphis, TN**

What are streetcars anyway? Streetcars are electrically powered vehicles, running on steel rails, most often in mixed traffic in streets, usually drawing their power from an overhead wire contact system. For several decades in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries they functioned as the preponderant form of mechanized mobility in American cities and were particularly important in providing mass access to America's city centers. Figure 1 shows a "traditional" streetcar operating on a newly implemented streetcar system.

City centers experienced a decades long decline in economic and social importance. Beginning with widespread use of automobiles, and accelerated by deindustrialization of our nation's economy, city centers have lost their traditional role as commercial, retailing and employment centers of their respective regions. The changes necessitated that cities reinvent themselves in the process of adaptation to new global and regional realities.

City centers have increasingly reinvented themselves as the cultural centers of their respective regions. Although retailers and major employers have departed for peripheral suburban locations, they have left in their wake a rich legacy of museums, parks, historic buildings, and other cultural attractions. Profound changes in industrial and transportation dynamics have rendered traditional port facilities and city centered industrial facilities obsolete. Far from being liabilities, the obsolete facilities represent valuable resources in the redefining of city centers' role.

Cultural attractions and walkable ambience are two of the most significant assets city centers have to build upon in redefining themselves. However a challenge arises in that the locations of the cultural assets are generally fixed in their traditional locations. The city center has two logistical challenges. First is to connect the existing and newly developed cultural attractions. The second is to extend the walkable range to maximize the economically productive area of the redefined city center.

Streetcars have emerged as a valuable tool in providing contextual connectivity and extension of walkability. The combination of those benefits serves to maximize the proximity value of the various cultural attractions and significantly enhance the experience of visitors.

**Table 1 New Streetcar Systems**

City	Implemented	Purpose	Type	Route Miles	Status
Astoria	1999	Attraction	Vintage	3.0	In Operation
Atlanta		Circulator	Modern	12.0	Proposed
Charlotte	1996	Attraction	Vintage	2.1	In Operation
Charlotte		Circulator	Modern	8.0	Proposed
Dallas	1989	Attraction	Vintage	3.6	In Operation
Denver	1989	Museum	Vintage	3.5	In Operation
Detroit	1976	Circulator	Vintage	2.9	Defunct
Fort Collins	1984	Museum	Vintage	1.5	In Operation
Fort Smith	1991	Museum	Vintage	0.3	In Operation
Galveston	1987	Circulator	Vintage	5.9	In Operation
Kenosha	2000	Attraction	Vintage	1.9	In Operation
Little Rock	2004	Circulator	Vintage	2.5	In Operation
Lowell	1984	Circulator	Vintage	1.0	In Operation
Memphis	1993	Circulator	Vintage	7.0	In Operation
Miami		Circulator	Modern	6.0	Proposed
New Orleans, LA	1825	Circulator	Vintage	16.0	In Operation
Philadelphia (Penn's Landing)	1975	Museum	Vintage	2.0	Defunct
Philadelphia (Girard Ave.)	2005	Circulator	Vintage	8.5	In Operation
Portland, OR (Vintage)	1991	Circulator	Vintage	2.0	In Operation
Portland (Modern)	2001	Circulator	Modern	2.5	In Operation
Richmond		Circulator	Vintage	1.5	Proposed
Salem, OR		Circulator	Modern	4.0	Proposed
Savannah, GA		Circulator	Vintage	3.0	Proposed
San Francisco	1983	Circulator	Vintage	4.4	In Operation
San Francisco	1880	Circulator	Cable	3.5	In Operation
San Pedro	2003	Attraction	Vintage	1.5	In Operation
San Jose	1988	Circulator	Vintage	4.5	In Operation
Seattle (Waterfront)	1992	Circulator	Vintage	1.9	In Operation
Seattle (South Lake Union)		Circulator	Modern	2.6	Proposed
Tacoma	2003	Circulator	Modern	1.6	In Operation
Tampa	2002	Circulator	Vintage	2.3	In Operation
Tucson	1992	Attraction	Vintage	1.1	In Operation
Yakima	2004	Museum	Vintage	5.0	In Operation

Community streetcar operation has been implemented in two dozen American cities in the last 30 years. Some systems, like those in Detroit, Little Rock, Memphis, Seattle, and elsewhere have been municipally sponsored to provide circulation within or close to the central cities.

Others have been established as more “attraction” related, with their main function as encouraging tourism or attracting visitors. Those are known as “theme” systems. They are frequently privately sponsored and or operated. In general, no streetcar system performs a single role; circulation based systems attract visitors; “theme” systems usually provide some degree of useful transportation. For some systems such as San Francisco’s “F” line the distinction is utterly blurred.

Have the streetcars achieved their goals of contextual connectivity? Have they extended walkability in their communities? Have they achieved the various other purposes identified by their sponsors, advocates and funders?

This paper will first inquire as to why the “old” streetcars were discarded and review the economic and physical changes in city centers that made reimplementation appropriate. It will discuss the purposes of the “new” streetcars and the kinds of streetcar systems that have either been implemented or are currently being proposed. It will chronicle the implementation process. It will identify the roles of groups and individuals in creating popular and political support. The paper will review financial and other resources used by municipalities and others bringing streetcars to operation. It will discuss the sequence in which organization takes place and resources are put in place.

Since streetcar systems have been instituted to fulfill a variety of purposes employing varying technologies, the paper will summarize streetcar technology and review the characteristics of streetcar systems implemented over the past 30 years as well those currently planned. The paper will categorize the measures of success in relation to the founders’ purposes. It will define “output measures” with respect to efficiency and effectiveness. It will summarize the necessary components that have brought success to streetcar systems. Some streetcar systems have not succeeded. The paper will consider what components of success were missing when systems have failed.

Finally, the paper will analyze three systems in the form of case studies, chronicling the practical application of the implementation process and the technologies employed. It will evaluate the success of the respective systems. The paper will conclude by summarizing elements of success, namely the common characteristics of successful streetcar implementation efforts.

## II. Background

### II. 1. Streetcars in the 19th and 20th centuries.

In the late 19<sup>th</sup> century and the early 20<sup>th</sup> century streetcars were the primary means of traveling beyond walking range in cities and towns throughout the developed world. Their technological development had been slow, but by the 1890's when they reached their prime, their influence on the geography, the politics and the sociology of cities was profound.

Cities before the industrial revolution were compact, usually overgrown villages, often clustered around the wharves of a river or ocean port, or near a river falls, where water power was abundant. The primary commercial activities in the city were transshipment of goods from the river or ocean, market exchange of agricultural products, and small manufacturing enterprises.

Emergence of railroads in the mid-19<sup>th</sup> century reinforced this by bringing their tracks into the central cities, along the waterfronts, and often onto the piers. The presence of water to rail transfer facilities only reinforced the tendency for wholesaling and freight handling activities to be centralized near the port and adjacent to downtown.

In reviewing the historical underpinnings of Kenosha, Wisconsin's, central city area, the Urban Land Institute described the 19<sup>th</sup> century:

**“The physical structure developed to support the basic industries and the related residential population and community serving businesses first consisted of industrial and warehouse structures surrounding the harbor, with a classic downtown business district adjacent to, but inland from the port facilities.”<sup>2</sup>**

Coincident with the implementation of intercity railroad technology was the implementation of street railways, namely networks of tracks using steel wheels on steel rails embedded in city streets. The street railways literally “lifted urban transportation out of the mud”, facilitating longer journeys and thereby opening large tracts of land for urban expansion.

Propulsion was initially by horses. Operational economics, the issue of disposal of the waste products from the horses, and susceptibility of horses to disease caused street railway managers to seek mechanical propulsion methods. Various forms of propulsion were tried before the electrically powered streetcar emerged as the most practical method. The methods and technology perfected by Frank Sprague in 1888 became the standard for the industry. The technology that Sprague perfected is not materially different from the technology employed by the vintage streetcar systems of today.

Rapid innovations in car body style and operational arrangements led to rapid expansion of the nation's streetcar networks. In 1890, there were 8,123 miles of street railway in the United States. By 1902 that number had grown to 22,597 miles and by 1917, approximately the apex of street railway growth, mileage had grown to 44,835. More than 1,000 electric railways used 8,000 cars to carry 11 billion passengers annually.<sup>3</sup>



## II. 2. Functions and impact of the streetcar

Certainly the streetcar had attained preeminence as the primary mode of urban transportation. Before availability of automobiles, nearly all intra-city trips beyond walking distance were made by streetcar. Work related trips, visiting relatives and friends, and shopping trips, all frequently involved “taking the cars.”

But the streetcar had multiple roles. In an era before television, air-conditioning or even widespread access to motion pictures, the streetcars themselves were entertainment. The traction companies (as transit operators were called at the time) used various methods to encourage recreational travel. Open sided trolleys were introduced to provide maximum ventilation. The traction companies developed “electric parks” namely amusement parks on the periphery of the community that not only generated traffic but were profit centers in their own right.

“Joy riding” as recreational travel was then called was especially important in summer before the advent of air-conditioning. In reporting the institution of trolley car service between Elgin and Aurora, Illinois on June 20, 1896, the *Elgin Courier*, reported:

“Hundreds of people enjoyed river scenery and a delightfully cool hour in the heat of the hottest day by taking the electric cars to Coleman...In the summer months the grove at Coleman was full of picnickers and sightseers.”<sup>4</sup>

In an industry promotion the Street Railway Journal published a verse that captured the essence of recreational travel of the time.

**Oh, what delight  
On a soft June night  
To ride in an open car!  
You can stand the expense -  
It's only five cents -  
No matter how poor you are.**<sup>5</sup>



Figure 2 Open streetcar - Shore Line Trolley Museum

The attraction of the streetcar as recreational activity was then and is now a popular activity for all participants.

Aside from its purposes as transportation and a recreational source, the streetcar had a role in shaping of the urban landscape. Initially streetcars and budding communication technology such as pneumatic tubes and telephones attracted commercial activity to a central location. Furthermore, the route structure of the streetcars, focused on the established concentration of wholesaling and commercial activity, tended to have radial route structures focused on the downtown center. The presence of large number of employees, combined with universal accessibility from all parts of the city, caused the retailers to continue to focus their attention there as well.<sup>6</sup>

As technology improved and speeds increased, the streetcar began to have the opposite effect. Streetcars allowed, and in fact encouraged, residential development farther from the central city. The streetcar companies were privately owned and operated but cooperated with municipalities through municipal franchise requirements. The streetcar systems were what we would now call public-private partnerships. Participants were frequently land development companies and electric utilities, each wanting to expand their markets by opening up new land and residential subdivisions.<sup>7</sup> In this way streetcars established their role as the organizing principle behind new development activity.

In their heyday the streetcars provided circulation within the dense central city environment, regional connectivity through routes extending out into newly developed subdivisions, an attractive means of recreation for the entire community, and an organizing device in urban expansion. And, in a sense, the streetcar ushered in the era of “sprawl.”

### **II. 3. Automobile and truck use increased**

Technology that developed concurrently with the streetcar was that of the automobile. Though automobile technology was developed in the 1880's, initial cost and a lack of hard surfaced roads inhibited use of automobiles by any except the very wealthy.

Both limitations were addressed early in the century by introduction of Henry Ford's Model “T”, and the through widespread extension of hard surfaced streets. By 1914, implementation of mass production methods resulted in production of a new Model T every three minutes.<sup>8</sup> Another significant innovation facilitating popularity of automobiles was the introduction of the electric starter on Cadillac automobiles in 1912. Hand crank automobile starting procedure was a difficult and dangerous activity performed only by those of considerable physical strength. Introduction of the electric starter opened up the automobile to a far broader market.<sup>9</sup>

Just as automobile technology evolved, so had motor truck technology. Prior to World War I, the motor truck was looked upon as a motorized wagon whose best function would be to ferry goods and merchandise to and from the nearest rail terminal. Extreme rail congestion during World War I, led to embargo of shipments for distances under 50 miles. Motor trucks were substituted and despite the primitive condition of many roads, their worth was immediately proved; not just for local or regional trips but for inter-regional movement of goods.<sup>10</sup>

The combined effect of increased use of automobiles and motor trucks was to begin the decline of the central city as commercial center. Consumers now could visit local shopping centers in outlying locations. Trucks could haul goods from wharves to warehouses, stores and industries throughout the region, without need for local transshipment to rail cars or use of the densely packed, increasingly obsolete local warehouse facilities. Central city supremacy was no longer ensured.

Continuation of these trends in combination with changing social values and advances in manufacturing, office and distribution technology and processes would accelerate the dispersal of urban activities. Central cities would have to redefine themselves to retain any kind of economic or social viability at all.

## **II. 4. Economic viability of streetcars declined**

Streetcars had reached the peak of their economic viability and their influence on urban form and activity. Increased automobile usage and development of motor bus technology ushered in the 50 year decline of streetcars. Beginning in the early 1920's transit systems in small cities began replacing streetcars with buses. Streetcar systems experienced massive ridership losses in the 1930's as a consequence of reduced economic activity and continued increases in automobile ownership. As a result many more transit systems discontinued their streetcars in favor of the smaller but more flexible buses.

Replacement of the streetcars was not necessarily the result of an internal decision at the transit system. Popular opinion had turned against the streetcars. Automobile drivers found the streetcar tracks (especially when maintenance had been deferred) to be a huge nuisance. The popularly suggested solution was to pave over the tracks and replace the streetcars with buses. In general, deferred maintenance and the location of the tracks, often in "obsolete" neighborhoods or settings, led citizens and civic officials alike to regard the streetcars themselves to be obsolete in the automobile age.<sup>11</sup>

Widening of streets to facilitate efficiency and speed of automobile travel also adversely impacted the streetcars. The need to widen main arteries, especially leading to and from central cities wrought havoc. Expensive reconstruction of streetcar tracks could be avoided through substitution of buses. Demolition of buildings to create space for widened streets reduced the universe of people available to ride the streetcar.<sup>12</sup>

Though streetcars experienced resurgence during World War II, when rubber and gasoline were rationed and transit systems carried record numbers of passengers, the decline resumed and accelerated once the troops had returned safely home. At the end of 1945, 85 streetcar systems remained in operation. Half of those systems gave up streetcar operation in the next two years alone. By 1960, 11 systems remained, and by 1973 that number had been reduced to seven. Of the nearly 45,000 miles of streetcar track in 1917, barely 200 miles remained. Streetcars appeared to face extinction.

Public transit in general experienced a drastic decline in the post-World War II era. From a peak of 23.4 billion riders in 1946, transit ridership fell to 6.6 billion in 1972. Journey-to-work trips have always been transit's "bread and butter" in the marketplace. Transit's share of journey-to-work trips fell from 12.62 in 1960, to 5.12 in 1990.<sup>13</sup> Was transit itself facing extinction?

## **II. 5. Evolution from streetcars to light rail**

In 1973, seven "streetcar" systems remained. Boston, Newark, Philadelphia, Pittsburgh, Shaker Heights, San Francisco and New Orleans, together operated about 200 miles of track. In the face of staggering obsolescence of the industry, the remaining properties survived largely because they possessed unique operating circumstances that provided greater value than the conventional streetcar lines.

Boston's and Philadelphia's remaining streetcars used subways for access to the city center. Operation through tunnels in San Francisco and Pittsburgh precluded substitution of buses. Shaker Heights (Ohio) and Newark (New Jersey) "streetcars" were operated entirely on exclusive rights-of-way and did not operate in mixed traffic at all. The remaining streetcars in New Orleans operated nearly entirely in exclusive rights-of-way. San Francisco's cable cars remained as America's only traditional "streetcar" style operation. Their survival was attributable solely to their value as a tourist attraction. The charm associated with the 1920's era New Orleans era streetcars resulted in citizen opposition to replacement of New Orleans' last route.

The common themes in the survival of the remaining systems were either advantages resulting from separation from street traffic for all or part of their routes or an "ambience" that made them civic "treasures." The distinction between those two attributes would evolve into the distinction between "light rail" and streetcars.

Light rail gets its name as a way to distinguish it from "heavy rail", namely the fully grade separated, usually elevated or subway, electrically powered, rail transit systems. Increasing traffic congestion in cities, led a national transit expert, Donald C. Hyde, manager of the Cleveland Transit System, to predict in 1965 that 19 United States cities would have new rapid transit systems under construction by 1980. In fact by 1980, 5 cities, namely Washington D.C., San Francisco, Atlanta, Baltimore and Miami, had indeed already introduced "heavy" rapid transit service or had systems under construction.<sup>14</sup>

Heavy rapid transit systems, however, are expensive to build and operate. They require high population densities and high ridership to justify their implementation and operating cost. Other cities, San Diego in particular, studied heavy rapid transit as an option but explored other solutions. As an alternative to a one billion dollar heavy rail installation, San Diego instead chose to implement the technology still in use on the remaining streetcar systems, but operate it over former freight railroad tracks on a regional scale. In 1981 San Diego opened the first segment of its 16 mile electric railway. The cost was \$116 million dollars.<sup>15</sup> So it was that "light rail" was introduced to American cities.

Since San Diego's system was opened in 1981, 13 new light rail systems have opened around the country, and six of the seven "legacy" streetcar systems from 1973 have evolved into light rail systems. Three new systems are currently under construction and many more are being planned.

## **II. 6. The distinction between streetcars and light rail**

Despite the way the legacy systems evolved, light rail systems are not streetcars. The differences are in function and scale. Light rail systems are regional in nature. Their purpose is to bring people **to** and **through** the central city, but less so **within** the central city. They operate primarily in reserved rights-of-way to provide speeds higher than those of parallel traffic. The stops are far apart (1/4 mile or more) to minimize transit times. Their cars are large enough to accommodate peak hour and special events loadings. They frequently operate in 2 or 3 car trains. They are used by regular commuters and others wishing to make regional trips without relying on an automobile.

In contrast, the newly implemented streetcars, the topic of this study, are smaller and are locally focused. Their primary purpose is to move people **within** the central city. They

customarily operate on streets, in mixed environments with automobiles, pedestrians and bicyclists. Their speed is slower, reflecting the human scale of their operating environments. They have frequent stops, often every block, to maximize their value as local circulators. Riders are tourists and local residents often making casual trips for lunch, shopping, or to visit cultural institutions.

In reality; however, there is no clear “bright line” distinction between light rail and streetcars. The light rail systems in Philadelphia and San Francisco function effectively like streetcars, moving in mixed traffic with frequent stops and lots of “on and off” local riding. The Tacoma system describes itself as light rail, yet is functionally identical to the Portland Streetcar. The Astoria streetcar operates entirely on private right of way, never operating in a city street.



**Figure 3 Obsolete industrial buildings – Memphis - 1992**

Industrial decentralization left obsolete multi-story buildings on narrow streets in and near the old city centers. Freight containerization beginning in the 1950’s left oceanfront and riverfront wharves bereft of economic value. The networks of rail tracks serving the wharves were similarly unnecessary relics of an earlier era.

Memphis’ riverfront traditionally service as a center for warehouse and transshipment of cotton and various other goods. Buildings such as those shown in Figure 3 were rendered obsolete through changes in technology and distribution practices.

Figure 4 shows the obsolete structures in their new incarnation, complete with streetcar service to connect them with central Memphis activity centers that are beyond walking distance.



**Figure 4 Adaptive reuse of industrial buildings -Memphis -2005**

Seattle’s central waterfront stretches approximately 1.5 miles along the eastern shore of Elliott Bay. The series of oblique piers once bustling with activity as passenger ferries, and packet steamers made their calls. Railroads laid tracks to and along the piers for freight

access. The city organized the Port of Seattle in 1911 to bring order to the frenzied activity. Relocation of the ferry terminals and construction of container handling facilities elsewhere along the bay diminished freight and passenger activity at the piers. The piers stood nearly abandoned, for want of new uses.<sup>16</sup> Memphis, Little Rock, Kenosha, Philadelphia, San Pedro, Astoria, New Orleans and Tampa are all cities whose waterfronts experienced rapid transformation resulting from changes in shipping and manufacturing practices.

The old commercial “downtowns” experienced change as well. The rise of automobile usage brought profound changes. Narrow streets leading to and through the old downtown areas, combined with the lack of parking capacity left the old downtowns “out of step with the times.” Cities sought to compete on equal terms with the newly emerging retail and office centers in outlying places and began to adapt themselves accordingly. Cities emphasized construction of highways and provision of ample parking facilities as close to downtown office buildings as could be accommodated.<sup>17</sup>

## **II. 8. Renewal and redefinition**

Edward DeBartolo, owner of one of the nation’s most successful mall development companies had words of advice in 1973.

**“I wouldn’t put a penny downtown. It’s bad. Face it. Why should people come in? They don’t want the hassle, they don’t want the danger...No individual or corporate set-up can make a dent on those problems. So what do you do? Exactly what I’m doing. Stay out in the country, that is the new downtown.”<sup>18</sup>**

Volumes could be, and in fact have been, written about the phenomenon of gentrification of inner city areas. Beginning first in “artsy” neighborhoods, gentrification and the immigration of middle class people to urban settings started slowly but has gained momentum. While a lot of economic activity had left the downtowns, there were still assets. Central cities possessed attributes the suburbs didn’t. Cultural attractions, museums, libraries, and universities were still located near the city center. Governmental functions still called downtown home.

In an effort to renew their downtown, retailing activities, many communities large and small, closed their main retailing arteries to automobile traffic entirely and created either pedestrian malls or transit malls. With some exceptions, pedestrian and transit malls have been a failure.

Arthur Grey, *People and Downtown; use, attitudes, settings*, observes that

**"Malls and public spaces ...depend for their value upon their relationship to peoples' activity patterns. It must be understood why people are there and how they use the immediate environment."<sup>19</sup>**

Cities initially overreacted in their adaptation to automobile traffic, first by destroying much of their urban fabric to accommodate accessorial streets and parking lots. Later, recognizing the loss of pedestrian ambience that resulted from wide streets and fast moving traffic, they attempted to separate prime retail streets from any automobile access through creation of pedestrian malls. The pedestrian malls “starved” the streets of casual passers-by, people who are a vital part of retailers’ potential market.

Retail businesses depend on a steady flow of people passing their establishments, a flow that appears to require the presence of automobiles, transit, or both. Of the 200 pedestrian malls built during the last 40 years, only about 30 remain.<sup>20</sup> In redefining downtown, transportation systems must strike a balance between promoting walkability and maximizing visibility of, and access to, retail establishments.

Despite the “false start” of the pedestrian malls, central city downtowns have made huge progress in redefining themselves and redeveloping both their physical aspects and their spirit. Successful redevelopment of central cities has required successful redefinition of the role of the central city in the absence of its regional economic supremacy. Several themes have emerged.

The revitalized downtowns have incorporated walkable neighborhoods, historic buildings, cultural attractions such as museums, libraries, theaters and parks, restaurants, entertainment venues and specialty shops. The gathering of these kinds of places has made traditional downtowns a mecca for young people, families and empty nesters alike. The central city locations have appeal for visitors from the region and from other cities as well as being an increasingly desirable living location. Put together, they occupy a space that extends beyond normal walkable range. Chicago’s downtown, transformed by new high rise buildings in the central business districts and loft conversions in the surrounding neighborhoods, has expanded far beyond traditional boundaries defined by the “loop” elevated rapid transit lines.



**Figure 5** Street life proximate to PNC Park – Pittsburgh - 2005

An additional civic trend is to locate sports stadiums and arenas in central city areas. Central location of sports venues serves two major purposes. First, the venues are centrally located and accessible from all parts of the region. Second, location close to the revitalizing downtown maximizes proximity value to the restaurant and entertainment districts. Pittsburgh, in replacing the formerly isolated Three Rivers Stadium with new baseball and football fields, has developed a new entertainment district adjoining the sports venues.

Effective placement of convention centers likewise emphasizes the proximity to a variety of recreational and cultural attractions, particularly restaurant and entertainment districts. Convention attendees customarily do not have access to automobiles and must rely on hired transportation to access cultural and entertainment attractions. Cities that can maximize the variety of interesting activities available to conventioners increase their competitiveness in attracting convention business. Rich and varied convention activities beget additional tourism benefits when conventioners return with their families.

Connectivity becomes important for casual visitors and tourists. The majority will arrive by automobile. They will park their cars and attend the attraction most important to them. When they return to their automobiles their choices are to park somewhere else and visit

another attraction or leave the central city. Connectivity that provides convenient access to a variety of attractions and activities without return to the automobile extends the stay and improves the quality of the experience for the visitor. The connectivity must additionally be one that involves continuous engagement of the visitors' attention. A long boring walk is a barrier to attendance at another attraction, regardless of the intrinsic value of the attraction itself.

Issues of connectivity, walkability and ambience were addressed in a market study of downtown Memphis, a comprehensive analysis of residential, office, employment, retail and tourist trends, sponsored by the Center City Commission. The study was conducted to assess downtown Memphis' competitiveness in comparison to other regional commercial nodes. The study stated that"

**"Downtown Memphis, however, has a number of distinct competitive advantages. Most notably is its uniqueness in having the Memphis area's only true urban environment, with densely developed, walkable corridors that provide easy access to amenities such as supporting retail, nearby hotel and conference facilities, restaurants, and entertainment facilities. At issue however is that Downtown's development, like that in many markets in the southeastern U.S., is very fragmented, with numerous pockets of dense development that are not easily connected by pedestrian or transportation corridors."**<sup>21</sup>

Accommodation of the activities of large numbers of visitors and residents and their mobility needs combined with the need to maintain the walkable ambience presents a logistical challenge. Circulation and access solutions must be implemented in a way that respects the walkable ambience of the community and provides continuity of visitor experience.

Finally, the renewal and redefinition of central cities is a dynamic process. New attractions are being established and residential and other construction is accelerating. Care must be taken that the pattern of new development respects and nurtures the ambience that made the redefined central city attractive.

Transportation solutions then must address several separate needs:

- **Provide neighborhood circulation in a way that extends walkability of the district**
- **Respect the ambience of the neighborhood and not destroy it as did previous transportation solutions**
- **Function effectively in a mixed environment with pedestrians, bicycles and automobiles**
- **Connect the neighborhood with the region and with other cities**
- **Provide "surge" capacity for sports and other events commanding large attendance**
- **Provide continuity of visitor experience while performing the circulatory function**
- **Provide a transportation resource people are willing to use**



### **III. The role of streetcars in the redefined city**

Streetcars are naturally suited to provide circulation within revitalized and rapidly evolving central cities. It was streetcars that were naturally suited to the dense built environment as it existed early in the 20<sup>th</sup> century. The streetcars provide transportation solutions in several ways.

#### **III. 1. Circulation and Linkage**

One function that streetcars perform particularly well is to link activity centers. The activity centers may be stores, hotels, entertainment venues, historical sites, museums, convention centers, scenic attractions, residential center nodes or parks. The streetcar is perhaps most effective in a waterfront setting where by reason of geographic definition activity centers are strung out in a linear configuration as opposed to being clumped around a central point.

Linkage is also important with respect to regional access. Previous efforts in providing regional access resulted in destruction of the urban fabric of the downtown by allocating prime land for parking and by increasing velocity of streets for efficient traffic flow. The present challenge is to combine regional accessibility with walkable, human scale environment. The streetcar facilitates a provision of adequate parking capacity while preventing the parking lots' domination of the urban landscape. The streetcar likewise performs the local distribution function for regional transit services, be they commuter rail, heavy rail, light rail, or regional bus.

#### **III. 2. Economic Development**

As a cultural attraction in its own right, the streetcar provides the continuity of visitor experience that encourages exploration of the central city and attendance at multiple attractions. The ride on the streetcar circulates people through adjacent neighborhoods, giving an opportunity for riders to visually survey the communities through which the streetcar runs. The streetcar ride in effect functions in the same way as a "catalog." In the same way that the prospective buyers casually peruse a catalog until they see something interesting, so does the streetcar allow for casual perusal of neighborhoods.

Economic development success comes from local business' recognition of the value of the streetcar riders and finding ways to entice riders to get off and explore, or make a note of interesting things they saw and return at a later time. Memphis' South Main Association, consisting of merchants, restaurateurs, and art gallery operators, works with Memphis Area Transit Authority (operator of the streetcars), to raise riders' awareness and understanding of neighborhood attractions. Sponsorship of the South Main Trolley tour (described on page 58) has increased the trolley's value in stimulating local business activity.<sup>22</sup>

Restaurants and entertainment establishments depend on an "agglomeration factor" to achieve a critical mass of variety to attract business. The presence of the streetcar is likely to extend the limits of agglomeration beyond the normal walkable range.

### **III. 3. Community character and definition**

The redefined central city blurs the distinction between locus for creative interaction and entertainment center. The restaurants, entertainment establishments, coffee shops and specialty shops are recreational, but at the same time are the tools of creative interaction. The “whimsical” nature of the vintage streetcar blends into and reinforces the work and play interaction.

In his book, *A Theory of Good City Form*, Kevin Lynch observes:

**“Streetcars' prominence in the revitalization trend is showing that they are playing an important role in bringing people back into their urban cores. A probable reason for this is that they generally contain a city's own unique symbols and cultural overlay - those sensory environmental characteristics that create vivid memories and give one an understanding of a place. These are the components which enable a person to make his way around a city and easily understand where he is at any given time.”<sup>23</sup>**

As cities seek to differentiate themselves from, rather than emulate, suburbs, they also seek to differentiate themselves from other cities. The streetcars facilitate differentiation through providing a transportation and visual experience that is different and unique. Vintage streetcars reinforce the historic neighborhoods through which they often operate. In New Orleans, the streetcars themselves are listed on the National Register of Historic Places.<sup>24</sup>

### **III. 4. Organization of development**

With redefinition comes redevelopment in central cities. Where and how will that redevelopment take place...and by whom? Developers have come a long way from Edward DeBartolo's “stay away from downtown” attitude in 1973. But risks remain. Is the city really committed to redeveloping downtown? Where in downtown? If I take a risk and build on Elm Street, how do I know that Oak Street won't become the focal point of economic activity? The streetcar by its physical presence guides that development activity and mitigates the local geographic risk for developers.

A study conducted by E.D. Hovee & Company, a Portland, Oregon economic and development services firm, found that between 1997 (when the Portland streetcar route was specified) and 2005, revealed that a significantly higher level of development occurred directly proximate to the streetcar line than in other areas of the traditional central business district or newly revitalizing Pearl District.<sup>25</sup>

The streetcar is the tangible symbol of commitment of resources by the city and the civic community and a tangible guide to the future geographic form of development patterns.

### **III. 4. Bring new people to transit**

Introduction of streetcars to the community means introducing new people to transit, not unlike the “joy-riding of a century ago. On-board surveys conducted on Dallas McKinney Ave. streetcar show that more than 90% of riders have never before used city transit of any type.<sup>26</sup>

This may be the result of the “fun” nature of the vintage streetcar, the fixed route with an easy to understand route structure, or the pure social acceptability of taking the trolley. Whatever the cause, the phenomenon represents an opportunity. It represents an opportunity to showcase an urban alternative to the automobile, to demystify the public transit experience, and to encourage public support for larger public transit initiatives such as regional light rail systems.

### **III. 5. Additional purposes**

Little Rock and North Little Rock, after decades of civic rivalry coordinated their efforts in revitalizing their respective center cities. In a three way cooperative effort the two municipalities along with Pulaski County focused on balance between the two communities in locating traffic attractions such as the Alltel Arena, Convention Center, River Market, baseball stadium and William J. Clinton Library. Implementation of the streetcar did more than provide physical circulatory connection. The streetcar has been a tangible symbol of civic leaders working together and working with the private sector to make good things happen.<sup>27</sup>

Streetcars in other places perform an interpretive role. At the Lowell National Historic Park, the streetcar, while providing connectivity between parts of the park, the streetcar itself is an icon of the urban travel experience of the late 1800’s and early 1900’s. The streetcar is used as one segment of the guided tour through the park.<sup>28</sup>

The Kenosha streetcar, in connecting downtown with the newly developed lakefront, provides service to the Kenosha Public Museum. The museum relocated to the lakefront as part of the overall redevelopment effort. In expanding the displays, the museum now finds the necessity of reactivating its previous building in downtown Kenosha. The streetcar, already a “companion” attraction to the museum, will provide the connectivity between the Kenosha Public Museum locations.<sup>29</sup>

In the revitalization of central cities there arose the need for a circulation and connectivity method that was harmonious with the ambience of the communities. The streetcar has shown itself to be an effective solution that is not only harmonious but can enhance the ambience of its host community.

## IV. The “new” streetcars

Terminology used for transportation vehicles can be confusing. Labels are not always used uniformly through the transportation communities. For that reason a description of current terminology and meanings is in order. Streetcars are also called “trolleys”, or outside of North America, “trams.” Some cities have implemented service with rubber tired buses



**Figure 6 Vintage streetcar - Memphis - 2005**

with bodies that have been designed to resemble trolley cars of yesteryear. Those vehicles are often colloquially referred to as “trolleys” when, to avoid confusion should be called “rubber tired simulated streetcars.” In Europe the term “trolley” may also refer to carts used by food vendors on intercity passenger trains. Another European use of the term “trolley” refers simply to what we would call in North America “shopping carts.” For our purposes here, the term “trolley” will be used interchangeably with the word “streetcar.”

The rubber tired simulated streetcars are also sometimes referred to as “trolley buses.” That is also a confusing appellation as the term “trolley bus” historically has referred to as electrically powered, rubber tired city buses receiving their electricity, as the streetcars do, through overhead contact wires. Presently in North America, “trolley buses” in the form of electrically powered city buses are operated in Boston, Dayton, San Francisco, Seattle, Vancouver, and Edmonton. The streetcars as reintroduced on the streets of American cities can take three forms, namely **vintage**, **replica** or **modern** trolleys.

**Vintage** trolleys refer to genuine historic cars built anytime from the late 19<sup>th</sup> century to the early 1950’s. They include both the “traditional” body styles as well as the streamlined “PCC” style introduced in the 1930’s.<sup>30</sup> Vintage trolleys may be cars that previously operated on American streetcar systems and have been restored to operating condition or cars imported from overseas tramway systems where little restoration was necessary to place them in operation on newly implemented streetcar systems. A vintage streetcar imported from Melbourne, Australia, is shown in Figure 6 above.



**Figure 7 Replica streetcar - Little Rock - 2005**

**Replica** trolleys, as shown in Figure 7 above, are newly manufactured streetcars with car body designs reflective of streetcar designs from early in the 20<sup>th</sup> century. In some instances a “generic” design is used, such as cars built by the Gomaco Trolley Company of Ida Grove, Iowa. The Gomaco generic trolley is reminiscent of the “double truck Birney” cars of the early 1920’s and are presently operated on streetcar systems in Tampa, Charlotte, Memphis, and Little Rock. Some cities, such as Portland, Oregon, arranged for Gomaco to build exact replicas of cars that previously operated in that city.<sup>31</sup>

**Modern** streetcars are just that, newly manufactured cars with a contemporary design. Portland introduced modern streetcars to America in 2001. Replica streetcars had previously begun operating as a supplement to the Portland light rail system in 1991. When implementing a streetcar system separate from the historic trolleys, however, Portland selected Czech built Skoda streetcars. The Tacoma system, opened in 2003, uses modern streetcars identical to those used in Portland (Figure 8). Modern streetcars are more appropriate where the primary purpose is circulation or connectivity rather than reinforcement of the historic nature of the community.



**Figure 8 Modern streetcar - Portland, OR**

The choice of which kind of streetcar is right for any streetcar system implementation is driven by the primary purpose of the streetcar operation as well as operating conditions and the characteristics of the community through which they will operate. Other car and route configuration aspects also impact the decision.

The McKinney Ave. trolley in Dallas uses genuine historic cars (Figure 9). Five of the six cars in the fleet formerly operated in Dallas, and have been lovingly restored by the enthusiast community. Acquisition and restoration was inexpensive in comparison to other options. Per car restoration cost (in 1992) was \$185,000. In comparison, replica cars would have cost \$450,000 each.



**Figure 9 McKinney Ave. – Dallas**

The McKinney Avenue Transit Authority has further leveraged the historical nature of the cars by incorporating the “genuine antique” aspect in their advertising and promotion.<sup>32</sup>

Similarly, the former Peninsular Railway cars in San Jose bring a distinct local flavor to the trolley system through the genuine nature of the cars. Like McKinney Avenue in Dallas, the

San Jose has an active enthusiast community who already had an interest in restoring the cars and was willing to bear the financial cost and provide the considerable technical expertise necessary to prepare the cars for service.<sup>33</sup>

Commitment to tramway technology in overseas cities has resulted in continuing replacement of vintage tram cars with modern equipment in those cities. Three cities in particular have engaged in fleet modernization just as the North American movement to reintroduce streetcars has begun. Melbourne, Australia, Milan, Italy, and Oporto, Portugal, all had recently retired vintage streetcars available for sale. Newly developing American streetcar systems have made good use of the cars that had provided so many years of good service in those overseas cities.

Cars were imported from each of those cities; some for imminent operation and others to be “cannibalized” for spare parts. Other cars have been imported from Brussels, Hiroshima, Kyoto, Vera Cruz and other cities.

In implementing the Waterfront Trolley in 1982, the City of Seattle initially considered historic cars that had once run in nearby Yakima, Washington. Rejecting those, the City employed a local trolley enthusiast to conduct a search for satisfactorily configured cars. Five cars were chosen from Melbourne. The purchase price was \$5,000, to which was added \$13,000 for shipping, bringing the cost for each of the five cars to \$18,000.<sup>34</sup>

Since imported cars arrive in varying states of mechanical condition, Gomaco Trolley Company undertakes rebuilding and rehabilitation of vintage cars in addition to their primary business of manufacture of replica cars. Gomaco themselves import streetcars from overseas sources to provide trucks (wheel sets) and electrical equipment for the replica cars.<sup>35</sup>

During the 1970’s and 1980’s, PCC cars on several of the remaining streetcar/light rail properties in North America reached retirement age. As the fleets were replaced, vast numbers of the streamlined cars became available for reuse or for parts.

Kenosha Transit System arranged for purchase of five such cars when implementing their streetcar operation in 2000. The cars, purchased second hand from Toronto, Ontario, were repainted in symbolic colors before entering service. Each paint scheme is authentic to a city where PCC cars were previously used. The green and yellow Cincinnati scheme resonates with residents as being the colors of the Green Bay Packers football team. The green, cream and orange Chicago scheme commemorates the PCC cars of Chicago, 60 miles from Kenosha. PCC cars operated in Chicago until 1958, and many visitors to Kenosha remember them well. The orange and cream Johnstown scheme salutes the city of Johnstown, Pennsylvania, the last small city streetcar system in the United States prior to resurrection of streetcar operations in Kenosha. The last car retains the dark red and cream colors of the Toronto Transportation Commission, on whose rails the five cars had run for



more than 40 years.<sup>36</sup>

### **Figure 10 Kenosha PCC streetcar**

The selection of paint schemes in Kenosha is more than whimsical. Each color scheme was carefully chosen as part of building and keeping a broad base of civic support which is vital to implementation and continued operation of the streetcar lines. Collectively the schemes celebrate the legacy of streetcar systems throughout North America.

Parts from second hand PCC cars are used in vintage and replica cars as well. Gomaco uses spare PCC trucks and electrical equipment in both remanufactured and newly built cars. The replica cars in Portland are visually identical to cars that operated in Portland for several decades. In regular service the cars have no need to exceed 25 miles per hour. In traveling over the light rail network to get to and from the heavy maintenance shop, however, the cars make good use of the “high-performance” PCC technology to operate at 45 miles per hour, reducing the time necessary to make the long trip.<sup>37</sup>

In planning the vintage trolley service as part of the Lowell National Historic Park in Lowell, Massachusetts, the National Park Service initially considered genuine historic cars. Proposed sharing of tracks with an operating freight railroad made the antique cars inappropriate. No domestic car builders were left in the United States from the original streetcar era.

Gomaco Trolley Company received the contract from the National Park Service, to manufacture two 16 bench “open” trolleys to be operated at the Historic Park site. The cars were handcrafted in the Ida Grove, Iowa, shop facility and equipped with motors and running gear from cars imported from Melbourne.<sup>38</sup> Since then Gomaco has built custom or “off the shelf” replica cars for Charlotte, Tampa, Memphis, Little Rock, and Portland.

Although streetcars have many common attributes and capabilities, such as the ability to operate on the same tracks, and receive electricity from the same overhead wire, they also have a variety of body styles and configurations. Proposed car configurations must be considered concurrently with operating configurations and physical design of the streetcar system.

Bi-directional or “double-end” cars have control equipment at both ends of the vehicle. Reversing direction is simply a matter of removal of the portable “brake-handle” and “reverse-key”, and lowering one trolley-pole and raising the other. The “changing-ends” procedure can be accomplished anywhere along the line where it is safe to do so, without the necessity of special track configurations. Most of the vintage cars operating on streetcar systems today use this configuration. The modern cars operating in both Portland and Tacoma are built with a “double-end” design.

Uni-directional or “single-end” cars, like buses, have control equipment at one end of the vehicle only. Reversal of direction of the car requires the presence of a loop or “wye” track for turning the entire car around. With some isolated exceptions the streamlined PCC streetcars were built in single-end configuration only. If operation of single-end cars is contemplated, consideration must be given early in system design to land acquisition for turn-around loops, or the disruption of street traffic flows associated with “wyes.” Systems operated in entirety as loops (as distinguished from turn-around loops), where streetcars operate one direction on one street and the other direction on another street, can accommodate single end cars without need for special turning facilities. Planners of streetcar systems must take into consideration subsequent system expansion as well as the possibility

of two-way operation during emergency situations. At present only the Kenosha and San Francisco systems make use of uni-directional cars.

Streetcars may be designed with “single-truck” or “double-truck” configuration. Each “truck” is a wheel-set consisting of two axles and four wheels. Early streetcars were customarily of the “single-truck” variety, as were the Birney streetcars introduced before World War I, as an economy measure for smaller streetcar systems. The single truck cars are smaller and limited in their carrying capacity. A typical single-truck car can accommodate 24 to 30 seated passengers.<sup>39</sup>

“Double-truck” cars have a larger carrying capacity and can negotiate tighter track curvature than the “single-truck” cars. Seating capacity of double-truck cars is customarily in the range of 40 to 48 passengers. Double-truck cars are also more satisfactory if there is any significant gradient on the streetcar system. With four motors instead of two, the double truck cars are more powerful; with eight wheels instead of four, the cars have greater adhesion to the steel rails, with consequently more effective braking ability.<sup>40</sup>

Another major consideration in car design is door height. Streetcars must be accessible for all age groups, ranging from very small children to senior citizens. Passengers may be boarding and alighting in a variety of operational circumstances, from raised platforms to relatively unprotected street locations. The “center-door” (midway along the length of the car) configuration of the cars imported from Melbourne has allowed a much lower door height (not right above the wheels) facilitating boarding and alighting.

The unfortunate trade-off is that the center door is away from the operator’s position. This impairs supervision of the boarding and alighting activity. It further creates confusion for passengers needing help from the operator on fare payment procedure or needing information about the streetcar experience.

Unless, as on San Francisco’s “F” Line, it is central to the mission of the streetcar system to provide a variety of car configurations and types, there are reasons to choose a single vehicle type. First, it simplifies maintenance of the streetcars by minimizing the combinations of technology for the maintenance staff to understand and the stock of replacement parts necessary for repair. This has the further benefit of reducing fleet size by reducing the number of spare cars necessary to operate the system. It allows passengers to recognize “the streetcar” and know they will “work the same way” on various routes. A common car type allows maximum flexibility in operating the cars on all parts of the system, in all operating conditions.<sup>41</sup>



## V. Making streetcars happen – process components

It is one thing to marvel at the streetcars operating in various cities around the country and to savor the benefits that may come from operation of such a system and another thing to actually implement a system. Each project that has been implemented has had specific identifiable components, each piece playing a crucial role in the initiation of streetcars. The development and sequencing of the components comprise the implementation process.

### V. 1. Conception

From a mere acorn a mighty oak tree springs. Each streetcar implementation began somewhere with an individual who had an idea. In Kenosha and Seattle it was a trolley enthusiast. In Dallas it was a restaurateur for whom unearthed streetcar tracks sparked his imagination. In Memphis it was a consultants' recommendation. In other instances the idea for the streetcar came from a civic official or a citizen who had visited a streetcar system in another city.

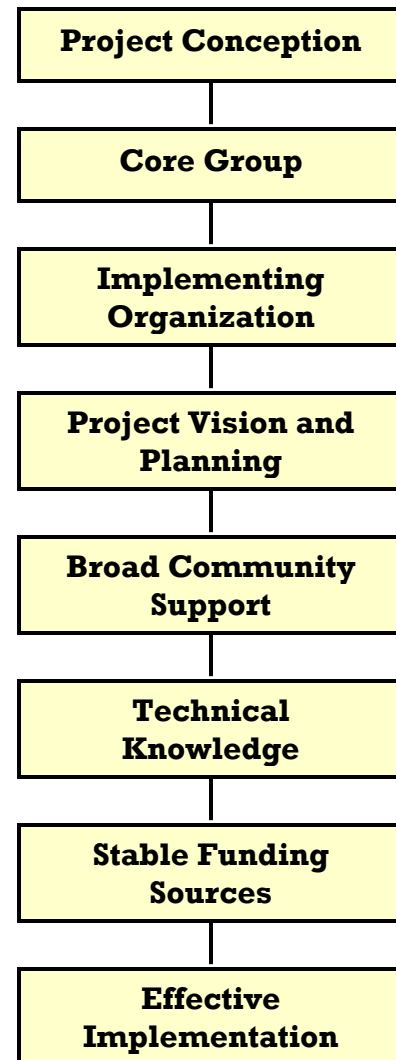
### V. 2. Core group

The first step is for the person with the idea to seek out others who share the vision. A group with a shared vision for streetcar implementation can then begin the process of educating other local citizens about streetcars and their benefits. The core group needs to function like a “steering committee” or working group and find people from different disciplines and with different perspectives.

Among the roles to be filled in the core group are the “champion” and the “spear carrier.” The champion is a person with high visibility and influence in the community. The champion is frequently but not necessarily a political figure, and acts as the public voice and “spark plug” for the project. The other role is that of the “spear carrier”, namely the person who is the organizer and the manager of the details in the early phase of the project.<sup>42</sup>

George Benson in a sense performed both roles in the initiation of Seattle's Waterfront Streetcar. Elected to the Seattle City Council in 1971, Benson was approached by a trolley enthusiast in 1974 with a proposal to implement a streetcar along Seattle's redeveloping waterfront. Although initially his proposal was derisively named “Benson's Folly”, Benson persisted in the initiation process. He selected the streetcars to be used on the route, and found a storage location for them until operations could begin. He personally convinced businesses and property owners to form a Local Improvement District to generate \$1.2 million as part of the start-up cost of the project. He spent his weekends painting the streetcars in preparation for service.<sup>43</sup>

**Figure 11. Implementation process components**



Kenosha's "champion" and "spear-carrier" were Mayor John Antaramian and Transit Director Joe McCarthy respectively. The streetcar was one of many suggestions put forward during public visioning sessions associated with lakefront and downtown redevelopment. Following commitment to the implementation of the streetcar, Mayor Antaramian set about to build public support as well as to use his background as former state legislator to arrange funding sources. McCarthy saw to the implementation details, investigating construction methodology, sources of cars and other operational details.<sup>44</sup>

Galveston's "champion" was George Mitchell a local entrepreneur with a keen interest in urban development and preservation of historic inner city neighborhoods. Mitchell led the civic campaign to implement the trolley across Galveston Island as one of several initiatives to revitalize "The Strand" seaport area. His vision and development efforts created a "vibrant neighborhood of museums, offices, apartments, shops, hotels and restaurants."<sup>45</sup>

### **V. 3. Implementing organization**

Effective organization is necessary to continue the initiation process. Early in the process it is important to formalize the core group relationship. This is customarily done by formation of a 501(c) (3) not-for-profit organization. Formal organization clarifies the activities of the group and provides a mechanism for acceptance of tax-deductible donations while more permanent funding sources are being explored.

In New Orleans, business people along the redeveloping waterfront formed the Riverfront Transit Coalition (RTC) in 1984, to promote a consultants suggestion that streetcars be implemented in the district. RTC worked in cooperation with the Downtown Development District, the Regional Transit Authority, the mayor, and other political figures to raise awareness, work out technical details and secure funding. The organization did most of the administrative implementation legwork, which was a lot. James Amdall, RTC's president described the process:

**"We had to get permits from about 21 different entities, including the Corps of Engineers, the Levy Board, the Dock Board, the City Planning Commission, the Planning Advisory Commission, it just went on and on."**<sup>46</sup>

After shepherding the Riverfront Streetcar through its implementation phase, RTC turned the project over to the Regional Transit Authority for operation.

Portland's implementing organization was more involved. Initial consideration of streetcar implementation began with the City of Portland in 1989. The following year the City commissioned a streetcar feasibility study and formed the Portland Streetcar Citizen's Advisory Committee (CAC) to assure community participation in the planning process. CAC met frequently for 15 years "to review and offer its advice on all significant project planning, design and operation issues."<sup>47</sup>

Conventional wisdom would dictate vesting the streetcar implementation with the local transit agency. There are reasons to reject this wisdom. Because the streetcar is a creative solution addressing multiple civic needs, vestment with any existing agency (transit provider or other) creates the likelihood that the implementing agency will design the project in accordance with that organization's narrow established goals rather than beginning with "a blank canvas" where preconceived limitations are avoided.

Tri-Met, the Portland transit agency had little initial enthusiasm for the concept. Opposition was based on two factors: 1) "frame of reference" problem - Tri Met focused on management of regional transit and couldn't focus on local level and 2) concern that streetcar might compete against other Tri-Met projects for federal funding."<sup>48</sup>

As a result a second non-profit organization was formed to implement the streetcar project. Portland Streetcar, Inc. (PSI) was formed in 1995 "to design, manage construction, and operate the Streetcar project." PSI's membership was comprised of community business people, developers in the community where the streetcar was proposed to operate. City Commissioner Charles Hales (a leading proponent of streetcars in Portland) was the sole elected official on the PSI board. Involvement of the local business community, especially developers, was instrumental in assuring community support for, rather than opposition to, the streetcar project.<sup>49</sup>

Use of the non-profit organization served several benefits. "The partnership allowed the city to retain basic control and employ a streamlined permitting and construction process." Furthermore, the organizational structure assured ongoing community involvement in the implementation process.<sup>50</sup>

A similar arrangement is in place in Tampa with Tampa Historic Streetcar, Inc. (THS). Created through an interagency agreement between the City of Tampa and the Hillsborough Area Regional Transit Authority (HART), THS is responsible for overall management of the streetcar system. THS contracts with HART for day-to-day operation of the streetcars as well as maintenance activities.<sup>51</sup>

An additional consideration in managing implementation organization has to do with public agencies and municipalities. Streetcar implementation tends to be an "organizational orphan." Its multiple roles as circulator, economic development facilitator and creator of central city ambience can lead to ambivalence as departmental responsibility. Ambivalence can lead to the project's being relegated to the role of a poor departmental step child. An important part of organization for implementation is to assure that the project has a continuing "sponsor" within each public sector agency. "If there isn't a departmental "home" for the project - create one" are the words of advice offered in the Miami Streetcar Corridor Feasibility Study.<sup>52</sup>

#### **V. 4. Project vision and planning**

Coincident with the formation of the implementing organization is beginning of the planning process. Any planning effort must consist of three parts:

1. An assessment of present conditions, including unmet needs
2. Creation of a vision of the future that meets needs and establishes appropriate goals
3. Defining the process for getting from present condition to fulfillment of the vision

A big part of assessment is the recognition of the locality's particular institutional setting. The political circumstances, the state of central city revitalization, the history of previous efforts at implementation of transportation solutions, the structure and effectiveness of existing transit resources, the relative wealth of the region and the willingness of civic leaders to try new solutions are all examples of the institutional setting into which the streetcar

initiation fits. The nature of the institutional setting will have a major impact on how needs are assessed and how resources are gathered in the implementation effort.

Funding of the Little Rock River Rail streetcar project came about because of a one-time political phenomenon. In the mid-1990's when circulation solutions were being considered to connect Little Rock and North Little Rock downtowns, an unusually high level of trust between the County Judge (the head of the Board of County Commissioners) and the two municipal mayors. Equally important, the United States President, Bill Clinton, and Secretary of Transportation, Rodney Slater, were both Arkansas natives. Recognizing the one time opportunity, local planning officials acted quickly to secure federal funding for implementation of the streetcar.<sup>53</sup>

In 1984, the New Orleans Mayor "Dutch" Morial enthusiastically supported the Riverfront Streetcar in part because he "needed something good to follow up after the economically disastrous Worlds Fair." The mayor directed the implementation agency and transit authority to work together to bring the project to fruition. The complex implementation of the project was expedited to assure its implementation in time for the 1987 Republican National Convention.<sup>54</sup>

Particularly among trolley enthusiasts there is a temptation to think of the streetcar for the streetcar's sake...or alternatively..."if you build it they will come." That kind of reasoning inevitably leads to trouble.

Perhaps nothing is as important in initiating the streetcar project as identifying the need to be filled and the vision for fulfilling that need. Identification of need goes far beyond whether there is a reason to build the streetcar or not. The mission of the streetcar project will direct where the streetcar is built, what technology will be used, how civic support will be generated, and how promotion will be undertaken.

**"Clear definition of mission must be developed. Transportation? Property development? Job creation? Mission must be established, goals (often competing) must be determined, careful assessment of trade-offs among competing goals is required, and costs shared accordingly."**<sup>55</sup>

When the local restaurateur observed the recently uncovered trolley tracks on Dallas' McKinney Avenue, he was inspired to inquire whether the tracks could be reused for a revived streetcar service along that street. The core group was convened and a determination was made that the tracks could be used. Their vision however was focused on availability of the tracks rather than capturing of a market. "The 2.8 mile original route was 'Phase I' of some undefined larger project. The founders had no real vision of a more extensive operation outside the vicinity of their own property holdings."<sup>56</sup>

The group continued to let their planning efforts be defined by availability of uncovered tracks. As a result the south end of the route (the "city" end) is located at a geographically insignificant place, requiring a multi-block walk to the central business district. More important is the failure to reach the "West End", a renovated warehouse district featuring restaurants and specialty shops, and having a visitor profile similar to that of the McKinney Avenue streetcar. That failure was a strategic error that in part resulted in ridership well short of projections and a severe financial crisis that nearly doomed the project.<sup>57</sup>

In the course of tying community needs to implementation of the streetcar, the mission should be clearly stated. Atlanta Streetcar Inc., the non-profit organization devoted to reintroducing streetcars in Atlanta, has adopted the following mission statement:

**“It is the mission of Atlanta Streetcar, Inc. to utilize and implement the modern Streetcar technology in Atlanta's Peachtree Corridor and ancillary streets of the City. If, after a determination that this technology meets certain criteria for feasibility, it intends to help provide the citizens and businesses of Atlanta and its visitors traveling along the Corridor with a safe, comfortable and inexpensive urban transit mode within and adjacent to the Peachtree Corridor. The Streetcar will be designed to link with existing transportation systems and enhance the ability of passengers of other modes to reach their destination seamlessly and without the use of an automobile. The streetcar is also intended to capture new investment opportunities within the Peachtree Corridor - commerce, recreation and housing, including workforce housing - and bring to the City additional jobs and tax revenues.”<sup>58</sup>**

## **V. 5. Broad community support**

The next step is to develop broad community support for the project. “Build a coalition of people with a broad variety of interests and local political clout,” counsels leading streetcar advocate Paul Weyrich, “business people, property owners’ developers, environmentalists, city activists for example. Appeal to as many varied groups as possible.”<sup>59</sup>

Broad support may be gained through involving people in the planning process. In the implementation of the River Rail project in Little Rock, a broad steering committee was created to plan the proposed implementation. The committee included municipal officials, residents of Little Rock and North Little Rock, public works representatives, and the heads of the Capital Hotel and other hospitality industry establishments. Other participants were from the University of Arkansas, NAACP, Metroplan (planning organization), real estate industry representatives, and community activists.<sup>60</sup>

In Kenosha, broad consensus was built by holding a “huge number of public meetings.” Civic officials state that the focus on public involvement initially delayed the project “but in the end saved lot of time due to the level of public consensus achieved in the process.”<sup>61</sup>

Community support can be found in non-traditional and unexpected sources. Center City Parking, Portland’s largest parking company operator was among the most enthusiastic supporters of the Portland Streetcar.<sup>62</sup> This is especially remarkable in that parking revenues are a major funding source for the streetcar project. Similarly, Atlanta Streetcar, Inc. counts among its stakeholders the Georgia State Road and Tollway Authority.<sup>63</sup>

Another reason for broad support is to facilitate pursuit of earmarked federal funds. Congressmen and Senators evaluating consideration of projects for earmarked funds will give greater consideration to projects with broad support and a high degree of visibility.<sup>64</sup>

A failure to build broad consensus can be fatal. In 1982 Penn’s Landing Trolley implemented service along Philadelphia’s Delaware River waterfront. Use of former railroad track in Columbus Blvd. was similar to the Seattle Waterfront Streetcar. The system used leased space in the covered piers for storage and maintenance. As revitalization of the waterfront progressed, the streetcar was repeatedly required to relocate the maintenance facility to different piers. The repeated relocations depleted Penn’s Landing Trolley’s resources and ultimately doomed the operation.<sup>65</sup>

Seattle's Waterfront Streetcar experienced a similar loss of access to its maintenance facility with contrasting results. Both the Port of Seattle and the City put forth proposals for alternative storage arrangements. While the line must shut down temporarily while the new facility is built, several city council members see the shutdown as an opportunity to consider extending the route.<sup>66</sup>

The building of broad community support may take extra time and effort up front but has multiple benefits. It will facilitate and streamline the implementation process. Furthermore it lays the groundwork for community support in times of trouble, such as were experienced by Penn's Landing and Seattle Waterfront streetcars.

## **V. 6. Technical knowledge**

Increasing degrees of technical knowledge are necessary throughout the implementation process. Early decisions regarding feasibility and scope are dependent on organizers understanding the nature of streetcar technology and operation. Building of support will require an ability to describe the proposed streetcar and its attributes.

Technical knowledge is not simply a matter of familiarity of the hardware and the implementation and operating processes. Technical knowledge is as much about understanding the interrelationship of the need, the vision, the physical aspects of the desired route, the geometric elements of the infrastructure, and the operating characteristics of the proposed route.

As with the implementation of any fixed route transit system there are many aspects of the project that require specialized expertise. Numerous consulting firms specialize in evaluating the feasibility of implementing streetcar systems as well as the implementation. The appropriate time to retain the services of a consultant is early in the process, when the core group is carefully considering the need, the market and the purpose. Some consultants specialize in the commercial and institutional aspects of implementation, while others see to the engineering aspect of the projects. There is an old saying "the devil is in the details." That is certainly true of streetcar implementation. The value of a good consultant is not to be overlooked.

The local enthusiast community can be of great assistance in demystifying the maze of unfamiliar technology. They can be of special value when issues of historical accuracy become important. While enthusiasts can provide amazingly detailed information about a variety of technical and historical aspects of streetcar operation it is important to define the relationship carefully. Enthusiasm and objectivity fit together only as well as they do. Compromises to historical accuracy may be necessary, much to the dismay of local enthusiast advisors. An arms length relationship with enthusiast organizations is appropriate.

## **V. 7. Stable funding source**

Except in isolated circumstances the streetcars, like public transit in general, are not financially self-sustaining. The revenues generated from farebox receipts and other sources, such as advertising or concessions, do not cover ongoing operating costs, let alone

implementation costs. For that reason great care must be given to sources of implementation and operating funding.

Capital (implementation) funding and operating funding tend to come from different sources. Federal funding may be available in the form of “small starts” or other grants. Individual states vary with respect to capital assistance programs. Grant money customarily is made available through the local transit agency.

Operating funding may be a bigger challenge. Obtaining grants for new projects is a politically popular activity. Politicians have the opportunity to appear at “ground breakings” and “ribbon cuttings” and proclaim the benefits of the project and how he or she is “proud to have been instrumental securing financing for this magnificent project.” Obtaining stable ongoing operating funding is another matter. Customarily the streetcar must compete with a variety of city functions in gritty annual budget allocation processes.

It is important to solidify commitments. Dallas’ McKinney Avenue project relied on an expectation of UMTA (Urban Mass Transit Administration, predecessor to the Federal Transit Administration) grants as well as commitments from the private sector for expansion of its original segment. Availability of federal money diminished with changes in grant administration policy. Private sector and locally generated money dried up when economic conditions, particularly in the oil industry, declined in the early 1990’s. Additional locally generated funding (or lack of it) was critical when ridership fell short of expectation due to the nature of the originally implemented operating segment.<sup>67</sup>

This is another circumstance that highlights the importance of fulfilling a well defined need in the community and of building and maintaining a broad base of community support in both the public and private sector. The variety of funding sources for streetcar system capital and operating costs is described in Appendix 2.

## **V. 8. Execution**

The best planning is of little value if not executed or if executed poorly. Unexpected obstacles will be encountered. The necessity of securing permits from 21 separate agencies in the implementation of the New Orleans Riverfront streetcar is an example.

The most important aspect of the initiation process is to identify a need that the streetcar is to fill. Alternative funding sources can be found, various members of the community may be supportive of or opposed to the project, technical knowledge can be found in various places. Once inescapable constant is present, regardless of the city or the stated purpose of the streetcar, which is that people have to use the streetcar. In providing guidance to the City of Savannah, Georgia, in a feasibility study the consultant eloquently stated that “the public’s perception that the service is useful and beneficial is crucial...an empty and unused streetcar will not survive for long.”<sup>68</sup>

## VI. Operation of the streetcars

What kind of service is being proposed? The anticipated operating characteristics must be considered before making meaningful projections as to necessary funding and other resources. Some key operating characteristics are, route configuration service span, service frequency, location and spacing of stops, how will the system be staffed, and what fare will be charged.

One of the most fundamental characteristics is the physical configuration of the route. Streetcar systems typically exhibit one of three general configurations:

1. Anchored by a major traffic attraction at one end. Other traffic attractions are located along the route. The number and importance of the stops along the route dictate the ridership pattern. New Orleans St. Charles Ave. is a good example of this configuration. The route runs from the intense central business district setting where passengers are exchanged with the Riverfront and Canal Street streetcar routes as well as with city buses, then reaches out through commercial and residential neighborhoods to a comparatively remote terminal location. Ridership is strongest at the downtown end. Similarly, the Tucson reaches out from the University of Arizona campus through adjacent neighborhoods, but without a strong anchor on the other end.
2. Anchored by terminals on both ends. Ridership will be much more evenly distributed along the route. San Francisco's cable cars and the "F" Line streetcar each have Market Street retail district on one end and the Fisherman's Wharf tourist area on the other. Intermediate stops are less important in traffic generation. Memphis' newly implemented Medical Center Extension exhibits this characteristic. The Medical Center anchors one end, the central business district the other, with little significant activity in between. One of the purposes of implementing the route is to stimulate development at intermediate locations on the route.
3. Primary traffic generation is in the middle of the route with comparatively weak attractions at the ends. Traffic is distributed somewhat in the configuration of a bell-shaped curve. The strategic objective is to develop sources of traffic at the "ends of the bell". Memphis Main Street Trolley is configured in this way. Central business district and Beale Street were the major traffic generators, both located in the middle in the route. Location of a transit center at the north end and intensive residential activity at the south end promises to even out the traffic distribution.<sup>69</sup>

Once traffic generators have been identified and a route selected, the issue arises as to placement and configuration of the stops. Several guiding criteria should be considered in stop selection and placement:

- **“Close proximity to major pedestrian corridors**
- **Close proximity to major activity centers**
- **Proximity to intersections with traffic signals and crosswalk**
- **Ability to provide safe conditions for pedestrians and vehicles**
- **No obstructions to vehicular or pedestrian traffic**



- Appropriate site area to accommodate platforms
- Least disruption to surrounding activities and conditions, i.e. parking spaces, utilities, railroad tracks, freight activities, street signage and traffic signals”<sup>70</sup>

Suggestions for configuration of the stops include:

- “Accessibility for handicapped and elderly
- Protection from vehicular traffic and adjacent railroad activity
- Protection from the elements
- Clear graphic and verbal instruction on use of the streetcar system
- Lighting for identification, access, and safety
- Visual identity
- Architectural finishes and details consistent with existing fabric of the surrounding community”<sup>71</sup>

**Table 2 Mean Distance Between Stops**

Mean Distances (feet) Between Stops		
City	System Length	Distance between stops
Denver	18,480	3,696
Fort Collins	7,920	2,640
Tacoma	8,448	2,112
Astoria	15,840	1,584
Galveston	31,152	1,483
Little Rock	13,200	1,320
Memphis	30,624	1,277
Seattle	9,768	1,221
Charlotte	11,088	1,109
Tampa	12,144	934
Portland (Modern)	13,200	776
Kenosha	10,032	627

A tradeoff for location of streetcar stops, as with any transit system, is to locate stops sufficiently close together to afford maximum pedestrian access, yet not so close that operating speed is adversely affected. The locally focused nature of the streetcar and the lack of emphasis on operating speed dictate much closer spacing of stops to afford maximum access in the community. Implementation cost may be a consideration in frequency of stops as well. Within each system,

spacing will most likely vary in relation to the purposes to be served and the operating conditions.

Streetcars functioning primarily as a museum will likely have station spacing at greater distances as the ride itself is more important than access to the neighborhoods. Denver and Fort Collins, shown in Table 2, exhibit this circumstance. Kenosha’s minimum cost platform design allows for frequent stops without incurring a high infrastructure cost at each stop. When interpreting the distance between stops the reader must keep in mind that distances will vary at different points on the line and the distances shown are merely the arithmetic mean for each entire system.

Streetcars with a more circulatory function will have stops much closer together. Memphis, Seattle, Tampa, and Portland all focus their streetcar service more closely on the neighborhoods through which they pass. Service span, the number of hours the streetcar is operated each day, is dependent largely on the purpose the streetcar is intended to serve. In general for the circulator routes the weekend service will operate on a 16 hour service span, from early morning to late evening.

**Table 3 Service Frequency (Minutes)**

City	Weekday	Saturday	Sunday
Charlotte	30	30	30
Dallas	15	25	25
Galveston	40	20	20
Kenosha	15	15	15
Galveston	40	20	20
Memphis	10	10	10
New Orleans	5-15	5-15	5-15
Portland (Modern)	14	14	14
San Francisco	8	8	8
Seattle	20-30	30	30
Tacoma	10	10	20
Tampa	15-20	15-20	15-20

*Service may vary slightly at different times during the day.*

Service often runs longer on Friday and Saturday evenings. Some systems end Sunday service at 6:00 p.m. Others operate longer into the evening. Circulator systems for whom journey to work trips are not a priority will start service in late morning.

Theme systems, whose focus is much more in the tourist and visitor market, customarily operate from late morning to early evening on weekdays, sometimes longer on weekends.

Service frequencies vary according to expected levels of ridership, purpose of streetcar operation, and budgetary and route configuration considerations. The circulator systems with high ridership levels generally operate the service most frequently. Those systems catering to tourist and visitor trade operate less frequently. Seattle’s Waterfront Streetcar, though it has high ridership potential and performs a circulatory role is limited by its single-track configuration that limits the number of cars that can be operated at any given time.

**Table 4 Streetcar Fare Structures**

City	Full Fare	Reduced	Day Pass	Other
Astoria	\$ 1.00		\$ 2.00	
Charlotte	\$ 1.00	\$ 0.50	\$ 3.00	
Dallas	Free			
Denver	\$ 3.00	\$ 1.00		
Galveston	\$ 0.60	\$ 0.30		
Kenosha	\$ 0.25	\$ 0.25		
Little Rock	\$ 0.50	\$ 0.25	\$ 2.00	
Memphis	\$ 1.00	\$ 0.50	\$ 3.50	
Portland (Modern)	\$ 1.50	\$ 0.70		the "Fare Free" zone
San Francisco "F" Line	\$ 1.50	\$ 0.50		
San Francisco Cable Car	\$ 5.00	\$ 1.00	\$ 10.00	
San Jose	\$ 1.75	\$ 0.75	\$ 5.25	
San Pedro	\$ 1.00			
Seattle	\$ 5.00	\$ 2.50		
Tacoma	Free			
Tampa	\$ 2.00	\$ 1.00	\$ 4.00	
Tucson	\$ 1.00	\$ 0.50	\$ 2.50	
Yakima	\$ 6.00	\$ 4.00		Family Ticket \$15

There is a wide variation in the fares charged on the various streetcar systems. Fare structures are summarized in Table 4 shown below. Where the streetcars are operated by the local transit agency, the fares generally mirror those of the transit system at large. There are exceptions. Kenosha’s 25 cent fare was originally intended as an introductory fare. The introductory fare has remained in place however,

reflecting civic officials desire to build and sustain ridership on the system. Dallas’ McKinney Ave. is operated without charge to passengers. Most of the Portland streetcar route is inside the “free fare zone” where fares are not charged on the streetcars, nor on the buses or light rail services. Free fares downtown reflect public policy commitment to minimize automobile use within the congested city center area.

The smaller tourist based operations whose operating costs are covered entirely by farebox revenue and contributions tend to charge more for the services. Yakima's \$6.00 fare amounts effectively to a museum admission fee. The \$5.00 fare for the San Francisco cable cars reflects the extreme popularity of the system. Despite the high fares, there are usually long waiting times for boarding at the end points, and cars are generally too crowded to be boarded at intermediate points. The high fare for the cable cars in comparison to fares for parallel transit services renders the cable system useful purely as a tourist and visitor oriented attraction.

## VII. Capital and operating costs

The streetcars cannot be expected to be financially self supporting. They must have enough value to the community however, to attract sufficient commitment of a variety of resources from a variety of sources. The most important of the resources are sources of stable and consistent funding that will be necessary for both capital and operating needs. Capital funding needs begin in the planning phase and continue until the system is fully constructed and ready for operation. Further capital funding needs will arise when expansion is desired or facilities must be replaced. Capital funding may be arranged on a pay-as-you-go basis, or may be achieved through issuance of bonds.

Generation of operating costs begins even before the streetcar has been officially opened. The costs begin as soon as regular operational testing begins. Since streetcar systems customarily only recover a small portion of their operating costs through the farebox sources of operating funding must be identified before the system is constructed.

If Federal Transit Administration (FTA) capital funding is desired then it will be necessary to identify a stable and ongoing source of operating funding at the time application is made for an FTA grant. As a practical matter operating funding is necessary regardless of the source of capital funding. It would be a source of both disappointment and embarrassment to open a streetcar system without the means to sustain its operation.

### VII. 1. Capital and implementation costs

Capital costs are generated in the design and construction of the streetcar system. Costs per mile can vary hugely from one system to the next. Variations arise from purposes for streetcar project, ability to use or adapt existing facilities, utility relocation expenses, need for major infrastructure adaptation, and methods of allocation of implementation expenses. Costs per mile for selected streetcar installations are summarized in Table 15.

**Table 5 Implementation Cost per Mile**

City	Year	Cost per Mile (Millions)
Dallas	1989	2.1
Kenosha	2000	2.9
Memphis (Riverfront)	1997	4.7
San Pedro	2003	4.7
Little Rock	2004	7.8
Memphis (Main St.)	1993	14.0
San Francisco "F" Line	2000	15.9
Charlotte	1996	19.0
Portland (Modern)	2001	22.8
Tampa	2002	23.0
Memphis (Medical Center)	2004	26.0
New Orleans (Canal St.)	2004	29.9
Tacoma	2003	56.3

Dallas' McKinney Avenue trolley and Kenosha's streetcar were implemented for \$2.1 million (1989) and \$2.9 million (2001) per mile respectively. Memphis' Medical Center extension (2004) cost \$26 million per mile, while Tacoma Link cost \$56.25 million (2004) per mile. Many factors account for the wide variability. Both the Memphis Medical Center and Tacoma Link were built in city streets in anticipation of ultimate use by longer and heavier light rail trains. Every aspect of construction, the extent to which street sub grade had

to be strengthened, dimensions of the stations were larger and more complex, and overhead electrical contact infrastructure was built to “heavier” standards.

Another cost impact is utility relocation. Memphis’ Madison Avenue (along which the Medical Center extension was built) contained subterranean fiber-optic cables in addition to the more “conventional” utility installations such as telephone lines, electrical conduits, water lines, sanitary sewers and the like.

Madison Avenue also crosses two highways, Danny Thomas Blvd. and Interstate Highway 240, on overhead bridges. Environmental regulations dictated seismic retrofits of the two structures. The enormous expense of the retrofits led the transit authority to seek alternative solutions. In one instance the streetcars were routed onto separate bridges on either side of the vehicular bridge. A similar treatment was considered for the second location, but necessity for relocation of local businesses led planners to locate the streetcars in the vehicular bridge and proceed with required seismic retrofit.<sup>72</sup>

Tacoma has no bridges but is a short route built to very high standards. Some costs, such as engineering, maintenance facility, and to some extent rolling stock, vary only slightly with the length of the streetcar installation. On a short route there are fewer miles over which to spread those relatively fixed costs. Tacoma’s cars are modern cars as opposed to reconditioned heritage cars that are used on many of the systems. Modern cars cost in excess of \$2 million each.<sup>73</sup>

Memphis’ original streetcar implementation, the Main Street Trolley, was opened in 1993, at a cost of \$14 million per mile. In that instance the implementation cost was high due to allocation of the entire cost of reconstruction of the decaying pedestrian mall to the streetcar project. In contrast, the Memphis Riverfront line, new track that combines with the original Main Street Trolley to form a loop through the downtown and adjacent neighborhoods, was opened four years later at a mere \$4.7 million per mile. Three significant factors accounted for the extraordinarily low cost of the Riverfront extension. First, most of the extension used a surplus rail track acquired from the Illinois Central Railroad. Second, as an extension of an existing system there was no additional cost associated with establishment of a maintenance facility. Third, the expanded system could be operated without acquiring additional cars.<sup>74</sup>

San Francisco’s “F” Line along the Embarcadero is another example of inflated implementation cost. The Embarcadero was recreated nearly “from scratch” following removal of the freeway after the 1989 earthquake. The street itself was reconstructed using highway funds. The streetcar was the treatment that gave the street its “ambiance.” Costs were allocated accordingly. A large component of the \$30 million per mile implementation cost was accounted for by extensive use of granite and marble along the right of way. Corridor enhancement cost allocated to the streetcar even included planting of palm trees along the route.<sup>75</sup>

The \$2.1 million per mile implementation cost of Dallas’ McKinney Avenue route represents the low end of the cost spectrum. Use of existing streetcar tracks paved over when Dallas’ original streetcars were discontinued in 1956 minimized infrastructure cost. Further economy was achieved by donation of cars by enthusiasts and extensive use of volunteer labor in the preparation of the cars for revenue service. Finally, an “in-kind” contribution by

the City of Dallas in the form of signage, pavement marking and traffic signal relocation avoided considerable implementation cost.<sup>76</sup>

Ultimately the low McKinney Avenue implementation cost may have been a hollow economy. By letting availability of the already usable tracks dictate the route, implementers were unwilling or unable to reach key traffic generating neighborhoods, to their economic detriment.<sup>77</sup>

Kenosha implemented their streetcar system at low cost by exercising economy in infrastructure, cars, and project scope. Most track on the 1.7 mile route is constructed in turf, either in median of a street or on separate right of way. Subgrade cost is minimized, paving cost is not an issue as only a small portion of the route is in pavement, and no utility relocation was necessary. Track installation was carefully coordinated with other lakefront redevelopment efforts, allowing for sharing of implementation costs. Overhead wire support poles were standardized to minimize installation cost. The vintage PCC cars were acquired economically.<sup>78</sup> The five cars were acquired for a total of \$132,000.<sup>79</sup> In contrast to the elaborate “safety-island” stop architecture on some systems, Kenosha’s trolley stops consist of a slab of concrete next to the track. Figure 11 provides an illustration.

In the implementation of the Kenosha streetcars civic officials were careful to observe the “keep it simple” rule. As Transit Director Len Brandup describes,



**Figure 12 Minimal cost car stop - Kenosha**

**“An important element in keeping implementation cost low was not to make it a “huge project” where the entire cost of redeveloping a corridor was allocated to the cost of streetcar implementation. It is tempting to “hang all the toys you want” on a project and then have costs get out of hand. In Kenosha we kept focus on the goal of implementing a simple streetcar loop through the redevelopment area for a reasonable price.”<sup>80</sup>**

Key elements in capital costs are cars, tracks, propulsion systems (power distribution and overhead contact systems), and maintenance facilities. To understand the costs of the various aspects requires some familiarity with the technology.

Costs for cars can vary greatly depending on whether the system uses restored “vintage” cars, new cars that are replicas of vintage cars, or new modern cars. For restored vintage cars, cost components are the acquisition of the cars themselves, the shipping costs, and the restoration costs. Several equipment dealers have acquired cars from Milan, Melbourne and other locations for resale to American streetcar properties. In general the combined cost of acquisition of vintage cars and preparing them for service will be in the range of \$400,000 to \$600,000 per car. Some systems have achieved economy by arranging with local enthusiast organizations to refurbish the cars with volunteer labor.

Replica cars, such as those produced by Gomaco Trolley Company, are available as custom designed cars or as “off the shelf” models. “Off-the-shelf” double-truck Birney style cars built for Tampa, Charlotte, Memphis, and Little Rock cost \$750,000 per car.<sup>81</sup>

The streetcar maintenance facility, scaled appropriately for the present system, but large enough to accommodate system expansion, is integral to the system. Location, cost and efficiency of operation must be considered. Space must be made available for the building itself, outside track storage, parking for automobiles and service trucks, and a fire access road. There must be satisfactory street access for trucks delivering parts and supplies or even the streetcars themselves. The facility should be located close to the streetcar line itself to minimize “non-revenue” movement of cars to and from the facility and should be in a neighborhood conducive to the industrial nature of the streetcar facility.<sup>82</sup>

The Kenosha maintenance facility, one that accommodates maintenance and storage activity for a five car fleet cost one million dollars.<sup>83</sup> A similar facility in Little Rock was built for \$815,000.<sup>84</sup>

Electric power distribution requires infrastructure for suspension of the overhead wires from which the streetcars draw their electricity, as well as substations to convert power from commercial voltage to streetcar operating voltage. Substations must be placed in such a way to provide capacity for surge conditions (all cars on line and carrying capacity loads), and enough capacity to allow continued operations if one substation must be taken off line. The stations should be located so as to allow access for maintenance.<sup>85</sup> Depending on capacity and configuration, substations cost about \$325,000 apiece.<sup>86</sup>

Many other cost factors contribute to the overall implementation cost of streetcar systems, stations, platforms, communication technology, engineering, traffic mitigation, environmental studies, and spare parts among them. There are enough cost components with enough variability that a municipality or organization contemplating implementation of a streetcar system should retain the services of a consultant early in the process, before estimates of the cost of the proposed system are publicized.

## **VII. 2. Operating costs**

Many varied factors influence streetcar system operating cost, making generalization difficult without consideration of the attributes of a specific system. The length of the system, operating speed, frequency of service, service span (hours of operation), and vehicle fleet size and composition will all have an impact. Consideration of key measurements provides a better understanding of comparative costs. In evaluation of cost effectiveness, two key measurements are important.

Operating cost per passenger mile and per passenger trip provide different insights into relative cost and benefit. How effectively does the streetcar circulate passengers through the central city in relation to its cost? Operating cost per passenger mile measures that. How effectively is the streetcar attracting people to ride? Cost per passenger trip measures that. Some interpretation must be made within that statistical measure.

A well established, longer streetcar system with more passenger ridership per mile, such as New Orleans, has a comparatively low cost per passenger mile and per trip. Conversely, a newer, shorter, tourist based system such as Kenosha’s, has higher cost components. Kenosha’s system, as currently configured, is dependent on tourist and recreational ridership. Operation and maintenance costs fluctuate in relationship to service delivery rather than in

direct relationship to ridership. Table 6 shown below provides a comparison of streetcar system costs and measures of effectiveness.

Memphis' high cost per trip likely resulted from a temporary system interruption in preparation for opening a new route. Memphis' passenger count for year 2003 was abnormally low in comparison to previous and subsequent years. Evaluation of operating cost per passenger and per passenger mile must be undertaken in relation to historical performance, but also on a "pro forma" basis anticipating higher ridership from the new development that the streetcar can be expected to attract.

Since the streetcar normally operates within the context of the larger transit service environment, it is worthwhile to consider the cost of streetcar operation in relation to that of the bus service in the same community. In general the streetcar operating costs exceed those of bus services in the same community by 15 to 50%.<sup>87</sup>

There are several reasons for the higher operating costs of streetcars.

- Economy of scale of fleet size. The larger bus system has a larger fleet over which to spread administrative and overhead cost.
- Not all maintenance is done at the streetcar maintenance facility. Necessity sometimes arises to truck a streetcar to a remote location for heavy or specialized maintenance.
- Higher spare parts ratio for smaller and more specialized streetcar fleet
- Smaller operator pool. Run assignments may not be as efficient as those on the larger bus system. Larger proportional pool of "extra-board" operators.
- Maintenance cost of track, power supply, and overhead contact wire system.

**Table 6 Streetcar and Bus Cost Effectiveness Measures**

City		Route Miles	Unlinked Passenger Trips	Passenger Miles	Annual O&M Cost (Thousands)	O & M Cost per Passenger Mile	O & M Cost per Passenger Trip
Galveston	Streetcar	5.9	54,335	67,875	\$ 96,840	\$ 1.43	\$ 1.78
	Bus		794,795	1,657,704	\$ 2,680,313	\$ 1.62	\$ 3.37
Kenosha	Streetcar	1.9	67,557	68,348	\$ 308,389	\$ 4.51	\$ 4.56
	Bus		1,601,445	5,931,860	\$ 5,173,010	\$ 0.87	\$ 3.23
Memphis	Streetcar	5.8	778,442	1,562,396	\$ 3,537,599	\$ 2.26	\$ 4.54
	Bus		10,692,573	61,166,849	\$ 39,862,939	\$ 0.65	\$ 3.73
New Orleans	Streetcar	16.0	6,340,217	13,475,205	\$ 9,472,948	\$ 0.70	\$ 1.49
	Bus		46,658,612	118,631,220	\$ 83,012,976	\$ 0.70	\$ 1.78
Seattle	Streetcar	1.9	403,590	410,245	\$ 1,421,503	\$ 3.47	\$ 3.52
	Bus		71,009,626	433,019,222	\$ 294,146,010	\$ 0.68	\$ 4.14
	Trolley Bus		23,679,298	42,467,497	\$ 42,331,347	\$ 1.00	\$ 1.79
Tampa	Streetcar	2.3	503,698	842,994	\$ 1,844,780	\$ 2.19	\$ 3.66
	Bus		9,185,410	43,832,969	\$ 30,445,904	\$ 0.69	\$ 3.31
Aggregate	Streetcar		8,147,839	16,427,063	\$ 16,682,059	\$ 1.02	\$ 2.05
	Bus and TB		116,963,147	588,076,101	\$ 414,639,523	\$ 0.71	\$ 3.55

Source: National Transportation Database

In the aggregate the statistics support the observation that streetcars cost more to operate. In selected instances the bus costs exceed those of the streetcars or the costs of the two modes are equivalent. Notably in New Orleans, where the long established streetcar system



carries more passengers longer distances, and where the streetcar plays a major circulatory role, the streetcar operating statistics compare favorably with those of the bus.<sup>88</sup>

Likewise in Galveston, a comparatively small bus system with light passenger loadings has an abnormally high cost per passenger mile. As a result the streetcar compares favorably with the bus system. Some comparisons are unfair. Seattle's streetcar cost per passenger trip compares favorably with bus service in the same community, however the bus statistic likely includes long, lightly patronized bus routes, whose operation is required by policy, rather than economic considerations.

## VIII. Ridership

The most important aspect of the streetcar system is the riders. Without the riders there would be no reason for the streetcar system to be operated. How many people can be expected to ride the streetcar? Why do they ride the streetcar? Who are the riders? When do they ride the streetcar?

### VIII. 1. Trip and rider characteristics

Any analysis of streetcar ridership requires a revisiting of the two fundamentally different roles performed by the streetcar, namely those of circulation and providing a meaningful visitor experience. Streetcar systems whose primary effectiveness is in providing effective transportation are circulator systems. The systems whose role is more as a generator of tourist traffic are considered “theme” systems. The most successful streetcar systems combine both aspects.

Several factors influence levels and kinds of ridership in the central city circulatory context. Those are:

- Intensity of land use – Not only are there more people in close proximity available to use the transit services, but central city land use intensity tends to attract the kinds of commercial activities and services that are more appropriately reached without use of an automobile
- Mix of land uses – Multiple land uses will result in diversity of trip purposes and consequently a mix of kinds of riders and times of ridership, mitigating the ridership “peaking” associated with primarily journey to work transit usage
- Travel time – In general this is associated with transit’s time competitiveness with automobile travel.
- Frequency and span of service - Service frequency is important to allow users to make trips without planning. Service span is important in attracting riders with a greater variety of trip purposes.
- Fares – High fares discourage ridership; low fares encourage ridership.
- Connectivity to a broader network – Effective connectivity to a broader transit network benefits both the central city circulator and the connecting services by providing more mobility options for more people.
- Legibility and information – A transit system that is easier to understand is easier to use, especially for visitors and other non-regular riders.
- Comfort – A comfortable waiting and riding environment will attract more riders.<sup>89</sup>

Who are the riders of the newly implemented streetcar systems? As with transit systems in general, ridership can be classified into transit-dependent and choice riders. The central city streetcar systems add two other distinctions, the first being diverted riders vs. induced riders. The other distinction is that of destination oriented riders vs. joy riders. Each has its importance as the streetcar carries out its desired purpose.

The riders may have been diverted from automobile use, wherein environmental, land use and congestion mitigation benefits are achieved. The riders may have been diverted from

alternate forms of public transit. The measure of benefit here is determined by the kind of transit the riders were diverted from. If the streetcar has replaced an equivalent bus service then environmental benefits are minimal. There may in fact be a negative impact in that civic resources have been expended and the community disrupted without any correlative increase in connectivity within the community. Diverted riders may formerly have been pedestrians. Unless sidewalk capacity is an issue, this could generally be considered a negative public health impact in that riders are deprived of their previous physical activity.

Much of the expected benefit of the streetcars comes from induced ridership. The economic benefits of increased tourism/visitor activity and convention attendance are dependent on the streetcars' role as "extenders of walkable range." Creation of a critical mass of downtown activity is dependent on a diverse range of activity and on enough new and different attractions to stimulate return visits especially for regional visitors. Extending of the walkable range is important in expanding the universe of reachable attractions for conventioners and out of region tourists. Those groups have not only had their visitation experience enhanced, but the increased range of attractions will hopefully induce them to extend their stay in the city.

The Downtown Market Study commissioned by the City of Memphis found that conventioners, visitors traveling on business, leisure tourists from other regions, and day visitors spent a combined \$563 million in downtown Memphis in 2003.<sup>90</sup> An economic impact study in Richmond projected that if each of the 85,000 people working in downtown Richmond spent an additional \$10 more per month because of extended range of options, retail sales would increase by \$10.2 million annually.<sup>91</sup>

The South Main district lies about 1/2 mile south of the core of Memphis central business district. Merchants, particularly the operators of art galleries have used the streetcar to increase awareness of, and access to, their establishments. Business owners collectively rented the Main Street Trolley system on the last Friday of each month to promote the area. From an initial response of 50 to 60 visitors, the attendance increased to 3,000 per night during the first year.<sup>92</sup> Indeed, induced riders are vital to the streetcars' effectiveness in carrying out their mission in the community.

The other ridership distinction is that of destination oriented riders vs. joy riders. Joy-riders' primary motivation of using the streetcar is for the experience itself. In essence the streetcar becomes an attraction that connects attractions. In its appeal to pure joy riders, the streetcar provides three benefits to the community.

First, the system attracts tourism. No streetcar, except perhaps for the San Francisco cable cars, can attract sufficient tourism on its own to justify its existence. Using a "multiplier" effect, however, positive tourism experiences generate more tourism through word of mouth.

The streetcar serves to raise the visibility of the community in general. The cover of the American Automobile Association *South Magazine* March/April 2003 issue featured the TECO streetcar on the cover. The magazine reaches 2.3 million readers. If the readers never opened the cover, they nonetheless had the "visit Tampa" message implanted in their minds.<sup>93</sup>

Little Rock also views the streetcar as a visibility tool. “It’s another tool we get to use to tell people about Little Rock,” said Barry Travis, director of the Little Rock Convention and Visitors Bureau. “People will still come to Little Rock just to ride the trolley. You don’t see trolleys with overhead wires every day anymore.”<sup>94</sup>

Once tourists, visitors and conventioners have been drawn to the community, the use of the streetcar for recreational trips produces in effect a moving catalog of businesses and traffic attractions in the adjacent neighborhoods. Similar to Memphis’ South Main district experience, the streetcar in Portland has “showcased” the businesses peripheral to the core downtown area. The art galleries in Portland’s Pearl District open their doors to the public on the first Thursday of every month. Gary Lawrence of the Lawrence Gallery observed that “the streetcar has made the Pearl District what it is.” He goes on to observe that since the opening of the streetcar, 4,000 to 6,000 people visit his gallery on the first Thursday openings.<sup>95</sup> It was not reported how many of the visitors arrived by streetcar or what the visitation rate was before implementation of the streetcar.

Ridership studies in Dallas and Memphis have yielded some understanding as to the nature of streetcar riders on those systems. An on-board survey on Dallas’ McKinney Avenue streetcar showed ridership distributed evenly between males, females and children. About one half the riders simply make the round trip and then go on their way, while the other half make stops along the route. This is particularly important for a system funded in part by the local commercial community to promote use of their businesses.

The split between out of town and regional visitors is noticeably dependent on convention activity in the city and especially by the amount of pre-convention coordination between the McKinney Avenue Transit Authority and the Dallas Convention Bureau. Interestingly, among conventioners, the younger the age group, the greater the number of visitors to the McKinney Avenue streetcar. Trend analysis at McKinney Avenue also revealed that moderately hot weather does not affect ridership, but cold weather has a significant negative impact.<sup>96</sup>

Two ridership studies in Memphis dealt with rider characteristics and behavior and timing of ridership. A 1994 survey administered by Indiana University roughly one year after the Main Street Trolley was introduced yielded the following insights:

- 51% rode for transportation, 49% for entertainment
- 17% “normally” get around Memphis by public transit
- 61% had eaten at restaurants along the trolley, 34% had shopped in stores
- 36% had annual incomes over \$50,000, 14% had incomes under \$20,000<sup>97</sup>

A second survey, conducted by Parsons, Brinckerhoff, Quade and Douglas in June of 2001, confirmed and expanded upon the findings of the 1994 survey: It also measured the impact of the 1997 Riverfront Loop extension. The findings were as follows:

- Riverfront ridership was higher on weekends, Main Street Trolley ridership was heavier on weekdays
- System trip count was evenly split between Memphis residents and non-residents
- Weekday boardings were highest at the North End (transit) terminal, the trolley’s primary interface with the bus system

- Weekend boardings were highest at Beale Street, the largest on line traffic attraction
- Weekday and weekend alightings were consistently highest at the Beale Street stop
- 68% of riders pay the regular adult fare, 7% use the special lunchtime fare, 6.4% rode on a fare plus a transfer, 3.6% rode on all day passes, and 3.2% paid senior fares
- Among non-residents 77% paid regular full fare, 4.4% paid lunchtime fare, and 3.8% paid senior fares
- Nearly 40% of riders reported their trips beginning at or ending at a hotel or restaurant
- 13% reported their trips as being journey to work or work related trips.<sup>98</sup>

Memphis Area Transit Authority's ridership tracking efforts provided further insights, particularly with regard to seasonal ridership variation. Not surprisingly ridership is highest in the spring and summer months and lowest in fall and winter. Spring and summer times provide the most favorable weather for outdoor activities that are natural traffic generators for the streetcar. Ridership is highest in the month of May due to a month long downtown celebration involving a variety of activities along the riverfront. Likewise the Beale Street Music festival is held annually during the month of May. Other events that cause variations in the ridership are Memphis Redbirds baseball games (where the season ends in late summer), basketball games, and cultural exhibits at the Convention Center.

Other observations from internal monitoring of the ridership involves day of the week variations. Quite naturally, on Monday through Thursday, ridership is dominated by Memphis workers and residents who use the system on a regular basis. Cultural, recreational and shopping activities exert a far greater influence on ridership on Friday through Sunday. Ridership is highest on Saturday, followed closely by Friday. Sundays, except during extraordinary special events, are the lowest ridership days.<sup>99</sup>

## **VIII. 2. Broader ridership base**

An additional consideration in the analysis of central city streetcar ridership is the apparent phenomenon of rail mode attracting more riders and more market segments than buses under similar conditions. Numerous implementations of streetcars in lieu of previous bus service have provided supporting empirical evidence. Streetcars on Spadina Avenue in Toronto experienced a 15 to 25% increase in ridership over the previous bus service on a nearly identical route. Ridership on "F" line streetcar service implemented on San Francisco's Embarcadero quickly grew to a volume triple that of the previously operated bus line.<sup>100</sup>

Tacoma's experience is the most dramatic. In 2003, Sound Transit replaced a shuttle bus running 1.6 miles through the length of downtown Tacoma with a modern streetcar. During its last full year of operation the bus carried 114,000 riders. During its first 16 months of operation, the Tacoma Link streetcar carried over 1 million people. When adjusted to compare equivalent time periods, the increase represents a more than five fold increase in ridership under identical operating circumstances.<sup>101</sup>

The 1994 Memphis ridership survey indicated that 83% of riders did not ordinarily use public transit.<sup>102</sup> The finding is corroborated by an on-board survey conducted on Dallas' McKinney Avenue streetcar. The survey revealed that more than 90% of riders "had never before taken city transit of any type."<sup>103</sup>

Edson Tennyson, in addressing the issue in a 1989 study, concludes that “transit mode does indeed make a significant difference in the level of use of a transit facility.” His study stops short of identification of an expected percentage of difference.<sup>104</sup> A civic official in Kenosha restates the effect in the context of possible implementation of new service in that city, saying, “Could Uptown people come to downtown Kenosha on the existing transit buses? Yes they could but they don’t. The bus transit system doesn’t draw from a broad base of society. Many people perceive the bus as being for ‘other people’ and have no interest in using it themselves. They would use the streetcar though.”<sup>105</sup>

What are some reasons that streetcars attract a higher level of ridership? They appear to have to do with identifiable presence, user understanding, ambience, ride quality, and sociology. With the rails in the street and overhead wires, as well as well marked stops, the streetcars provide a visible presence that gives the prospective user some validation that the streetcar “really does run on this street.” The bus stop illustrated in Figure 13 how passenger confidence can be undermined.



**“Riders can stand at a stop and literally see where the line comes from and where it is going. Streetcar routes generally make few deviations from a straight path, giving the user more confidence. Visitors and occasional users are more inclined to use them, since there is less confusion about the streetcar than about taking one of many possible bus routes.”<sup>106</sup>**

**Figure 13 Does the bus stop here or not?**

Ride quality appears to make a meaningful difference. Passengers appear to react negatively to the bus’ “weaving” motion at stops. They appear to experience physical discomfort as the bus repeatedly pulls over and then remerges back into traffic. Riders are reported as perceiving the “weaving” as “taking too much time” and “letting the traffic control the bus.”<sup>107</sup> These circumstances were described in a consultants study and would appear to have some intuitive basis in fact but no study source was cited.

Psychological attitude of users toward the ride experience appear to explain in part the difference in bus and rail ridership. A study of the sociology of transit use provided some illumination. The study described a transit trip for most people as “purely instrumental and not pleasurable.” The study’s authors described transit riders as generally “exit oriented” and “making mental preparations to leave as soon as they board a vehicle.” The authors described a notable exception, that being the St. Charles streetcar line in New Orleans:

**“The streetcar sways and jerks. Its steps are high and its acceleration rate is low. But the windows open wide on the open air; and the wooden seats, the unshaded lights, the standing motorman with a hand-operated rheostat, and the constant ringing in of fares all have a nostalgia and charm about them that makes the regular patron a perpetual tourist. Among a considerable number of New Orleanians the motto is ‘Streetcars Desired.’ They simply find the ride pleasant.”<sup>108</sup>**

Understanding of the service offering, visibility of the service, the ambience of the ride experience, and the sociology of modal choice all appear to combine to make streetcar experience more attractive than that of the bus under comparable circumstances.

### **VIII. 3. Welcoming riders to transit**

If, as the Memphis and Dallas surveys have shown, the majority of streetcar riders have not had experience with public transit, an opportunity exists for the transit industry to use the streetcar as a means of attracting new regular users. It is especially important that their streetcar experience be a good experience.

The Dallas survey revealed some important profiles of new users:

**They are either transit ignorant or transit-hostile, and must be cultivated with gentle handling by the crew. The riders are generally apprehensive or intimidated about their first time ride. They are afraid of getting lost and looking foolish because they do not know how things "work." Everything is a new experience, from boarding, paying a fare, finding a seat, to managing a return to the vicinity of their automobiles. Car crews must make sure that these riders do not take a trip to "the twilight zone."<sup>109</sup>**

Ensuring the streetcar riders' good experience goes beyond cultivating new individual transit users. The profile of new riders as conventioners and tourists visiting cultural attractions implies a significant component of potentially influential people in their communities. Can streetcars build political support for implementation of regional rail transit? In some communities such as Little Rock and Memphis, planners are betting that the answer is yes. Should transit advocates and planners use the streetcar as an interpretive tool looking forward in the same way the Lowell streetcar interprets the past? There may be an opportunity.

### **VIII. 4. Ridership projections and counts**

Ridership projection for any new transit service is an inexact science. It would appear that ridership projection is often driven more by political considerations than by objective methodology. The streetcar lends itself even less well to objective methodology. Demand models and econometric projections do not take into account the "ambience" factor or the exact form the revitalizing central city will take.

To qualify for federal money, particularly New Starts or Small Starts money, where projects are objectively compared with other projects in a rigorous "side by side" evaluation process, some methodology must be used to produce a reasonably accurate projection. Especially as larger cities such as Charlotte, Atlanta, and Miami begin serious planning for streetcar implementation, more sophisticated methods are being used.

Atlanta Streetcar Inc., the non-profit agency convened by civic leaders to implement streetcars in that city has addressed ridership projection for the Peachtree Corridor. A study collated ARC data, journey to work and vehicle ownership rates as reported in the 2000 U.S. Census, and the Institute of Traffic Engineers (ITE) Trip Generation Manual to calculate total daily person trips in and out of the relevant traffic zones. Out of the 102,000 daily person trips originating or terminating in the corridor, the study estimates that 17,800 or 17% of trips would be made on the streetcar. The study used the same process to estimate

ridership for the proposed Downtown Loop streetcar. The study anticipates 21,500 daily riders for the combined Peachtree Corridor and Downtown Loop system.<sup>110</sup>

Anecdotes abound with respect to underestimates and overestimates of ridership. The inexact nature of the process renders that vulnerability. Hnedak Bobo Group, the consultant who conducted the initial feasibility study for the Memphis trolley projected that the system would carry 1.9 million riders per year, rising to 2.8 million annual riders by the year 2000. In fact the system currently carries approximately 1.1 million annual riders<sup>111</sup>

Tampa's initial projection was pegged at 264,000 annual riders before the system was opened in 2002. Early ridership results led to an upward revision to 600,000. In fact for year 2003, the actual ridership was 504,000.<sup>112</sup>

Though accurate estimation is an inexact science, ridership projection is essential in securing political support and a reliable funding system that will ensure the future of the streetcar system.



## **IX. Effectiveness and “success” of streetcar projects**

Streetcars have been reintroduced in cities across the country for a variety of purposes. The major purposes are circulation and linkage, economic development, either through promotion of convention attendance and tourism or through stimulation of physical growth of the central city, community character and definition, and organization of development.

By what measures can a streetcar project be judged “a success?” Have the streetcars accomplished all the things that were promised at the time of their initiation? How well? How can the streetcars effectiveness be measured? Are there other, unexpected benefits that the streetcars brought? Have the streetcars had negative impacts? What kinds?

Over 600 million dollars have gone into streetcar implementation since 1980, most of it public money. Have the taxpayers gotten their money’s worth? Is there a benefit/cost analysis that has allowed comparison of this investment with alternative uses of the money?

The streetcar systems can be evaluated in several ways. The “metrics” of public transit service offerings are measured by objective standards so that side-by-side comparison can be made for purpose of funding and commitment of community resources. The second measure addresses the streetcars’ effectiveness in bringing about economic revitalization or other community objectives. A more qualitative measure is the fulfillment of political objectives. An overall measure of the “success” of a streetcar project is simply whether or not it continues to attract sufficient resources to assure continued survival.

### **IX. 1. Measures of effectiveness**

In an exhaustive review of literature and in numerous interviews with civic leaders I have concluded that very few quantitative benefit/cost measurements are in place. This largely results from the nature of the benefits the streetcars are expected to achieve and the fact that streetcar systems are implemented simultaneously with a variety of other activities.

To be sure there are evaluation criteria available, but they customarily address some component of the streetcars’ efficiency or effectiveness rather than the overall community benefit. Those criteria can be grouped into categories:

- Economic benefit
- Cost effectiveness
- Performance effectiveness
- Environmental benefit
- Political Effectiveness

Economic benefits from the streetcars occur in several interrelated ways. The first is to increase the level of transactional sales. Secondary benefits from increased transactional sales are the multiplier effect of money respent in the community and tax revenues generated by additional sales. These benefits may come from attraction of additional day visitors, overnight tourists, or conventioners. Benefits may also come from extension of the visits due to convenient accessibility to a greater number of attractions in the community.

Have the streetcars increased transactional sales? Convention and tourism officials have described the streetcars as being “part of the sell” in attracting convention business. They have acknowledged the streetcars’ role in making the communities a more attractive place to visit. Business’ and institutional reference to the streetcar in advertising, signage and business names in Memphis provides anecdotal indication of the importance of the streetcar to those organizations in the conduct of their daily business.

Civic leaders such as Sharon Priest with Little Rock’s Downtown Partnership, and Andy Kitsinger of Memphis’ Center City Commission provide further indication of general civic satisfaction with the benefits from the streetcars’ presence. In general their conclusion is that streetcars draw people and people draw more people until an economic and sociological critical mass is reached. For them, sheer ridership numbers are the important measurement metric. 107,000 riders on the Little Rock River Rail trolley are 107,000 people who were very likely spending money in downtown Little Rock and later enthusiastically describing their experience to family, neighbors and friends. There is an implicit assumption that many of those 107,000 riders would not otherwise have visited downtown, or have extended their visitation time as a result of the presence of the streetcar. In the aggregate streetcars carry about 18 million riders through American cities each year.

Little Rock’s Walter Malone described his focus on ridership as the key success metric. “I consider (the streetcars) a success when I see people in them.” There is a direct connection between the number of people on the streetcar and the success of downtown Little Rock in drawing people in. Everybody wants downtown to work.”<sup>113</sup>

Detailed studies undertaken as part of the Memphis Downtown Market Study and Richmond streetcar feasibility quantify the importance of visitors, tourists and conventioners to their communities and present historical empirical data as to visitors spending habits. The Richmond study attempts to quantify economic benefit from visitors and downtown employees’ access to a greater geographical range of services that would result from implementation of the proposed streetcar.

Though there is widespread consensus among civic leaders and consultants that streetcars do attract visitors and that they contribute to an urban ambience that extends visitors’ stays, there is no available empirical data to support, dispute, or quantify those assertions.

Streetcars’ contribution to economic development through attracting and organizing development is measured by the amount of new development occurring in communities with newly implemented streetcar systems. Portland is held up as the prime example of the positive relationship of streetcars’ stimulation of new building development. Charles Hales, a City Commissioner in Portland at the time of the streetcar’s implementation describes development impact:

**“The streetcar succeeded. The \$55 M streetcar line has sparked over \$1.2B in new development, making it probably the best municipal investment anywhere in recent times. The Pearl District neighborhood, organized along the line on the redevelopment site, is the nation’s most successful new urban district.”<sup>114</sup>**

Andy Kitsinger, with Memphis’ Center City Commission observed “While there is widespread enthusiasm for the streetcars and general acknowledgment of their benefit, there is no ‘hard and fast’ means of numerically measuring their benefit.”<sup>115</sup> The measurement

metrics cited by others in Memphis' downtown revitalization were the number of low cost construction loans applied for in the vicinity of the streetcar. Other potential measures could be measures of building and/or renovation permits issued or in the case of Portland, the aggregate value of new construction and renovation proximate to the streetcar.

Memphis' CCC's Kitsinger suggested that correlation between proximity to the Main Street Trolley and higher property values would be a potential measure.<sup>116</sup> While there is no reason to doubt the correlation, the question must be asked whether or not the same correlation would have existed without streetcar implementation owing to the historic relationship between land values and proximity to the prime commercial street. The measure may have value in the future as projected redevelopment takes place along Memphis' present low density Madison Avenue between the central business district and the Medical Center.

Cost effectiveness can be considered either in terms of maximum benefit derived per dollar of implementation cost or efficiency with which the system is currently operated. Civic leaders' focus on overall ridership as a measure suggests that the measurement of annual ridership in relation to investment cost would be valuable. A comparative table of Implementation cost per rider is shown in Table 7.

**Table 7 Implementation Cost per Annual Rider**

The implication of the wide variation in cost per annual rider must be interpreted carefully. Memphis and Tacoma each began new services in the last three years, where routes were built to light rail standards in anticipation of ongoing ridership gain. Also, implementation costs on the preceding chart are not indexed to account for cost escalation over time. Implementation cost per rider does not take into account other land use or political benefits that may derive from the project, nor does it reflect how much extraneous construction activity was charged to the streetcar implementation.

Annual ridership per dollar of implementation cost			
City	Cost (\$)	Annual Ridership	Cost per Trip (\$)
Galveston	12,000,000	54,335	221
Tacoma	80,400,000	738,536	109
Little Rock	19,600,000	200,000	98
Memphis	109,300,000	1,132,378	97
Tampa	32,000,000	420,023	76
Kenosha	5,100,000	67,256	76
Portland (Modern)	56,900,000	1,960,000	29
Seattle (Waterfront)	10,100,000	403,590	25
Dallas	5,900,000	236,400	25
San Jose	1,900,000	143,332	13
San Francisco "F" Line	70,000,000	6,500,000	11
New Orleans (Riverfront)	5,400,000	1,642,500	3

Several measures are used to evaluate streetcar operations. Service efficiency can be measured by apportioning operations and maintenance cost by revenue vehicle mile or revenue vehicle hour. The service efficiency index measures how well the streetcar system is providing service in relation to its operating cost. Efficiency and effectiveness of various streetcar systems are compared in Tables 8 and 9, shown below.

**Table 8 Streetcar Service Efficiency Measures - 2003**

City	Route Miles	Annual Revenue Vehicle Miles	Annual Revenue Vehicle Hours	Annual O&M Cost (Thousands)	O & M Cost per Revenue Vehicle Mile	O & M Cost per Revenue Vehicle Hour
Galveston	5.9	8,252	1,426	\$ 96,840	\$ 11.74	\$ 67.91
Kenosha	1.9	20,272	2,896	\$ 308,389	\$ 15.21	\$ 106.49
Memphis	5.8	500,810	38,151	\$ 3,537,599	\$ 7.06	\$ 92.73
New Orleans	16.0	732,771	77,064	\$ 9,472,948	\$ 12.93	\$ 122.92
Seattle (Waterfront)	1.9	42,865	11,130	\$ 1,421,503	\$ 33.16	\$ 127.72
Tampa	2.3	80,220	17,329	\$ 1,844,780	\$ 23.00	\$ 106.46

Source: National Transportation Database

**Table 9 Streetcar Service Effectiveness Measures - 2003**

City	Route Miles	Annual Revenue Vehicle Miles	Annual Revenue Vehicle Hours	Unlinked Passenger Trips	Passenger Trips per Revenue Mile	Passenger Trips per Revenue Hour
Galveston	5.9	8,252	1,426	54,335	6.6	38.1
Kenosha	1.9	20,272	2,896	67,557	3.3	23.3
Memphis	5.8	500,810	38,151	778,442	1.6	20.4
New Orleans	16.0	732,771	77,064	6,340,217	8.7	82.3
Seattle (Waterfront)	1.9	42,865	11,130	403,590	9.4	36.3
Tampa	2.3	80,220	17,329	503,698	6.3	29.1

Source: National Transportation Database

While civic officials may be subjective about effectiveness measurement, the FTA is not, at least not when it comes to comparative evaluations for New Starts grants. Each project must meet specific criteria with respect to mobility improvements, environmental benefits, operating efficiencies, user benefits, and transit supportive land use. FTA, in New Starts project evaluation also considers the capital and operating financial arrangements of the sponsoring agency.<sup>117</sup>

**Table 10 Environmental Benefits**

Measurement of **environmental benefits** under the New Starts program is similar to the measurement of other kinds of transit projects under the New Start program. Consideration of environmental benefits includes the air-quality designation given to the region by the Environmental Protection Agency (EPA). The primary focus is on the streetcars' positive impact on regional pollutant emissions. Table 10 provides an example of FTA environmental benefit analysis.

Medical Center Extension - Memphis, Tennessee	
Criteria Pollutant	New Start vs. No-Build
Carbon Monoxide (CO)	13
Nitrogen Oxide (NOx)	2
Volatile Organic Compounds (VOC)	1
Carbon Dioxide (CO2)	177
Values reflect annual tons of emissions reductions	
Source: FTA New Starts Annual Report, November 1999	

While FTA measures other types of transportation projects in part by change in regional energy consumption, the measure is not meaningful in the case of the streetcar. The streetcars' dual purposes of circulator and visitor attraction results in an inconclusive or negative impact on energy consumption. As a circulator, the streetcars have the potential to reduce energy consumption through elimination of short trips. As a visitor attraction the streetcars are likely inducing trips, therefore potentially increasing regional energy consumption. For these reasons FTA does not weigh changes in regional fuel consumption heavily in evaluation of the systems for funding.

Because the streetcar projects provide a variety of benefits to the community beyond efficiency in providing transportation, the new Small Starts program in SAFETEA-LU, modifies the evaluation criteria. Under the new program the FTA must:

- **“Determine the degree to which the project is consistent with local land use policies and is likely to achieve local developmental goals**
- **Determine the cost-effectiveness of the project at the time the service is initiated**
- **Determine the degree to which the project will have a positive effect on local economic development”<sup>118</sup>**

The subjective way in which streetcar systems are conceived and implemented makes it appropriate to search for evaluation criteria that reflect political or civic effectiveness. In this regard measurement of streetcars' success is found in evidence of worth to the community. One indication is found in willingness to expand the system. Nine communities have found their streetcar systems to have sufficient worth to warrant expansion of the systems using municipal funds. Three cities have undertaken two extensions. Four more cities are actively planning extensions to their systems.

Seattle's Waterfront Streetcar currently represents an object lesson in competition for resources and measurement of worth of the system to the city. First, the streetcar maintenance facility was located on land belonging to the art museum. The art museum served notice of its need to use the land and that the maintenance facility must be removed. The streetcar system, unable to continue operations without a place to store and maintain the cars was faced with shutdown.

The Port of Seattle and City of Seattle have each put forth proposals to provide replacement sites for the maintenance facility. Each proposal involved a cost of one million dollars or more. Clearly the streetcar was valuable enough that civic leaders rallied to commit resources to assure its continued operation.<sup>119</sup> The streetcar operation has been temporarily suspended while a new maintenance facility is built.

Another indication of streetcars' cultural importance is the priority placed on restoration of service in New Orleans following the destruction wrought by Hurricane Katrina. Partial streetcar service was restored within three months. “Restoration of the streetcars is viewed as an important part of the city's recovery, said Sandy Shilstone, president of the New Orleans Tourism and Marketing Corp., the agency that develops ad campaigns for the city's tourism industry. To New Orleanians, it means everything," she said. "The streetcar is more than a means of transportation. It means tradition and continuity -- life moving forward and the strength forged by fire and steel."<sup>120</sup>

Could the resources committed to implementation of the streetcar have been better used for a different purpose? The decision as to where to commit civic improvement resources is nearly always a subjective one. Can anyone definitively calculate a benefit cost ratio for a fountain, a river walk, decorative street lighting, or neighborhood defining banners and arches? In comparison with other potential uses of civic resources the streetcar's combination of attractiveness and connectivity is a unique attribute.

Mayor Antaramian of Kenosha summed up the value of the streetcar to his community by saying,

**“Measurement of the ‘value’ or ‘success’ of the streetcar can only be done in the broader perspective of the overall vision for redevelopment. Implementing the vision involves working with a ‘smorgasbord of opportunities’ that are all interrelated. The streetcar would be of little value without HarborPark, the River Walk, the relocated Kenosha Public Museum, and lakefront events. Yet the value of those initiatives is enhanced by the presence of the streetcar. The streetcar serves to “broaden the redevelopment impact across the urban land fabric.”** <sup>121</sup>

## **IX. 2 Casualties**

Not all streetcar implementations have been successful. Streetcar systems in Detroit and Philadelphia, begun in 1976 and 1982 respectively, have ceased operation. The Detroit project had its genesis in the desire of the Detroit Central Business District Association to rehabilitate a five block stretch of Washington Blvd. The original ¾ mile streetcar line was incorporated into the plan as a way to connect Washington Blvd. hotels with the Cobo Convention center. In 1980 the streetcars' effectiveness was enhanced by extending the route through Hart Plaza to the Renaissance Center. Hart Plaza regularly drew 5 million annual visitors to Detroit's various ethnic festivals.

Funding for the \$1.8 million project came from a variety of sources. Most notable were \$676,000 from the State of Michigan General Transportation Fund, \$422,000 of Federal financing through Title X of the Public Employment Act. The City of Detroit provided \$200,000 in Capital Funds and an additional \$480,000 in in-kind services and Community Development Block Grant allocation, mostly for ancillary infrastructure improvements.

Initially the line was successful. The streetcar was cited as “a major factor in arresting the decline of the (Washington Blvd.) area”. In 1979 the line carried 75,000 people. The City demonstrated its satisfaction by providing an additional \$920,000 in capital funds for the 1980 extension to the Renaissance Center.<sup>122</sup>

In a continuing exploration of revitalization and connectivity strategies, the City of Detroit, with the help of a substantial Urban Mass Transit Administration grant, established an automated “people mover”, covering substantially the same area as the streetcar.<sup>123</sup> Streetcar ridership declined to 3,500 per year, far too few to justify the \$300,000 annual operating and maintenance budget.<sup>124</sup> Early in its history the Detroit Downtown Trolley achieved its sponsors' expectations by providing an effective connection between hotels and the convention center. Unfortunately the challenges facing downtown Detroit were, and are, huge. Not the trolley, nor the people mover, nor other strategies have brought about the kind of revitalization necessary for downtown Detroit to return to the state of vibrancy desired by civic leaders.

Another “failed” streetcar effort was that of the Penn’s Landing Trolley in Philadelphia. The project began as a rural trolley museum operated by enthusiasts. The late 1970’s and early 1980’s saw the revitalization of formerly industrial piers and wharves along the Delaware River. A marriage of convenience arose between the enthusiasts and the managers of the Penn’s Landing development. Implementation was comparatively easy owing to the presence of the rail tracks remaining from switching of freight cars to and from the wharves. Operation of the Penn’s Landing Trolley began in 1982.

Successful streetcar implementations result from the combination of need, advocates, and resources. In the case of Penn’s Landing, each was weak. Arguably there was a need. As a linear tourist attraction, Penn’s Landing needed connectivity along the riverfront and with other Philadelphia transportation nodes and activity centers. Advocacy was problematical. While the trolley enthusiasts possessed the technical skills to implement the project, no single high visibility and high energy visionary was present to coordinate the interests of the various stakeholders and integrate the streetcar into the overall Penn’s Landing context. Resources were also insufficient. The group had neither the money nor the political clout to establish a permanent home base for the trolley system.

Without strong leadership, the enthusiast group was not taken seriously by the Penn’s Landing site management. The streetcar operation was repeatedly required to move its car barn from one location to another as new uses were found for the various wharfs. Continuing relocations drained the already meager resources of the enthusiast group. As Penn’s Landing became more successful as a tourist attraction all of the wharves were renovated and the streetcars were relegated to outside storage. Vandalism and resultant compromises of the group’s insurance coverage brought about the line’s closure in 1995.

The streetcar was nearly resurrected in 1996 when \$1.25 million in Federal funding was made available for rehabilitation and extension of the line. Pennsylvania Department of Transportation however, lacking faith in the leadership of the enthusiast organization, insisted on a guarantee of continued operation by the City of Philadelphia or the local transit agency. Neither the city nor the transit agency had the funding to make the necessary guarantee. As a result the Penn’s Landing Trolley never resumed operation and the badly vandalized historic trolleys were relocated to storage elsewhere in the city.<sup>125</sup> In the case of Penn’s Landing, the need to some extent existed, but neither the advocacy nor the resources were satisfactory to sustain continued operation of the streetcar.

Other small, usually volunteer run, streetcar operations have failed to survive. With the sole exception of the Detroit system, all of the systems that have failed have been tourism based, pseudo-museum operations without providing meaningful transportation or circulation benefits to their respective communities.

While tourist based operations such as those in Astoria, Yakima, Fort Collins, Fort Smith and elsewhere have been able to gather sufficient resources to begin and continue operations, they remain vulnerable to the discretionary nature of the tourist/visitor economy. Kenosha’s system, although it has solid municipal backing, is vulnerable to changes in political administrations or in the economic climate of the community.

Circulator systems such as that in Memphis are justified on the basis of bringing people downtown, bringing “human scale accessibility” and creating an “ambience” in the community. The same justification was made for conversion of downtown streets to

pedestrian malls in the 1970's. Another vulnerability of the streetcars is the further shifting of demographics. Streetcars have thrived in rapidly gentrifying communities characterized by rapid immigration by "empty-nesters" and young adults who have yet to start families. Will those trends continue?

Some streetcar systems have failed to meet the original objectives of the implementers. Kenosha's system, for example, was conceived as a circulatory system. It has not yet succeeded in that role. It has, however, provided enough other benefits to warrant continued operation and consideration for system expansion. Though that system did not achieve all of its original objectives, it has been a success in providing a positive value to its sponsors. A streetcar system can only be considered a failure if the benefits it provides are so small as to prevent it from attracting the resources it needs to continue in operation.



## X. Case studies

Streetcar systems have been implemented by a variety of groups, by a variety of means, for a variety of purposes. Three systems, namely Kenosha, Memphis, and Little Rock, are representative of different circumstances that brought about initiation of streetcar systems. Two common threads are the redefinition and revitalization of their respective communities and the high degree of municipal “sponsorship” of the systems. The systems differ, however, in the specific roles they are intended to play in their communities. They also vary in implementation dates. Memphis’ was among the earliest municipally sponsored systems, Little Rock’s was (to date) the most recent. Kenosha is the smallest city to undertake a streetcar implementation. The case studies are intended to describe the context into which the streetcars were introduced, the processes by which implementation was undertaken, and the results of the efforts.

### X. 1. Kenosha – Lakefront revitalization

Kenosha is a traditionally “blue-collar” town with an historic abundance of industrial employers. Geographic and economic changes in the mid-1970’s changed the economic base of the city and that changed the character of downtown Kenosha. Retail activity dispersed to the edge of the community. Industrial facilities relocated production. Chrysler Corporation’s acquisition of hometown automaker American Motors Corporation in 1987 hastened the pace of change. Two years later Chrysler closed the AMC lakefront engine plant, leaving a huge vacant brownfield site.

In 1992, Joseph Antaramian was elected Mayor of Kenosha. The same year Joseph McCarthy was named director of the city owned transit system. Under Mayor Antaramian’s leadership plans were developed for redevelopment of the lakefront brownfield site and revitalization of the commercially declining central business district.

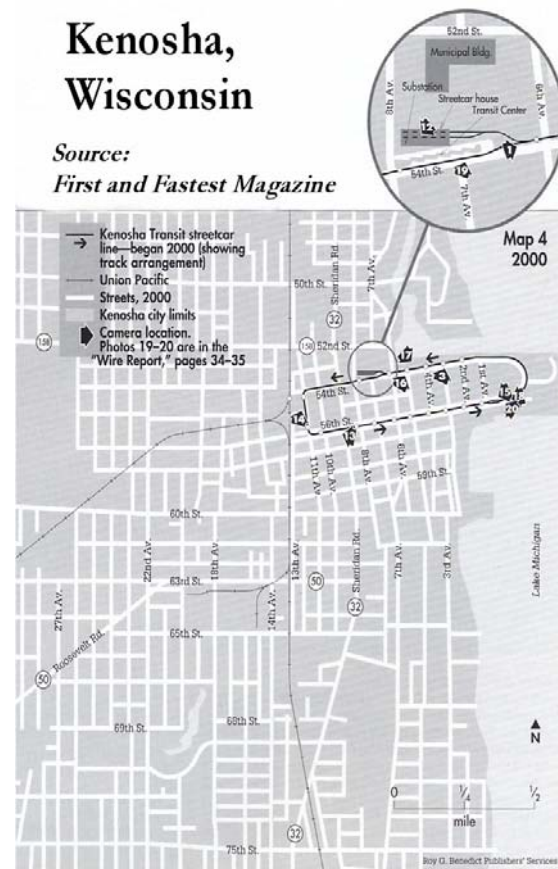


Figure 14 Kenosha streetcar map

Community leaders considered numerous creative suggestions for lakefront redevelopment. Among the suggestions was one from a local trolley enthusiast who suggested a circulator streetcar be implemented in downtown Kenosha. Joseph McCarthy was intrigued and discussed the matter with the Mayor.

In 1995 the Urban Land Institute (ULI) was invited to convene a panel to analyze Kenosha's situation and make recommendations for a lakefront and business district redevelopment. A concept emerged to redevelop the brownfield site with a marina, a residential development of town homes and condominiums, and relocation of the Kenosha Public Museum to the lakefront.

ULI supported the streetcar concept, recalling Harland Bartholomew's 56<sup>th</sup> Street "axial vista" from the pioneering 1925 Kenosha City Plan. Bartholomew's "axial vista" was conceived as a boulevard connecting downtown Kenosha to the waterfront with automobile lanes with a transit line in the median.<sup>126</sup>

The streetcar was envisioned to serve three purposes:

1. To distinguish Kenosha and the HarborPark development from other places in the region that might compete for residents and tourists
2. To provide transportation to community events at Celebration Place (the lakefront park) and for residents of the future HarborPark homes, giving them convenient connection with the Metra commuter trains to and from Chicago
3. To act as a downtown distributor for riders from Kenosha Transit<sup>127</sup>

The lakefront redevelopment plan and its constituent parts, including the streetcar, were introduced to the public through numerous public hearings. A broad base of support of civic leaders, citizens and business people was developed.

Mayor Antaramian took the lead in securing funding for the proposed project. Antaramian's background as State Representative in the 1980's was of enormous value as he and Joseph McCarthy identified sources of funding and secured them. The \$5 million implementation cost of the Kenosha streetcar system was among the lowest of any streetcar project before or since.

80% of project cost was covered by federal funding.<sup>128</sup> The two federal funding sources were Section 5309 funds and CMAQ money. Local funding for both the streetcar and other lakefront redevelopment infrastructure was provided by tax increment financing.<sup>129</sup> Federal and local funding was supplemented with state funding from Wisconsin's Local Government Grant Program.<sup>130</sup>

Five 1940's era PCC type streetcars were acquired from Toronto for operation on the 1.9 mile system. Operation began in July 2000. As originally conceived, the loop shaped route connected the HarborPark residential development, Kenosha's central business district, and the Metra commuter train station. A single car makes the entire loop circuit every 15 minutes, seven days per week. Hours of operation are from 11 a.m. to 7 p.m. on weekdays and 10 a.m. to 5:30 p.m. on weekends.

The nominal 25 cent fare, along with sales of daily passes, generated \$15,250 from nearly 68,000 riders in 2003. Farebox receipts covered 5% of operating costs, in comparison to a farebox recovery ratio of 9% for Kenosha's bus system.<sup>131</sup>

The system was implemented by and is operated by municipally owned and managed Kenosha Transit. Operating costs are covered as part of overall funding transit system

operations. Streetcar system management and workers are employees of the City of Kenosha.

While the Kenosha streetcar was conceived in large part as a circulatory system, except for occasional “spikes” in use for special events, that promise has remained unfulfilled. While some people traveling to and from the Metra commuter train station do use the streetcar for casual trips, the lakefront residential development generates too few journey to work trips to warrant operation of the streetcar before 11 a.m. on weekdays. A study undertaken for Salem, Oregon, a city similar in size to Kenosha had cautionary advice about the Kenosha streetcar:



“While the system is very popular with residents and visitors alike, and now is integral with the identity of Kenosha, the initial thought that the system would operate synergistically with urban development has not been supported. It is apparent that the density of development in HarborPark (300 housing units and 120,000 square feet of commercial space), and the level of retail and employment activity in downtown Kenosha is not high enough to support the operating costs of the system as a fully functioning transit system.”<sup>132</sup>

**Figure 15 Kenosha streetcar**

The system relies on ridership by tourists and visitors and casual rides by local residents for its usage. Interestingly, the narrow ridership base provides the same ridership per vehicle hour as does the Kenosha bus system, albeit at a much lower fare per passenger.<sup>133</sup>

In spite of failure to develop as a genuine circulatory system, civic officials are enthusiastic about the streetcar’s presence and the role it plays in providing community identity, attracting development, and generating tourism.

Mayor Antaramian and other civic leaders generally express a level of satisfaction with the streetcar and that implementation was the right thing to do. They appear to be in universal agreement that the streetcar is a work in progress, that it must be expanded to reach its full potential, particularly as a circulatory resource.

An industrial site formerly occupied by the American Brass Foundry, southwest of downtown, is being redeveloped into a mixed use residential and retail complex similar to the HarborPark project. Under consideration is the extension of the streetcar from downtown to the American Brass site. A funding earmark was inserted in the recently passed SAFETEA-LU, federal transportation funding authorization bill for planning of the proposed 3.4 mile route.<sup>134</sup>

Incorporating the streetcar extension plan in its 2006-2007 Capital Improvement Plan, the city approved \$500,000 (with an additional \$500,000 in each of the two subsequent years) to further study and undertakes design and engineering work for the streetcar extension. The approval was not without dissent. “This is a waste of local and federal dollars to study

something I already see as a bad idea,” said Alderman Pitts. “The trolley is a very expensive novelty for the taxpayers in this town.” The Capital Program was nonetheless overwhelmingly approved.<sup>135</sup>

Kenosha is the smallest American city to implement streetcar operation since the streetcars were reintroduced to the national landscape. While downtown density appears to be too low, and travel distances too short for the streetcar to function as a day-in, day-out, circulation system, the streetcar has made a meaningful difference in the redevelopment of Kenosha’s lakefront, as source of identity for the community, an attractor of development, and as a tool for attracting visitors and enhancing the visitor experience. The proposed extension to the American Brass site will truly determine whether a streetcar can effectively perform a circulatory role in a small city setting. If it succeeds, Kenosha can very well find itself in the forefront of progressive transportation thinking anywhere in America.

## **X. 2. Memphis – Rebound from the pedestrian mall**

Located on a bluff overlooking the Mississippi River, the City of Memphis is the geographically central component of a 1.2 million person metropolitan area. Memphis central city shared the experience of cities across the nation in its post World War II decline as a retail, office and residential center. In the early 1960’s efforts to combat the decline focused on development of a civic center municipal office complex on the north edge of the central business district and on the anticipated revitalization of the Beale Street National Historic District, a three block strip of buildings made famous by performance of blues and jazz music.

In 1971 the City, in conjunction with the Downtown Council of the Chamber of Commerce, commissioned the first comprehensive plan for the downtown area. The downtown plan proposed conversion of Main Street into a pedestrian mall, and indeed, the Mid-America Mall was opened in 1975 in accordance with the plan. Over the next 15 years a number of bus shuttle options were tried for circulation through and around the central business district. A consultant's report indicated that the bus service “lacks glamour” and that “visitors are reluctant to use the bus because there are no fixed indicators to guide them in moving about.”<sup>136</sup>

Creative suggestions for circulation systems had previously been considered. In the mid-1960’s a proposal was made to construct an elevated bus loop through the downtown that would connect directly to the new built expressway system. In 1973 a report evaluated transit options to coincide with the opening of the Mid-America Mall. The report considered “activity center rapid transit, namely a fully automatic grade separated system, mini-bus/midi-bus transit, small 20-25 passenger diesel or electrically powered buses, or “open tram transit”, light tractor pulled rubber tired trains with open sides.”<sup>137</sup>

In 1975 there emerged the first interest in using streetcars for central city circulation. Memphis Area Transit Authority (MATA) and a local business group jointly sponsored a proposal to connect the central city with the Medical Center and the mid-town entertainment district (about four miles east of the central business district). After thorough study the project was shelved. The \$6 million/mile implementation cost was considered prohibitive.<sup>138</sup>

In 1977 the City of Memphis and Shelby County jointly formed the Center City Commission (CCC) to function as a liaison between business interests and government agencies and to provide leadership in the redevelopment of an area officially designated as the Central Business Improvement District. CCC had the further responsibility for promotion and coordination of “partnerships between public and private partnerships in parking facilities, effective public transportation, user-friendly directional signage, and visual enhancements of thoroughfares and walkways.”<sup>139</sup>

A revised downtown plan sponsored by the newly formed CCC envisioned housing development on the bluffs south of downtown Memphis, Interstate Highway connectors that would funnel traffic into a south bluff parking area, a people mover to connect the housing and parking area with the central business district, and a riverfront trolley between the parking lot and the Rivermont Hotel.

Through the 1980’s it became evident the Mid-America Mall would not succeed in preserving Main Street’s commercial vitality. The mall’s disadvantages were described as too long to walk, lacking in convenient parking access, and an insufficient flow of people to support retail businesses. Furthermore the mall had suffered serious physical deterioration. An unstable sub-base foretold of the necessity of a complete reconstruction. Civic discussion about alternatives for reconstruction led to considerations of how the mall could be improved.

It was evident that public transit would be pivotal in rectifying the problems that the mall had created. A proposal to operate rubber tired buses on a Main Street transitway was rejected by civic leaders as being “environmentally and aesthetically incompatible with the pedestrian oriented setting of the downtown area.”

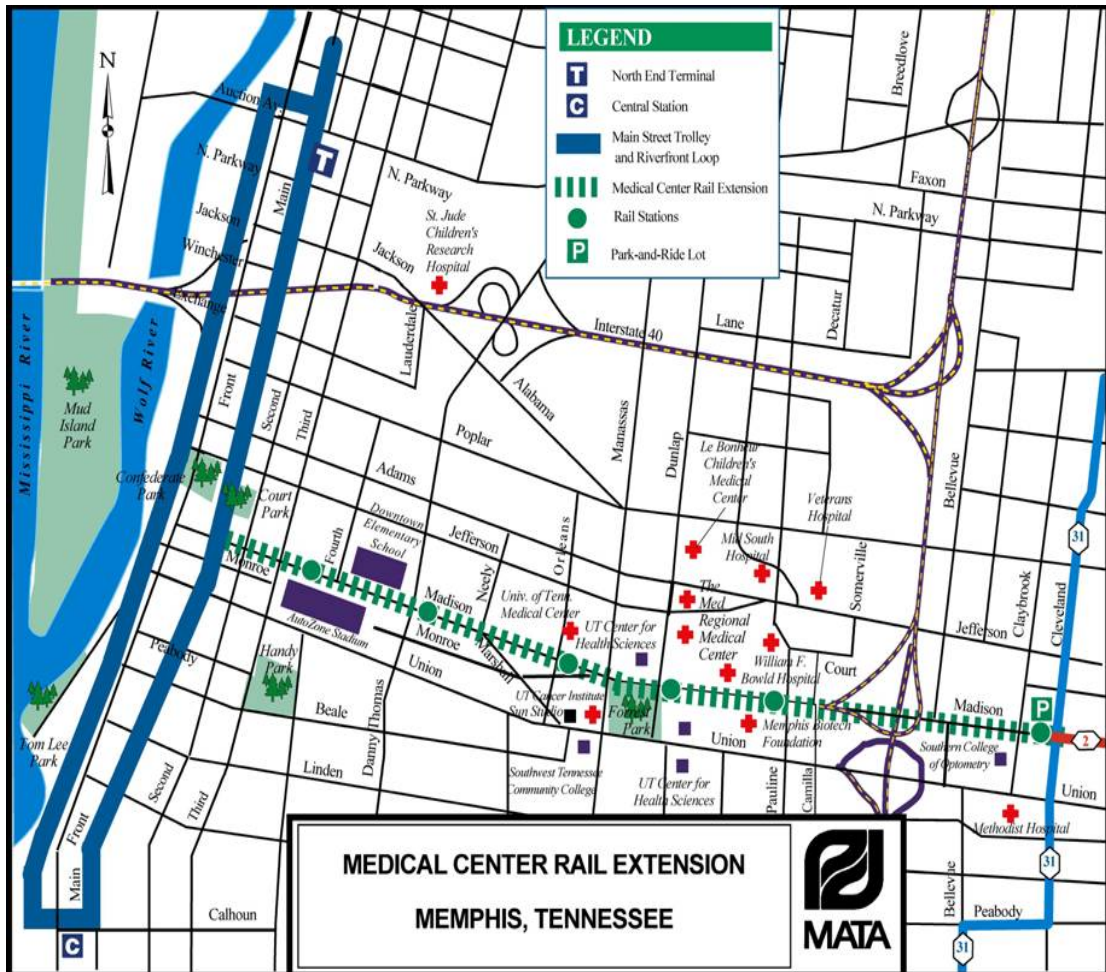
In 1989, Hnedak Bobo Group prepared a study recommending implementation of vintage streetcar operation on the moribund pedestrian mall. The study addressed the proposed streetcar’s possibilities for connecting nearby traffic attractions such as the Cook Convention Center, Pyramid Arena, the Civic Center, as well as hotels, restaurants, residences and parking facilities.<sup>140</sup>

The proposal drew the support of the Mayor, who set about building a broad base of support by arranging for a Gomaco replica streetcar to be displayed during the groundbreaking for the new Pyramid Arena. The Memphis City Council initially rejected the plan but approved it the following year.<sup>141</sup>

The Hnedak Bobo study envisioned the completed system essentially as it exists today, connecting the former Main Street pedestrian mall with the Arena, Pinch District (residential area north of downtown Memphis), the riverfront, and the Medical Center. It envisioned interface with conventional Memphis transit system services at the north and south ends of the Main Street portion of the route.<sup>142</sup>

Service on the Main Street Trolley (Figure 17) was inaugurated in 1993, over a 2.5 mile segment running north and south on Main Street, including the former pedestrian mall, using restored vintage streetcars imported from Australia and Portugal. Construction cost for the initial segment was \$34.9 million dollars. The relatively high cost, amounting to \$14 million per mile (in contrast to Kenosha’s \$2.9 million per mile), was accounted for by three major factors.

Initiation of service on the initial system segment, the Main Street Trolley, coincided with the beginning of a remarkable physical and economic transformation of Memphis' central business district as well as the adjacent South Main District. Reconstruction of the Main Street mall subgrade was charged to the streetcar. Significant utility line relocation was necessary under Main Street. The cost of operations and maintenance facility, large enough to serve the needs of the eventual three line system was charged to the original operating segment.<sup>143</sup>



**Figure 16 Memphis Main Street Trolley, Riverfront Loop, and Medical Center Extension** *Source: Memphis Area Transit Authority*

Financing for the Main Street Trolley was assembled from a variety of federal, state and local sources. \$24 million of federal funding came from the Interstate Substitution program. Interstate highway 40 was originally designed to cut a swath through central Memphis, destroying picturesque Overton Park in the process. Citizen opposition stopped the Interstate 40 and two other freeway projects. Under the Interstate Substitution program, construction funding not spent on the highways was made available for transit projects, including the streetcar.

An additional \$3 million of federal money was provided through an FTA formula grant. Tennessee Department of Transportation provided \$2.5 million. The City of Memphis

made \$4 million available. Memphis Area Transit Authority and private sources provided the remaining \$1.4 million.<sup>144</sup>



**Figure 17 Memphis Main Street Trolley**

The second phase of the Memphis streetcar, the Riverfront Loop, was opened in 1997. The Riverfront loop route runs parallel to Main Street, using a former Illinois Central Railroad track running along the bluffs overlooking the Mississippi River. It provides direct service to the Pyramid events center, the Tennessee Visitors' Center, several riverside restaurants and the South Bluffs residential area.

Implementation expenses were minimized by using two miles of former mainline railroad track. The extension cost \$9.6 million dollars, equating to \$3.8 million per mile. The funding method was similar to that of the Main Street Trolley. Federal funds consisted of formula grant and Interstate Substitution money, supplemented with \$225,000 of CMAQ funding. Tennessee Department of Transportation provided \$800,000. The City of Memphis provided an "in-kind" contribution of land valued at \$636,000 and provided an additional \$211,000 in proceeds from the sale of revenue bonds. \$15,000 was provided from private sources.<sup>145</sup>

The third and final phase of the Memphis streetcar implementation was the Medical Center Extension along Madison Ave. The 2.5 mile route was opened in 2004 and passes through an underutilized commercial and institutional corridor. Construction cost for the Medical Center Extension was dramatically higher than for the other two segments. Several factors accounted for that.

Utilities relocation costs were a major expense item as a result of Madison Avenue's status as a major fiber optic route. Seismic retrofit of one bridge and construction of another bridge also contributed to the high cost. Construction standards for the Medical Center route were much higher than for the other two routes. Corridor infrastructure was designed with the expectation of future integration into a projected light-rail service connecting the Memphis central business district with the airport.<sup>146</sup>

Platforms on the Madison Avenue segment are designed to accommodate future low-floor light-rail vehicles. They are raised to 14" above street level and are 90' long (the length of a light-rail vehicle). Stations are  $\frac{3}{4}$  mile apart, in contrast to the much closer spacing on the Main Street segment, reflecting light-rail operating practice. Handicapped access is by means of separate mechanical lift devices.<sup>147</sup>

Eighty % of the funding for the Medical Center Extension route implementation came from the FTA Section 5309 New Starts program. Tennessee Department of Transportation and the City of Memphis each contributed a 10% share to the project. The project was completed on time and nearly \$18 million under budget.<sup>148</sup>

Ridership has grown from 468,000 in 1994, the first full year of operation of the Main Street Trolley, to 1.1 million in 2004. While ridership growth has been generally steady, it has experienced “dips and bumps.” Initial ridership was strong as people investigated the novelty. Ridership averaged 85,000 per month for the first three months, before settling back to an average of 40,000 for the next three years. Following the opening of the Riverfront Loop monthly ridership jumped to 60,000 and grew steadily to 80,000 in 2003. Farebox recovery for the streetcars is reported as 13.11% in comparison to 20.63% for the bus system.<sup>149</sup>

Since the inception of the Main Street Trolley in 1993 the Memphis central city has undergone a remarkable transformation. An intense agglomeration of activity centers has developed between the former retailing district and the Beale Street entertainment district. The FedEx Forum (arena), the Auto-Zone Park baseball stadium, Peabody Place retail development and a variety of new hotels and restaurants have clustered in the downtown core.<sup>150</sup>

Residential development has taken place at and around Central Station (the renovated mixed use structure that houses the Amtrak station) and elsewhere in downtown Memphis. Auto-Zone, the auto parts distributor has located their corporate headquarters in downtown Memphis. Retail revival has taken place among the many storefronts lining South Main Street. 20,000 new residents have moved into downtown Memphis.

The extent of the positive impact of the streetcar is unclear. There is no doubt that the pace of redevelopment has paralleled that of the implementation of the streetcar. Spokespersons for the Center City Commission speak positively of the streetcar’s impact. The Commission provides low interest loans for restoration of building facades. Prior to implementation of the Main Street Trolley only three applications were made for the loans. Following opening of the trolley, twenty applications were made. Similarly, the Commission can offer tax freezes to small businesses. Two tax freezes were arranged before implementation of the trolley, and 15 were arranged afterward.<sup>151</sup> Jeff Sanford, President of the Center City Commission credits the trolley with helping to draw two billion dollars of project investments to downtown and the South Main area.<sup>152</sup>

Center City Commission’s Andy Kitsinger describes that streetcars have attracted the attention of developers. In conversations with the city, “the developers kept coming back to streetcars” as a resource. The developers see visitors spending money at business establishments around the streetcar stops. Previously people would drive through the community and look but not stop. Now the visitors see the streetcar as a “destination vehicle” and can get off when they see an interesting place to go or shop.<sup>153</sup>

Kevin Kane of the Memphis Convention and Visitors Bureau is more cautious. “I don’t know if it generated a lot of downtown development. It did spark a couple of hotels, but it didn’t do as much as we hoped it would.” Speaking in regard to the influx of 20,000 residents into downtown Memphis, Kane’s enthusiasm is tempered. “You can’t attribute all of that to the trolley, but it didn’t hurt. You would hope it sparks development, but its not guaranteed....We still have entire blocks around Main Street that are pretty dismal.” Kane was more positive in regard to the streetcar’s impact on convention business. “The trolley is part of the convention sell....it’s definitely part of the package.”<sup>154</sup>



In the Downtown Market Study, sponsored by the Center City Commission in 2004 the sole reference to the streetcar was decidedly negative.

**“It was noted that the Trolley, while offering a unique experience for tourists and transportation options for special events, is not viewed as effective transportation among Memphis residents. To some extent the Trolley may actually hinder retail growth along Main Street, but apparently would be far too expensive to change. The Trolley is widely perceived as slow, and passengers must have exact change, which is often inconvenient.”<sup>155</sup>**

An indication of the value of the streetcar to the downtown merchant community is the use of the streetcar in naming and advertising. 30% of the cover of the Summer 2005 – downtown Merchant Guide is occupied by the Main Street Trolley. Advertisements and brochures for various businesses feature the trolley in advertising copy, photography or artwork:

- South Main Galleries and Shops – photograph and reference to “Trolley Night”
- Krosstown Cleaners and Laundry – “East End of Madison Ave. Trolley Line”
- Central Station Apartments – “Next to Mass Transit and Main Street Trolley”
- Court Square Sleep Inn – “The Main Street Trolley, just outside our door...”
- CB Richard Ellis Real Estate – Photograph of trolley occupies one half of a full page ad in Downtown Memphis guide
- South Main Association – quarter page photograph of SMA president on a trolley
- Claridge House Condominiums – photograph of trolley in one half page ad
- Downtown Art Galleries – photograph of trolley on Downtown Memphis guide galleries listing page
- Downtown Memphis Guide – photograph of business person and trolley
- Blair Tower Apartments – prominently features map of trolley system in brochure
- Center City Commission Downtown Apartments Map – map shows trolley line and proximity of apartments to the trolley
- Number 10 Main Street Apartments – trolley featured in photo of trolley on front cover of brochure
- Residence Inn by Marriott – artwork features outdoor diners with trolley in background
- Downtown Memphis Museums brochure – shows trolley route on map
- Peabody Place brochure – shows Main Street trolley on map
- Downtown Entertainment District Map and Guide – trolley is the orienting feature on both downtown maps
- Blue Suede Brigade (visitor assistance representatives) brochure – trolley line and trolley stops are the orienting feature on map
- Mud Island River Park brochure – features trolley on access map
- Dr. George G. Matz – Ad in Memphis Downtowner Magazine - “Located on trolley line”
- Frank’s Liquors – ad in Memphis Downtowner Magazine – “Located Downtown on the Trolley Line”
- Main Street Convenience Store – features trolley on sidewalk sign
- Grand Central Subs – Sidewalk sign in the shape of a trolley
- CB Richard Ellis property vacancy sign on store front – “Foot Traffic, Car Traffic, Trolley Traffic”
- Madison Hotel – photo of trolley on website
- Memphis Marriott Downtown - hotel bar named “The Trolley Stop”

It is reasonable to conclude that the streetcar system in Memphis has made an impact on the development and economic activity in center city Memphis and is effectively functioning as a circulator, but that its impact is not universally appreciated.

### **X. 3. Little Rock – Symbolic connection of two cities**

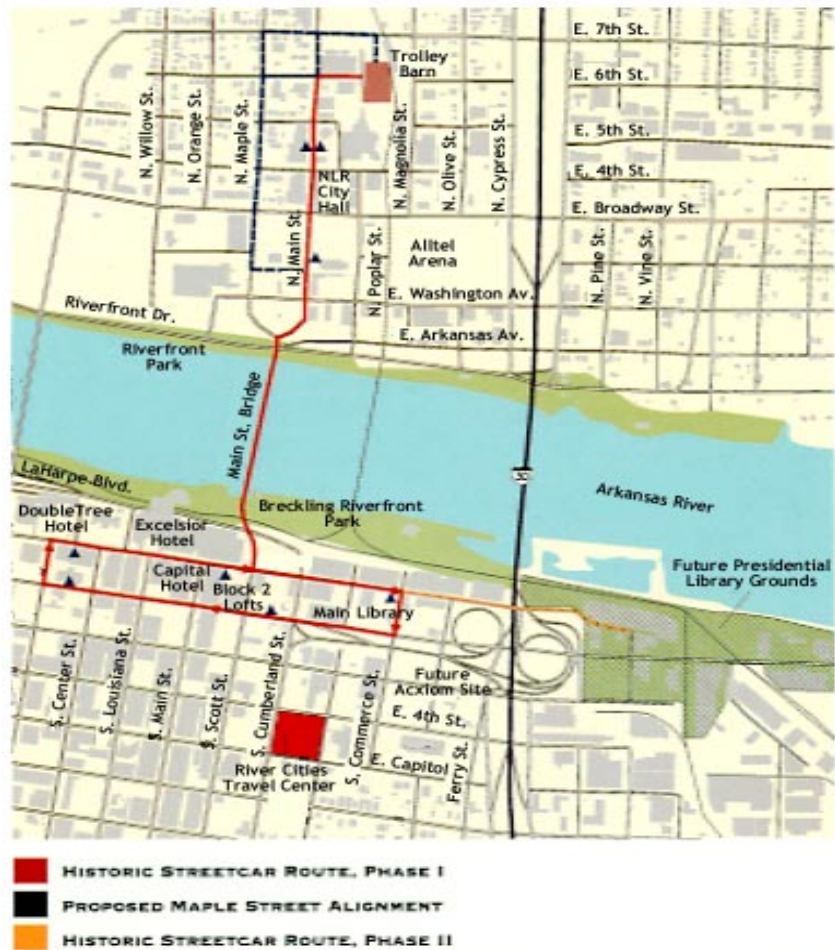
Little Rock has experienced the same issues of commercial out-migration and decline as most cities around the nation. Also, like other cities, Little Rock grappled with inner city issues such as racial polarization, crime, and dispersal of middle class residents to the suburbs. Efforts were made to revitalize downtown. Main Street and Capitol Avenues were converted to pedestrian malls. A mixed use retail mall and office building was attempted. Failure to lease up the accompanying office space ultimately doomed the retail mall. A proposal to create the Diamond Center, a mixed use facility incorporating retail development and a sports arena failed to materialize. Downtown department stores moved to the suburbs.<sup>156</sup>

To better manage the disparity between regional growth on the one hand and downtown decline on the other, Little Rock city officials made the decision to “grow by choice and not by chance.” A community based planning initiative named “Future-Little Rock” was undertaken in the early 1990’s. One of the initiatives that came out of the Future-Little Rock process was the River Project. Recognizing the Arkansas River as a civic asset, the River Project sought to create a place along the river bank for residential, office, and recreational activities.<sup>157</sup>

Civic leaders visited Portland, Oregon, as part of the process of developing a vision for a revitalized Little Rock riverfront. The Portland visit stimulated community awareness of rail transit as an urban development tool. A proposal was made to connect downtown to the historic Central High School. Alternate routes were considered via the state capitol or via Main Street and Daisy Bates Drive. Federal appropriation for that project was not forthcoming. The streetcar proposal was shelved.<sup>158</sup>

Through the Portland visit and community visioning sessions, the River Project began to take shape. Proposals for the Riverplace Market, the William J. Clinton Library, a convention center, and an arena, all emerged as elements of the revitalized riverfront. The Riverplace Market consisted of a farmers market, concert venue, small retail shops and restaurants.<sup>159</sup>

In the mid-1990’s there emerged a spirit of cooperation between the City of Little Rock, the City of North Little Rock, and Pulaski County, in which both cities were located. Cooperation on that level was historically uncharacteristic of the three governmental bodies. There arose a focus on balance between the Little Rock and North Little Rock communities. The Arena was designated for the north side of the river, the Riverplace Market on the south side. “We needed connectivity between the facilities” says Sharon Priest, Executive Director of Little Rock’s Downtown Partnership and former Little Rock mayor. “It (the streetcar) fit right into the proposed urban design.”<sup>160</sup>



**Figure 18 Little Rock "River Rail" streetcar map – Source: Central Arkansas Transit**

The streetcar proposal was redesigned to provide connectivity between downtown attractions such as the newly developed William J. Clinton Library, the Alltel Arena, the Riverplace Market, and the expanded convention center. Development of the various projects was packaged into a single initiative undertaken by the two cities. From the two cities' initiative came the concept that the streetcar should connect the two cities.

A broad steering committee was formed to develop the streetcar proposal. Participants included the Cities of Little Rock and North Little Rock, residents, public works representatives, business leaders including the heads of the Capital Hotel and other hotels. There were also representatives from the University of Arkansas, Little Rock, Metroplan (the local regional planning organization), the real estate community, the Hillcrest Trolley Project, One Source Home and Building Center and various civic organizations.<sup>161</sup>

A route was laid out providing connectivity between the various activity centers and between Little Rock and North Little Rock business districts. Funding for the \$19.6 million project was provided by a combination of 80% federal and 20% local funding. Funding sources were as follows:

- FTA Section 5309 New Starts program \$8.6 M (57%)
- STP/FHWA Sec 1602 (High Priority Projects) \$3.9 M (25.8%)
- Local Funding – Little Rock, North Little Rock, \$2.6 M (17.2%)<sup>162</sup>

In November 2004, the 2.5 mile system was opened using three Gomaco built replica cars. (Figure 19) The purpose for implementing the new streetcar system was to:

- Improve downtown mobility
- Revive the historic connection of residents and streetcars
- Promote economic development and tourism
- Provide transportation to Convention Center and Arena events<sup>163</sup>

Has the streetcar lived up to the expectations of its sponsors? Inasmuch as the system is barely a year old it is a little too soon undertake a serious critical evaluation. At this early date civic officials are enthusiastic. “It is unique and different”, says city planner Walter Malone. “Tourist ridership is strong, especially in the evenings. It gives traditional downtown Little Rock a niche.”<sup>164</sup>

Sharon Priest is also enthusiastic. Has the system been successful? Can a benefit/cost ratio be calculated? “We measure that by the ridership, the economic return to the community and the emphasis on people. It is important to watch people looking at the streetcar. The streetcars create an ambience...you can get anywhere. It has attracted 107,000 riders. That exceeds the ridership expectations. People are now coming into downtown. The streetcar



has extended the walking distance and has prevented the need for overbuilt parking.”<sup>165</sup>

Malone agrees. “Did we get our money’s worth from the streetcar? The targets for measurement are ridership and fares collected. “I consider (the streetcars) a success when I see people in them. There is a direct connection between the number of people on the streetcar and the success of downtown Little Rock in drawing people in.

Everybody wants downtown to work.”<sup>166</sup>

**Figure 19 River Rail streetcar at River Place**

George Wittenberg, coordinator for Urban Design at the University of Arkansas at Little Rock counsels patience in evaluating the new rail system, noting that impacts are sometimes slow to reveal themselves. “It can be expected to attract new businesses close to the line and improve property values, and that makes it worth subsidizing. It just takes some time for the impact to be seen...but there is a definite economic development impact because of the trolley.”<sup>167</sup>

“This is really just the beginning,” Pulaski County Judge Buddy Villines said of the future. “What we’ve got now is the hub. There’s no telling what we can do with variations of this.”<sup>168</sup>

One extension to the streetcar is already planned and partly constructed. Phase 2 of the River Rail streetcar will be the extension to the William J. Clinton library. Tracks are already in place for a portion of the route. Construction is expected to take place next year. There is a proposal to relocate the baseball stadium from West Little Rock to North Little Rock. A streetcar extension might be undertaken to provide access to the relocated baseball park.

There is an active proposal to run a light-rail route to the airport. Another consideration for light rail has been to connect the “two downtowns”. There is the traditional downtown Little Rock and then the “new” downtown in West Little Rock out at the end of I-630. The area has offices, stores and lots of hotels. The hospitals are intermediate between the downtowns.<sup>169</sup>

#### **X. 4. Lessons from the case studies**

The civic communities in Kenosha, Memphis and Little Rock all embraced implementation of central city streetcar systems. Each community saw the streetcar as a device for providing connectivity within and adding “personality” to their revitalizing city centers. Each system was implemented as part of a larger effort to bring attractions and leisure oriented economic activity back downtown. The streetcar systems were all judged successful enough to warrant expansion (or thus far proposals for expansion). While each system is perceived as “successful” by civic officials, the greatest expected benefits still lie in the future.

The Kenosha and Little Rock systems are object lessons in containment of implementation costs. At \$2.9 million and \$7.8 million per mile of implementation cost respectively, the projects have demonstrated that streetcars can be introduced without “breaking the bank.” In each instance the evaluation of the “success” of the system is subjective. As long as subjective satisfaction is sufficient to allow the streetcar to attract resources for continued operation then each can effectively be judged as a “success.”

## XI. Elements of success

Some 30 streetcar systems have been started since the mid-1970's. They were implemented for a variety of purposes, some by enthusiasts, some by municipalities, and one by the National Park Service. Nearly all are still in operation. Some have been extended and others have extensions planned. Objective measurement of the "success" of the systems has proved elusive. The streetcar systems that have been expanded, have enjoyed expanding ridership and impact on the community have common elements that have assured their ongoing popularity and community support.

- **Clearly defined purpose**– The clearly defined purpose, be it circulation, attraction of visitors, stimulation of development, interpretation of local history, or some other purpose is clearly understood by implementers. Successful systems are designed to achieve the purposes for which they were implemented.
- **Clearly defined market** - The clearly identified market assures that people will really use the system. Robust ridership is the key element in sustaining community support.
- **Multiple benefits** – Dependence on a single market, tourism for example, leaves a system vulnerable, first to low ridership in relation to operating cost, also to ups and downs of the economy. Streetcar systems with multiple purposes such as circulation and visitor attraction are viewed by civic leaders as necessities in the community.
- **Broad political/civic support** – Development of a broad supportive constituency from all parts of the community is vital to assembling the resources to start a streetcar system, to overcome objections of naysayers, and to assure the continued availability of future resources.
- **Strong leadership** – Implementation and continued operation of a streetcar system is fraught with huge challenges that require patience, determination, and effective mobilization of resources to meet them.
- **Adequate financing** – Promoters of successful systems identify the financing necessary for implementation and ongoing operations early in the initiation process. Successful streetcar systems draw upon a variety of financing sources, partly to lessen the amount required from any particular source, but also to "cushion" the impact of loss of any one particular component of the financing system
- **Expertise** – Streetcar system implementation involves dealing with voluminous arcane details, both in the technology and in the administrative context in which the streetcar system is implemented. Successful implementers are knowledgeable both about cities and about trolley cars.
- **Regional Connections** – People who ride the streetcar had to have come from somewhere. Interface with parking lots, transit systems, and highways are all important in assuring prospective riders have access to the system
- **Satisfactory rider experience** – Both the on-vehicle and "before and after" experiences must be satisfactory for riders. Robust ridership is made of repeat customers. Robust tourism is made of "word of mouth" advertising of the visitation experience.

With each of these characteristics a streetcar system should be able to meet the needs of the community and attract enough resources to continue operations long into the future.

## XII. The future

The first streetcar projects were small installations with narrow purposes. Detroit's system in 1976 sought to provide circulation in a revitalizing downtown. Seattle's implementation in 1982 introduced the concept of the waterfront connector. Systems implemented in the 1980's were often enthusiast inspired and/or pseudo-museum and tourist based in their purposes. Fort Collins, Lowell, Dallas, Denver and Fort Smith and Astoria all fell generally into this category. Two systems were implemented as adjuncts to the newly implemented light-rail systems, namely San Jose and the Portland Vintage trolley.

Memphis start-up in 1993 heralded the arrival of the urban circulator system operating in mixed traffic. With the turn of the century came a flurry of new municipally sponsored circulator systems such as Kenosha (intended as a circulator), Portland (modern), Tampa, Tacoma, New Orleans, and Little Rock. Streetcar design and purpose evolved even within that group. Portland and Tacoma forsook the nostalgia factor of the vintage streetcars and introduced modern vehicle design. New Orleans reinstated streetcar service on a route that had been discontinued as late as 1964.

New systems are planned. Modern streetcars are proposed for Seattle, Charlotte, Miami, Atlanta and Birmingham, among others. Charlotte, Atlanta and Birmingham are reaching out beyond the traditional one to five mile range to consider streetcar use on arterial streets where significant bus service is now provided. The twin-cities of Champaign and Urbana, Illinois, are considering modern streetcar implementation between the business districts and the campus of the University of Illinois. A similar system is being considered for Madison, Wisconsin. The design and purposes of the proposed streetcars continue to evolve.

Streetcars have been a part of the American scene for 175 years. Their presence has taken the form of horse cars, cable cars, streetcars that dominated urban transportation, streetcars that evolved into light rail, historic streetcars that helped define revitalizing central city communities, and modern streetcars providing circulation function to increasingly larger parts of American cities. Only time will tell whether the streetcars will once again achieve dominance in urban circulation or what form they will take. We can expect with some certainty that their implementation will be undertaken with both a serious effort in attending to the ever changing needs of central cities and a delightful touch of creative whimsy.



**Figure 20 Go by streetcar!**

## Appendix 1. Enthusiasts and advocates

From their inception streetcars have had their admirers. Small boys would spend their days riding around on the streetcar, visiting the car barn, and begging for a chance to sit on the stool at the front and move the controller and brake handle. In the 1930's however, groups of railroad fans and trolley fans began to organize into groups for the purpose of touring facilities or sharing photographs and historical materials.

As streetcar systems began to disappear, the enthusiasts established museums to preserve selected streetcars. The museum groups acquired short stretches of right-of-way where they could display and interpret the preserved cars in an operating setting. Increasingly they sought to "contextualize" their displays by replicating "real" streetcar operation.

Development and operation of the streetcar museums would become important to the reintroduction of streetcars in three ways. First was preservation of the cars and technology itself. Second it preserved the "institutional memory" of how to operate and maintain the cars. Third it preserved the enthusiasm for streetcars as a legitimate means of transportation, forgotten in the construction of interstate highways and widening of downtown streets.

The enthusiast community is valuable to the process of streetcar system implementation for several reasons. The aforementioned preservation of cars and institutional knowledge is a major contribution. Second, enthusiasts in many instances have been the creative thinkers credited with providing the conceptual "seed" for several of today's successful streetcar ventures. Enthusiasts also build and maintain civic support and mobilize resources for streetcar implementation. Finally, the enthusiast community provides thousands of hours of volunteer labor and creative management.

The Kenosha streetcar had its origins in the suggestion of Tom Matola, a streetcar enthusiast from nearby Milwaukee, who suggested the concept to the newly hired Transit Director in Kenosha. The timing was right. The city was in the midst of a lakefront brownfield redevelopment. The city sought a creative means of providing connectivity between the soon to be redeveloped lakefront site, the revitalizing downtown, and the commuter train station.<sup>170</sup>

In Seattle, a local butcher and trolley enthusiast named Robert Hively owned two vintage streetcars built in the 1920's and operated for many years in Yakima, Washington. In 1974, Hively approached Seattle Councilman George Benson with a plan to run the cars on underutilized freight tracks along Seattle's waterfront. Though Hively's cars themselves proved unsuitable for the proposed service, Councilman Benson shepherded the project to completion.<sup>171</sup>

In 1983, the City of San Francisco, facing a two year shut-down of the famous cable car system for rehabilitation, sought ideas to provide a suitable substitute to sustain tourism. Maury Klebolt, San Francisco resident and trolley and rail enthusiast stepped forward with the suggestion of a "Trolley Festival." In 1992, the transit system, San Francisco Municipal Railway had relocated the route J, K, L, M and N, light rail service off the surface level tracks on Market Street and into a subway. Klebolt suggested the city acquire vintage streetcars from various cities and operate them on Market Street as a substitute while the cable car



system was rebuilt. Klebolt went on to build the civic support and facilitate the acquisition and preparation of the vintage streetcars.<sup>172</sup>

An “enthusiast” of a different kind was Friedel Klussman. In 1947 Ms. Klussman was President of the San Francisco Federation of the Arts. Early in 1947, Mayor Roger Lapham, who had been elected in a “civic revolt” and intended to implement efficiencies in government in San Francisco, announced the imminent replacement of the Powell Street cable cars with buses. The buses would have a much lower operating cost and the cable system was in need of costly renovation. The Mayor was quoted as saying:



**“I know there are strong, sentimental reasons for keeping this old, ingenious and novel method of transportation, the fact remains that the sentimentalists do not have to pay the bills and do not have to run the risk of being charged with criminal negligence in the very possible event a cable breaks and a car gets loose on one of our steep hills.”**

**Figure 21 San Francisco cable car**

Friedel Klussman formed the “Citizens’ Committee to Save the Cable Cars.” She pointed out the tourism value of the cars and that tourism had generated more than \$34 million dollars for the city in 1946 (a year in which travel restrictions were still in place), and that the cable cars were the number one attraction. Klussman replied to the Mayor that:

**San Francisco, “is constantly striving to interest the rest of the world in its historical and colorful background, of which the cable cars are the No.1 attraction. It is the Powell Street line that catches the tourist’s eye. The loss of the famed turntable at Powell and Market would be a loss to San Francisco’s identity that cannot be measured.”<sup>173</sup>**

Friedel Klussman prevailed in her arguments and the Powell Street cable cars were saved. The same debate has relevance today in the approval process for federal funding. Viewed purely from the perspective of operational efficiency, a bus is preferable to a streetcar. When considered in the overall context of fulfilling community circulation and ambience objectives, the streetcar can become the preferred mode.

Peninsular Railway ended streetcar operation in San Jose in 1938. The streetcar bodies were stripped of usable metal and parts and sold to regional farmers for use as storage sheds, chicken coops, and even living quarters. During the 1950’s one such body, that of Peninsular Railway car 61, was retrieved and moved to a local restaurant for partial restoration as an attention getter.<sup>174</sup>

In 1982 a group of trolley enthusiasts formed the San Jose Trolley Corporation for the purpose of restoring vintage trolley cars. Among the charter members was Ron Diridon, a Santa Clara County Supervisor. Peninsular Railway car 61 and several similar car bodies were located and trucked to the car shop. Restoration of the cars was undertaken in conjunction

with implementation of local downtown streetcar service in downtown San Jose. The downtown streetcar would augment the newly opened Santa Clara Valley light rail service.<sup>175</sup> When restoration was complete, the San Jose Trolley Corporation leased the cars to Santa Clara County Transit District to operate them along the downtown transit mall.<sup>176</sup>

Seashore Trolley Museum and the National Park Service have entered into a “joint venture” to expand the present streetcar installation to provide a genuine circulatory role and to operate authentic historic streetcars in a contextual environment. The National Park Service implemented electric trolley operation in Lowell in 1984 as part of the Lowell National Historic Park, celebrating and interpreting industrial revolution life and technology. Seashore Trolley Museum has been involved from the outset, providing technical knowledge for system implementation and detailed information for creation of replica streetcars for the system.<sup>177</sup>

Because operating streetcar and railroad museums house and operate a variety of equipment types with varying technologies, members become particularly skillful in adapting infrastructure to accommodate diverse technologies in a single operational setting. That specific knowledge became relevant at Lowell, where Seashore Trolley Museum members had to advise in favor of replica trolleys and against historic specimens due to technical limitations of streetcar wheels being used on railroad (as distinguished from streetcar) track.

The McKinney Ave. Transit Authority streetcar system in Dallas made a special point of including a trolley enthusiast on their Board of Directors. The enthusiasts “brought technical depth and mechanical experience” to the project.<sup>178</sup>

Without the boundless energy, the technical knowledge, and preservation of the “institutional memory” of how vintage streetcars operate, that the enthusiasts have exhibited, streetcars might have disappeared forever from America’s cities.

## **Appendix 2. Sources of capital and operating funding**

### **Capital Funding**

In creating a funding plan for the streetcar system, it is important to identify as many sources of funding as possible. Funding can come from public sources at the federal, state and local level, as well as from private sources. Federal grants are dependent on commitment of local “match” implementation funding as well as a stable source of ongoing operating revenue. Federal funding also usually requires one or more “sponsors,” namely elected officials from the region where the streetcar is projected to operate.

Some federal grants are made in the form of “formula” funds, namely those provided to states and localities according to a predetermined formula. The formula will be based on population, total transit system ridership and other measurements. Other funds are “discretionary”, namely funds that are granted at the discretion of the FTA, the Congress, or both.

Some formula funds flow to each state and/or metropolitan area as a matter of policy. In this circumstance the streetcar system must compete with other transportation projects, both transit and highway, for a share of these funds. Formula funds require a 20% local match to be used for any particular project.<sup>179</sup>

Section 5309 of TEA-21 authorized discretionary funding for fixed guideway transit. Cities with established rail transit systems, namely those that have been operation for at least seven years, can qualify for FTA Fixed Guideway funds. While these funds may not be used for new streetcar systems in cities without established rail operations, they can be used for system expansion. Funds can be used for rehab of rolling stock, track, overhead wire structures, passenger stations and similar structures.<sup>180</sup>

The FTA “New Starts” program has historically funded some streetcar systems. New Starts grants are part of a discretionary program wherein FTA rates and ranks new fixed guideway projects of all kinds and provides grants to projects that meet a rigorous set of qualifications. Many projects apply for the limited amount of funding so competition for New Starts money is fierce. The Little Rock River Rail system, the New Orleans Canal Street route, and the Memphis Medical Center extension were all recipients of New Start grants. While in the past some projects only required a 20% local match, as a result of the stiff competition for New Starts funds, FTA now requires that 50% of the project funding comes from non-federal sources.

Because streetcar projects are small and often have a difficult time meeting some of the rigorous transportation efficiency thresholds in the New Start program, a new FTA program called “Small Starts”, has been created. The Small Starts program provides a rating exemption for projects requesting less than \$25 million, and where the total project cost does not exceed \$250 million. The rating process takes into account public transit supportive land use policies, local economic development effects, as well as cost effectiveness and reliability of cost and ridership projections. As with the New Starts

Program, Small Starts requires that a stable source of local funding be in place before grants will be issued.<sup>181</sup>

Transportation and Community and System Preservation (TCSP) funds may be used for project that emphasize the link between the streetcars and land use and community quality of life. Grants are made either to cities or to transit agencies, though partnerships are encouraged with non-traditional groups such as the environmental community, businesses or other groups. Projects that have a substantial non-federal funding component are given priority.<sup>182</sup>

Similar to TCSP is the Transportation Enhancements (TEA) program. TEA funds are intended to enhance mass transit service by providing facilities funding. Funding can be used for historic mass transit buildings, bus shelters, pedestrian or bicycle access, signage, or other similar structures.<sup>183</sup>

Federal Highway Administration (FHWA) provides Congestion Mitigation and Air Quality (CMAQ) funds to “air quality non-attainment” zones as designated by the Clean Air Act Amendments. Transit projects are one of the Transit Management/Congestion Relief Strategies in the Clean Air Act.<sup>184</sup>

Kenosha County in Wisconsin was designated as a “severe non-attainment area” under the Clean Air Act. As a consequence, the streetcar qualified for \$76,000 CMAQ grant. The system subsequently qualified for CMAQ operating funding.<sup>185</sup>

Among the more creative uses of federal funding was Portland’s use of Housing and Urban Development (HUD) funds. Annual grants averaging \$500,000 were used to fund planning and design of the streetcar project. By using the funds for planning and design and not for construction, Portland was able to bypass federal requirements for construction projects. HUD grants, like FTA grants, require a local match. The City of Portland provided the match.<sup>186</sup>

States vary widely in the kinds and amounts of grants that can be made available for streetcar projects. In examining potential funding sources for the proposed Miami streetcar several possibilities for State of Florida funding were identified:

- Transit or rail service development programs
- Strategic intermodal system funding
- Park and ride program
- Commuter assistance program
- Public transit block grant program
- State infrastructure bank loans<sup>187</sup>

The Kenosha streetcar was the recipient of \$56,000 from Wisconsin’s Local Government Grant program. The grant was made in the context of a much larger grant for overall lakefront redevelopment infrastructure improvements.<sup>188</sup>

Locally originated public funding can take several forms. Several of the more common forms are direct subsidies, development funds, tax incentives and “in-kind” services.

In Little Rock, Pulaski County and the cities of Little Rock and North Little Rock together provided the 20% local match for the federal grant.<sup>189</sup> In Miami, a ½ cent sales surtax, known as the Peoples Transportation Plan, was implemented as a dedicated funding source exclusively for the improvement of transportation.<sup>190</sup>

Seattle's Waterfront Streetcar was faced with shutdown due to the loss of access to their maintenance facility. Civic officials banded together to craft a solution. To replace the old car storage location, a local developer and the City of Seattle have entered into an agreement for construction of a replacement maintenance facility as part of a mixed use building incorporating the car maintenance facility, residences, and retail business establishments. The Seattle City Council has approved \$1 million in the 2006 city budget as the city's share of the project.<sup>191</sup>

New Orleans voters in 1985 passed a one cent sales tax for transit, but the provision exempted hotels and motels from collecting the tax. Elimination of that exemption in 2000 provided New Orleans Regional Transportation Authority with funding for the local match for construction of the Canal Street route.<sup>192</sup>

“In-kind” contributions are an effective way for local resources to be made available in streetcar system implementation. Since the Kenosha streetcar was implemented and is operated as part of city services, the donation of land for streetcar track and for the maintenance facility are, in sense, a reallocation of resources between city departments. The City of Dallas' providing of reconfiguration of traffic signals and providing street marking and signage is a more tangible “in-kind” contribution.<sup>193</sup>

Implementers of streetcar systems are increasingly looking to the private sector for capital and operating funding. Private sector participation in capital funding takes the form of sponsorships of cars and stations, naming rights, advertising on cars and stations, subscriptions and memberships, and donations of cars or facilities.

Little Rock solicited sponsors for stations. The Peabody Little Rock Hotel displays its name as sponsor on the stop opposite the Convention Center. Alltel Corporation sponsored the stop nearest to the Alltel Arena in North Little Rock. Each stop is sponsored for \$100,000 over 10 years.<sup>194</sup>

Tampa has undertaken a similar naming rights project. Individual cars may be sponsored for \$250,000 and individual stations for \$100,000. Though the system is managed by Tampa Historic Streetcar, Incorporated, it is officially known as the TECO system, the moniker of Tampa Electric Company. Tampa Electric bought the naming rights for the entire system for \$1 million.<sup>195</sup> Automated announcements on board the cars also specify the sponsor's name as the car approaches each sponsored stop.<sup>196</sup>

Individual and corporate donations have been a major source of private capital funding. The New Orleans Riverfront Streetcar received direct capital contributions from several on-line institutions. The French Market, Aquarium and New Orleans Convention Center together provided nearly \$500,000 for implementation of streetcar service to and past their respective locations. An additional \$288,000 was provided by the Downtown Development District.<sup>197</sup>

Among the most effective ways that streetcars attract private funding is through benefit districts, developer impact fees, and tax increment financing. Each of these is a value

capture mechanism designed to capture the streetcars' positive impact on the economic fortunes of the communities in which they operate.

Local Improvement Districts or Business Improvement Districts are areas proximate to the proposed streetcar line where business owners and/or residents are assessed a property tax surcharge for the purpose of providing capital or operating funding for the streetcar.

Seattle's Waterfront Streetcar was funded in part from an improvement district. In January 1981, the Seattle Waterfront Business Community and Seattle Development Association voted 72% to 28% to form a Local Improvement District (LID) in the effort to implement the streetcar system. Objections were raised by owners of residential property, who argued that the streetcar provided no benefit for them. The LID was divided into three zones with different levels of surcharges depending on the properties' distance from the streetcar line. The project provided for a one-time assessment payable over 10 years. The LID generated approximately \$1.1 million toward the capital cost of the project.<sup>198</sup>

A similar district was put in place in Tampa. Businesses in the Channel District and in Ybor City (the places connected by the streetcar) pay 33 cents per \$1,000 of assessed property value. The Improvement District revenues generate about \$345,000 per year. Because of objections similar to those in Seattle, residential properties were exempted from the assessment.<sup>199</sup>

Officials are rethinking the residential exemption in Tampa. When the special assessment district first formed, people living there were ones of modest means," said Michael English, president of Tampa Historic Streetcar Inc., "It's only been the past several years [that] the great housing boom has swept through the urban core. Those are not necessarily people of modest means."<sup>200</sup>

Others concur. Councilman John Dingfelder wants to reconsider the tax exemption. "Developers say they're building there because the streetcar is right there," he said. "Residents' property values have shot through the roof. They've gotten a lot of benefit." Another civic official observed that "people who can afford to pay \$350,000 and up for a condo can afford the assessment." Annual assessment on a \$350,000 condominium would amount to \$116. Elimination of the exemption could bring an additional \$250,000 to the streetcar fund. As more residences are established, proceeds are projected to reach one million dollars annually. The proposed change is currently being debated in the Tampa City Council.<sup>201</sup>

Proceeds from the Tampa Business Improvement District, sponsorship revenue, charter tour receipts, and other sources of income, are placed in an endowment fund. The endowment fund then supplements farebox revenues to cover operational costs.<sup>202</sup>

The Seattle Local Improvement District provided 32% of the capital cost of the Waterfront streetcar. A similar district generated 17% of the capital cost of the modern streetcar. Proponents of the proposed Seattle South Lake Union Streetcar anticipate that 50% of its capital cost will be generated through an improvement district.<sup>203</sup> In general "value capture" financing appears to be playing an ever larger role in financing streetcar capital and operating costs.

## Operating Funding

As with capital funding, operating funding may come from federal, state, local, or private sources. Though some federal funding opportunities continue, in general federal funding of transit services, except in the smallest of communities is being phased out. It is important for any streetcar system to attempt to diversify the sources of funding to the maximum extent possible. Two examples exemplify funding diversity.

Tampa Historic Streetcar, Inc., which oversaw the implementation of the 2.3 mile system in 2002, manages funding through an endowment fund. A previously implemented, privately operated monorail system was a financial failure. As the monorail was losing one half million dollars per year, the owners were willing to buy themselves out of the 17 year contract for \$5 million. Tampa Historic Streetcar, Inc. took the system over and used \$1 million of the buyout amount to demolish the monorail structure. The remaining \$4 million was used to establish the endowment fund<sup>204</sup>

The initial \$4 million was supplemented with money from an initial CMAQ grant, and from naming rights to the system as a whole and to individual cars and structures. Operations of the Tampa streetcar have been funded by an annual CMAQ grant, farebox receipts, proceeds from the special assessment district, interest on the accumulated endowment fund principle, contribution from the Tampa Port Authority, and proceeds from special service offerings (charters, etc.).<sup>205</sup>

The draw downs are causing increasing concern. In a narrow acceptance of the Tampa Historic Streetcar (THS) 2006 Annual Budget, HARTline (the Tampa transit agency and co-operator of THS) board members expressed concern about the future finances of the streetcar operator. While the endowment fund currently has a balance of \$5.2 million, the 2006 THS is depending on fund withdrawals for half its operating funding. Board members are further concerned about the future of federal (CMAQ) and local operating funding. “The crisis isn't today or tomorrow, but it's certainly on its way,” board member Steven Polzin said. Polzin suggested “it might be time to fold the streetcar into HARTline or a city department.”<sup>206</sup>

In the 2006 Tampa Historic Streetcar budget, 40% of the operation cost will be covered from farebox receipts, 24% from the special assessment district, and 20% from government grant sources. The remainder will be covered by draw down from the endowment fund. In an effort to diversify the funding sources, THS has launched a renewed campaign to sell advertising on its system<sup>207</sup>

Stable funding sources are integral to successful implementation and continued operation of streetcar systems. Multiple funding sources should be sought. Conditions change. Funding sources as originally identified might not continue. Spreading the cost burden over many sources reduces that vulnerability.

### **Appendix 3. Streetcar systems in the United States**

**Astoria** – Three mile system runs on former BNSF rail track along Astoria’s waterfront. Astoria Riverfront Trolley Association initiated service in 1999 with a former San Antonio streetcar purchased from a San Antonio streetcar preservation group. Volunteer employees operate the system on a daily basis eight months out of the year and on weekends during the 4 off-season months. Propulsion is accomplished by a diesel generator carried on a platform attached to the car.

**Charlotte** – Beginning in 1996 as small volunteer run operation using a restored, generator propelled, local Charlotte streetcar, the system has grown into a 2.1 mile full fledged trolley line using former Norfolk Southern Railway track using Gomaco built replica cars. The Charlotte Transit system now operates the route in a corridor that will soon host full fledged regional light rail service.

**Dallas** – The McKinney Avenue streetcar began in 1989, as an instrument to stimulate business in a local restaurant and entertainment district. Initially operated as a non-profit organization, the system survived an early funding crisis, rectified by creation of a Public Improvement District. In 2002 the Dallas Area Rapid Transit took over operation, and the system is now operated as a free shuttle using two imported heritage cars and several restored local Dallas cars.

**Denver** – The 3.5 mile Platte Valley Trolley was begun by the Denver Rail Heritage Society in 1989 to provide tourist rides along the South Platte River using a Gomaco built “open” replica streetcar. The system runs daily during the summer and weekends during the off-season, using a right-of-way owned by Denver Regional Transportation District and intended for future use by the regional light-rail system. This theme system operates primarily as a tourist attraction.

**Fort Collins** – Fort Collins Municipal Railway Society operates a single “Birney” type streetcar that operated in Fort Collins until 1951. Service over a former Fort Collins streetcar route was begun in 1985. Operators have resisted city efforts to extend the route into downtown Fort Collins citing vulnerability of the historic streetcar in downtown mixed traffic. The theme system is operated entirely with volunteer help, and functions primarily as a museum and tourist attraction.

**Fort Smith** – Fort Smith Streetcar Restoration Association began operation in 1979 using “Birney” type streetcar that previously operated in Fort Smith. The theme system is operated entirely with volunteer labor and functions primarily as a museum and tourist attraction.

**Galveston** – The Galveston Trolley was initiated in 1988 as a result of the vision and drive of a local oil entrepreneur and developer. It was developed as a tourist attraction and a circulator between “The Strand” waterfront development and the remainder of Galveston Island. It was financed with federal, local, and private money. Fearing damage to overhead wires during recurrent hurricanes the Miner Railcar built replica cars are propelled by on-board diesel generators.



**Kenosha** – Sponsored by the City of Kenosha and operated by the Kenosha Transit system, the theme system began service in 2000 to connect a lakefront brownfield redevelopment site with the revitalizing downtown and the Metra commuter train station. Initially conceived as a circulator and a tourist attraction, it has not developed significant “transportation” ridership. The system uses 5 former Toronto, 1940’s era PCC type streetcars. Civic officials are considering extension of the system to a second, inland, brownfield redevelopment site.

**Little Rock** – This circulator system was opened in 2004 to connect the central business districts of Little Rock and North Little Rock, both physically and symbolically. Service is provided by three Gomaco built replica trolley. Construction is underway to extend the system to the newly opened William J. Clinton Memorial Library.

**Lowell** – Circulator system is operated by the National Park Service as part of the Lowell National Historic Park, preserving and interpreting America’s industrial revolution heritage. The one mile route was opened in 1984 using three Gomaco built replica streetcars. Future plans include a joint venture with Seashore Trolley Museum to provide an expanded circulator system reaching into the Lowell business district and to function as a satellite location for operation of Seashore Trolley Museum’s large historic trolley fleet.

**Memphis** – Initial operation of the 2½ mile Main Street Trolley was begun in 1993 as a replacement for the moribund downtown pedestrian mall and to facilitate downtown revitalization. Riverfront loop was opened in 1997, using former Illinois Central Railroad track overlooking the Mississippi River. In 2003, the system was completed with the opening of the Medical Center extension 2½ miles eastward through a commercially depressed corridor along Madison Ave. Medical Center extension was built to light-rail standards in anticipation of future implementation of light-rail service between downtown Memphis and the airport. Streetcar service is operated by the Memphis Area Transit Authority using vintage cars imported from Melbourne and Oporto as well as one Gomaco replica car.

**New Orleans** – The St. Charles Ave. streetcar line is America’s oldest continuously operated transit line, having been opened in 1835. For a quarter century, the St. Charles Ave. route was the sole remnant of a once vast streetcar network in New Orleans and uses vintage 1920’s era streetcars that have operated on that route since they were built. The route, and the cars that operate on it, are listed on the National Register of Historic Places. The Riverfront streetcar was opened in 1988 to provide circulation along New Orleans’ revitalizing waterfront. In 2004 streetcar service was reintroduced on Canal Street after a 40 year absence. The Riverfront and Canal Street routes use replica cars built in the company shops to resemble the cars used on the St. Charles route. Though the system was ravaged in 2005 by hurricanes Katrina and Rita, service is partially restored and full system operation is anticipated in the months to come.

**Philadelphia** – As Philadelphia’s transit system shrank its once vast streetcar system to its present 5 route, “Subway-Surface” light rail system, some street trackage elsewhere in the city was retained, inactive, for future operation. The 8.2 mile Girard Ave. route, inactive since 1992, has returned to streetcar operation. The route uses 18 extensively rebuilt PCC-II cars, rebuilt from PCC cars that previously operated on the Philadelphia system. The streetcar is seen as the catalyst for economic and cultural revitalization of the street.

**Portland** – Two streetcar systems operate in Portland. The Portland Vintage Trolley was begun in 1991 to connect downtown Portland with the Lloyd District, two miles distant. It operates entirely on the tracks of the Portland MAX light-rail system. Overall management, fundraising and policy direction is provided by Vintage Streetcar Inc., a non-profit organization. Operation of the cars is done by Tri-Met, the local transit agency. The system uses four replica trolleys built by Gomaco to the exact specifications of cars that operated in Portland early in the 20<sup>th</sup> century. Portland’s other streetcar is currently the “model” by which all other streetcar systems are measured. Implemented in 2001, the circulator system operates over a 2½ mile route through central Portland, using seven modern design newly built by Skoda in the Czech Republic. The route is credited with stimulating over a billion dollars of new residential development in a formerly abandoned railroad yard and warehouse district.

**San Francisco** – San Francisco Muni (the local transit system) operates two streetcar systems, the fabled cable car system and the “F” Line. The cable cars have been in continuous operation (except for temporary shutdown for rebuilding) since their inception in the 1880’s. Three routes remain from the once vast network. Vintage electric streetcars operate on the “F” line connecting Market St. with Fisherman’s Wharf via the Embarcadero. Evolving from the “Trolley Parade” in the early 1980’s, the “F” Line uses vintage 1940’s era PCC type streetcars as well as other imported and domestic cars built earlier in the 20<sup>th</sup> century. Both the cable cars and the “F” Line are operated as circulator routes by San Francisco Muni.

**San Jose** – Santa Clara Valley Transportation Authority leases six local and imported vintage streetcars rebuilt by a local enthusiast organization for operation over the central city portion of its light-rail system. Vintage streetcar service has operated daily from April through October since its inception in 1988 and functions as a downtown circulator and adjunct to the light-rail service. Vintage trolley service in San Jose was temporarily suspended during the 2005 season due to budgetary constraints.

**San Pedro** – Service was initiated on the “Port of Los Angeles Red Car Line” in 2003 commemorating the red cars of the former Pacific Electric interurban. The 1½ mile line connects a cruise ship terminal with other waterfront attractions using a pair of replicas of Pacific Electric cars built in the Port of Los Angeles shop. The theme system operates regularly on Fridays through Mondays, and on other days when cruise ships are in port.

**Seattle** – The Waterfront Trolley is a circulator system operating over a 1.9 mile single track line with passing sidings along the waterfront and through the Pioneer Square neighborhood. The system, opened in 1982, uses five vintage streetcars acquired from Melbourne. Acquisition of the land upon which the current maintenance facility rests has required temporary shutdown of the system pending construction of a new facility as part of a mixed use development in Pioneer Square. Construction on a second system, connecting downtown Seattle with the South Lake Union neighborhood is expected during 2006.

**Tacoma** – The second “modern” streetcar system in the United States was opened in 2003. The 1.6 mile system uses three Skoda build modern streetcars identical to those operated in Portland. The system was built to light-rail standard anticipating an eventual connection with the light-rail system presently being built southward from Seattle.

**Tampa** – The 2.3 mile TECO line was opened in 2002 to connect downtown Tampa with the Ybor City shopping and entertainment district and replace a defunct monorail system. The system is managed by Tampa Historic Streetcar, Inc., (THS) a joint non-profit venture of Hillsborough Area Regional Transit (HART), the City of Tampa, and the local business community. THS contracts with HART to operate the system. Daily service is provided with 8 Gomaco built replica streetcars. The TECO name comes from the sale of system naming rights to Tampa Electric Co. for one million dollars.

**Tucson** – The Old Pueblo Trolley began operation in 1993 as a tourist attraction and museum type operation. The 1.1 mile route is operated by volunteers on Friday evenings and weekends connecting the University of Arizona campus with adjacent neighborhoods. The system uses heritage cars from Kyoto, Brussels and Toronto. The sponsors are working with the city on a proposal to extend the route through downtown Tucson to create a circulator type system.

**Yakima** – Originally established as tourist operation in 1974 using the tracks of the Yakima Valley Traction Co. interurban, the original system suspended operation in 2000. Service in the 5 mile museum type system using four vintage trolleys, two that formerly operated in Yakima and two imported from Portugal. The system is operated using volunteer labor by a non-profit organization.

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<sup>1</sup> Boothe, p. 6.

<sup>2</sup> Urban Land Institute, 1996, p. 8.

<sup>3</sup> Abraham, p.7.

<sup>4</sup> Elgin Courier, June 20, 1896, quoted by Andy Roth in Fox River Museum Extension to Blackhawk Grove, Fox River Lines, 02-2 (Summer, 2002).

<sup>5</sup> Street Railway Journal, quoted by Frank Rowsome in Trolley Car Treasury, p. 97.

<sup>6</sup> Teaford, p.4.

<sup>7</sup> Hales, p.1.

<sup>8</sup> Urban Mass Transit Planning, p.28.

<sup>9</sup> Flammang, p.63.

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- <sup>10</sup> America's Highways, p.108.
- <sup>11</sup> Hales, p.1.
- <sup>12</sup> Ridolph, p.64.
- <sup>13</sup> Urban Mass Transit Planning, pp.35-37.
- <sup>14</sup> Urban Mass Transit Planning, p.98.
- <sup>15</sup> Holle, p.24.
- <sup>16</sup> Benson, George, p.330.
- <sup>17</sup> Teaford, pp.4-5.
- <sup>18</sup> Olsen, pp. 248-249.
- <sup>19</sup> Grey.
- <sup>20</sup> Branaugh.
- <sup>21</sup> Downtown Market Study, p.61.
- <sup>22</sup> Schultz III, p.350.
- <sup>23</sup> Lynch, p.143.
- <sup>24</sup> Benson, Jyl.
- <sup>25</sup> Jordan, p. 4.
- <sup>26</sup> Schultz III, p.351.
- <sup>27</sup> Priest interview.
- <sup>28</sup> Evans, p.18.
- <sup>29</sup> Touhey interview.
- <sup>30</sup> PCC is the acronym for Presidents' Conference Committee, comprised of presidents of transit systems in the 1930's. The group was convened to develop a new streamlined streetcar intended to reverse the decline in ridership brought on by economic hardship and increased automobile ownership. PCC cars were introduced in 1936. Ultimately 5,000 such cars were operated in North America in 25 cities. A small fleet continues in operation in Boston.
- <sup>31</sup> Gomaco.
- <sup>32</sup> Schultz III, p.350.
- <sup>33</sup> Gaddis, pp. 337-338.
- <sup>34</sup> Benson, George, p.333.
- <sup>35</sup> Weyrich, p.37.
- <sup>36</sup> Electric Streetcar Route Map and Schedule.
- <sup>37</sup> Farnsworth, p.356.
- <sup>38</sup> Electric Transit Operations in North America, p.31.
- <sup>39</sup> Graebner, p.33.
- <sup>40</sup> Graebner, p.33.
- <sup>41</sup> Parsons Brinckerhoff, p.37.
- <sup>42</sup> Weyrich, p.34.
- <sup>43</sup> Benson (1919-2004)
- <sup>44</sup> Antaramian interview.
- <sup>45</sup> Horatio Alger Association.
- <sup>46</sup> Sargent, October 18, 2004, p. 4.
- <sup>47</sup> Portland Streetcar.org
- <sup>48</sup> Miami Streetcar Corridor Study, p.12-3.
- <sup>49</sup> Weyrich, p.29.
- <sup>50</sup> Portland Streetcar.org.
- <sup>51</sup> TECO System 2003 Annual Report, pp.1, 13.
- <sup>52</sup> Miami Streetcar Corridor Study, p 12-3.
- <sup>53</sup> Priest interview.

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- <sup>54</sup> Sargent, October 18, 2004, p.2.
- <sup>55</sup> Schultz III, p. 353.
- <sup>56</sup> Schultz III, p. 349.
- <sup>57</sup> Schultz III, pp. 350-351.
- <sup>58</sup> Peachtree Corridor Streetcar Feasibility Study, p. 1.
- <sup>59</sup> Weyrich, p. 34.
- <sup>60</sup> Malone interview.
- <sup>61</sup> Antaramian interview.
- <sup>62</sup> Saporta.
- <sup>63</sup> Peachtree Corridor Streetcar Feasibility Study, p. 13.
- <sup>64</sup> Central Salem Streetcar Feasibility Study, p. 86
- <sup>65</sup> Young, 1997, p. 91.
- <sup>66</sup> Mulady, October 10, 2005.
- <sup>67</sup> Schultz III, pp. 350.351.
- <sup>68</sup> Savannah Streetcar Feasibility Study, p.20.
- <sup>69</sup> Schultz III, p.353.
- <sup>70</sup> Evans, p.95.
- <sup>71</sup> Evans, p.95.
- <sup>72</sup> Lancaster interview.
- <sup>73</sup> Miami Streetcar Corridor Study, p.20-1.
- <sup>74</sup> Fox, pp.7-8.
- <sup>75</sup> Weyrich, p.18.
- <sup>76</sup> Jewell, p.18.
- <sup>77</sup> Schultz III, pp.350.351.
- <sup>78</sup> Lightrailnow! Website.
- <sup>79</sup> Dorman, p.1
- <sup>80</sup> Antaramian interview.
- <sup>81</sup> Heritage Trolley.org website.
- <sup>82</sup> Parsons Brinckerhoff, p.74,
- <sup>83</sup> Dayton Economic Impact Study, Sec.4, p.1.
- <sup>84</sup> Rail Transit On Line, September, 2001.
- <sup>85</sup> Miami Streetcar Feasibility Study, p.18-2.
- <sup>86</sup> Henry, pp.47-50.
- <sup>87</sup> Central Salem Streetcar Feasibility Study, p. 78.
- <sup>88</sup> Descriptions and statistics associated with the New Orleans streetcar system reflect conditions previous to the disruption wrought by Hurricane Katrina.
- <sup>89</sup> Parsons Brinckerhoff, p. 44.
- <sup>90</sup> Downtown Market Study, p.128.
- <sup>91</sup> Burgess & Niple, p. 77.
- <sup>92</sup> Costello, p. 70.
- <sup>93</sup> TECO 2003 Annual Report, p. 12.
- <sup>94</sup> Holcolombe.
- <sup>95</sup> Saporta.
- <sup>96</sup> Schultz III, p. 351,
- <sup>97</sup> Fox, p. 10.
- <sup>98</sup> Memphis Trolley Survey, pp. 1-12.
- <sup>99</sup> Parsons Brinckerhoff, p.13.
- <sup>100</sup> Parsons Brinckerhoff, p. 7.
- <sup>101</sup> Build the Streetcar.

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<sup>102</sup> This statement, incorporated into the Seattle South Lake Union Streetcar Feasibility Study, must be interpreted carefully. The 1994 study said that 17% of riders did not ordinarily use public transit in Memphis. Inasmuch as many of the Memphis streetcar riders surveyed were visitors from other cities, the “83%” interpretation is potentially misleading. It ignores the possibility that visitors to Memphis DO use public transit in their home cities. Nonetheless it is safe to conclude that a huge proportion of riders on the Memphis streetcar are not regular transit users.

<sup>103</sup> Schultz III, p. 351.

<sup>104</sup> Tennyson, p. 59.

<sup>105</sup> Labahn interview.

<sup>106</sup> Central Salem Streetcar Feasibility Study, p. 86.

<sup>107</sup> Parsons Brinckerhoff, p. 12.

<sup>108</sup> Davis, Morris, and Levine, Sol: “Toward a Sociology of Public Transit,” Social Problems, vol.15, no. 1, (Summer 1967), quoted by Alan Black, in Urban Mass Transportation Planning, McGraw-Hill, 1995, p.296.

<sup>109</sup> Schultz III, p. 351.

<sup>110</sup> Atlanta Streetcar Feasibility Study, p. 3.

<sup>111</sup> Finger.

<sup>112</sup> Savannah Streetcar Feasibility Study, p.19.

<sup>113</sup> Malone interview.

<sup>114</sup> Hales, p. 4.

<sup>115</sup> Kitsinger interview.

<sup>116</sup> Kitsinger interview.

<sup>117</sup> Schlickman, p. 11.

<sup>118</sup> Boothe, p. 6.

<sup>119</sup> Eskenazi.

<sup>120</sup> McCulley, p.1.

<sup>121</sup> Antaramian interview.

<sup>122</sup> Jewell, pp. 40-42/

<sup>123</sup> Detroit Downtown Peplemover, p. 1.

<sup>124</sup> Smatlak.

<sup>125</sup> Young, 1997, p. 91.

<sup>126</sup> Antaramian interview.

<sup>127</sup> Schultz and Benedict, p. 24.

<sup>128</sup> Sandler, p. 58.

<sup>129</sup> Antaramian interview.

<sup>130</sup> Young, 1997, p.83.

<sup>131</sup> National Transportation Database.

<sup>132</sup> Central Salem Streetcar Feasibility Study, p. 14.

<sup>133</sup> National Transportation Database.

<sup>134</sup> Antaramian interview.

<sup>135</sup> Trolley Extension Plan Approved, p. 63.

<sup>136</sup> Woods.

<sup>137</sup> Abraham, p.44.

<sup>138</sup> Abraham, pp. 44-45.

<sup>139</sup> Downtown Market Study, p. 7.

<sup>140</sup> Fox, pp. 2-3.

<sup>141</sup> Finger.

<sup>142</sup> Fox, p. 4.

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- <sup>143</sup> Fox, pp. 7-8.
- <sup>144</sup> Memphis Main Street Trolley Project Description, p. 4.
- <sup>145</sup> Memphis Riverfront Loop Project Description, p. 1.
- <sup>146</sup> Madison Ave. Line, p. 1.
- <sup>147</sup> Lancaster interview.
- <sup>148</sup> Madison Ave. Line, p. 1.
- <sup>149</sup> Memphis Area Transit Authority.
- <sup>150</sup> Downtown Market Study, p. 96.
- <sup>151</sup> Burgess & Niple, p. 68.
- <sup>152</sup> Costello, p. 69.
- <sup>153</sup> Kitsinger interview.
- <sup>154</sup> Holcolmbe.
- <sup>155</sup> Downtown Market Study, pp. 161-162.
- <sup>156</sup> Malone interview.
- <sup>157</sup> Priest interview.
- <sup>158</sup> Malone interview.
- <sup>159</sup> Priest interview.
- <sup>160</sup> Priest interview.
- <sup>161</sup> Malone interview.
- <sup>162</sup> Center for Transit Oriented Development, p. 6.
- <sup>163</sup> Henry, Lyndon, p. 6.
- <sup>164</sup> Malone interview.
- <sup>165</sup> Priest interview.
- <sup>166</sup> Malone interview.
- <sup>167</sup> Holcolmbe.
- <sup>168</sup> Rail Transit On Line, December, 2004.
- <sup>169</sup> Malone interview.
- <sup>170</sup> Schultz interview, 2005.
- <sup>171</sup> Benson, George, p.332.
- <sup>172</sup> Laubscher.
- <sup>173</sup> Rice and Ruiz.
- <sup>174</sup> Gaddis, p.337.
- <sup>175</sup> Gaddis, pp.337.338/
- <sup>176</sup> Abraham, p.42.
- <sup>177</sup> Alternative Transportation System, Appendix A.
- <sup>178</sup> Schultz III, p.351.
- <sup>179</sup> Central Salem Streetcar Feasibility Study, p.86.
- <sup>180</sup> Central Salem Streetcar Feasibility Study, p.86.
- <sup>181</sup> Schlickman, October 5, 2005.
- <sup>182</sup> Central Salem Streetcar Feasibility Study, p. 86.
- <sup>183</sup> Schlickman, October 5, 2005.
- <sup>184</sup> Alternative Transportation System, p.92.
- <sup>185</sup> Young, 1997, p. 83.
- <sup>186</sup> Central Salem Streetcar Feasibility Study, p. 88.
- <sup>187</sup> HDR Engineering, p. 4.
- <sup>188</sup> Dorman.
- <sup>189</sup> Smatlak.
- <sup>190</sup> Miami Streetcar Corridor Study, pp. 2-3.
- <sup>191</sup> Mulady, October 13, 2005.

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- <sup>192</sup> Sargent, November 1, 2004, p.1.
- <sup>193</sup> Jewell, p.18.
- <sup>194</sup> Rail Transit On Line, February, 2004.
- <sup>195</sup> Rail Transit On Line, February, 2004.
- <sup>196</sup> Miami Streetcar Corridor Study, p. 20-11.
- <sup>197</sup> Evans, p. 135.
- <sup>198</sup> Evans, pp.93-94.
- <sup>199</sup> Gedalius, May 21, 2005.
- <sup>200</sup> Gedalius, May 21, 2005.
- <sup>201</sup> Gedalius, May 21, 2005.
- <sup>202</sup> Alternative Transportation Systems, P. 93.
- <sup>203</sup> Parsons Brinckerhoff, p.7.
- <sup>204</sup> Center for Transit Oriented Development, p. 13.
- <sup>205</sup> TECO Annual Report, p. 7.
- <sup>206</sup> Holan, October 13, 2005.
- <sup>207</sup> Malek, September 30, 2005.