Executive Management & Audit Committee Item # 27
Operations Committee Item # 43

FINAL DRAFT

Metro Rail Gating Study

Los Angeles, California
November 15, 2007

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- Executive Summary
- Methodology
- Option 1 Red Line only
- Option 2 Red Line and Green Line, and Strategic Stations
- Option 3 System-Wide Gating
- Summary

LACMTA Board has directed staff to study installation of fare gates on Metro rail and Orange lines to achieve the following key objectives

- Improve revenue recovery by reducing fare evasion
  - Fare evasion is currently estimated at 6% for a revenue loss of $2.6 million annually
- Enable alternative fare policies, such as distance based fare structure
  - Current fares are flat
  - Passengers are expected to pay for transfers
- Reduce vulnerability to terrorist threat and passenger perception of security

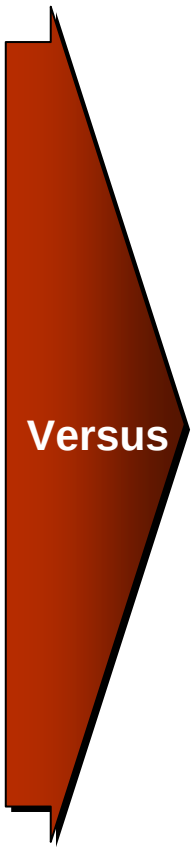
Booz Allen and Metro staff surveyed rail and Orange busway stations to determine the feasibility of installing faregates using the following criteria

- **Architecture and Infrastructure**
  - Adequate space for the number of gates required to serve ridership at each station
  - Infrastructure considerations, such as availability of communications and power
  - Adequate space leading to the gate (both in and out) to allow for passenger queuing
  - Passenger crowding along platform edges, trackways, curbs, planters, etc…
  - Sufficient space for TVMs, add-fare devices, and additional validators
- **Operations**
  - Passenger safety
  - Working space and access for maintainers, lifts, and other equipment
  - Emergency egress and access for police, fire and facilities maintenance
- **Fare Enforcement**
  - Effectiveness for fare enforcement
  - Ability to provide effective barriers separating paid from non-paid areas
  - Minimize potential for fare evaders to bypass gates

Gating the Metro stations balances the investment for physical barriers against the level of inspection required to decrease evasion levels

Fencing and Barriers

- Installing fare gates to automatically verify valid fare has been paid
  - Fare Gates
  - Tag-on validator located outside paid area
- Fencing to control access to paid area and control passenger flow
- Migrating customers to contactless smart card technology



Degree of Fare Inspection

- Manually verify fare has been paid
  - Readers on-board vehicles
  - Bus driver inspection
  - Fare inspection force
- Fare inspection effectiveness is driven by the court's enforcement when a violation has occurred

Based on the station surveys, number of passengers captured, and operational impacts, three implementation options were developed

	DESCRIPTION	KEY DRIVERS
Option 1	Installs gates on the Red Line only	*Red Line subway was originally designed for fare gates* *–Sufficient space for gates* *–Existing infrastructure* *–Sheltered location* *Fare inspection needs to be maintained at current levels on light rail lines*
Option 2	Expands physical gating across the Green Line and includes strategic stations on the Blue and Gold Line	*Focus is on light rail stations that require minimum infrastructure modifications* *Number of fare inspectors further reduced*
Option 3	Installs gates at all Metro rail line where architecturally NOT constrained	*At grade stations most challenging and costly to physically gate* *Bringing power and communications, weather shelter to fare gate and relocated TVM locations is the most costly component*

The cumulative results of the station surveys resulted in the following physical gating strategy

Implementation Scenario	Physical Gating Strategy	Number of Gates	Passengers Checked at Gates During Their Journey
Option 1	Red Line only	154 gates	59%
Option 2	Red and Green Line, and strategic light rail stations	275 gates	84%
Option 3	All Metro Stations, not architecturally constrained	394 gates	98%

- All fare media will be based on contactless smart card technology
- For those stations where a physical barrier is not installed, a single tap-on validator or a series of tap-on validators will be strategically placed so that passengers can validate their fare media

The business case for gating is based on reducing the fare inspection force and improving fare evasion rates and increasing fare recovery. Options to "buy" or "lease & maintain" were analyzed.

CAPITAL ACQUISITION MODEL	Option 1 Red line only	Option 2 Red & Green Lines	Option 3 All Metro Stations
Direct capital cost – ONE TIME			
Equipment	$9 million	$15.3 million	$18.4 million
Civil Station Modifications*	$12.4 million	$30.9 million	$46.4 million
Net Change in Annual Operating Costs			
Maintenance	$0.5 million	$1.0 million	$1.2 million
Police patrolling, fare inspection	$1.4 million	$2.4 million	$2.8 million
Customer Service	$0.5 million	$0.7 million	$1.1 million
Annual Benefits			
Contracted civilian inspectors	($7.06) million	($7.06) million	($7.06) million
Reduced fare evasion	($2.7) million	($3.8) million	($4.5) million
Net Decrease Annual Cost	**($7.30) million**	**($6.77) million**	**($6.47) million**

The business case for gating is based on reducing the fare inspection force and improving fare evasion rates and increasing fare recovery. Options to "buy" or "lease & maintain" were analyzed.

LEASE & MAINTAIN MODEL	Option 1 Red line only	Option 2 Red & Green Lines	Option 3 All Metro Stations
Direct capital cost – ONE TIME			
Civil Station Modifications*	$12.4 million	$30.9 million	$46.4 million
Net Change in Annual Operating Costs			
Equipment Lease & Maintenance	$2.01million	$3.51 million	$4.27 million
Police patrolling, fare inspection	$1.4 million	$2.4 million	$2.8 million
Customer Service	$0.5 million	$0.7 million	$1.1 million
Annual Benefits			
Contracted civilian inspectors	($7.06) million	($7.06) million	($7.06) million
Reduced fare evasion	($2.7) million	($3.8) million	($4.5) million
Net Decrease Annual Cost	**($5.81) million**	**($4.23) million**	**($3.40) million**

* includes 30% contingency

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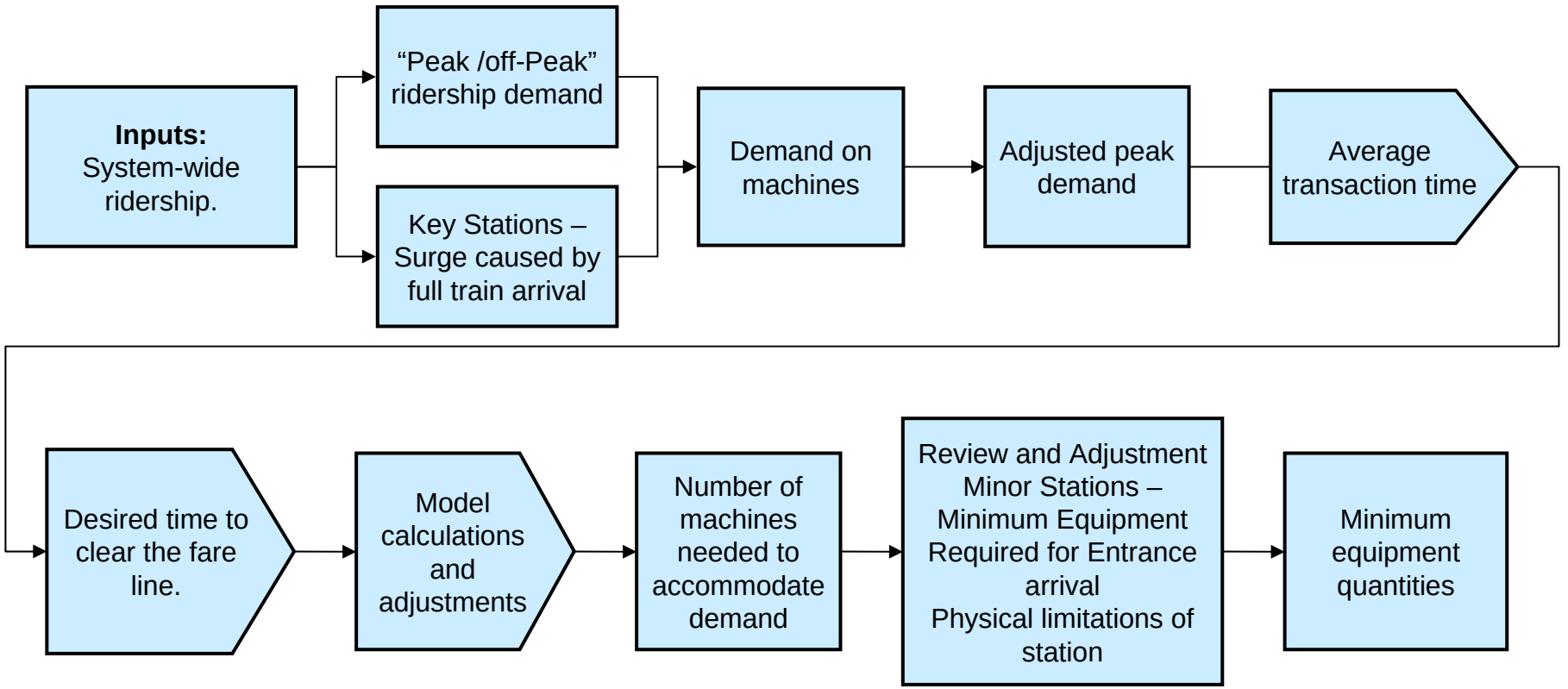
Booz Allen provided an assessment of the benefits and costs of gating the Metro rail lines based on an evaluation of multiple factors

- **Faregate Configuration** – Reviewed the types of faregates available and some advantages and disadvantages, including implications of fire safety standards for gating
- **System Configuration** – Provided information on faregate configuration by station based on the results of station surveys and the transactions which will be sent to the TAP back-office as a single integrated system
- **Equipment Quantities** – Identified equipment quantities required based on ridership levels and transaction times
- **Fare Media and Tariff Options** – Identified impact on fare media and tariff options by reviewing the implications for fare media and fare policy options of gating the rail system
- **Qualitative Impact on Passengers** – Demonstrated the impact that gating will have on passengers' interactions with the Metro Rail System
- **Impact on Fare Evasion and Inspection** – Evaluated the potential to reduce fare evasion by gating rail stations
- **Cost Estimates** - Identified both direct and indirect costs of gating the Metro Rail System.

The methodology used to analyze gating the Metro System consisted of the following key steps

- Each line has unique characteristics that impact how it is gated. Therefore, an analysis of each line considering the following was being completed:
  - Physical (Architectural) features drive the gating configuration
  - Infrastructure such as power and communications availability
  - Operational characteristics that impact passenger throughput
- The most common types of fare gate designs were evaluated
- The survey data formed the basis for developing a detailed cost model to serve as a bench mark for evaluating supplier proposals and providing an independent estimate for Metro
- Key data input was provided by Metro for the following items:
  - TMD fare evasion report for most recent fare evasion rates
  - Current cost of fare inspection services

The basis for the capital investment used in the cost model was determined by analyzing the operational characteristics of each station



The equipment quantities may be adjusted during the detailed station design process to ensure meeting emergency egress requirements

Each possible fare gate design was evaluated against the following criteria

Cost	The capital costs associated with the gate procurement and operating cost resulting from reliability.
Throughput	The maximum number of passengers that can flow through the gate in an ideal situation (throughput is dependent upon the processing of the fare media).
Ease of Use	The likelihood of an inexperienced patron being able to use the gate in an efficient manner.
Durability	The ability of the gate to sustain operation in an exposed marine environment, due to the proximity of Green Line stations to marine air.
Reliability	The ability of the gate to sustain operation while requiring a minimal level of maintenance.
Security	The level of protection offered against would-be fare evaders (gate jumpers).
Bicycle/ADA	The ability of the gate to accommodate patrons with bicycles and in wheelchair access
Aesthetics	The way in which the physical appearance of the gate is commonly perceived by the public.

Each Metro Line has unique characteristics that drive the investment and required modifications to infrastructure

- **Red Line –**possible to completely gate all stations, because the stations have been designed for gating
- **Blue Line –** there are stations where physical gating is possible, add fencing and barriers to direct passengers to dedicated corridors, use strategically placed smart card validators for tag-on
- **Green Line –** all stations can be physically gated, placing fencing and barriers to direct passengers to dedicated corridors will improve operations
- **Orange Line –** place fencing and barriers to direct passengers to dedicated corridors with validators
- **Station related Fare Policy –** transfers should not be an issue with the use of smart cards and limited use cards
  - To accommodate transfers to and from Metrolink, placing a smart card validator in Metrolink stations to record the ride is required
  - Gating will enable the adoption of a distance based fare structure in the future

The following three baseline implementation options where developed for cost modeling

Option 1
Red Line only

- Gate all Red Line stations

Option 2
Red and Green Line, Strategic Light Rail Stations

- Gate all Red Line stations
- Gate all Green Line stations
- Blue Line, 6 stations
  - Imperial
  - Slauson
  - Firestone
  - Compton
  - Artesia
  - Del Amo
- Gold Line, 3 stations
  - Sierra Madera
  - Allen
  - Lake
- Improve validator placement at remaining light rail stations

Option 3
Gate all Metro Stations

- Gate all Red Line stations
- Gate all Green Line stations
- Blue Line, all stations except
  - Transit Mall
  - 1st Street
  - 5th Street
  - Pacific
  - Florence
- Gold Line, all stations except
  - Mission
- Improve validator location at exception stations

The cost model included the following key elements:

Capital Investment

- Supplier provided equipment
- Engineering station modifications
- Civil construction station modifications
- Passenger communications
- Additional CCTV surveillance
- Project management
- Contingency

Operating Cost Impacts

- Maintenance of gates
- Fare inspection and enforcement at gates
- Customer service

Revenue Impacts

- Reduced fare evasion
- Increased fare recovery
- New fare policies

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Option 1 requires the installation of turnstiles on the Red Line only

- The Red Line subway was originally built to accommodate future gates, therefore, there is sufficient physical space available to install the fare gates
- Existing infrastructure, such as power and communication, accommodates gating
- Faregates would be installed in sheltered locations, reducing maintenance and weather-related problems

Option 1 presents the lowest implementation challenges, however the lowest passenger rate of capture

- All other stations would require additional validators in convenient locations
- Additional fencing would be provided at all stations to channel passengers to gates and resist fare evasion
- Fare inspection will need to be maintained at current levels on the light rail lines to maintain or reduce fare evasion
- Gating the Red Line will only capture 59% of the passengers entering Metro

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Option 2 expands physical gating across the Green Line and includes strategic locations on the Blue and Gold Line

- The focus of Option 2 is to gate those stations that only require a minimum level of infrastructure modification
- The number of inspectors patrolling Metro system-wide will be further reduced
- Gating both Red and Green Lines, and strategic locations on the Blue and Gold Line, will capture approximately 84% of the passengers entering the Metro Rail system

Option 2 presents several challenges for gating across Green, Gold, and Blue lines

- Some stations have narrow passages or walk ways that restrict space for gates
- Some stations have multiple entries
- Emergency egress and surges due to multiple trains arriving in close succession need to be explored in detail

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Option 3 requires the installation of gates at the majority of Metro rail lines

- Due to space constraints and architectural features, gates at grade-level stations may be difficult to install
- There is insufficient space at some stations to provide fare gates and emergency egress gates
- Many stations have no provision for gates, and will require underfloor duct, fencing, and other modifications to establish paid areas
- The capital cost of civil work includes major construction required to bring power and communications to turnstyles, and the addition of shelters over gated areas

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Summary - Gating the Metro Rail system will present advantages and a reduction in net operational costs over the life cycle of the equipment

- The business case for gating Metro Rail assumes one time capital and civil investments which are overcome through cost savings realized from reduction in fare inspection expenditures
  - This investment over the life cycle of the equipment will result in cost recovery from fare evasion
- In addition, other fare recovery strategies, distance based and congestion pricing fare structures can then be implemented
  - Fare policies, such as enforcement of rail-to-rail transfer payments can then be implemented
  - Bank card programs and cell phone technology will have easy transitions with gate infrastructures in place as these future programs are developed
- Gating the Metro system will allow future retrofit to include advanced detection technologies increasing passenger security

Booz Allen identified the following next steps

- Complete line by line conceptual design for gating
- Identify fare policies that need to be changed and new fare policies that need to be added for gating
- Develop implementation plan and schedule