Mobile Farebox Repair Program: Setting Standards & Maximizing Regained Revenue

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March 2012 Fare Collection Workshop & TransITech Conference
Forth Worth, TX

Agenda

- Agency Overview
- Farebox Overview
- Farebox Maintenance Models
- Pilot Program & Regained Revenue
- Next Steps

Agency Overview

- Multi-modal state-wide transit administration
  - Commuter Rail
  - Commuter Bus
  - Heavy Rail
  - Light Rail
  - Local Bus
  - Paratransit
  - Local agency grantor

Agency Overview (cont'd)

- Average weekday ridership
  - System-wide: 371,000+
  - Local bus: 241,000+ (65% of all boardings)
- Typical yearly revenue: $143M+
- Flat-fee core service fare structure:
  - $1.60 one-way / $3.50 day pass for HR, LR, Bus
- Bus peak vehicles: 590

Bus Farebox Overview

- GFI Odyssey farebox by Cubic
- Main forms of payment accepted: cash, mag-strip ticket, smart card
- Other pass types (rider counts w/o revenue)
  - Student tickets (paper stubs)
  - Flash passes

Image obtained from: http://www.gfigenfare.com/Downloads/Odyssey.pdf

Farebox Malfunctions – the Problem

- (Sh!) It happens…
- Lost revenue
- Lost ridership data
- Lost confidence in your transit system
  - Bus operators
  - Riding public
  - Non-riding public
- What should we do?

Vocabulary

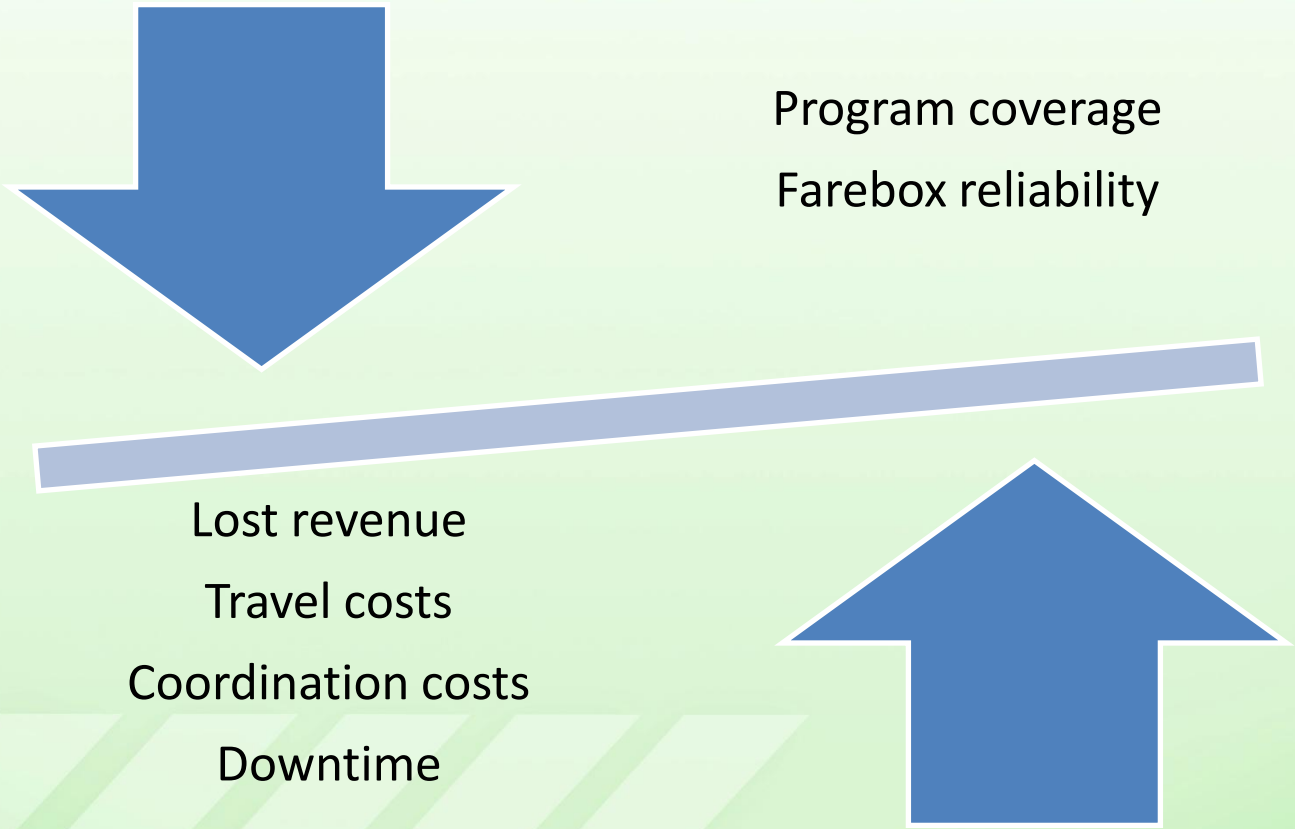
- OOS (out-of-service): Whenever a farebox is unable to collect fares and/or count riders
- Downtime: the time that passes from the point of a farebox malfunction until the point of repair (or end of revenue service)
- Coverage: the portion of all malfunctioning fareboxes that can be repaired
- Travel costs: costs (in distance and time) associated with transportation of repair staff and parts to the point of repair
- Coordination costs: costs (in time) associated with coordinating repair of an OOS farebox that would otherwise be used
- Technician: any person (mechanic or otherwise) that can reliably put an OOS farebox back in service
- Lost revenue: all fare dollars that would have been collected if the farebox was not OOS
- Service delay: any delay to revenue service that is caused by repair of an OOS farebox

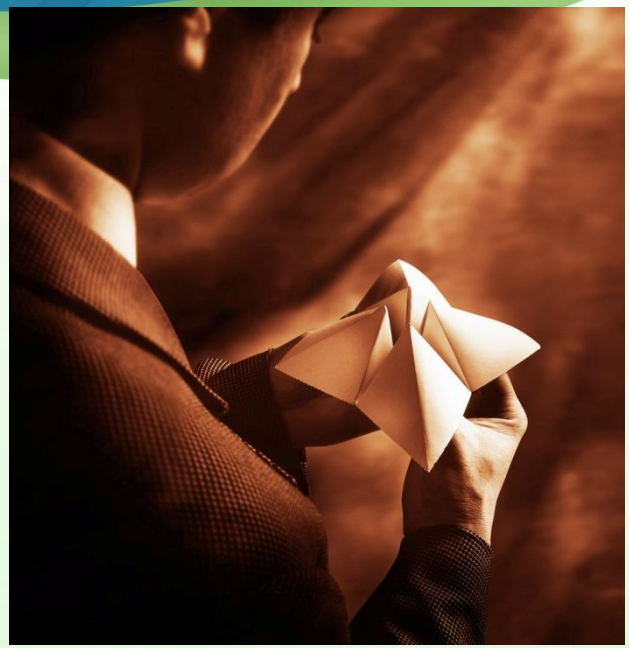
Farebox Repair – The Price Point

- How much do you invest in your farebox repair program before you actually LOSE money as a result of your efforts?

$$Net\ revenue = Gross\ fare\ - fare\ maintenance\ costs$$

Usual Farebox Repair Goals





MAINTENANCE MODELS

Farebox Malfunctions – Repair Options

Fixed-base model

- Process:
  - Flag farebox as needing repair at pull-in
  - Repair during coach yard time
  - PM fareboxes on fixed schedule
- Pros:
  - No delay to revenue service
  - Centralization of parts, labor
  - No maintenance travel costs
  - Full-repair services available
  - Full coverage of all fareboxes
- Cons:
  - Potential for farebox to be out-of-service for duration of work block
  - Communicating need for repair sometimes lost

Farebox Malfunctions – Repair Options

Bus replacement model

- Process:
  - Operator notifies control center of malfunction
  - Control center coordinates bus replacement
  - New operator or mechanic takes new bus to replacement point
  - Return malfunctioning bus to base for repair
- Pros:
  - If replacement points are termini, delay to revenue service is minor
  - Reduces total down-time of sub-set of fareboxes
- Cons:
  - Travel costs
  - Coordination costs: requires several coordinating steps between operator, control center, bus base
  - Need a spare bus and driver available

Farebox Malfunctions – Repair Options

Fixed-field model

- Process:
  - Station mechanics at key locations
  - Service fareboxes during revenue service (usually random)
- Pros:
  - If locations are layovers, delay to revenue service is minor
  - Reduces total down-time of sub-set of fareboxes
- Cons:
  - Limited impact: fixed locations cannot service ALL buses
  - Travel costs: must transport parts and labor to fixed locations
  - Can produce minor delay
  - Non-productive time

Farebox Malfunctions – Repair Options

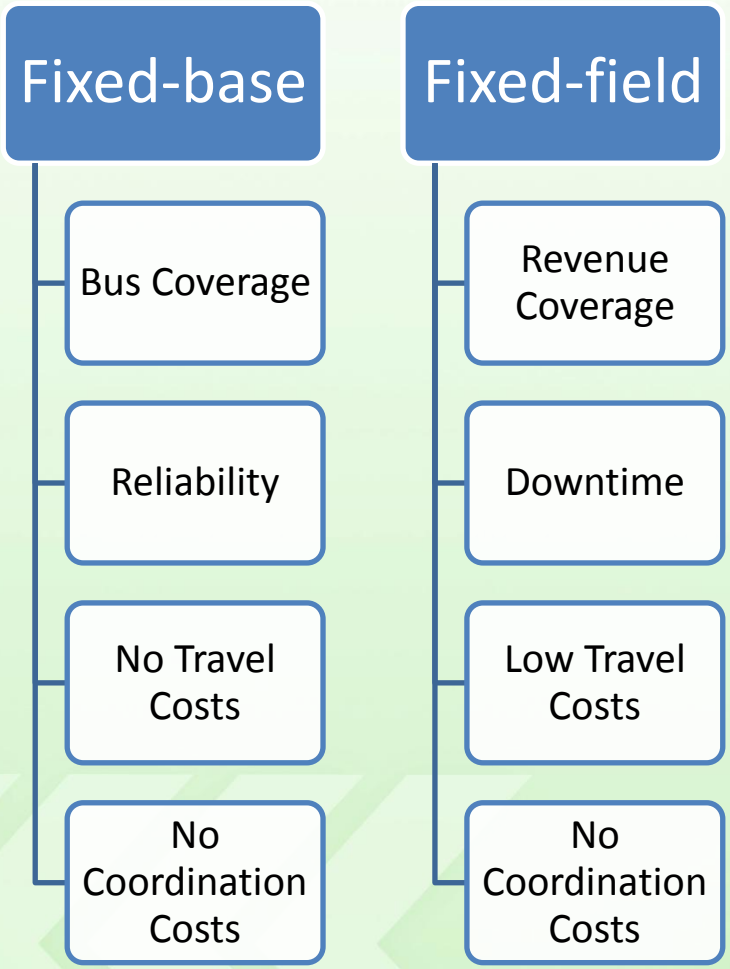
Dispatched-field model

- Process:
  - Station technicians at key locations
  - Dispatch technicians upon report of malfunction
  - Mechanics intercept coaches during revenue service
- Pros:
  - Potential to repair large portion of disabled fareboxes
  - Reduces total down-time of many fareboxes
  - Can address problems on any bus line
- Cons:
  - Large travel cost: must drive around to intercept points with labor and parts
  - Increased potential for service delay
  - Large coordination cost: Operator, control center, and field technician must work together to select intercept point and time

Farebox Repair Models

Model	Coverage	Minimize Down-time	Minimize Costs	Minimize Service Delays	Overall
Fixed-base	★★★★★		★★★★★	★★★★★	Great for farebox reliability but not for real-time fixes
Fixed-field	★★	★★★	★★★★	★★★★	Low-cost and helpful if locations ensure coverage
Bus replacement	★★★	★★★		★★★	Too costly
Dispatched-field	★★★★	★★★★	★	★★	Great for real-time but costly and difficult

Hybrid Model

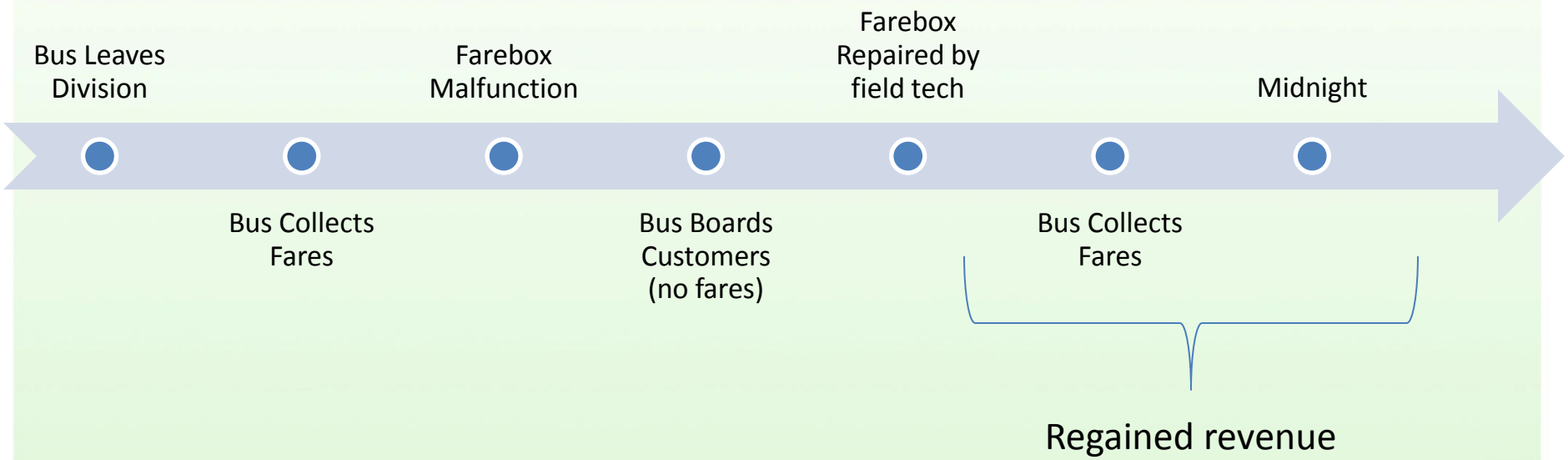


MTA’S MOBILE FAREBOX REPAIR PILOT

How to choose fixed-field locations / times?

- Regained Revenue
  - *Definition:* for any OOS farebox, all fare collected from time of repair through the end of the service day (for us, midnight was chosen)
  - Note: if you have a robust fixed-base program for pre-PM pull-out, midnight might not be best cut-off

Regained Revenue



Chose the locations and times where

- Maximize bus throughput (bus coverage)
- Maximize incoming revenue (revenue coverage)
- Minimize service delay
- Parking / storage available

MTA's Pilot Program

- 2 locations chosen
  - Mondawmin bus loop
    - serves 10 bus lines with transfer to Metro subway
    - Most lines have layover here
  - Patapsco Light Rail
    - Serves 5 bus lines with transfer to Light Rail
    - Most lines have layover here
- 2 shifts per location per day (4 technicians)
  - 5:00 am – 12:30 pm
  - 12:00 pm – 8:30 pm
- 2 trucks with modular parts

Mondawmin Bus Loop

Mondawmin Bus Loop

Basic Process

- Technicians arrive on-location at 5 AM
- Spend entire shift in location (less lunch)
- Board coaches as they arrive (as many as possible)
  - Note whether problem found
  - If problem
    - Record nature of problem
    - Record repair time (or if not repaired)
    - Record auxiliary data (bus line, coach number, work block, etc.)
- Return truck to base for parts, fueling
- Next shift takes truck to location
- Etc…

Performing an Inspection

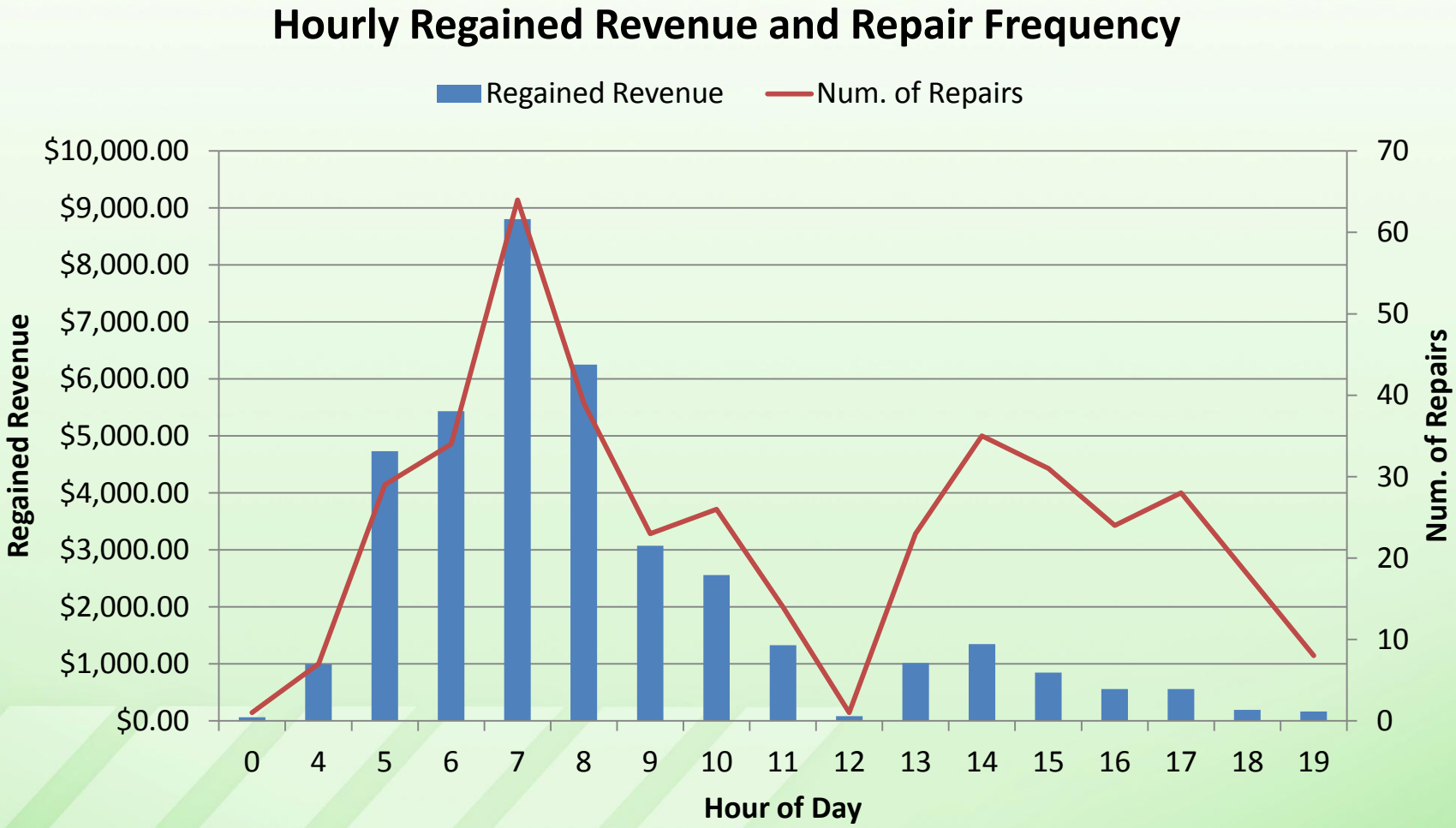
How to Maximize Regained Revenue?

- Regained revenue is a function of
  - Total number of boardings from point of repair to end of service day
  - Portion of boardings that pay fare
    - Cash fare payments
    - SmartCard cash payments

Regained Revenue Analysis

- Focus repair program during morning
  - Largest regained revenue for AM hours
- Large variation across bus lines

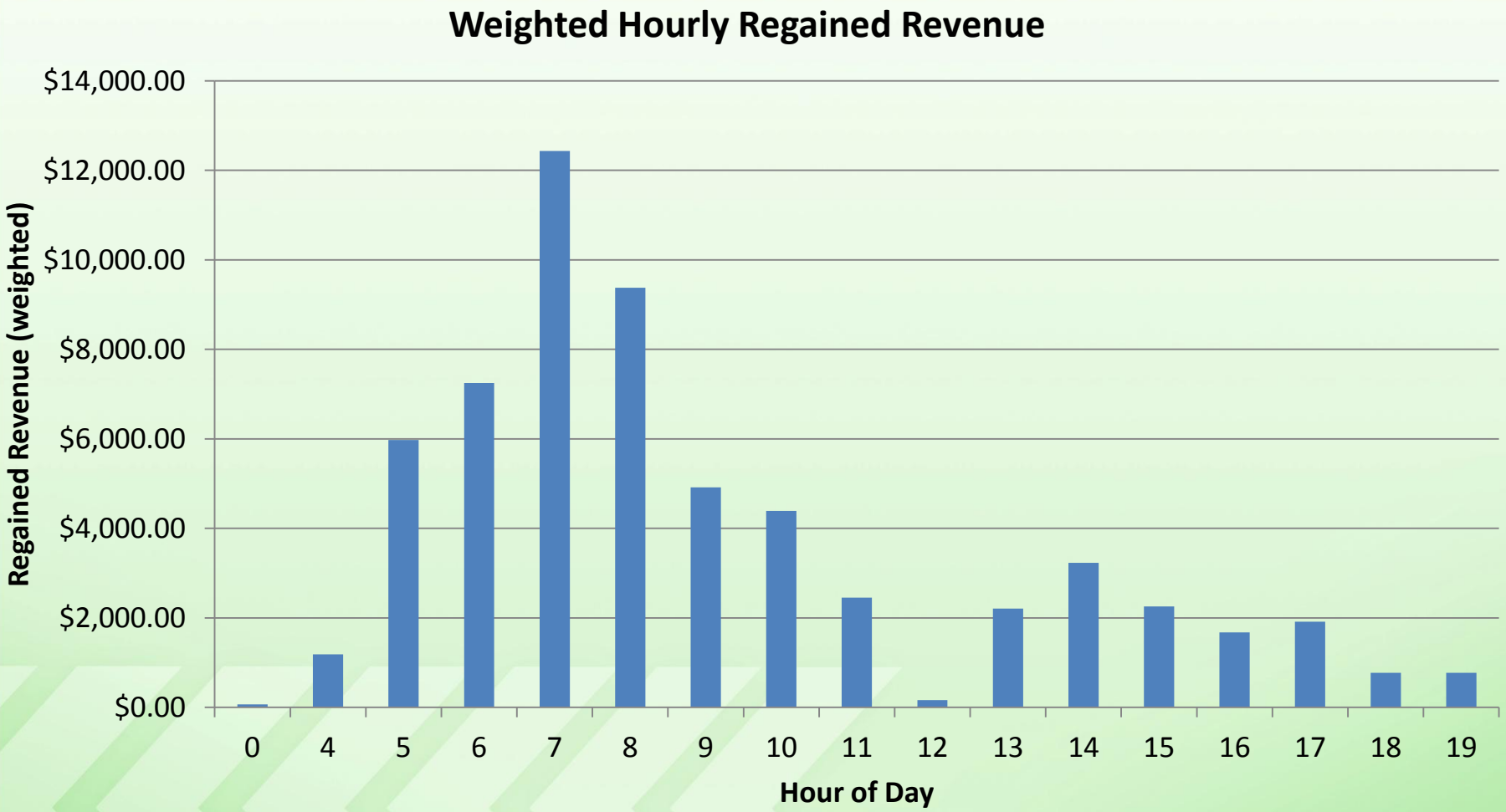
Hour of Day


Hourly Regained Revenue and Repair Frequency
Regained Revenue
Num. of Repairs
$10,000.00
$9,000.00
$8,000.00
$7,000.00
$6,000.00
$5,000.00
$4,000.00
$3,000.00
$2,000.00
$1,000.00
$0.00
70
60
50
40
30
20
10
0
0 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
Hour of Day

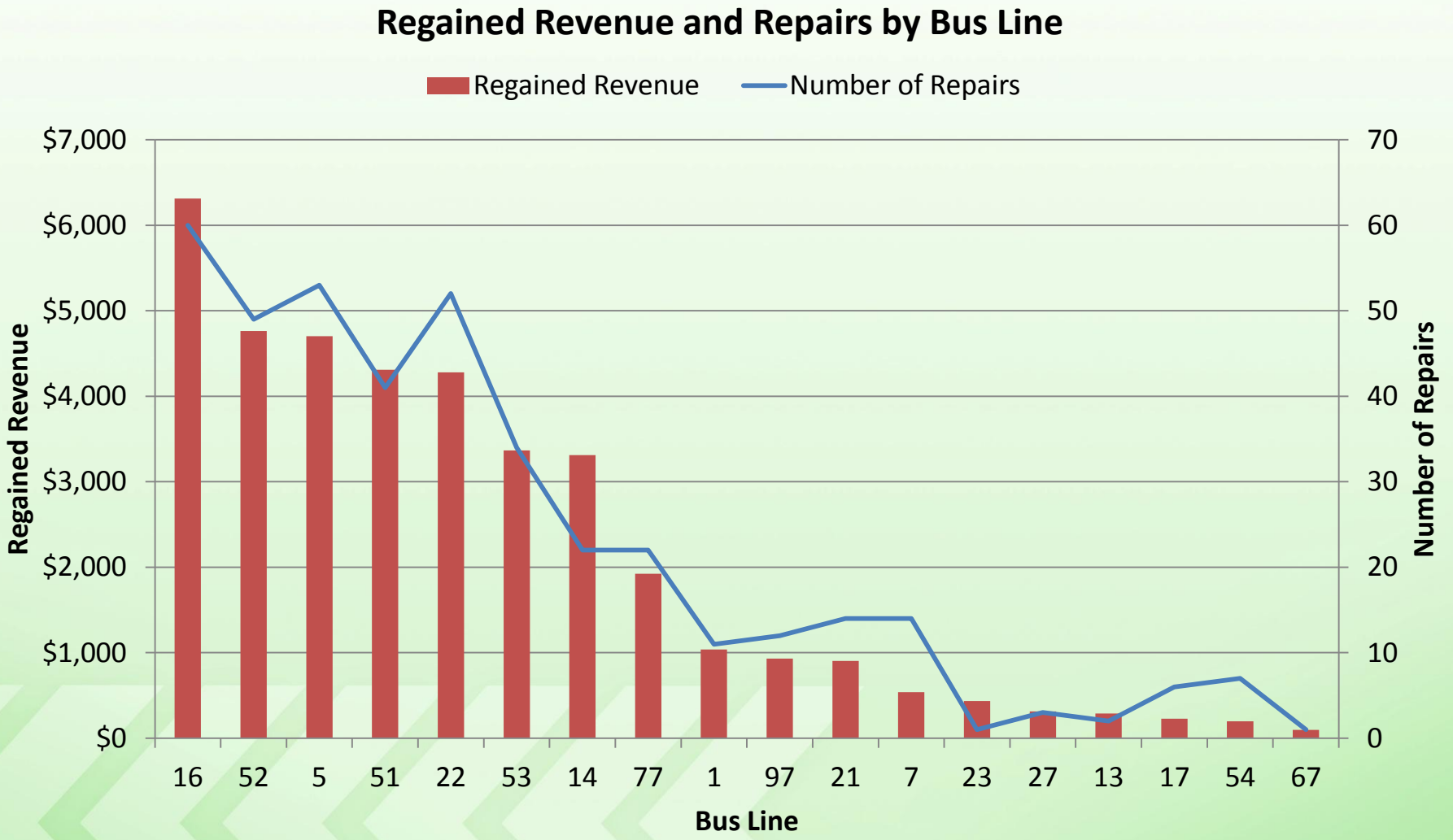
Weighted Regained Revenue

- Because of our operational definition of regained revenue, early hours have "advantage," because more in-service hours follow repair than for late hours
- Weighted regained revenue:
  - Treats all hours of the day as equals, based on average hourly regained revenue

Hour of Day (Weighted Regained Revenue)



Bus Lines


Regained Revenue and Repairs by Bus Line
Regained Revenue
Number of Repairs
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
70
60
50
40
30
20
10
0
16
52
5
51
22
53
14
77
1
97
21
7
23
27
13
17
54
67
Bus Line

Overall Summary

- About 208 inspections performed per day
- 7% problem rate
- 85% repair rate
- Total regained revenue Jan – Feb: $42,228
- Total program cost: ~ $36,317
- Net regained revenue: ~$6,000
- Total regained riders Jan – Feb: 43,535
  - Average weekday regained riders: 1,036 (<1% of total)

Recommendations & Next Steps

- Use actual fare collection data to target locations and hours
  - Highest-ridership lines (our locations failed to cover most heavily utilized lines)
  - Highest-revenue lines
  - Highest-revenue hours
- Cycle-time analysis
  - Depending on schedule design, probability of seeing newly broken farebox decreases over time
- Day analysis
  - Likely that certain days exhibit more revenue than others

Conclusion

- A hybrid model achieves
  - Full coverage of buses
  - Targeted coverage of revenue
  - Minimized downtime
  - Minimized service delays
  - Minimized cost
- Intangibles
  - Operator confidence
  - Public confidence

Thank you

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