

Full of Energy Today? How to Get the Most from Your Energy Budget

Daniel Lee AICP, LEED-AP BD+C

*Washington Metropolitan Area
Transit Authority,*

Sustainability Analyst

Washington, DC



Presentation Agenda

1

Metro Overview

2

Audit Approach/Outcomes

3

Energy Monitoring Progress

4

Conclusions and Takeaways



Metro at a Glance



Service Area:
1,500 square miles
3.9 million population

Metrorail


- 91 stations
- 117 track miles
- ~650,000 daily trips

Metrobus

- >11,000 stops
- 307 routes
- ~450,000 daily trips

MetroAccess

- ~7,000 daily trips

- 
- Largest single user electrical user in region after the federal government
 - FY18 energy budget of \$120 million
 - 550 utility accounts/delivery points
 - 850,000,000 kWh annually



Energy Audit Approach/Outcomes



Facilities Assessment

Levels	1 - Poor	2 - Average	3 - Good	4 - High Performance	5 - Optimized
Building Envelope	Poor Envelope Performance & Condition	Average Envelope Performance / Good Condition	Envelope Retrofit to Good Performance	High Performance Façade Elements	Optimized Façade
Lighting Fixtures	T-12 / HPS / MH Fixtures	1st Gen T-8 Fixtures	3rd Gen T-8s or T-5 Fixtures	Increasing use of LEDs	Widespread use of LEDs
Boilers	Oversized, poor efficiency	Oversized, avg. efficiency	Right-sized, code efficiency	Right-sized, high efficiency	Right-sized, high efficiency
HVAC Equipment	Poor Efficiency	Avg. Efficiency	Current Code Efficiency	High Efficiency	Optimized Low Energy Delivery Systems
HVAC Delivery System	Constant Air Volume System	VAV - Basic Zoning	VAV - Increased zoning	VAV - Optimized zoning	Optimized Low Energy Delivery Systems
Large Motors / Drivers	Standard Efficiency	High Efficiency	High Efficiency Motors, VFDs	Hi-Eff. Right sized motors with VFDs	Hi-Eff. Right sized motors with VFDs
Lighting Controls	None	Limited	Occ. & Timers, limited daylight	Full control some DDC Integration	Full control and DDC integration
HVAC Programming	None	Limited	Std programming - non energy optimized	Std programming - energy optimized	Optimized programming
HVAC Controls	None / Pneumatic	Basic DDC / No Monitoring	DDC / Local Monitoring	DDC / Central Monitoring	DDC / Realtime Monitoring
HVAC Operation	No tuning / Cx	Infrequent tuning / min Cx	Annual tuning / 10yr Retro Cx	Monthly tuning / 5yr Retro Cx	Weekly / Daily tuning 5yr Retro Cx

Branch Avenue

- Assess technology to re-use excess braking - battery storage and inverters
- Address service expansion and improve traction power distribution system performance



- Impacts of utility charges associated with electric buses
- Fleet and route infrastructure e.g. traffic signal priority and dedicated bus lanes

Supporting Business Processes

- Business/Technology opportunities
 - Update specifications e.g. Standardizing controls systems and responding to rapidly evolving lighting technology
 - Linking lighting, heating and cooling (Maintenance, Management, and Rehabilitation)
 - Job descriptions – skills for modern technology
 - Democratize the data



Energy Monitoring Progress

Compressed Natural Gas Totals

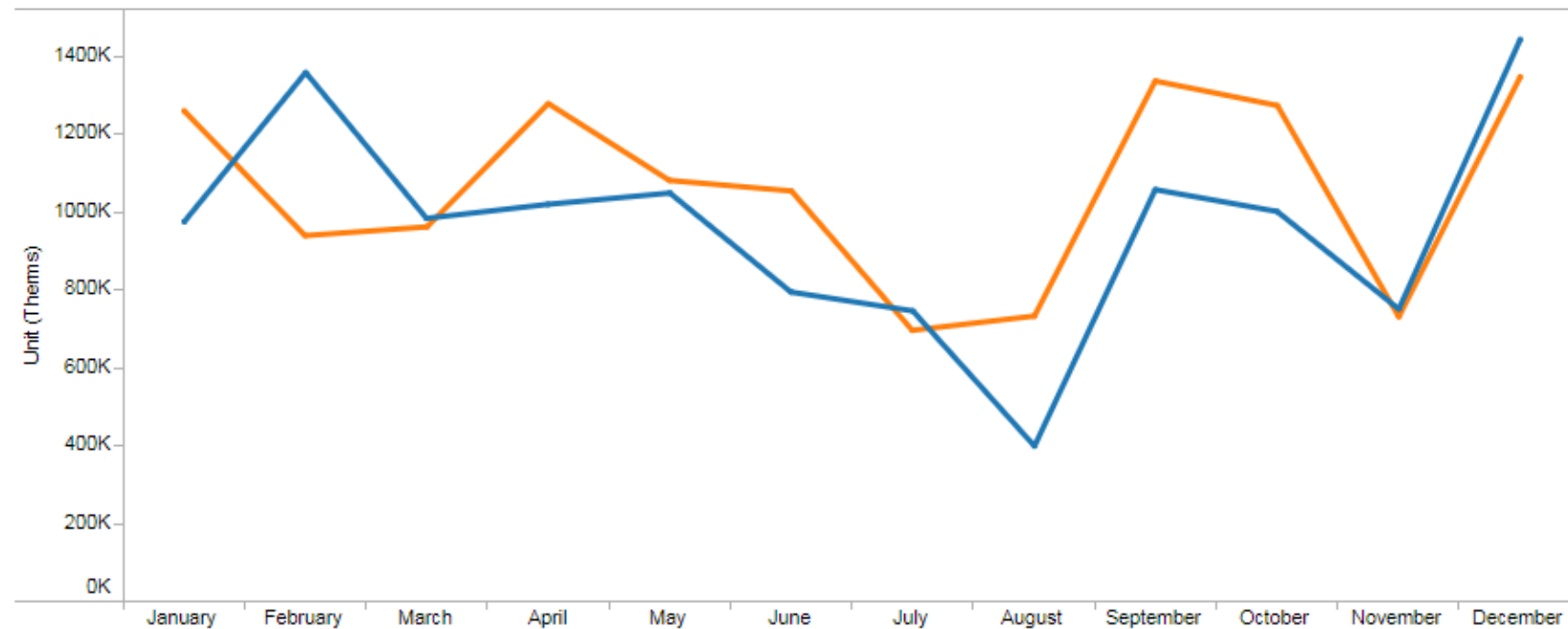
Bill Date

Location

(All)

Metric Selector (CNG)

Unit (Therms)



CNG Invoice Data

Account #	Location	Servie City1	Service State1	Service Zip1	Service Addr..	Bill Date	Invoice Number	
172977514	Bladensburg Depot	Washington	DC	20018	2251 26th St NE	12/6/2013 12:00:00 AM	172977514-201312	328,022
						1/8/2014 12:00:00 AM	172977514-201401	339,306

"Without data you're just another person with an opinion."

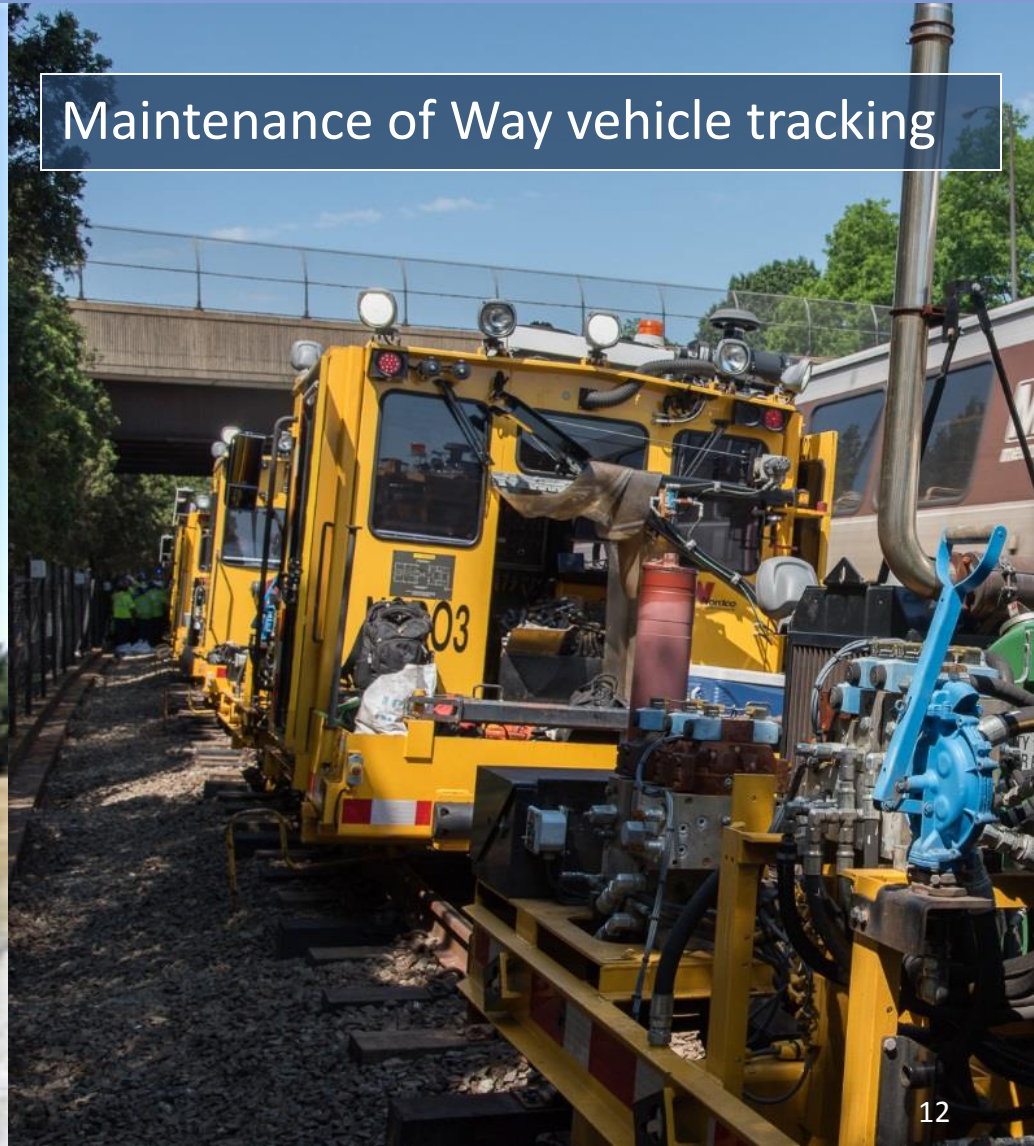
- W. Edwards Deming

12/6/2014 12:00:00 AM	172977514-201412	345,373
1/8/2015 12:00:00 AM	172977514-201501	344,072
2/7/2015 12:00:00 AM	172977514-201502	318,499

Tracking of Lab Projects



Solar temporary lighting



Maintenance of Way vehicle tracking

Conclusions and Takeaways

- By managing your utilities and associated data you manage assets and improve efficiency
- An audit as an objective project analysis before performance contracting
- Managing the transition - pilot project to full rollout



Thank you!

Daniel Lee, AICP, LEED-AP BD+C
WMATA - Office of Sustainability

dalee1@wmata.com

www.wmata.com/initiatives/sustainability