Legistar File
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Office Of Inspector General
“Is LA Metro Ready for Climate Change?”

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Inspector General

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Executive Management Committee

Los Angeles County Metropolitan Transportation Authority

Metro

Rail Vulnerabilities and Adaptations

Rail expands with high heat temperatures

(1) Sun Kink

(2) Cupping

(3) Pull-Apart

A. Impacts

Trained staff walk the track, ride on high-rail vehicle and manually/visually check for anomalies in the rail

1. Sun Kink (longitudinal displacement in the track alignment)
2. Cupping (a lack of ballast rock support around the sides of the ties)
3. Pull-Apart (failed and separated at bolted or welded joints)

B. Mitigations

1. Track Sensor or Temperature Lasers
2. Track Weather Stations

Overhead Catenary System (OCS) Heat Impacts

A. Impacts

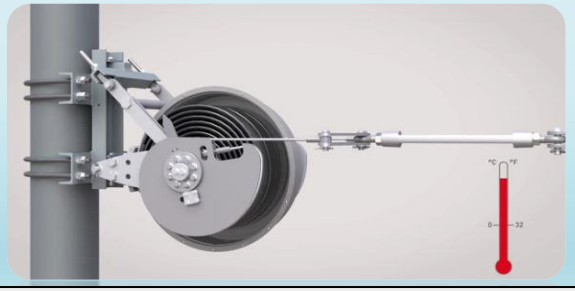
1. **Existing Weight Stack** (4) is used to reduce and eliminate sagging of catenary lines
   A. Wires fraying & broke due to incorrect pulley design. Result weights fell to the ground.
   B. Manual inspections on hot summer days, looking for sagging catenary lines
   C. Sagging catenary lines oscillate, as pantograph hook (5) passes causing entanglement with the wires

(4) Existing Weight Stack Tensioning System

B. Mitigations

1. **Spring Stack Tension System** (6) prevents sagging & eliminates inspections
2. **Pantograph Inspection System** trackside & determines signs of wear or cracks
3. **On-board roof mounted OCS/trolley wire inspection system**, performs real time analysis of the OCS to alert ROC of power system **conditions before failure.**

(5) Pantograph Entanglement with OCS Wires

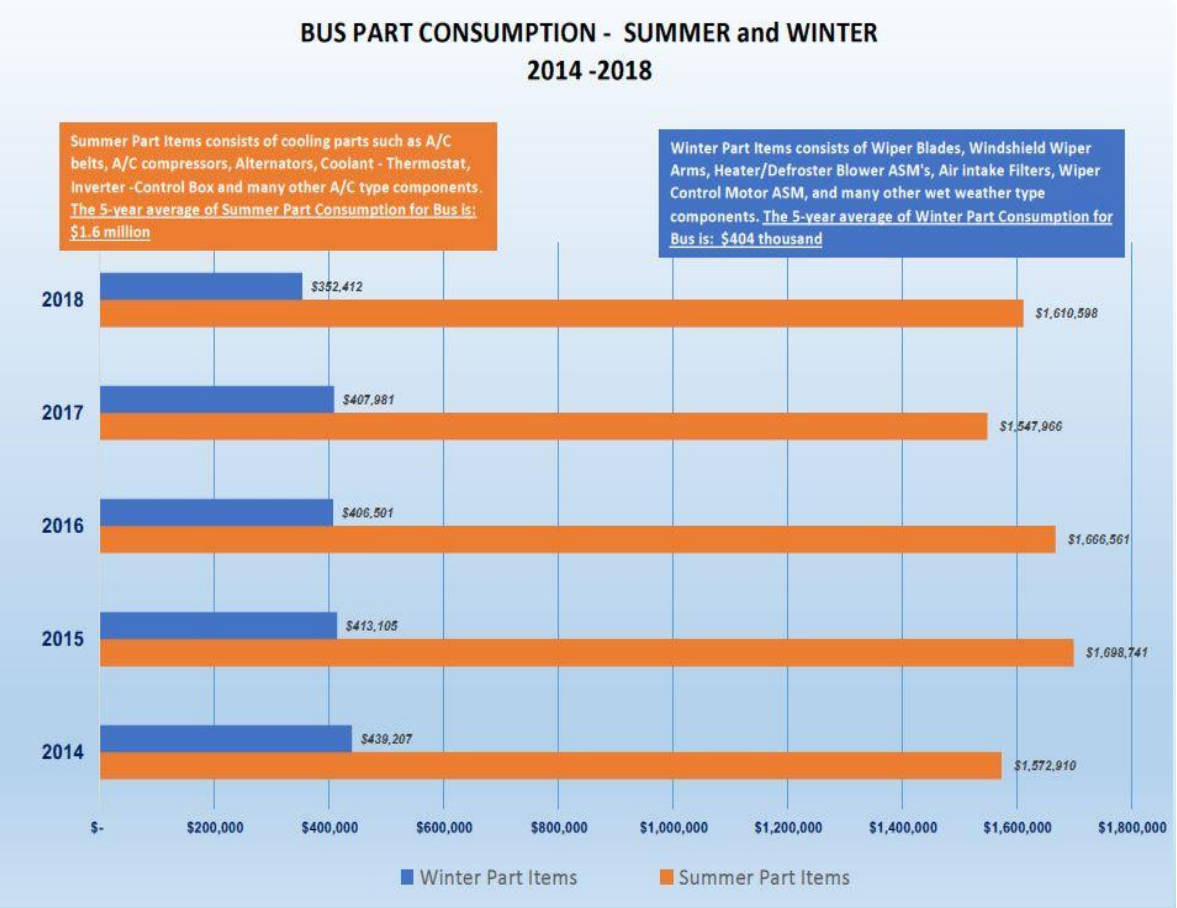


(6) Proposed Spring Stack Tensioning System

Bus Vulnerabilities To Heat

A. Impacts

1. Buses break down more summer, 10% decrease in available buses
2. Bus equipment has a higher failure in summer resulting in unscheduled repairs
3. Current Bus Part Consumption $1.6 Million in summer vs. $404 thousand for winter
4. Maintenance costs could significantly increase over extended summer, greater temperatures



B. Mitigations

1. Plan for increased maintenance
2. Pre-Summer Operations Summits
3. Parts and spares inventory readiness

C. Electric Bus

1. LA Metro Comprehensive Plan states zero emission vehicles by 2030
2. Service test failed for first generation electric buses
3. Metro is waiting for next generation to be developed

Benchmarks of Other Transit Agencies

Other Mitigations:
Nationally

A. Las Vegas, Nevada

1. Multiple Chill Stations for patrons waiting for bus
2. Hand out complementary water bottles
3. Solar powered bus shelters with LED lighting
4. Bus tires filled with pure nitrogen (exhibit less pressure change)

B. Phoenix, Arizona

1. Additional second AC on the bus roof
2. Electric engine cooling fan system on buses
3. Non-metalic shade canopies on light rail platforms
4. Solar powered cool air ventilation system at platform, button controlled by passengers
5. Solar reflective window tint and solar reflective paint on the train bodies
6. Two over-sized AC units on each light rail vehicle
7. Partner with local refrigeration school and provide custom training programs

Benchmarks of Other Transit Agencies

Other Mitigations:
Globally

A. Hong Kong
Regenerative braking technology that pushes energy back into the overhead catenary system to be used by other trains

B. Melbourne, Australia
Installed electronic monitoring sensors in rail tracks to monitor real-time rail track temperature (7)

C. London
Installed remote automated weather-stations (8) and thousands of track-side probes to monitor the local trackside temperatures and conditions

(7) Rail Track Temperature Monitoring Sensor

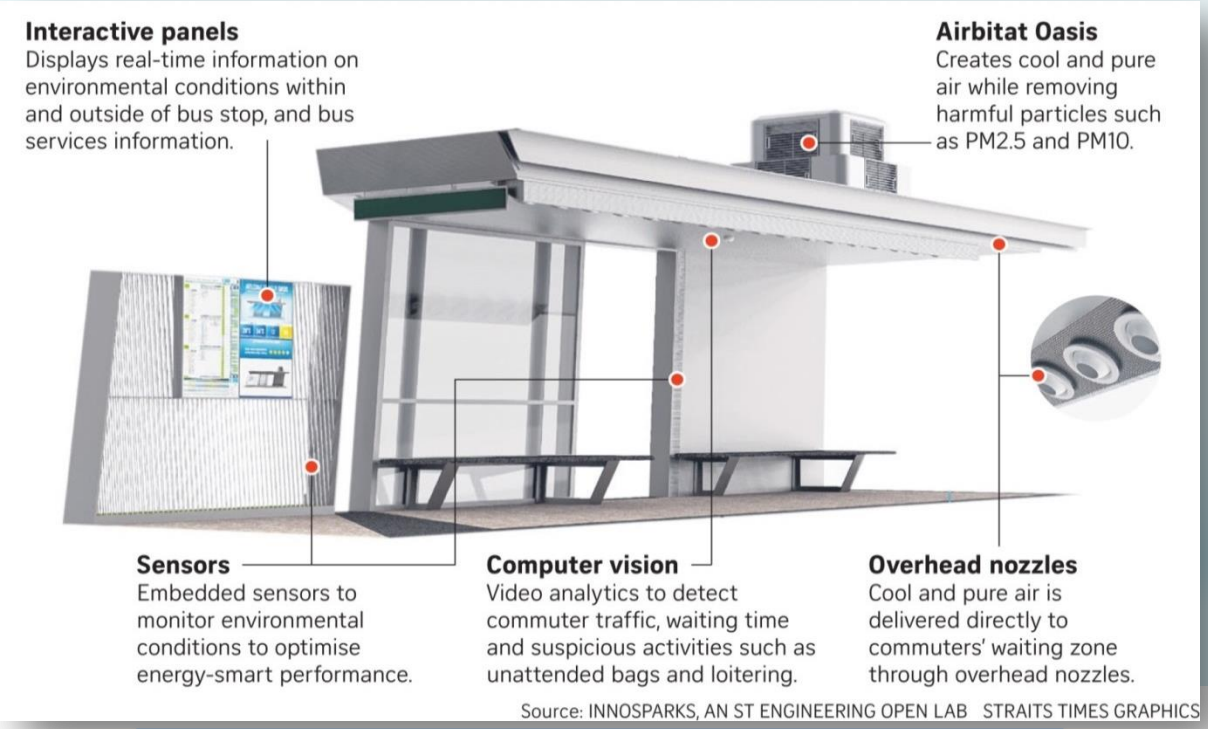
(8) Remote Automated Weather Station

Benchmark of Other Transit Agencies

Other Mitigations:
<u>Globally</u>

D. Singapore

1. Smart bus-stop equipped with the Airbitat Oasis ventilation system
2. Electric fans installed at bus stops



(9) Bus stop with Airbitat Oasis Ventilation System

(10) Electric fans at bus stop

Summary of Recommendations for LA Metro

Recommendations for Rail

1. Spring stack tension system
2. Solar reflective paint
3. Track sensors to immediately measure rail temperatures
4. Remote automated weather-stations and track-side probes to monitor trackside temperatures & conditions

Recommendations for Rail Operation Control

1. ROC to receive “real time” weather information from automated weather-station
2. Establish a coordinated Severe Weather plan
3. Establish “baseline” Preventive Maintenance for servicing and testing emergency generators

Recommendations for Bus

1. Add bus shelters with shade canopy and side ventilation louvers
2. Add dome top bus shelters featuring solar panels and LED lighting
3. Solar-powered ventilation system with overhead nozzles for cooling
4. Solar reflective paint, window tint and special films on buses
5. Purchase buses with electric engine cooling fan system

Summary of Recommendations for LA Metro

Other Key Recommendations

1. Utilize CAAP report to further analyze L A Metro's adaptation to climate change
2. Elevate the sustainable and pro-green comments and suggestions made by the environmental ECSD engineers. Environmental sustainability features should not be dismissed and eliminated as luxury items
3. ECSD should advise on climate impacts to the L A Metro system and coordinate a unified response to climate change
4. Factor climate change impacts into the State of Good Repair schedule
5. Finalize the Emergency Management Plan as it relates to system heat impacts
6. Make improvements in projects directed at climate change resiliency part of the agency performance goals
7. Consider environmental and sustainability considerations for every major project and procurement