Work Session:
Clean Energy Meets Green Transportation
Panel B
March 16, 2021

SMART CITIES, SMART FLEETS, AND GREEN COMMUNITY MOBILITY:

- FLEET ELECTRIFICATION AND EVSE DESIGN
- NEIGHBORHOOD E-MOBILITY HUBS
- TRANSIT ELECTRIFICATION AND PARK AND RIDE OPTIMIZATION

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1. FLEET ELECTRIFICATION AND EVSE DESIGN
FLEET INFRASTRUCTURE PLANNING PROCESS

Fleet Analysis

Energy Needs Assessment

Charging Site Evaluation

Charging Strategies

Fleet Electrification & EVSE Implementation Plan

- Prioritization and project implementation phasing
- Funding considerations
- Policy considerations
Planning Charging infrastructure

- Hours to Charge 60 kWh Battery
  - 1.80 hours
  - 3.57 hours
  - 6.25 hours

- Table showing charging availability by week and day:
  - Week 0:
    - Monday: ✅
    - Tuesday: ✅
    - Wednesday: ✅
    - Thursday: ✅
    - Friday: ✅
    - Saturday: ✅
  - Week 1:
    - Monday: ✅
    - Tuesday: ✅
    - Wednesday: ✅
    - Thursday: ✅
    - Friday: ✅
    - Saturday: ✅
  - Week 2:
    - Monday: ✅
    - Tuesday: ✅
    - Wednesday: ✅
    - Thursday: ✅
    - Friday: ✅
    - Saturday: ✅
  - Week 3:
    - Monday: ✅
    - Tuesday: ✅
    - Wednesday: ✅
    - Thursday: ✅
    - Friday: ✅
    - Saturday: ✅
  - Week 4:
    - Monday: ✅
    - Tuesday: ✅
    - Wednesday: ✅
    - Thursday: ✅
    - Friday: ✅
    - Saturday: ✅
  - Week 5:
    - Monday: ✅
    - Tuesday: ✅
    - Wednesday: ✅
    - Thursday: ✅
    - Friday: ✅
    - Saturday: ✅

- Legend:
  - 9.6 kVA Charger
  - 16.8 kVA Charger
  - 33.36 kVA Charger
  - Unused Charging time
  - Vehicles in Use
<table>
<thead>
<tr>
<th>Charging Strategy</th>
<th>Dedicated L1 &amp; L2 chargers</th>
<th>Dedicated L2 chargers with load management</th>
<th>Shared L2 chargers</th>
<th>Shared DCFC</th>
<th>Mobile charging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenience and simplicity</td>
<td>🟢</td>
<td>🟢</td>
<td>🟥</td>
<td>🟥</td>
<td>🟢</td>
</tr>
<tr>
<td>Capacity for future fleet expansion</td>
<td>🟢</td>
<td>🟢</td>
<td>-</td>
<td>🟥</td>
<td>🟢</td>
</tr>
<tr>
<td>Reduces peak demand and resulting service upgrades</td>
<td>🟥</td>
<td>🟢</td>
<td>🟢</td>
<td>🟢</td>
<td>N/A</td>
</tr>
<tr>
<td>Costs for hardware purchase, installation, and load upgrades</td>
<td>🟥</td>
<td>🟥</td>
<td>🟢</td>
<td>🟢</td>
<td>🟢</td>
</tr>
<tr>
<td>Requires active parking/charging management</td>
<td>🟢</td>
<td>🟢</td>
<td>🟥</td>
<td>🟥</td>
<td>N/A</td>
</tr>
<tr>
<td>Risk of vehicles not being charged</td>
<td>🟢</td>
<td>🟢</td>
<td>🟥</td>
<td>🟥</td>
<td>🟢</td>
</tr>
<tr>
<td>Flexibility for different vehicles and users</td>
<td>🟢</td>
<td>🟢</td>
<td>🟥</td>
<td>🟥</td>
<td>🟢</td>
</tr>
</tbody>
</table>

Charging strategy ranking from excellent to poor for fleet applications - 🟢, 🟢, 🟥, 🟥, 🟥, 🟥.
FLEET CHARGING TECHNOLOGIES

Today’s chargers

Tomorrow’s chargers

Inductive charging

Automated charging

Robotic charging
NEIGHBORHOOD E-MOBILITY HUBS
E-MOBILITY HUB COMPONENTS

EV Charging:

1. **High power chargers** for microtransit, ride hail vehicles and possibly electric buses

2. **Level 2 chargers** for car share and possibly private EVs

3. **Level 1 charging docks** for micromobility: e-bikes and scooters

SOURCE: SWIFTMILE & EVGO
3

TRANSIT ELECTRIFICATION AND PARK AND RIDE OPTIMIZATION
TRANSIT ELECTRIFICATION

On-route/Opportunity Charging

Benefits:
- Less electrical infrastructure at bus depots
- Lighter, less expensive buses
- Fewer chargers shared by more buses

Inductive charging

Automated Pantograph

SOURCES: MASS TRANSIT & NGT NEWS
Scenario 1
Surface Parking Lot

<table>
<thead>
<tr>
<th>Parking Spaces</th>
<th></th>
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<tbody>
<tr>
<td>Total Number of Spaces</td>
<td>305</td>
</tr>
<tr>
<td># of EV Charging Stations</td>
<td>19</td>
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</tbody>
</table>

Cost Breakdown

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Surface Parking Lot</td>
<td>$2,497,000.00</td>
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<tr>
<td>Amenities</td>
<td>$704,000.00</td>
</tr>
<tr>
<td>Additional Cost To Upgrade to Electric Bus Charging Infrastructure</td>
<td>$475,000.00</td>
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<tr>
<td>Traffic Control and Mobilization (20%)</td>
<td>$735,200.00</td>
</tr>
<tr>
<td>Contingency (25%)</td>
<td>$919,000.00</td>
</tr>
<tr>
<td>Total</td>
<td>$5,330,200.00</td>
</tr>
</tbody>
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THANK YOU