ACEforward

Altamont DMU Study
March 2017
Agenda

Altamont DMU
- Alignment
- Operations
- Rolling Stock
- Capital Costs

Key Decision Points

Next Steps
Altamont DMU – Regional Connections

- Pittsburg / Bay Point
- Railroad Ave.
- Hillcrest Ave.
- ACE Station
- DMU (proposed)
- DMU Station (proposed)
- DMU (extension)
- DMU Station (extension)
- eBART
- Potential eBART Extension to Tracy

- BART Network
- Dublin / Pleasanton
- Isabel
- Greenville Rd.
- Vasco Road
- West Tracy
- Tracy
- Lathrop / Manteca
- Paradise
- Banta
- Stockton
- Downtown
- Tracy
- Hansen
- ACE Services
- Hillcrest Ave.
- Pittsburg / Bay Point
- Railroad Ave.
- DMU Station (proposed)
- DMU Station (extension)
- eBART
Altamont DMU
BART to West Tracy

Dublin - Pleasanton
Isabel
Greenville
West Tracy

Legend
- Existing ACE Route
- Existing ACE Station
- BART Connecting Station
- Potential ACE Connecting Station
- Potential DMU Station
- BART
- DMU
Altamont DMU Travel Times

Altamont DMU during Peak

- West Tracy to BART: 42 minutes
- Greenville to BART: 14.3 minutes
- Isabel to BART: 5.6 minutes
Travel Time by Segment

End-to-End Travel Time: 42 mins
(with Greenville ACE/DMU transfer)
- 1 minute dwell at Greenville and Isabel Stations
Service tied to BART Schedule

- Weekdays: half-hour service meeting every other BART train
- Weekends: hourly service meeting every 3rd BART train
Existing and Proposed Connections

Existing Shuttle Connections

Proposed DMU Connection

Existing ACE Service

Legend:
- Existing Route
- Public Grade Crossing
- Existing Station
- BART Connecting Station
- BART Alignment
- Existing Bus Connection
- DMU

map details including existing shuttle connections, proposed DMU connection, and existing ACE service.
Current Condition

Current Condition during Peak*

**West Tracy to BART: DMU 42 min**
- By Car:
  - AM Peak, traffic 35 – 60 min (7:00 am)
  - PM Peak, traffic 35 – 60 min (5:20 pm)
- By ACE and Shuttle (Tracy to BART):
  - AM Peak, 55 min
  - PM Peak, 74 min

**Greenville to BART: DMU 14.3 min**
- By Car:
  - AM Peak, traffic 16 – 22 min (7:20 am)
  - PM Peak, traffic 20 – 40 min (5:20 pm)
- By ACE (Vasco Road) and Shuttle
  - AM Peak, 26 min
  - PM Peak, 44 min

**Isabel to BART: DMU 5.6 min**
- By Car:
  - AM Peak, traffic 10-14 min (7:20 am)
  - PM Peak, traffic 9 -16 min (5:10 pm)

* - Travel times current from Google maps as of 2.28.2017
Why DMU?

Required min. clearance over non-freight railroads: 19 ft. (Caltrans Highway Design Manual)

Approx. 16½ ft.

Existing ACE rolling stock (locomotive + passenger cars)

VERTICAL CLEARANCE APPROX. 16½–17½ FT. (TYP.)
DMU Meets Vertical Clearance Requirements

Approx. 15½ ft. min. clearance

Approx. 16½ ft.

VERTICAL CLEARANCE APPROX. 16½–17½ FT. (TYP.)

BART height is approx. 14 ft.

Diesel Multiple Unit

* Not to scale
<table>
<thead>
<tr>
<th></th>
<th>Automobile</th>
<th>DMU (FLIRT)</th>
<th>Existing ACE Locomotive</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx per Passenger Trip (g)</td>
<td>4.8</td>
<td>1.1</td>
<td>7.9</td>
</tr>
<tr>
<td>PM per Passenger Trip (g)</td>
<td>1.96</td>
<td>0.03</td>
<td>0.12</td>
</tr>
<tr>
<td>CO2 per Passenger Trip (g)</td>
<td>8,047</td>
<td>1,355</td>
<td>3,874</td>
</tr>
</tbody>
</table>

**Estimated Annual DMU Emission Reduction vs. ACE:**
- 3,435,000 NOx g
- 44,000 PM g
- 1,260,000,000 CO2 g
## Fuel Savings

<table>
<thead>
<tr>
<th></th>
<th>Dublin - Pleasanton</th>
<th>Isabel</th>
<th>Greenville</th>
<th>West Tracy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel per Passenger-Trip (gal)</strong></td>
<td>0.9</td>
<td>0.1</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td><strong>Annual Fuel (gal)</strong></td>
<td>451,667</td>
<td>66,736</td>
<td>190,820</td>
<td></td>
</tr>
</tbody>
</table>

**Estimated Annual DMU Fuel Savings vs. ACE:**

- 124,084 Gallons
- $215,000 - $242,000 fuel costs*

*Fuel costs based on estimated SJRRC / Herzog fuel costs*
## DMU Preliminary Capital Cost Summary Table

<table>
<thead>
<tr>
<th>Section</th>
<th>Segment Length (miles)</th>
<th>Project Cost (millions)</th>
<th>Project Cost Per Mile (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dublin/Pleasanton DMU Station</td>
<td>-</td>
<td>$15.6</td>
<td>-</td>
</tr>
<tr>
<td>Dublin/Pleasanton to Isabel</td>
<td>5.5</td>
<td>$425.4</td>
<td>$78.1</td>
</tr>
<tr>
<td>Isabel DMU Station</td>
<td>-</td>
<td>$48.0</td>
<td>-</td>
</tr>
<tr>
<td>Isabel to Greenville</td>
<td>5.1</td>
<td>$498.3</td>
<td>$98.1*</td>
</tr>
<tr>
<td>Greenville DMU Station</td>
<td>-</td>
<td>$36.1</td>
<td>-</td>
</tr>
<tr>
<td>Greenville to West Tracy</td>
<td>15.3</td>
<td>$213.9</td>
<td>$14.0</td>
</tr>
<tr>
<td>West Tracy DMU Station</td>
<td>-</td>
<td>$16.8</td>
<td>-</td>
</tr>
<tr>
<td>West Tracy Operations and Maintenance Facility</td>
<td>-</td>
<td>$84.7</td>
<td>-</td>
</tr>
<tr>
<td>DMU Vehicles</td>
<td>-</td>
<td>$52.5</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25.81</strong></td>
<td><strong>$1,391</strong></td>
<td><strong>$53.4</strong></td>
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</tbody>
</table>

Note: UPRR fees not included.

* Depends on BART extension
**Estimated Preliminary Capital Costs: Phase 1 (Dublin / Pleasanton Option)**

<table>
<thead>
<tr>
<th>Corridor Segment</th>
<th>Estimated Cost (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altamont DMU</td>
<td>$987.3</td>
</tr>
<tr>
<td>BART Dublin/Pleasanton to Greenville (includes BART station improvements and</td>
<td></td>
</tr>
<tr>
<td>Isabel DMU Station)</td>
<td></td>
</tr>
<tr>
<td>Greenville Station</td>
<td>$36.1</td>
</tr>
<tr>
<td>Operations, Maintenance And Storage Facility (temporary)</td>
<td>$60.0</td>
</tr>
<tr>
<td>DMU Consists</td>
<td>$52.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$1,136</strong></td>
</tr>
</tbody>
</table>
### Estimated Preliminary Capital Costs: Phase 1 (Isabel Option)

<table>
<thead>
<tr>
<th>Corridor Segment</th>
<th>Estimated Cost (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altamont DMU</td>
<td>$546.3</td>
</tr>
<tr>
<td>BART Isabel to Greenville (includes BART station improvements)</td>
<td>$36.1</td>
</tr>
<tr>
<td>Greenville Station</td>
<td>$60.0</td>
</tr>
<tr>
<td>Operations, Maintenance And Storage Facility</td>
<td>$52.5</td>
</tr>
<tr>
<td>DMU Consists</td>
<td>$695</td>
</tr>
</tbody>
</table>

**Total** $695
Estimated Preliminary Capital Costs: Phase 2

Dublin - Pleasanton Isabel Greenville West Tracy

<table>
<thead>
<tr>
<th>Corridor Segment</th>
<th>Estimated Cost (millions)</th>
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</thead>
<tbody>
<tr>
<td>Altamont DMU</td>
<td>$199.7</td>
</tr>
<tr>
<td>Greenville To West Tracy</td>
<td></td>
</tr>
<tr>
<td>West Tracy Station</td>
<td>$16.8</td>
</tr>
<tr>
<td>Tunnel Rehabilitation</td>
<td>$14.2</td>
</tr>
<tr>
<td>Operations, Maintenance And Storage Facility (permanent)</td>
<td>$84.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$315</strong></td>
</tr>
</tbody>
</table>

Note: UPRR fees not included.
## Preliminary Capital Costs

<table>
<thead>
<tr>
<th>Total Project</th>
<th>Preliminary Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dublin/Pleasanton To Tracy</td>
<td>$1.4 billion</td>
</tr>
<tr>
<td>Isabel To Tracy</td>
<td>$950 million</td>
</tr>
</tbody>
</table>

Note: UPRR fees not included.

- Can complete in phases with Phase 1 to Isabel/Greenville (adds $60 million)
- Cost per Rider: To Be Determined
- Cost Benefit: To Be Determined
- Cost dependent on decisions made
  - Assumes Greenville Station cross platform transfer and share track with UP
  - Capital Cost will be refined as design progresses
Segment Detail: Caltrans I-580 Corridor

Dublin - Pleasanton to Greenville

Distance: 11.7 miles

Right of way: Median of I-580

Alignment: Single track with trains passing at station crossings

Average Speed: 41 mph

Notes:
• Possible BART extension (Isabel)
• Overpass clearances for rolling stock
BART/DMU Station Configuration

Dublin - Pleasanton to Greenville

Dublin - Pleasanton Isabel Greenville West Tracy
**Decision Area: Caltrans I-580 ROW**

**Dublin - Pleasanton to Greenville**

- **Dublin - Pleasanton**
- Isabel
- Greenville
- West Tracy

**Decision:**
Meet BART at Dublin – Pleasanton Station or Isabel?

**Factors:**
DMU can use I-580 right of way to meet BART at either location
Segment Detail: Alameda County Corridor

Greenville to Alameda County Line, Alameda County owned

**Distance:** <14.0 miles

**Right of way:** Former UPRR right of way, owned by Alameda County

**Alignment:** Mainly single track with added long siding, tunnel work at Altamont Pass, and grade separation

**Average Speed:** 32 mph (Greenville – West Tracy)
Decision Area: Alameda County ROW

Structured Parking

Greenville Station

Greenville Alternative
Decision Area: Alameda County ROW

**Decisions:**
- Include Greenville Station
- Implement Greenville Alternative

**Factors:**
- Ridership – To Be Determined
- Time savings – 2.2 minutes (39.3 run time)
- Phased implementation requires Greenville Station
- Not including Greenville has implications (ridership)

**Next Steps:**
Ridership for options, Committee/stakeholders to determine preferred approach
Altamont Pass Road Grade Separation

NOT FOR CONSTRUCTION
Existing Tunnel

Dublin - Pleasanton  Isabel  Greenville  West Tracy
Segment Detail: Owens-Illinois UPRR Lead

**Distance**: <1 mile

**Right of way**: Current UPRR freight right of way

**Alignment**: Shared right of way corridor with UPRR freight

**Average Speed**: Dependent on alignment and track improvements

**Notes**: Negotiations with UPRR over sharing tracks or sharing right of way impacts rolling stock selection. Musco Olive Plant appears to have one freight movement a month.
Decision Area: Owens-Illinois UPRR Lead

Sharing UPRR Right of Way

Dublin - Pleasanton  Isabel  Greenville  West Tracy
**Decision Area: Owens-Illinois UPRR Lead**

**Decision:**
Should future service run adjacent or share track with UPRR?

**Factors:**
- Sharing track requires vehicle to be FRA compliant or waiver capable
- Rolling stock, capital cost implications
- Negotiations with UPRR required for either option
- New Bridge over aqueduct for shared corridor
- Station moves to maintenance facility site for shared corridor option

**Next Steps:** Further design on shared corridor option
Rolling Stock Decision Considerations

**Cost Factors:**
- Infrastructure requirements (catenary)
- Cost per seat

**Compliance Factors:**
- FRA regulations and waiver requirements
- ‘Buy America’ and federal funding requirements

**Seating Capacity Factors:**
- Ridership
- Vehicle and service operations
- Cost impacts

**Performance Factors:**
- Travel time
- Environmental impact
- Cap and trade applications
Rolling Stock Alternatives

- **Stadler GTW 2/6 (DMU)**
- **Stadler FLIRT (DMU)**
- **Kawasaki M-8 (EMU)**
- **Bombardier Talent Class 93 (DMU)**
## Rolling Stock Comparison*

<table>
<thead>
<tr>
<th></th>
<th>Stadler GTW 2/6 (DMU)</th>
<th>Stadler FLIRT (DMU)</th>
<th>Kawasaki M-8 (EMU)</th>
<th>Bombardier Talent Class 93 (DMU)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FRA Compliant</strong></td>
<td></td>
<td></td>
<td></td>
<td>(with waiver)</td>
</tr>
<tr>
<td><strong>Buy America Compliant</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compatible Clearance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Top Speed</strong></td>
<td>75 mph</td>
<td>79 mph</td>
<td>100 mph</td>
<td>87 mph (tilt technology)</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>$16 million ($8 million)</td>
<td>$13 million</td>
<td>$8 million +$6 million per mile</td>
<td>$8 million</td>
</tr>
<tr>
<td><strong>Seated Capacity</strong></td>
<td>208 (104)***</td>
<td>224</td>
<td>212</td>
<td>164</td>
</tr>
<tr>
<td><strong>Standees (estimated)</strong></td>
<td>192 (96)***</td>
<td>254</td>
<td>230</td>
<td>160</td>
</tr>
<tr>
<td><strong>Total Capacity</strong></td>
<td>400***</td>
<td>478</td>
<td>442</td>
<td>324</td>
</tr>
<tr>
<td><strong>In Service</strong></td>
<td>Texas eBART</td>
<td>Texas***, Europe, Africa, and Central Asia</td>
<td>Connecticut New York</td>
<td>Norway</td>
</tr>
</tbody>
</table>

* - Other manufacturers exist, select sample presented above for major distinctions and decision points
** - Planned service late 2018
*** - Assumes double trainset
Next Steps

- Ridership
- Operations and Maintenance Cost
Altamont DMU Simulation

- Video