DISTRIBUTION SYSTEM UPGRADES IN DOWNTOWN EAST

Andy Dammel
OUTLINE

• High-Level Overview
  – New Buildings
  – Old Buildings
  – Substations
• Planning Philosophy
  – Service Policy
  – Reliability Issues
  – Cost Issues
• Final Design
  - Operating Drawings (Feeder Maps)
NEW BUILDINGS

• US BANK STADIUM
  - 8 to 12 MW
  - Primary Voltage Service
  - Three Feeders
  - Customer-Owned ATO Primary Switchgear

• WELLS FARGO TOWERS
  - Approx. 1 MW each
  - 20 Floors
  - Combination of Primary Service and Secondary
  - Customer Owned ATO Primary Switchgear

• OTHER PROJECTS
AERIAL VIEW OF DOWNTOWN.
LOOKING WEST
LOOKING EAST
• Fifth Street
  - 200 MW Firm Capacity
  - Indoor, Below Grade
  - Water-Cooled Transformers

• Elliot Park
  - 175 MW Firm Capacity
  - Across the Street
  - Outdoor Bus
FUTURE HOME OF ELP75
XY FEEDERS
EMS SCREEN

- Opening ELP51, place FST Well Pump Sw in Circulating Pump Sw to #2 position.
- Restoring ELP51, FST Sta Aux must be returned to normal.

(For M West Bank)
• $500 per foot for ductline/manholes
• $50 per foot for cable installed in ductline

• Due to congestion
• Limited access
• Restoration cost
• Environmental costs

• Moratorium after street resurfacing
TILE DUCTLINE SUPPORTED WITH STEEL BEAM
Reliable Feeder Design

Feeder 1
Section 1
Loading = 25%

Feeder 1
Section 2
Loading = 25%

Feeder 1
Section 3
Loading = 25%

Tie to Feeder #4

Key
○ Switch - Normally Open
× Switch - Normally Closed

Switch

Feeder Breaker
Feeder #1

Tie to Feeder #2

Tie to Feeder #3
FIRST ITERATION – TWO FEEDERS TO STADIUM
SECOND ITERATION – 3 FEEDERS TO STADIUM
NEW ELP75 FEEDER MAP

PRELIMINARY
FST78 FEEDER MAP
ELP64 FEEDER MAP
PAD SITE
## Tracking Spreadsheet

<table>
<thead>
<tr>
<th>ELP74</th>
<th>ELP64</th>
<th>ELP86</th>
<th>ELP63</th>
<th>Increase capacity by rerouting head end out of congested ductline</th>
<th>7000</th>
<th>7570</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELP82</td>
<td>ELP64</td>
<td>ELP86</td>
<td>ELP63</td>
<td>Unchanged, but tie to ELP 64 will be removed. Will need additional new head end tie, ELP 61? Probably 2016 project.</td>
<td>15100</td>
<td>15600</td>
</tr>
<tr>
<td>ELP86XY</td>
<td>ELP61</td>
<td>ELP63</td>
<td>Increase capacity of ELP 63 and 61 by relocating their head end cables to less congested ductlines.</td>
<td>15100</td>
<td>15600</td>
<td></td>
</tr>
<tr>
<td>This will in turn increase the capacity of ELP 66. Upgrade capacity of 66 feeder bay and add separate metering for 86X and 87Y.</td>
<td>15100</td>
<td>15600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FST77</td>
<td>ELP61</td>
<td>ELP64</td>
<td>ELP73</td>
<td>Extend to Wells Fargo Buildings</td>
<td>5300</td>
<td>5300</td>
</tr>
<tr>
<td>FST78</td>
<td>ELP86</td>
<td>No changes</td>
<td>3500</td>
<td>5430</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FST85</td>
<td>ELP72</td>
<td>No changes</td>
<td>3300</td>
<td>3920</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FST87</td>
<td>ELP61</td>
<td>ELP72</td>
<td>ELP71</td>
<td>ELP64</td>
<td>FST 87 will pick up one third of stadium load. LC N will be transferred to ELP 72</td>
<td>5200</td>
</tr>
<tr>
<td>FST88</td>
<td>FST85</td>
<td>ALD75</td>
<td>No changes</td>
<td>3500</td>
<td>3600</td>
<td></td>
</tr>
</tbody>
</table>

### Stadium Feeders

#### Wells Fargo Feeders

<table>
<thead>
<tr>
<th>Mitigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>New ELP 75 Feeder $330K for feeder bay $200K for pulling and splicing 2000 ft of cable</td>
</tr>
<tr>
<td>Upgrade ELP 86 to 1200 A capacity, separate metering for X and Y, $100K?</td>
</tr>
</tbody>
</table>

#### Extend FST 87 feeder to new stadium, transfer LC N south of stadium to ELP 62

### Load Additions

- New Stadium - 3 MVA to ELP 64X
- New Stadium - 3MVA to FST 87 - 1/3 Stad load
- New Stadium - 3 MVA to ELP 75 - 1/3 Stad load
- WF Tower 1 to ELP 61 - .5 MW assuming 1 MW per building, Split Bus
- WF Tower 2 to ELP 61 - .5 MW assuming 1 MW per building, Split Bus
- WF Tower 2 to FST 77 - .5 MW assuming 1 MW per building, Split Bus
- HCEC - ELP 73 - .5 MW new buildings in area
- HCEC - FST 77 - .5 MW for new buildings in area
- NRG Energy Center - ALD 75 1.5 MW for Stad cooling
- Ryan Co’s Tower - ELP61 1 MW
- Ryan Co’s Tower - ELP75 .5 MW
NETWORK BOUNDARIES