PSCo Transmission & Substations Wildfire Protection
Xcel Energy Service Territory
Xcel Energy at a Glance

- 4th largest utility in the United States
  - Largest in CO (PSCo)
- 8 State service territory (CO, MI, MN, NM, ND, SD, TX, WI)
- Electric revenue = $7.6 billion
- 3.3 M electric / 1.9M gas customers (1.7M in CO)
- Approximately 90,000 miles of electric lines
- Approximately $50 million vegetation management budget
From Generation to Your Home

When electricity leaves a power plant (1), its voltage is increased at a “step-up” substation (2). Next, the energy travels along a transmission line to the area where the power is needed (3). Once there, the voltage is decreased or “stepped-down,” at another substation (4), and a distribution power line (5) carries the electricity until it reaches a home or business (6).
Colorado Mountain Pine Beetle (MPB) Epidemic

Increased risk of:

- Tree-conductor contact, outage & fire ignition
- Wildfires through T&D right of way, damaging/destroying facilities
Quantify the Problem (Spatializing the data)

- Electric T&D Assets (Xcel Energy)
  - Beetle- Kill Aerial Survey Data (CSFS)
  - Species Distribution (USFS)
  - Property Ownership (BLM)
  - County Data (CDOT)
  - Roadless Areas (USFS)
  - Parcel information (County)
  - Slope data (ESRI)

Results:
170 miles of electric distribution, 32% on Fed lands
130 miles of electric transmission, 75% on Fed lands

Estimated worst case: 854 and 179 miles respectively
What is LiDAR?

- LiDAR stands for **Light Detection And Ranging**

- LiDAR quickly and accurately builds a three dimensional “point cloud” model of facility infrastructure, corridor terrain and adjacent vegetation.

- LiDAR data can provide physical location accuracies of ~15cm and distance between object accuracies of ~5cm. The data is geo-referenced and compatible with industry work environments such as GIS and PLS-CAD.
LiDAR & Imagery – One Pass

- GPS satellite Signal
- Inertial navigation & mapping system
  - On board computer & storage
- Digital Still Camera
  - Structure imagery
- 90° Digital Still Camera
  - Downward Ortho images
- Downward looking LiDAR
MPB Transmission Hazard Tree Identification & Wildfire Heat Protection
MPB Transmission-Hazard Tree Identification

Fall-In algorithm

Distance to wire
Hazard Tree Mitigation Totals
(2008-2012: 5th year of engagement)

Transmission:
$6.1M (~158,700 trees)

Distribution:
$7.6M (~64,500 trees)

No hazard tree ignitions
MPB Transmission- Wildfire Heat Protection
MPB Transmission - Wildfire Heat Protection

- Structure focus (~3,500 poles/structures)
  - Wood (60%)
  - Aluminum (16%)
  - Steel (24%)
- Determine heat tolerances
- Plots ground surveyed to quantify fuel load and crown fire potential
- Established strong correlation (82-87%) between ground survey data and LiDAR data (algorithmic association)
- Establish Triggers for mitigation:
  - Ground fuel load - 10 tons/acre
  - Crown closure - >40%
MPB Transmission - Wildfire Heat Protection
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Some additional factors considered:

- Predictive wildfire behavior by Wildfire Influence Zones (WIZ)
- Wildfire Susceptibility Index (WFSI)
- Merge with line criticality

- Prioritize higher risk lines/structures for mitigation
- Utilize LiDAR generated grid patterns for mitigation (higher risk structures AND all C1 and C2 line structures in forested areas)
Quantifying Cost of Prioritized Wildfire Protection Work

- High/very high risk structures in forested areas
- Wood poles on critical lines in grassland/light brush areas with high fire susceptibility
Other Options

- Bare Ground Herbicide
- Fire-Guard
- Technisoil
Next Steps

- Negotiations with federal land managers
  - MOU & Collection Agreement
  - Validation of fire science
- Negotiations with private property owners
- Can the wildfire protection work be capitalized?
  - At least capitalize off-ROW work?
- Manage public perception
Colorado Drought History

Fraction of Colorado in Drought
Based on 48 month SPI (SPI < -1)
(1890 - August 2012)

Note – current drought just “getting started”
Wildfire Trend - Western US
Substations Wildfire Protection

- Prioritization by Subs based on operational criticality
- Initial review with Google Earth/GeoDigital imagery
- Factors considered: buffer space, fuels- surface/crown, veg type

**MPB Area**

- Six substations of concern
- Work completed October 2012

**Statewide Expansion**

- 20 substations of concern
- Five prioritized and completed; 15 to be completed by Spring of 2013
- On-going protection requirements incorporated into annual maintenance plans