Pole Loading and Abandonment in Place

Joint Use Attachments

Presented by:

Tim Gasser

Project Manager, Wireless Co-Location

PowerPoint® slides prepared by:

Laura Kraft

Engineering Assistant, Communication Sitings & Services

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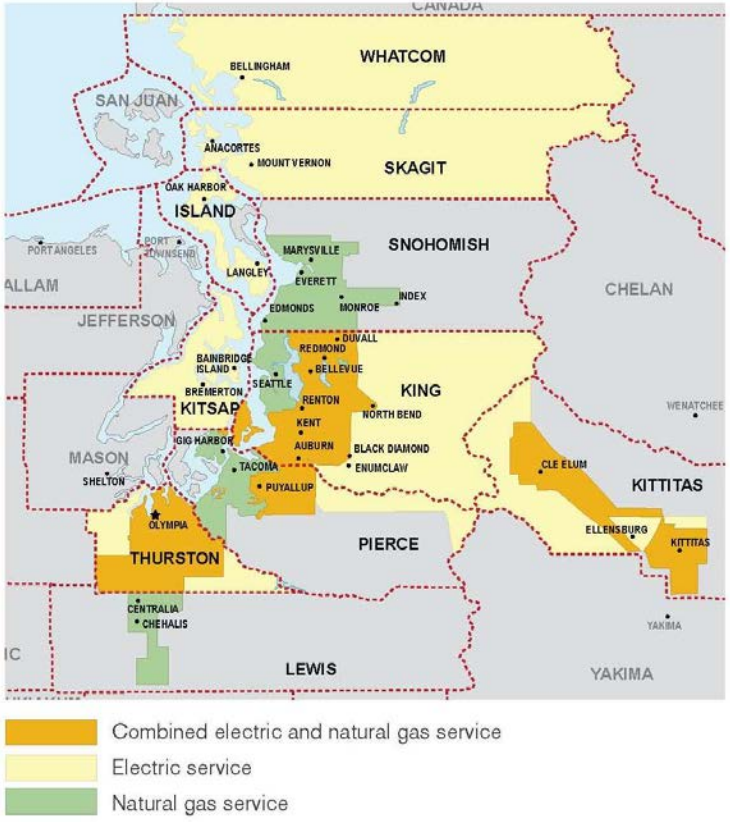
About Puget Sound Energy

- Washington state's oldest local energy company, providing electric and natural gas service to customers primarily in the vibrant Puget Sound area
- Customers
  - More than 1 million electric
  - More than 760,000 natural gas
- Service area:
  - 6,000+ square miles
- 325,000 poles
- 420,000 wireline attachments
- 400 wireless co-location sites
- Based in Bellevue, Wash., Puget Sound Energy (PSE) is the utility subsidiary of Puget Energy. More information is available at www.pse.com



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	Utility A	Utility B	Utility C	Utility D	Utility E	Utility F	Utility G	Utility H	Utility I	Utility J	Utility K	Utility L
Pole analysis for new attachments:												
Transmission	YES	YES	NO	YES	YES	YES	YES	YES	YES	N/A	YES	YES
Distribution	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	NO	YES
Every Pole or Sample/Percentage	Sample worst case	all poles		All Trans; Sample Dist worst case	percentage	all poles	all poles	all poles	all poles	all poles	Trans only	all poles
Cause of Failure:												
Overloading	YES	YES		YES			YES	YES		YES	YES	
Upgrade in Standards	YES	YES						YES			YES	YES
Percentage of Failure	3%	75%		90+%	N/A	N/A	5%	N/A	N/A	Was 65% now 12 – 18%	18-25%	85%
Abandonment Policy:												
Incentive type										X (1)		
Policing type		Annual Maint Inspect								X (2)		
None				Security bond	Letter of credit				Security bond			
Comments:			Attachee responsible for pole analysis				Identified having policy					

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Utility J – Incentive Type

(1) Info sharing leads attachees to remove instead of replace

(back)

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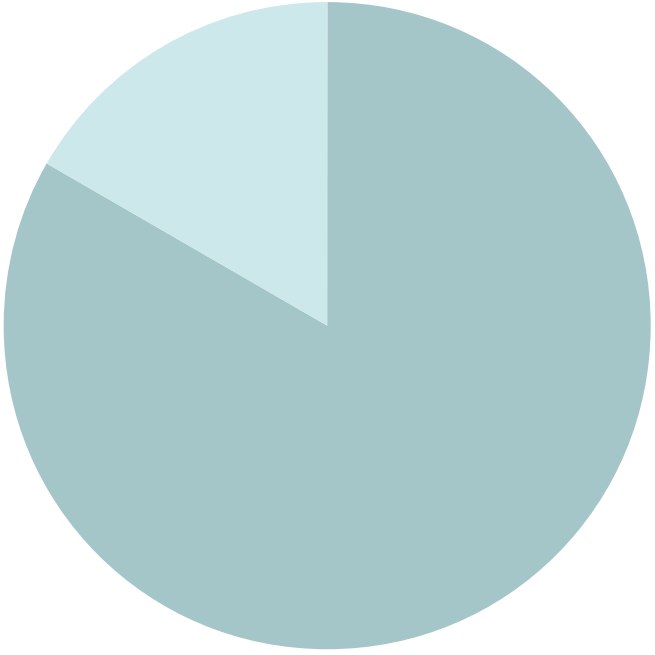
Utility J – Policing Type

(2) 90 day notice if found during inspection or owner removes

(back)

Survey

10/12 utilities perform analyses for new attachments



- Utilities that perform analyses for new attachments
- Utilities that do NOT perform analyses for new attachments (one utility does transmission only)

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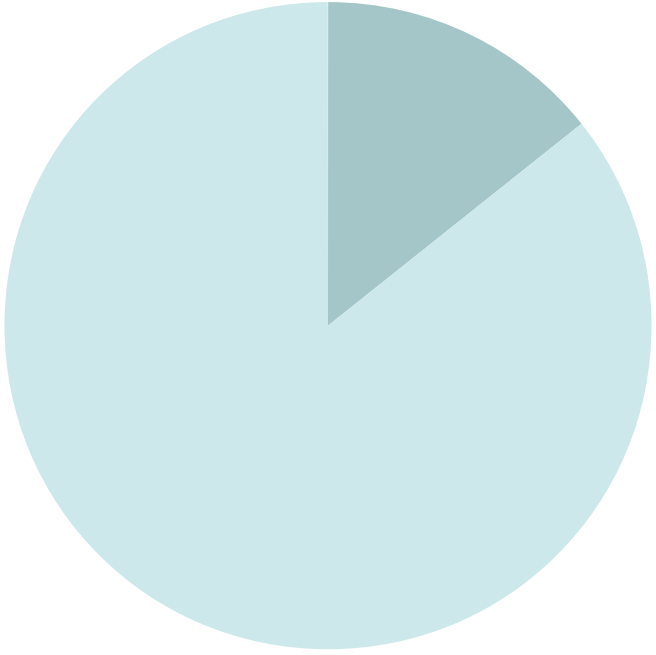
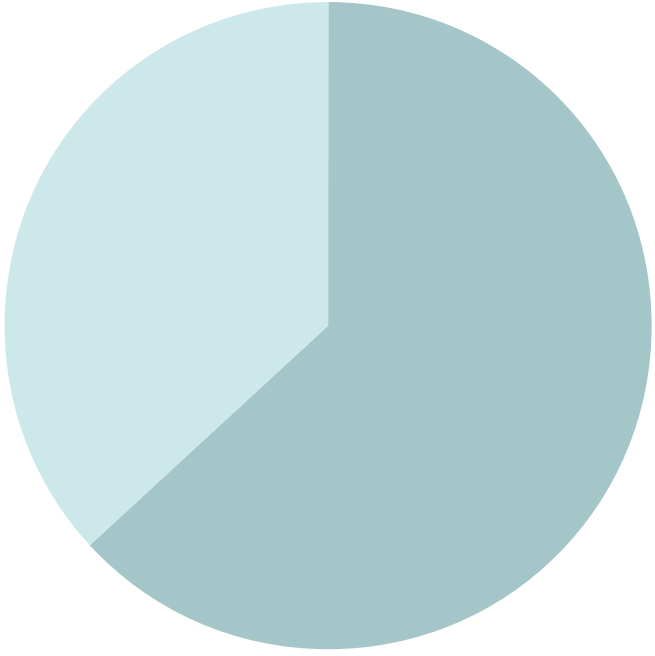
Survey

2/12 utilities make attachee or contractor responsible



Survey

7/12 utilities require analyses for all poles



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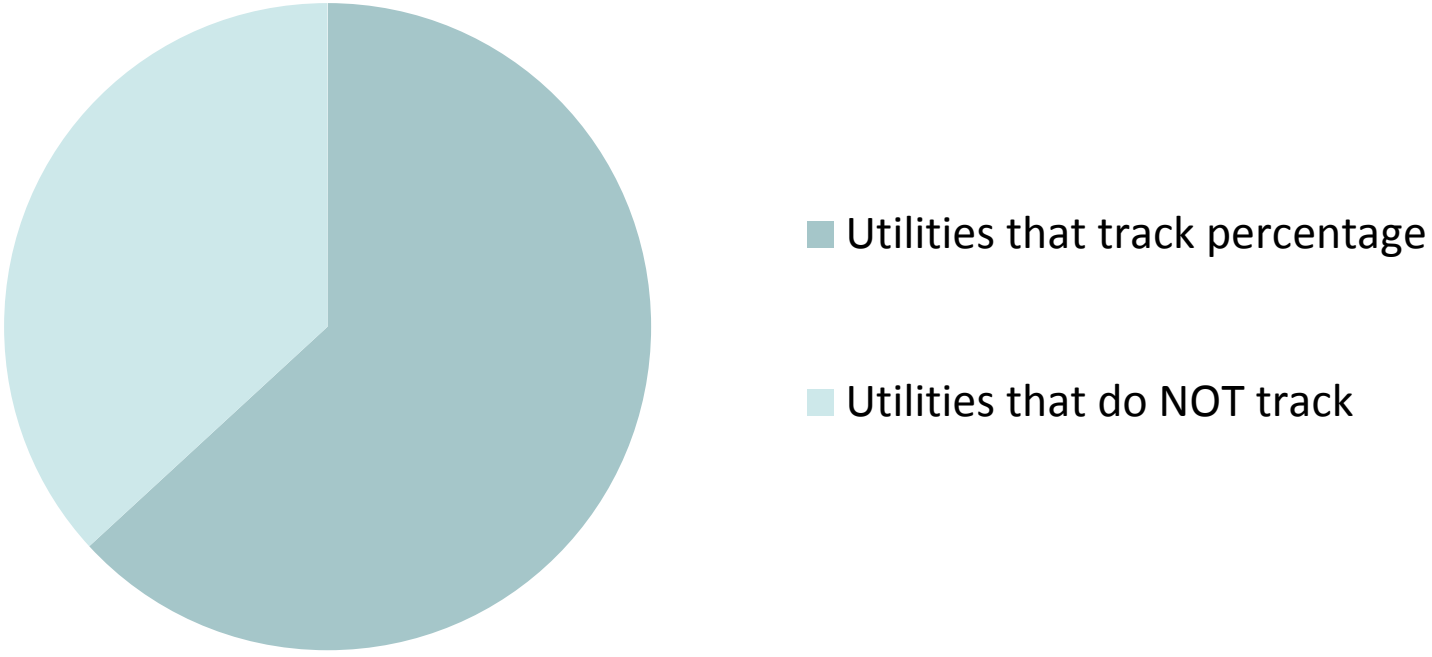
Survey

7/12 utilities track failure percentage



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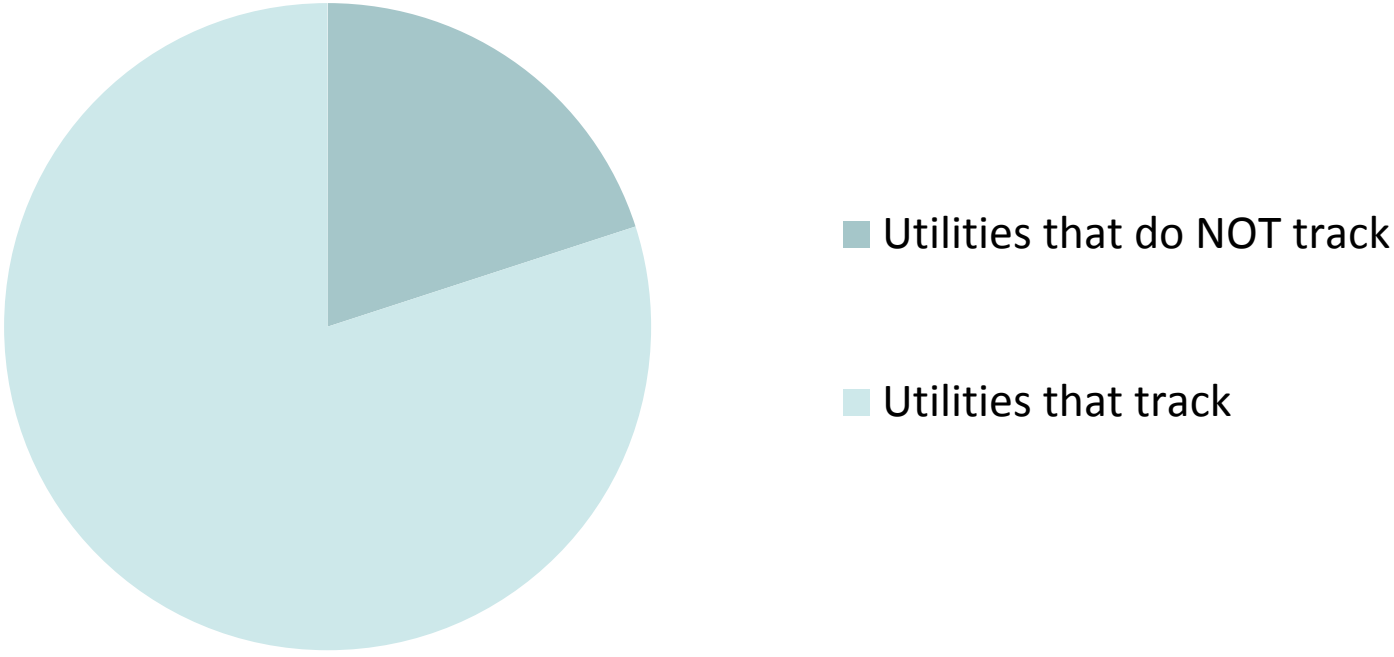
Survey

3/12 utilities do not track cause of pole failure



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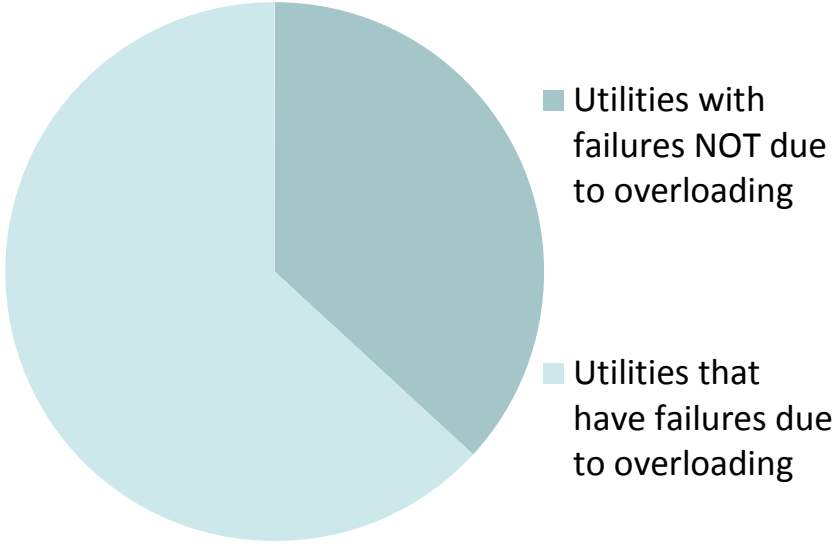
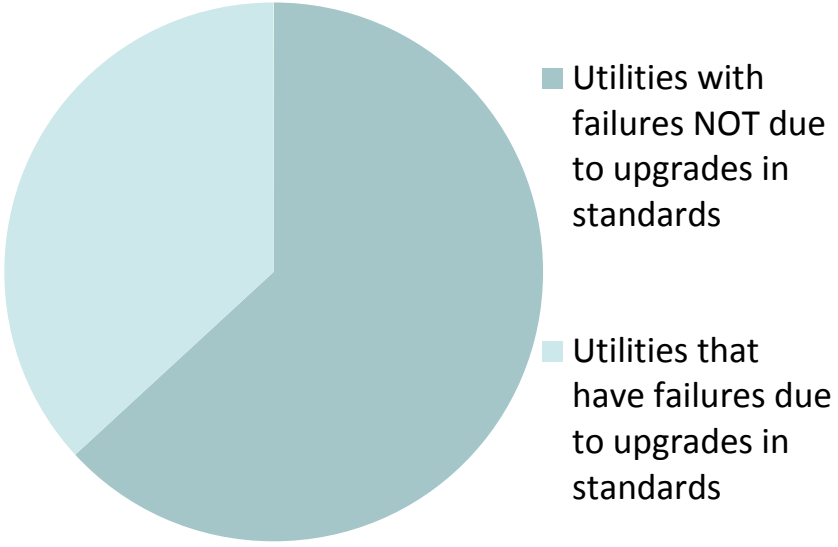
Survey 4 overlaps

7/12 utilities have failure due to overloading

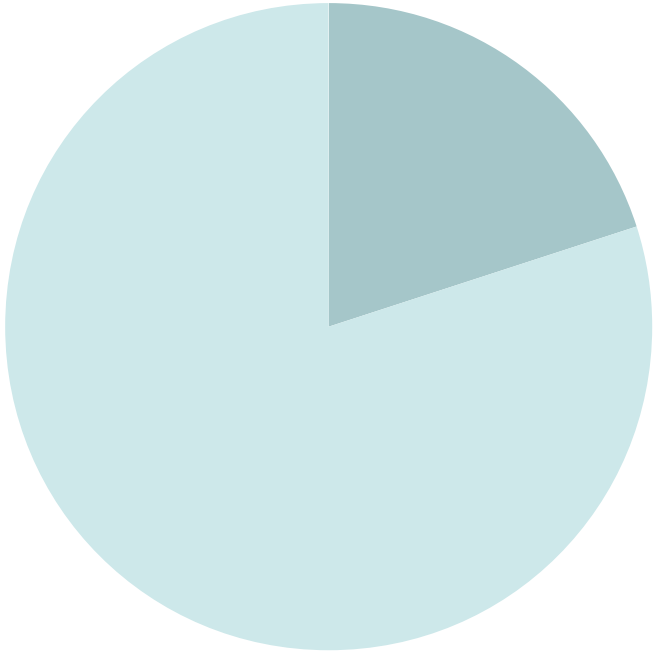


5/12 utilities have failure due to upgrades in standards



Survey

3/12 utilities have abandoned equipment policy



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What Causes Poles to Fail?

- Storm damage
  - According to the North American Wood Pole Council, "*The primary cause of outages in ice storm events is the falling of ice-covered trees or branches on the utility lines. In extreme wind events like hurricanes, the utilities report that most failures are caused by secondary damage effects such as falling trees or wind-blown debris.*"
  - A news report from 2012 reported that storms were responsible for more outages that grid issues
    - http://www.texastribune.org/2012/09/20/texas-storms-cause-more-outages-grid-failures/
- Car hit poles
  - A search of the Internet will turn up tens of thousands of car pole stories
  - According to at least some attorney groups, car hit poles are the leading cause of pole failure

What Causes Poles to Fail? (cont.)

- Environmental conditions
  - Rot
  - Insects
  - Woodpeckers
- Age
  - Aging Power Delivery Infrastructures – Second Edition, by H. L. Willis and R. R. Schrieber: “Many utility systems … were originally built many decades ago … a large portion of the equipment now in service … installed 50, 60, 70, or even more than 80 years ago.”
    - http://quanta-technology.com/sites/default/files/doc-files/Aging_Infrastructures-12-01-13.pdf

Analyzing Failure Root Cause

- Most pole owners do not regularly perform root cause analysis on pole failures
  - 2006 Florida study on ILEC poles
    - http://www.psc.state.fl.us/publications/pdf/telecomm/ILEC_Pole_Inspection-03-2008.pdf?bcsi_scan_D93EF5AA08308DE4=0&bcsi_scan_filename=ILEC_Pole_Inspection-03-2008.pdf
- When failure analysis is performed it is usually at the directive of state regulators
  - 2011 California SCE windstorm report
    - http://www.cpuc.ca.gov/NR/rdonlyres/C85B9B30-E5BC-4D9D-BB5F-0DC91EEEE6D7/0/SCEWindstormReportCPSD_Final1_11_13.pdf

California Public Utilities Commission Report

- The causes of pole failures during the incident fall into two categories
  - Trees, tree branches or other objects falling into poles
  - The poles not strong enough to withstand the force of the wind
    - This could have been the result of inadequate design and construction, overloading, weakening due to cracks and cavities, down guy failures or low fiber strength

Table 1 from Report

Cause of Outage	Number of Circuits
Unknown	263
Other(5)	177
Vegetation	170
Conductor or Splice Failure	134
Pole Failure	79
Crossarm Failure	23
Conductor - Conductor Contact	13

PSE Pole Failure Causes (non-storm)

- **Environmental / Age**
  - ~ 600 poles / year
  - 6% failure rate at 8,000 to 10,000 poles inspected / year

- **Car Hit poles**
  - 2010 - 579 car pole claims
  - 2011 - 601 car pole claims

Where Utility Focus Is

- **Outage prevention/reduction**
  - Reliability is a key performance measure
    - Replacing poles before they fail
- **Managing pole replacement**
  - Controlling costs becoming increasingly important
    - Inspect and treat to prevent need for replacement

Conclusions

- Utilities do not have good data on what causes a pole to fail
- Focus is on outage recovery and inspect & treat – not overloading
- Increasing number of utilities are requiring structural analysis for pole attachments
- Abandoned equipment accounts for a portion of poles failing analysis – amount is not well known
- Primary reason for removing it may be to prevent having to replace poles

Clearances

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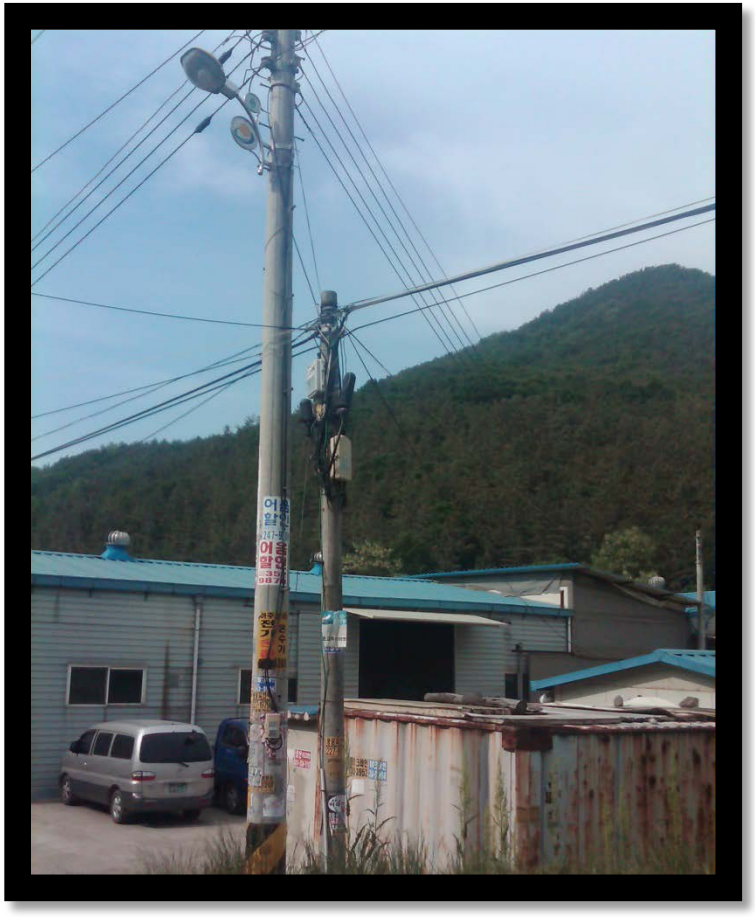
Transfer and Removal



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Safety Space

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Wireless Poles

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