Energy Storage Considerations for Rural Coop PV Markets

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Why Coop Markets for PV?

- Approximately 1000 coops in U.S.
  - 8% of annual retail electrical sales, ~1Quad
  - If just 1% of coop sales displaced by PV Systems, market opportunity is ~ 3M MWh
- Current opportunities for PV systems exist because
  - Aging Infrastructure
  - Long lines and light loads
- Early applications for water pumping & off grid residential systems

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Why PV Water Pumping Systems?

- Already cost competitive at specific sites
- Storage options
  - Water storage typically least cost option
  - Batteries are options for slow recharge wells
    - Additional PV to supply energy for storage
    - Additional components – batteries, charge controller
    - Battery option can increase initial cost on small systems by 50-80% for comparable water quantities

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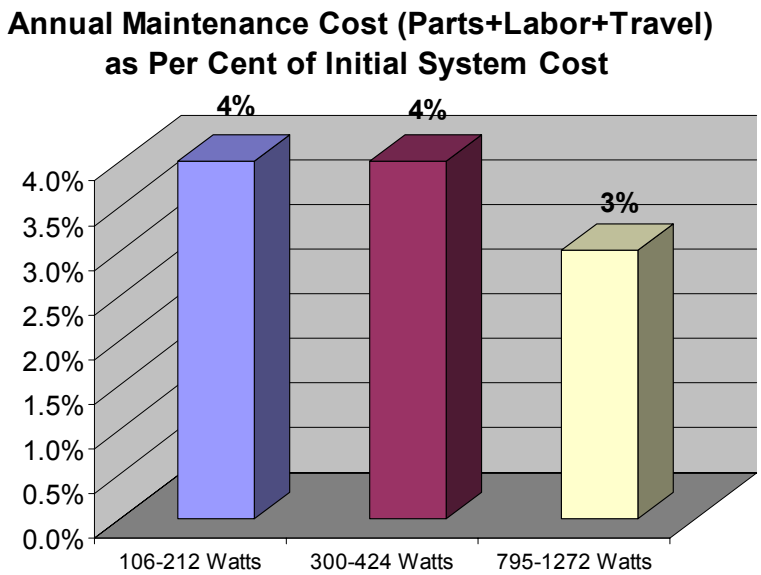
What Have We Learned About PV Water Pumping Systems?

- Tracked O&M field experience on 32 NRPPD systems without energy storage since 1990
- DC pump failures ~ 67%
- Controller failures ~25%
- PV problem negligible



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Remember - PV Water Pumping for Livestock *as a Business*

- Existing power lines
  - 50-70 years old
  - Replacing 30-40 miles @ $12,000/mile ~ $*500K* long term value
  - Yearly maintenance - $200 per mile
- PV viable alternative- NRPPD experience is Yes

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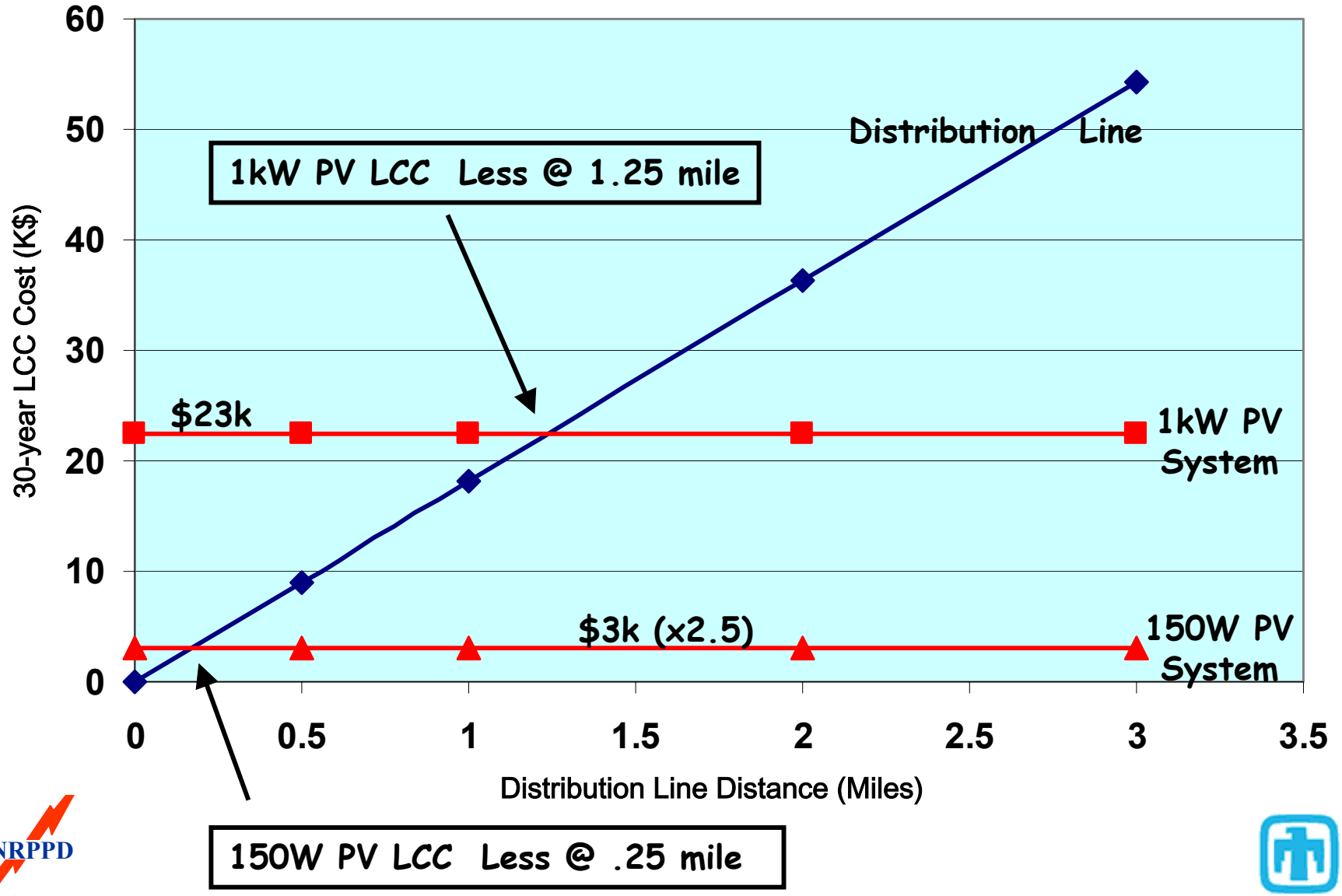
Northwest Rural Public Power District (Data from Fielded Systems): Lifecycle Cost Comparison of Distribution Lines And Photovoltaic System for Livestock Water Pumping



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Why Off-Grid Residential Systems?

- Arizona Public Service/Pinnacle West focused on business opportunity via leased systems to meet customer needs in rural areas
- 62 systems installed 1996-2002
- Sized to provide 2.5-10kWh per day in four configurations
- Includes propane generator & battery storage

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APS The power to make it happen.

Summary

- Energy Storage
  - Research valuable to create ‘enhanced’ battery with increased energy storage
  - ‘Enhanced’ battery capability supports new applications and extension of existing application
- Aging lines, long lines with light loads provide PV system market opportunities *at this time*

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Summary

- Energy Storage
  - Requires additional upfront & O&M cost. These costs need to be predictable.
  - Technical issues to be addressed in battery storage
- Research important but better balance on understanding O&M costs/problems in the field
- Study of O&M costs on water pumping/off grid residential systems valuable – need similar work for battery system

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The End