

# Solar Interconnection Case Studies

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**Central Hudson - Distribution Planning and Interconnections**

# Landscape

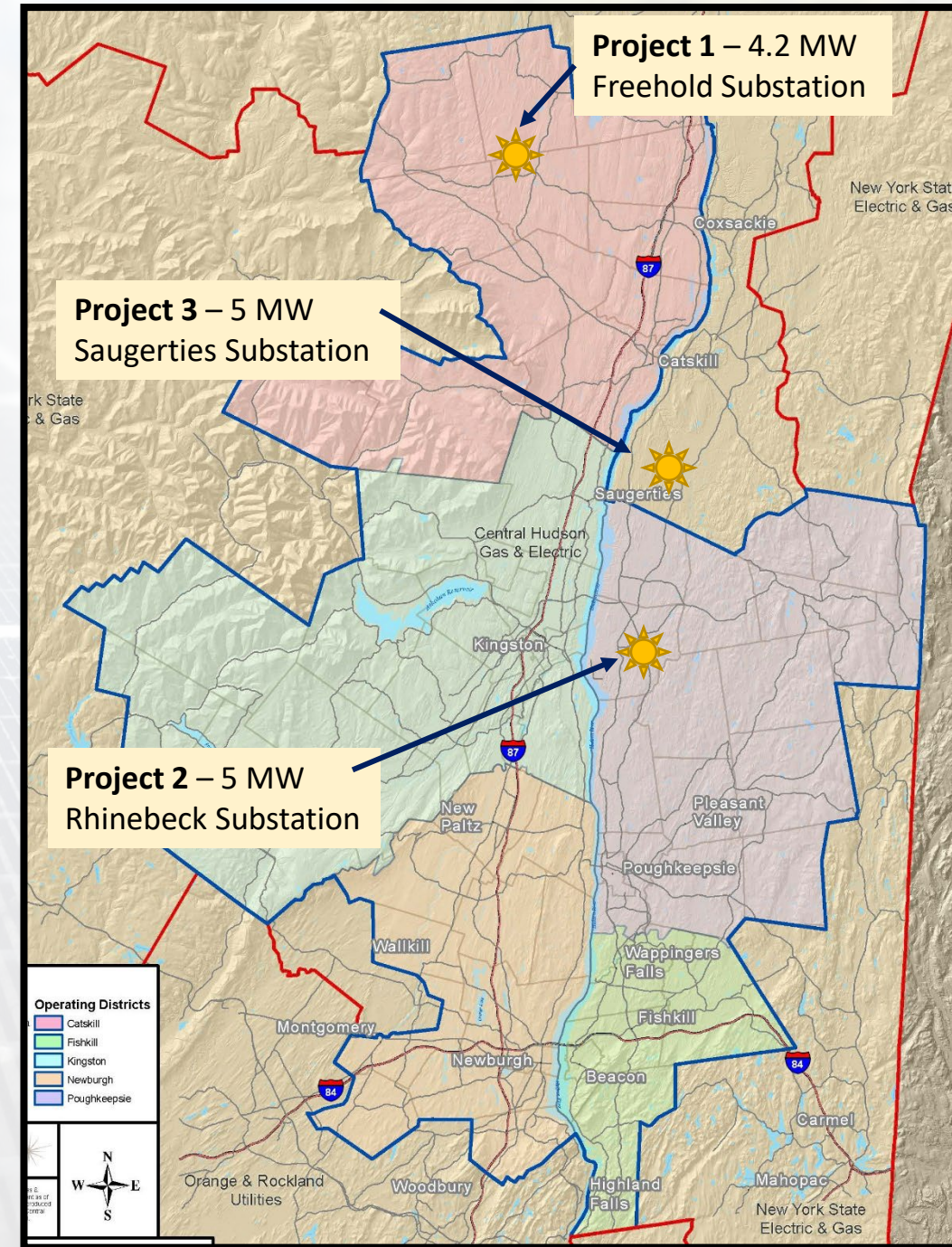
## Northern Districts – Catskill and Kingston Districts

- Low population
- Low loads
- Spaced out
- Not built for large load

## Southern Districts – Newburgh Poughkeepsie Fishkill

- Not as much space
- Higher loads
- Infrastructure to support load

Review three projects from various Districts



# Distribution Circuit Characteristics

Location, Location, Location

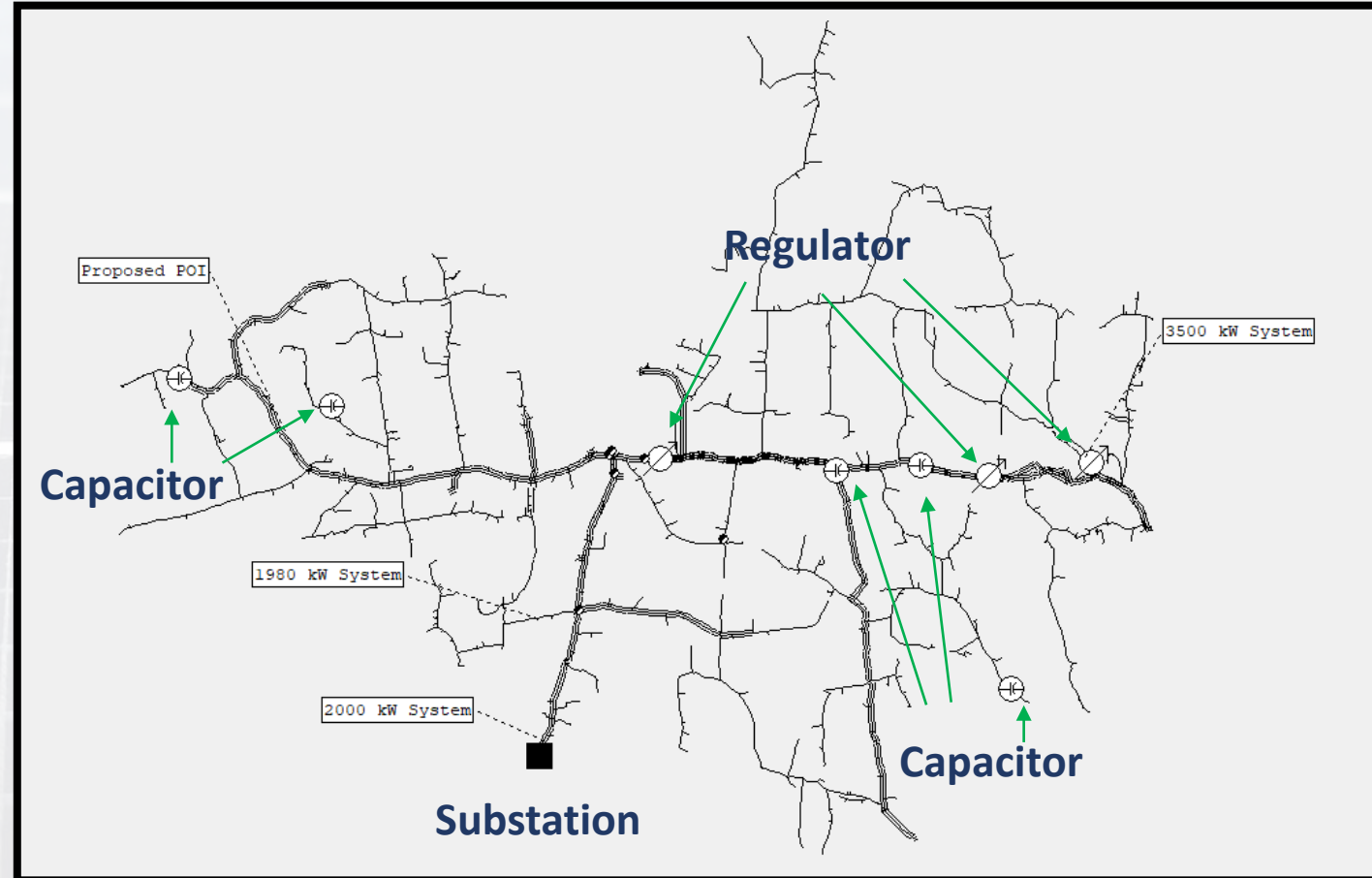
- Circuit Loading
- Conductor Size
- Voltage
- Existing DG
- Distribution Equipment
- Protective Devices
- Stiffness Factor



# Project 1 – 4.2 MW PV Catskill District

## System Characteristics

Miles from Substation	7 miles
Peak Feeder Load (MW)	4.6
Minimum Feeder load (MW)	3.0
PV on Feeder Interconnected/In Queue (MW)	2.5/5.5
Individual (PCC)/Aggregate Stiffness (Feeder) - Screen F	6.2/8.73
Overloaded Components (Prelim)	3
Regulator Banks	3



# Project 1 Upgrades – 4.2 MW PV

## Issues that Arose

- Excessive tap movement issue on distribution line regulator on Peak and Light load
- Voltage Fluctuation
- Thermally overloaded conductor segments

## Upgrades

New Feeder Circuit 7 miles

New Substation Breaker and Circuit Exits

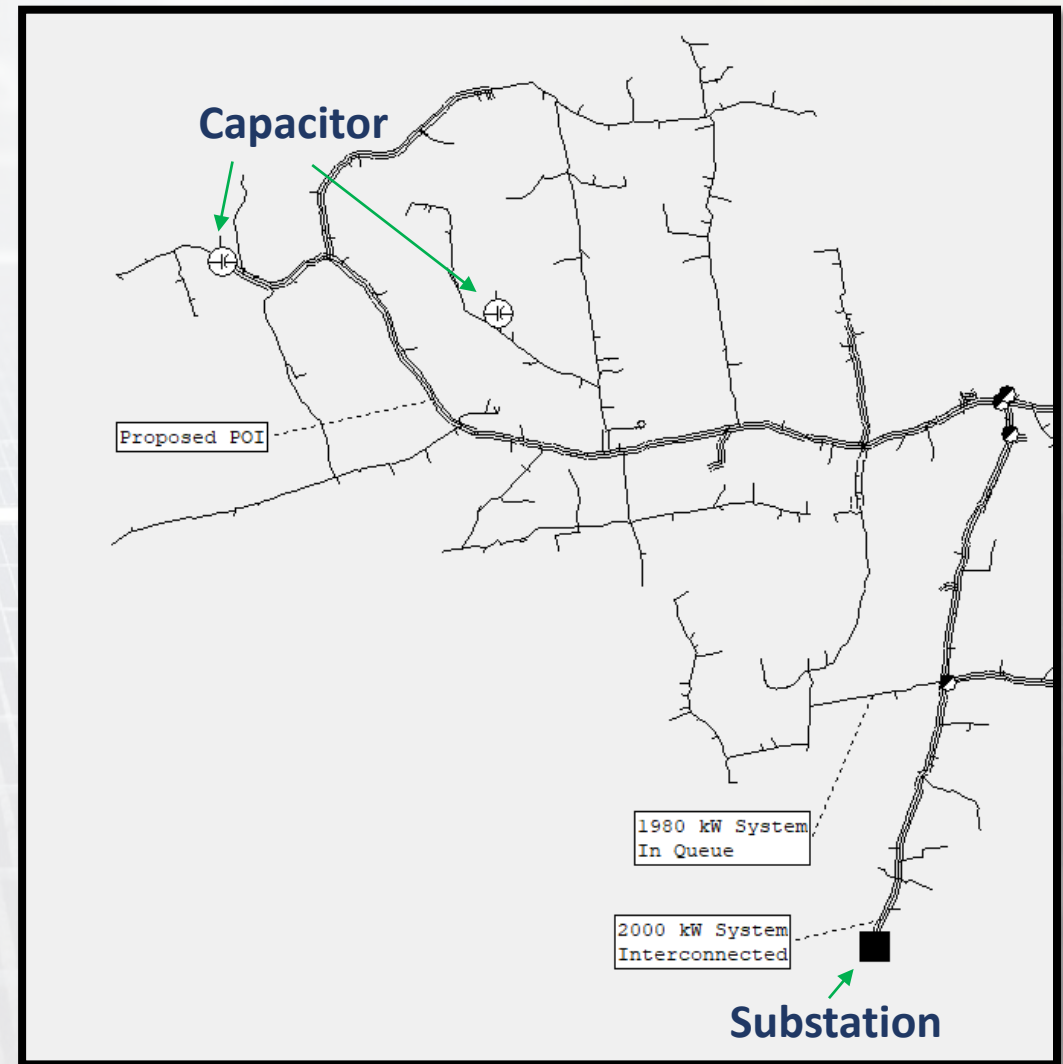
Install a PCC electronic recloser

Install Reclose Block

Install New Service

Total ~ \$8,700,000

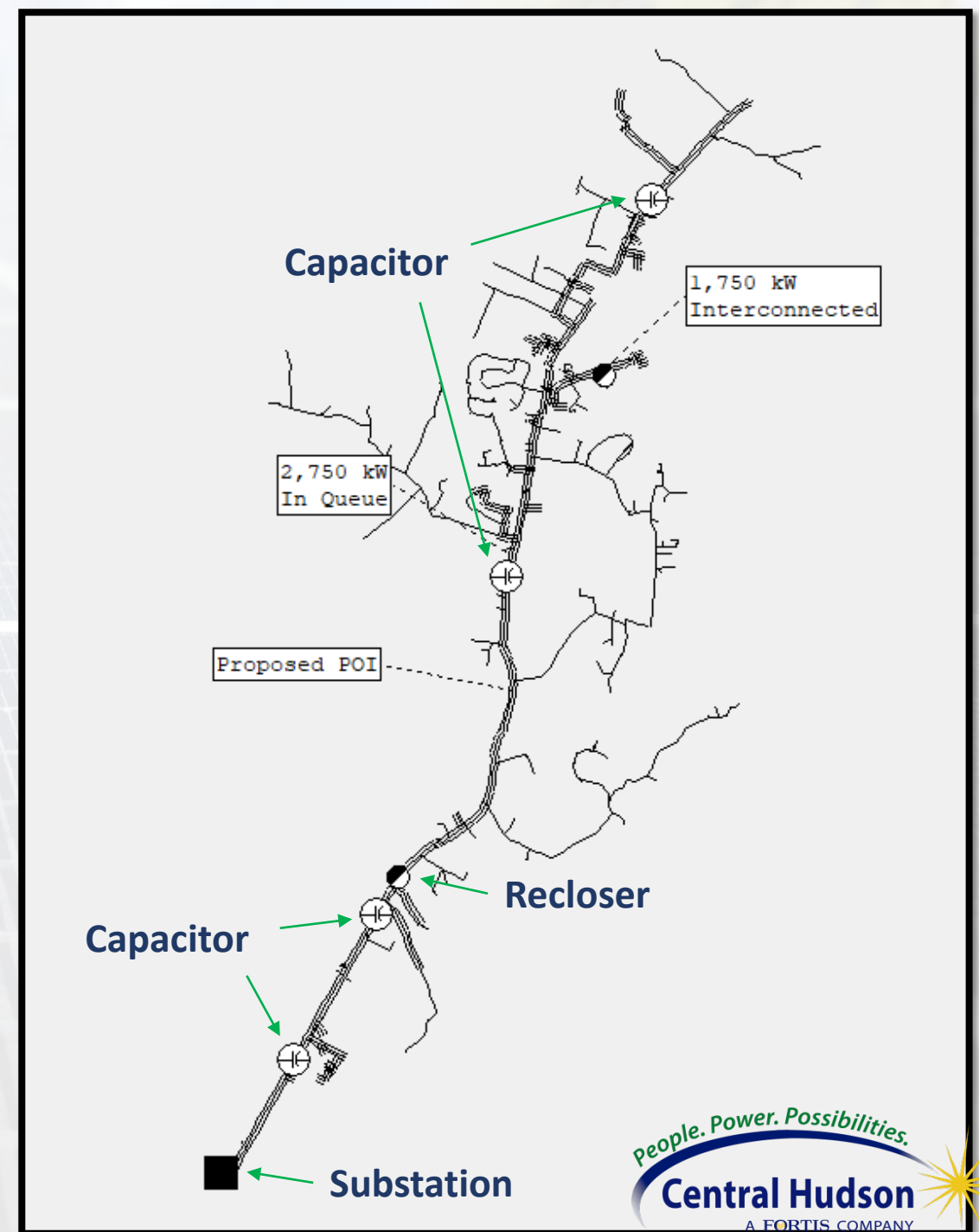
\$/kW AC ~ \$2,000



# Project 2 – 5 MW Poughkeepsie District

## System Characteristics

Miles from Substation	2.5 miles
Peak Feeder Load (MW)	4.18
Minimum Feeder load (MW)	2.65
PV on Feeder Interconnected/In Queue (MW)	2.5/2.75
Individual (PCC)/Aggregate Stiffness (Feeder) – Preliminary Screen F	13.9/17.05
Overloaded Components (Prelim)	0
Regulator Banks	0



People. Power. Possibilities.

**Central Hudson**

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# Project 2 Upgrades – 5MW PV

## Issues that Arose

- Overvoltage
- Voltage Fluctuation

## Upgrades

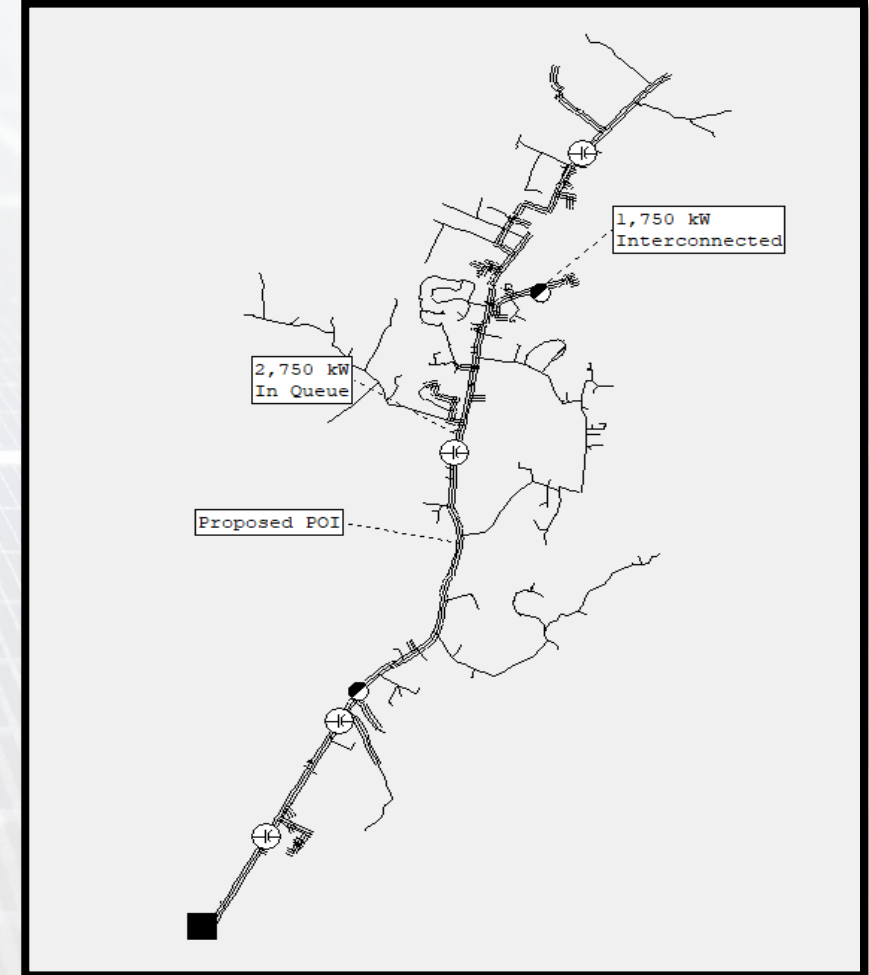
Install 600 kVAr switched capacitor bank

Install a PCC electronic recloser

Install New Service

**Total ~ \$200,500**

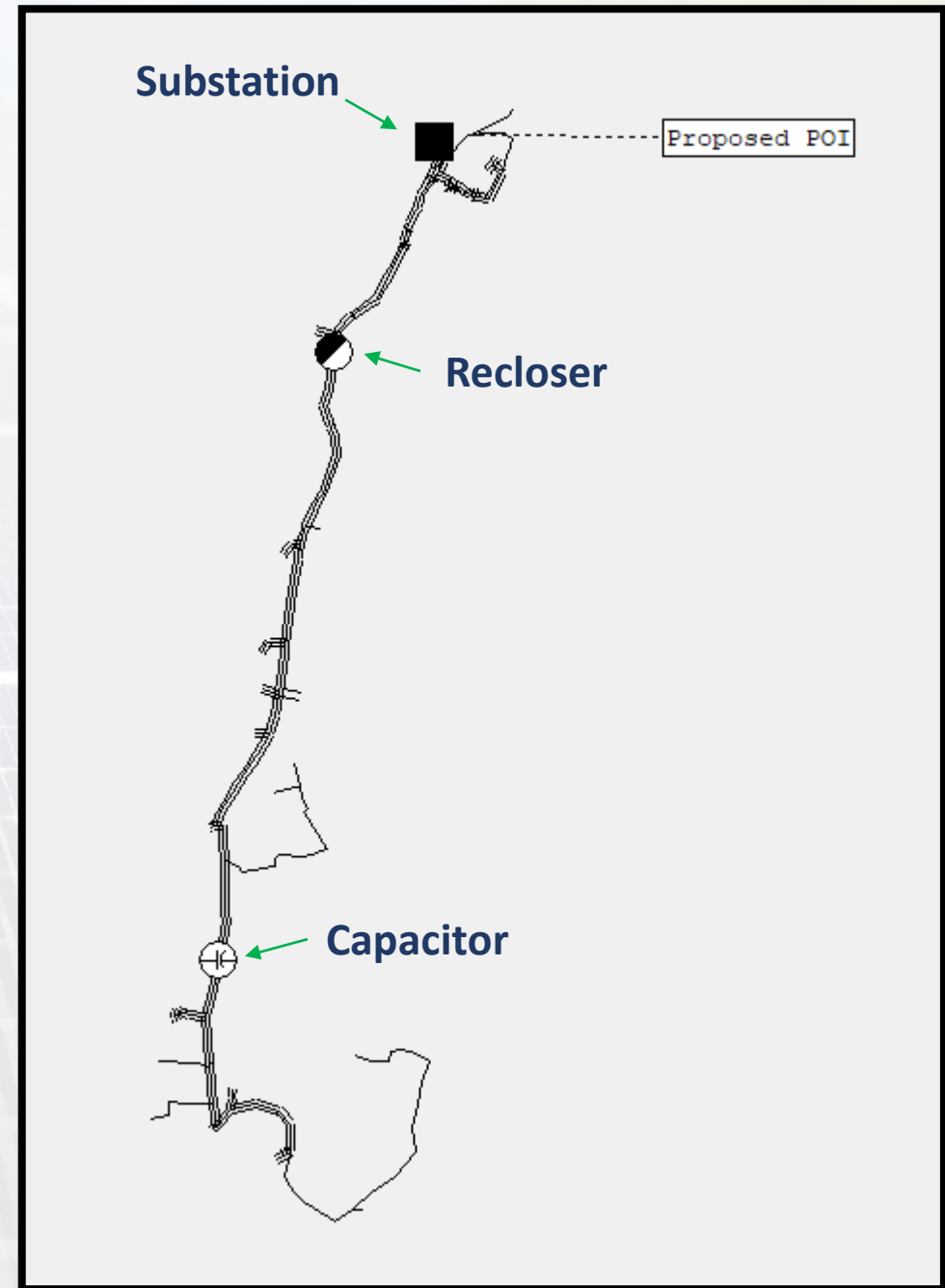
**\$/kW ~ \$40.10**



# Project 3 – 5 MW Kingston District

## System Characteristics

Miles from Substation	0.26 miles
Peak Feeder Load (MW)	1.85
Minimum Feeder load (MW)	0.38
PV on Feeder Interconnected/In Queue (MW)	0/0
Individual (PCC)/Aggregate Stiffness (Feeder) - Screen F	24.89/34.51
Overloaded Components (Prelim)	4
Regulator Banks	0





# Project 3 Upgrades – 5MW PV

## Issues that Arose

- Substation reverse power flow
- Unintentional islanding
- Thermally overloaded equipment

## Upgrades

Reconductor single to three phase

Upgrade fuse to electronic recloser

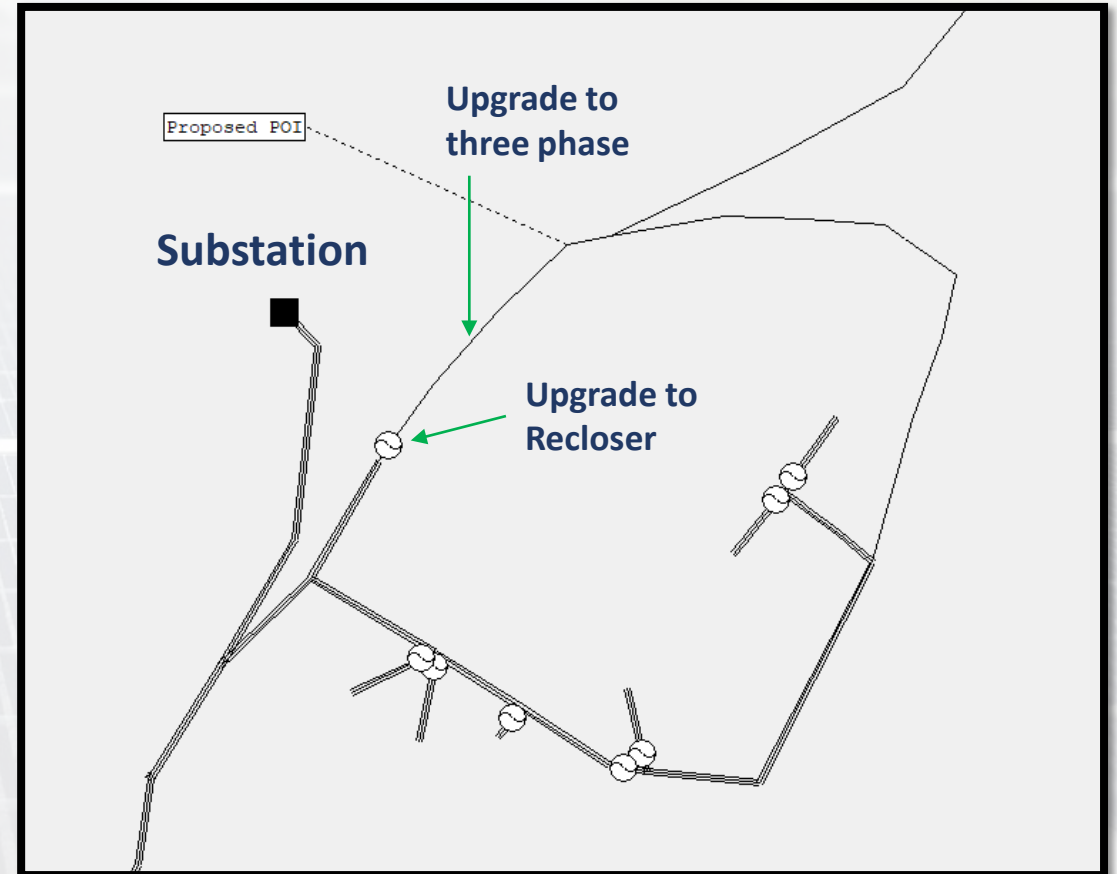
Upgrade Substation LTC controls

Install Reclose Block

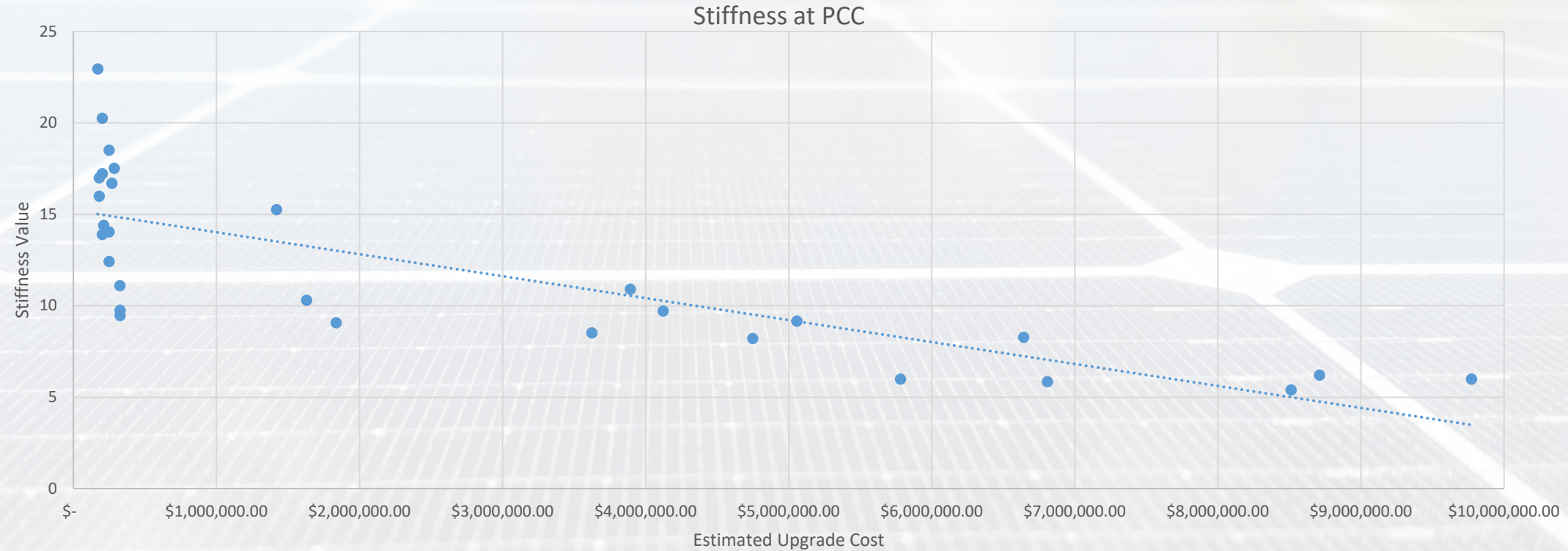
Install New Service

**Total ~ \$320,000**

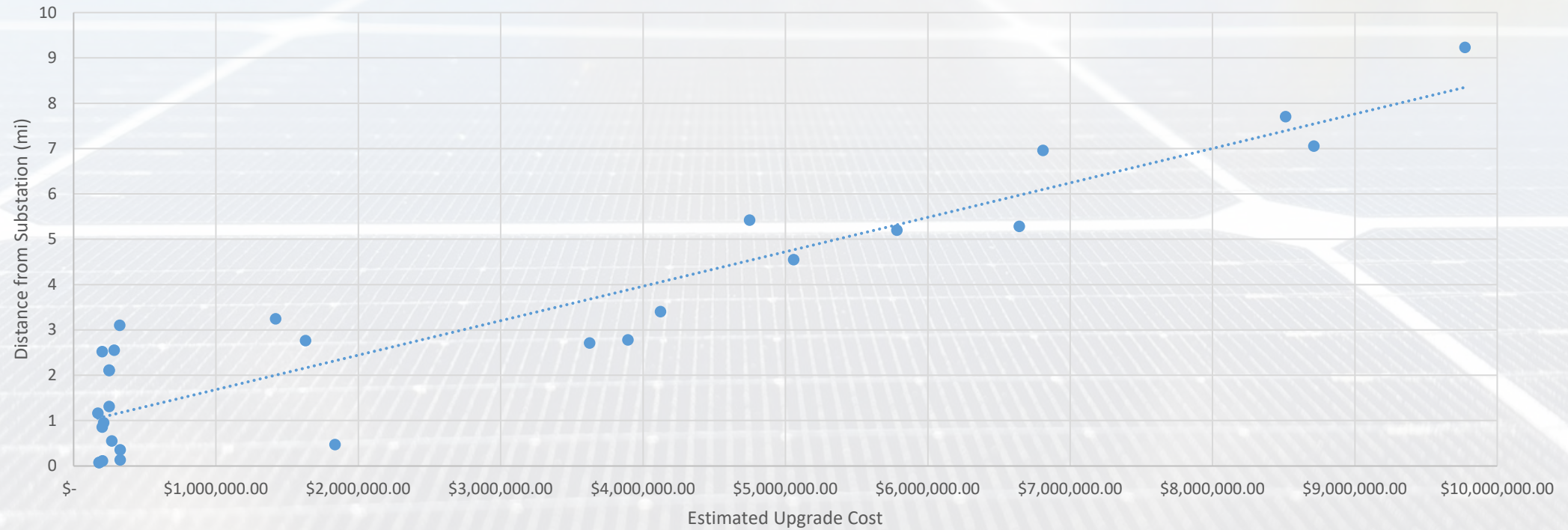
**\$/kW AC = \$64.00**



# Stiffness Factor



# Distance from Substation



# Final Remarks

- No single “dependent” factor on upgrade costs
- Projects in Northern districts will likely carry a higher cost
- Further from the Substation the likelihood of a high upgrade cost increases
- A correlation exists between Circuit Stiffness at the PCC and estimated construction cost

# Thank you

