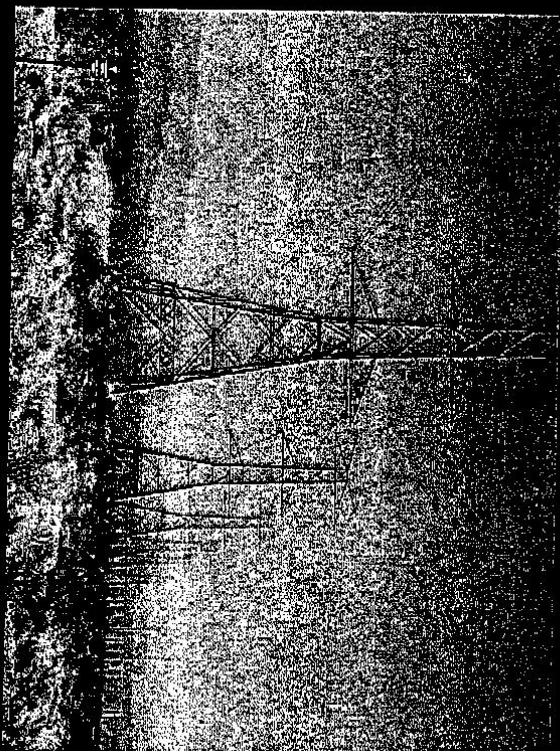


Overview of NPC / SPPC Transmission Options



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Disclaimer

The material presented in this document is ONLY to be used for general comparative analysis. Actual projects have specific complexities that will in all cases deviate from these general statements and costs.

Summary of RETAAC I Recommended Preliminary Transmission Routes

Line	Energy Source	Station Name	Location (City/County)	Length (Miles)
1	Wind 8, Geothermal 2	Wind 8, Geothermal 2	Aluras, CA (Hilltop)	70
2	Wind 8, Geothermal 2	Wind 8, Geothermal 2	Lovelock, NV (Oreana)	90
3	Wind 7	Wind 7	Doyle, CA (Ft. Sage)	45
4	Wind 7	Wind 7	Wadsworth, NV (Tracy)	40
5	Wind 6, Biomass 1	Wind 6, Biomass 1	Carson City, NV (Blackhawk)	15
6	Geothermal 1	Geothermal 1	Lovelock, NV (Oreana)	40
7	Geothermal 1	Geothermal 1	Yerington (Ft. Churchill)	90
8	Geothermal 3, Wind 12, Solar 1	Yerington (Ft. Churchill)	Las Vegas, NV (Northwest)	300
9	Wind 2, Wind 3, Biomass 3	Wind 3	Ely, NV (Robinson Summit)	100
10	Wind 2, Wind 3, Biomass 3	Solar 3	Ely, NV (Robinson Summit)	75
11	Solar 4, Geothermal 5	Solar 4, Geothermal 5	Ely, NV (Robinson Summit)	75
12	Wind 1, Geothermal 6	Wind 1, Geothermal 6	Ely, NV (Robinson Summit)	90
13	Wind 5	Wind 5	Cortez, NV (Cortez)	25

General Cost Estimates

Costs in Millions

- 230kV Line: \$0.6/Mile
- 345 kV Line: \$0.85/Mile
- 345 kV Compensation Station: \$10 /Station
- 500 kV Line: \$1.4/Mile
- 500 kV Compensation Station: \$ 12/Station
- 230 kV Terminal Sub: \$ 3 – 30
- 345 kV Terminal Sub: \$ 5 – 50
- 500 kV Terminal Sub: \$ 7 – 70

What are the Maximum MW Thresholds for each Voltage?

Given the SPPC / NPC systems are
~250 miles apart:

- 230 kV – 200 MW
- 345 kV – 500 MW
- 345 kV compensated – 750 MW
- 500 kV – 1200 MW
- 500 kV compensated – 1800 MW

Existing Endpoint Voltages

Sierra Pacific

West

- 345 kV - Blackhawk, Tracy
- 230 kV - Anaconda

East

- 345 kV - Gonder
- 230 kV - Gonder

Nevada Power

West

- 500 kV - Northwest
- 230 kV - Northwest
- 138 kV - Jackass Flats

East

- 500 kV - Harry Allen, Crystal
- 230 kV - Harry Allen, Pecos

To avoid the cost of additional transformers, it is prudent to select line voltages that match one or both ends of the planned circuit.

To phase shift or not to phase shift



As line loading increases, flow migrates to adjacent systems

If this becomes burdensome, steps must be taken to mitigate the effect.

Phase shifters assist in fixing this migration

Phase shifters are very expensive – except when compared to new lines

Summary of PUCN Approved Preliminary Transmission Route Siting in SPPC and NPC

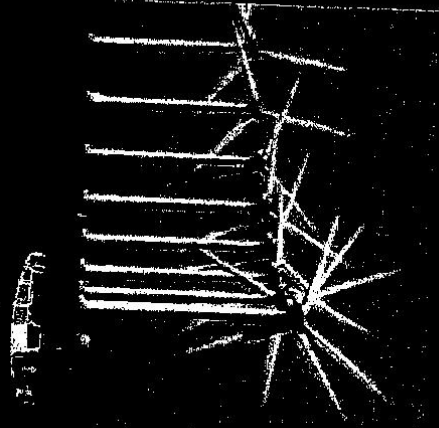
Line #	Zone (G) Resource	Service Point (City)	Approved Resource (City/County)	Line Length (Miles)	Cost (\$M)
1	Wind 8, Geothermal 2	Wind 8, Geothermal 2	Alluras, CA (Hilltop)	70	\$ 134.50
2	Wind 8, Geothermal 2	Wind 8, Geothermal 2	Lovelock, NV (Oreana)	90	\$ 151.50
3	Wind 7	Wind 7	Doyle, CA (Fr. Sage)	45	\$ 88.25
4	Wind 7	Wind 7	Wadsworth, NV (Tracy)	40	\$ 64.00
5	Wind 6, Biomass 1	Wind 6, Biomass 1	Carson City, NV (Blackhawk)	15	\$ 42.75
6	Geothermal 1	Geothermal 1	Lovelock, NV (Oreana)	40	\$ 109.00
7	Geothermal 1	Geothermal 1	Yerington (Fr. Churchill)	90	\$ 151.50
8	Geothermal 3, Wind 12, Solar 1	Yerington (Fr. Churchill)	Las Vegas, NV (Northwest)	300	\$ 355.00
9	Wind 2, Wind 3, Biomass 3	Wind 3	Ely, NV (Robinson Summit)	100	\$ 115.00
10	Wind 2, Wind 3, Biomass 3	Solar 3	Ely, NV (Robinson Summit)	75	\$ 93.75
11	Solar 4, Geothermal 5	Solar 4, Geothermal 5	Ely, NV (Robinson Summit)	75	\$ 93.75
12	Wind 1, Geothermal 6	Wind 1, Geothermal 6	Ely, NV (Robinson Summit)	90	\$ 106.50
13	Wind 5	Wind 5	Cortez, NV (Cortez)	25	\$ 96.25

Assumptions:

Complex Interconnection: \$50M

Collector Substation: \$25M

Existing Substation with Open Terminal: \$5M



Cool Stuff



Student Tour of Galena 3

Q & A