Nevada Energy Assistance Corporation

Transmission Initiative Routing Study
Then and Now

Tri Sage Consulting

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Transmission Initiative History in Nevada

- **1997**: State of Nevada adopts a renewable energy portfolio standard that increases in subsequent years to bring it to its current rate.
- **2007**: Gov. Gibbons establishes the Renewable Energy Transmission Access Advisory Committee (RETAAC). This committee developed recommendations to encourage transmission development within renewable energy zones (REZs) to enhance generation within Nevada.
- **2008**: Gov. Gibbons signs an Executive Order authorizing the second phase of RETAAC wherein the REZs are mapped to identify viability of renewable resources.
- **2008**: US DOE and BLM complete the West-Wide Energy Corridor EIS establishing energy corridors to facilitate future siting of renewable energy development projects and associated electric transmission on Federal Lands. One multi-modal energy corridor is proposed for South Nye County in Nevada.
- **2009:** US Secretary of Interior authorizes BLM to establish Renewable Energy Coordination Offices to facilitate expedited permitting for generation and transmission. State offices include Nevada, Arizona, California and Wyoming.

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Transmission Initiative History in Nevada (cont.)

- **2009:** Nevada State Legislature passes AB 387, making transmission development to support renewable generation public policy. The bill requires NV Energy to expand its Integrated Resource Plan (IRP) to include a plan to serve REZs which incorporates development of transmission facilities.
- **2010:** NV Energy files an Integrated Resource Plan proposing a renewable energy conceptual transmission plan to serve REZs. This plan is accepted by PUCN.
- **2010:** NV Energy breaks ground on One Nevada Transmission Line interconnecting the southern and northern Nevada electric grids.
- **2011**: NV Energy develops a Renewable Transmission Initiate (RTI) to explore customer-driven approach to renewable development. The plan does not open up new transmission paths, but rather provides for intra-state connection to multiple points of delivery for renewable energy. This line, referred to as RTI, was never built.
- **2011:** Nevada Energy Assistance Corporation (NEAC) initiates a renewable energy export transmission study. The study results are published in 2012 identifying three potential new corridors to support generation export.
- **2013**: Valley Electric Association is accepted into CAISO as a participating transmission owner.

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Transmission Initiative Goal – Then & Now

2011 - Identify new transmission paths to allow for renewable generation export

2017 - Identify new transmission paths to allow for a more robust and diverse energy market

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Transmission Initiative Objectives

Identify specific transmission projects or improvements that would:

- make optimum use of existing transmission facilities and/or corridors
- significantly improve export paths directly or indirectly to California electric buyers
- provide key integration of transmission/distribution collector systems for renewable energy resource zones
- enhance the reliability of the transmission system and benefit overall transmission operation.

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Transmission Initiative Study Approach

- Examined existing transmission limitations
- Identified and evaluated obstacles for new paths
- Evaluated regulatory and political climate in Nevada and neighboring states
- Identified viable new routes
- Conducted preliminary siting to verify viability of preferred and alternative routes
- Concluded with system impact modeling

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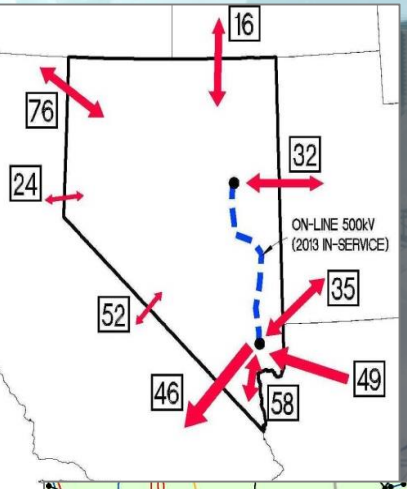
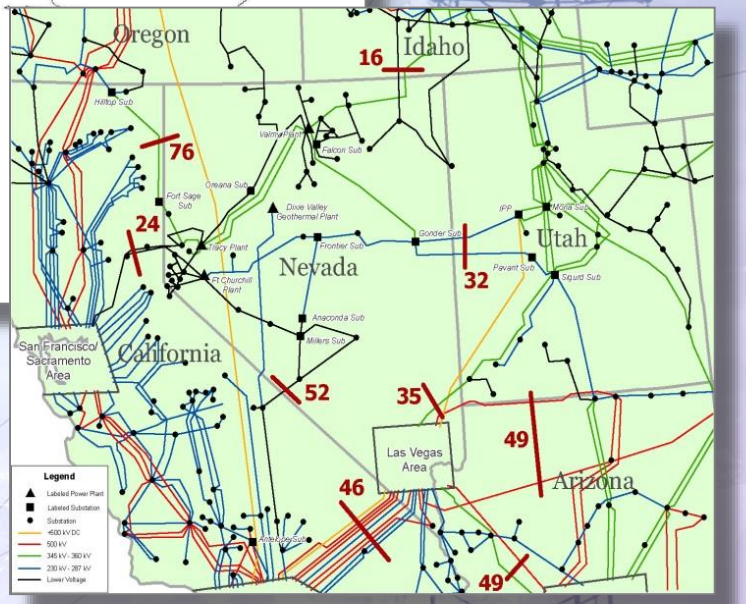
Existing Transmission Limitations

2011 Data

PATH	kV	DATE	RATING	IMPORT/EXPORT/WHEELING
16	(1)345kV	1980	360MW EXPORT 500MW IMPORT	IMPORT/EXPORT
24	(1)60kV (2)120kV	1930- 1960	150MW EXPORT 160MW IMPORT	IMPORT/EXPORT
32	(2)230	1975- 1985	235MW EXPORT 440MW IMPORT	IMPORT/EXPORT
35	(1)345kV	1990	300MW EXPORT 300MW IMPORT	IMPORT/EXPORT
46	(14)230- 500kV	1930- 1990	10,623MW EXPORT	EXPORT/WHEELING
49	(6)345- 500kV	1930- 1990	9,300MW IMPORT	IMPORT/WHEELING
52	(2)55kV	1901- 1930	17MW EXPORT 17MW IMPORT	IMPORT/EXPORT
58	(2)230kV	1966	1140MW EXPORT 1140MW IMPORT	IMPORT/EXPORT
76	(1)345kV	1998- 2000	300MW EXPORT 300MW IMPORT	IMPORT/EXPORT





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New Transmission Obstacles

IDENTIFICATION

- Terrain Constraints
- Routing Constraints
- Renewable Potential Resources
- Existing Transmission Path
- Identification of New Routes

EVALUATION

- Regulatory Setting in Nevada and Neighboring States
- Financing Options
- Grid Impact

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Terrain Constraints

Typical Land Constraints

- Topography
- Slopes
- Landforms
- Public vs Private Land
- Water bodies

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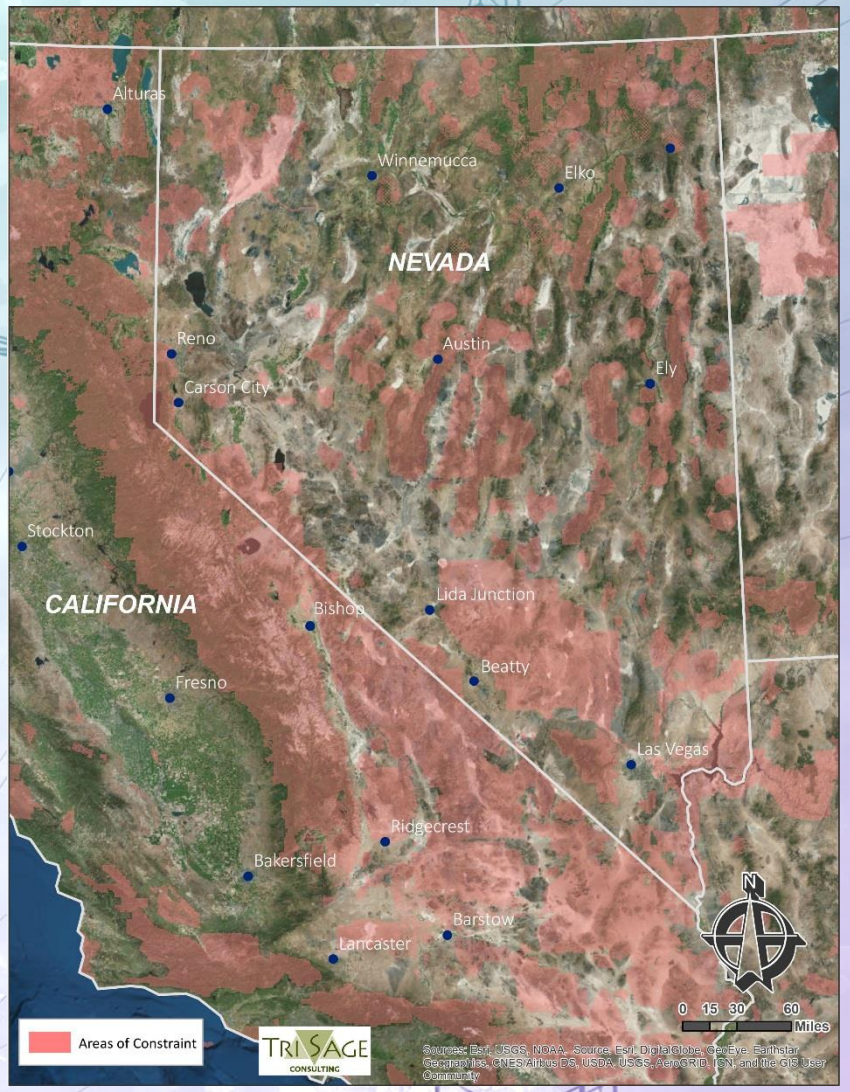
Routing Constraints

Typical Mapping Constraints

- Stream and Wetlands
- Railroad Crossings
- Areas of Critical Environmental Concern
- Desert Tortoise and Sage Grouse Habitat
- Herd Management Areas
- Existing Utilities and Utility Crossings
- Wilderness Areas
- Vegetation



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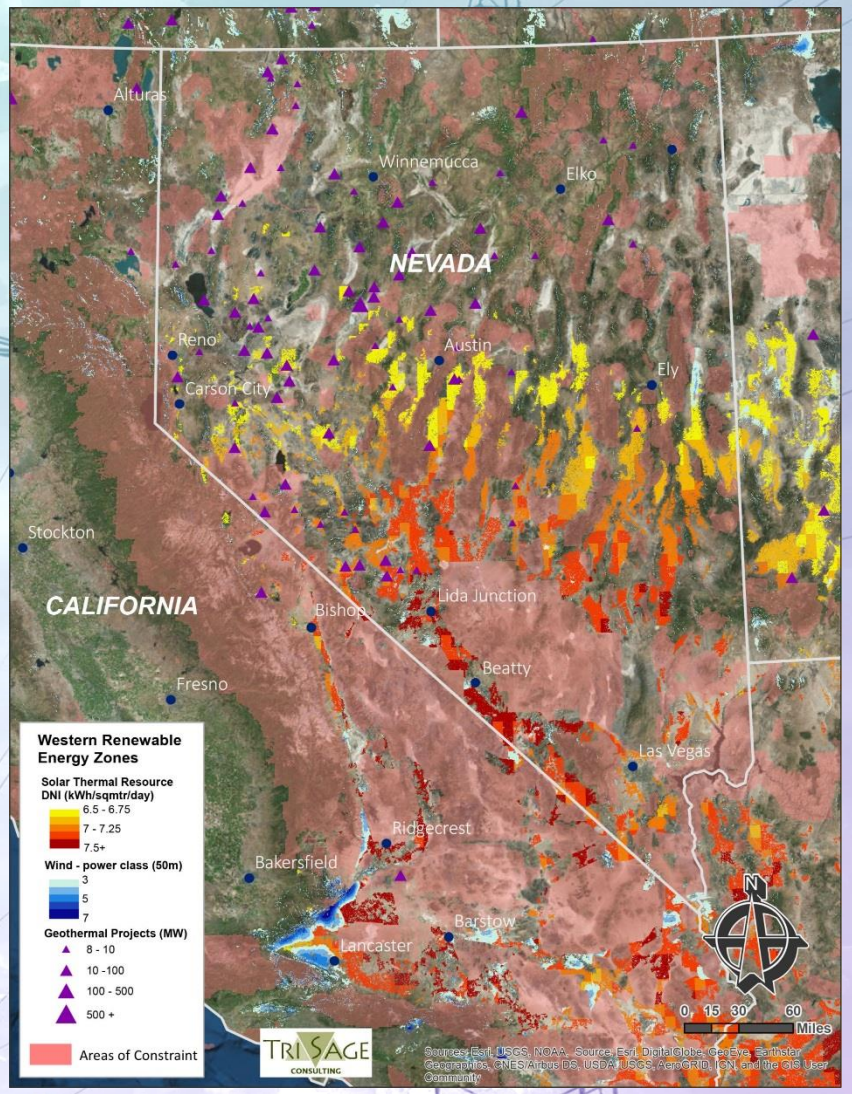
Renewable Potential Resources

Western Renewable Energy Zones

(WREZ initiative HUB map and the RETAAC Resource GIS Data)

- Solar
- Wind
- Geothermal
- Hydro
- Biomass



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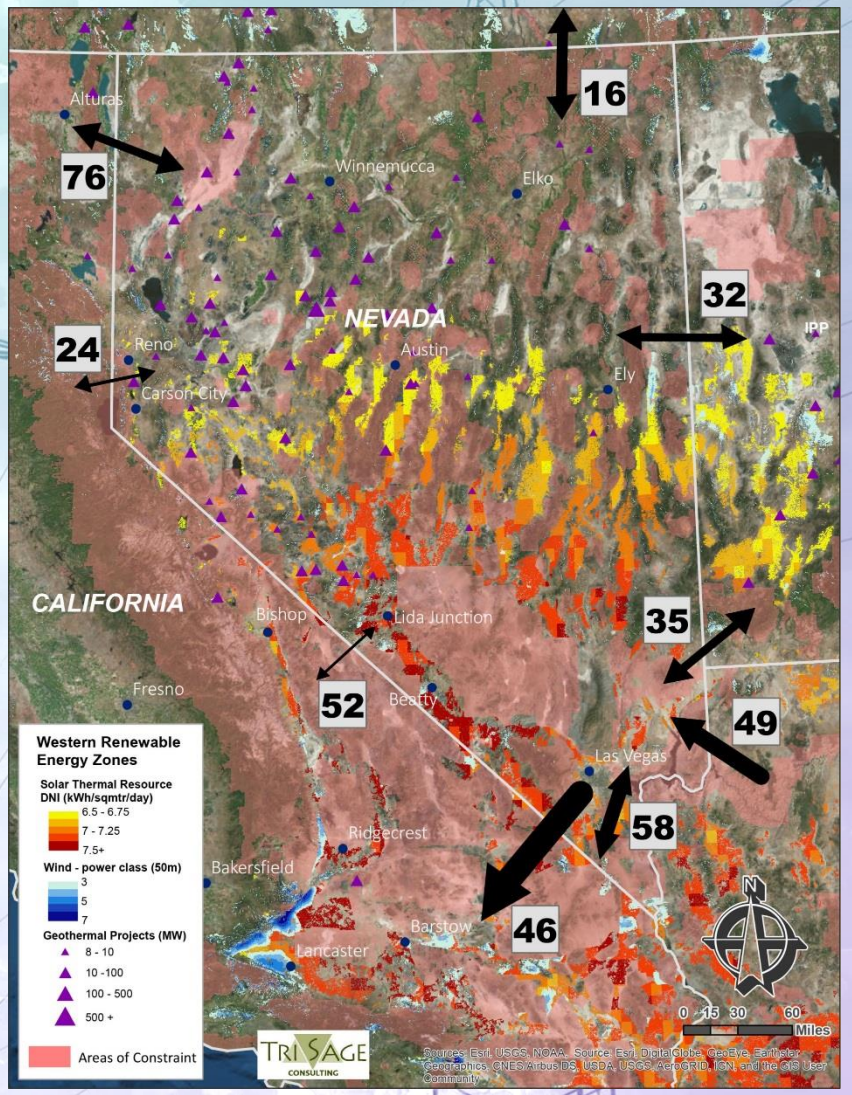
Existing Transmission Paths

Western Electricity Coordinating Council (WECC)

- Electric transmission mapping overlay
- Consideration of transmission capacity constraints
- Consideration of system vulnerability
- Consideration of viable termination points specific to buyers interest



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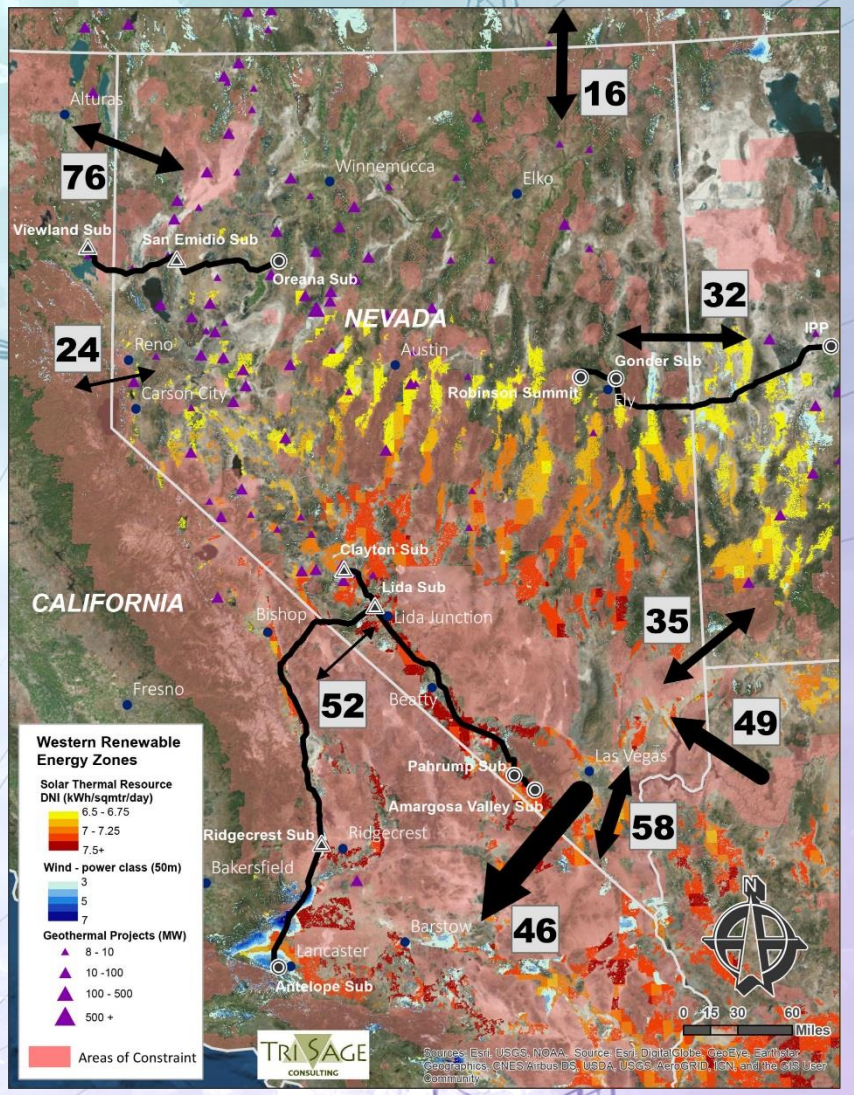
Identification of New Transmission Paths

Transmission Initiative Results

- Identified 9 potential new routes to allow for export from Nevada
- Narrowed to 3 routes based on all considerations
- North route taps geothermal, East route taps heavy solar, and South route provides a balance of resource potential
- Each selected route met the four objectives of NEAC



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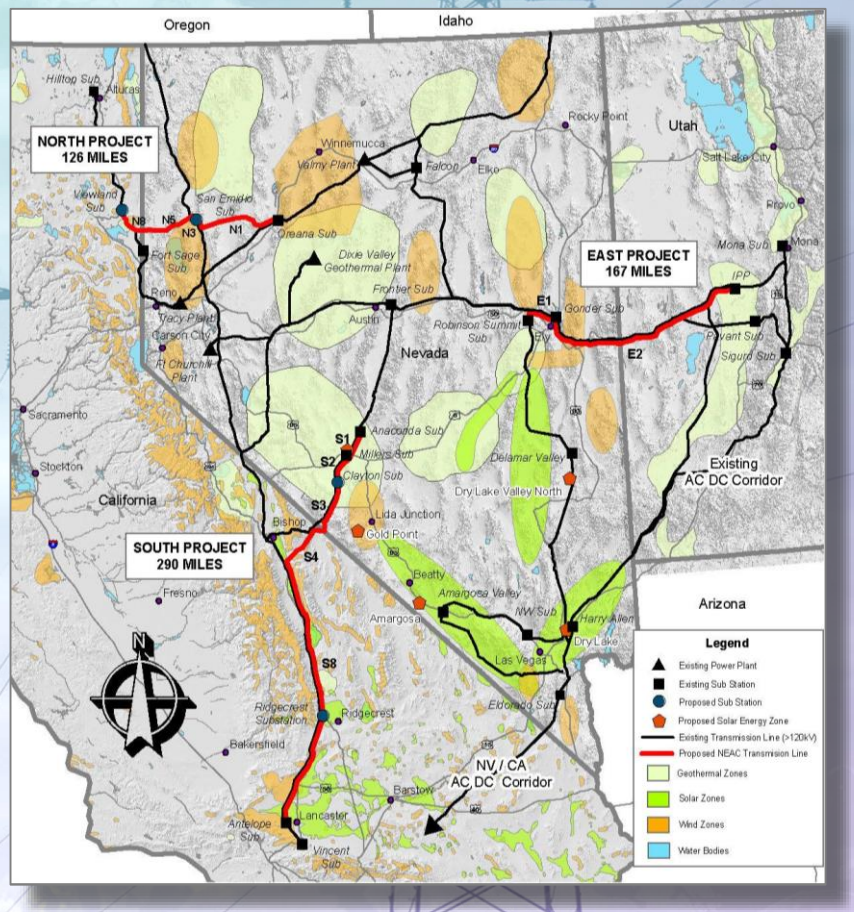
2012 Study Results

Identified Three New Viable Transmission Paths

- **North Route**
  Oreana to Viewland (CA)
- **East Route**
  Robinson to IPP (Utah)
- **South Route**
  VEA System to Antelope (CA)



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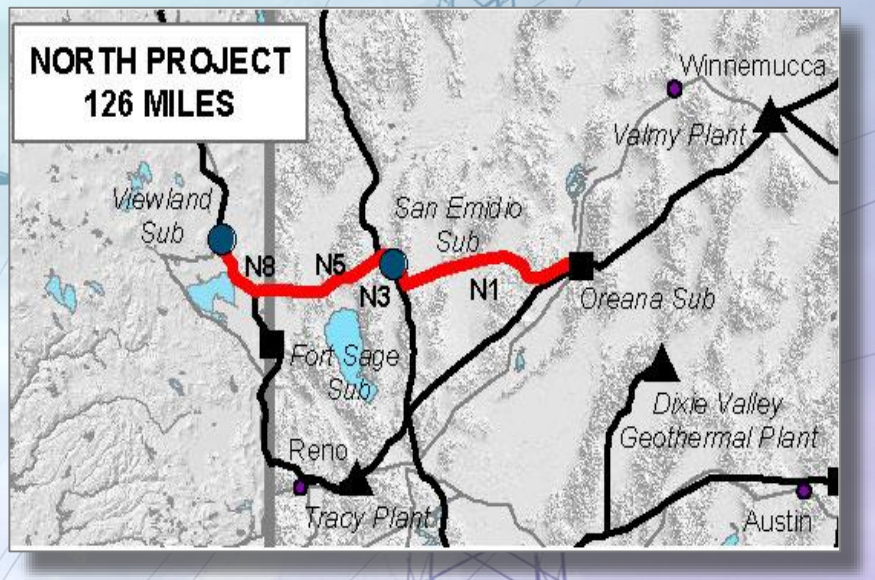
North Route Details

Oreana to Viewland (CA)

- 500 MW incremental Export and 1,000 MW total with LMUD project rating
- Cost estimated in 2012 to be $197,880,000



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North Route (Cont.)

North Route Benefits

- Provide a backbone collector system for Northwestern Nevada.
- Relieve congestion and increase firm transfer capacity of the Alturas tie line.
- Provide another transmission source into the proposed Viewland Substation, facilitating future transmission projects from Northwest Nevada to the Northern California backbone transmission network.

The North Route evaluation assumed the RTI Tracy to Ft. Sage segment is not constructed, but the RTI portion from Dixie Valley to Oreana is constructed. This assumption was made since this Dixie Valley to Oreana segment provides a strong collection opportunity.

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East Route Details

Robinson to IPP Sub (Utah)

- 345 kV – 400 to 600 MW for a cost of $230,570,000

or

- 500 kV – 750 to 1000 MW for a cost of $413,740,000

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East Route (Cont.)

East Route Benefits

- Allow for the export from Nevada, through Utah, into the Southern California utilities that have rights at IPP.
- Create opportunity for Nevada to capture capacity as it becomes available from the reduction of coal-based power purchases.
- Utilize existing line projects to assist with permitting and land acquisition.
- Support renewable energy interconnection and sales from central Nevada.
- Does not require California Environmental Quality Act (CEQA) project permitting review.

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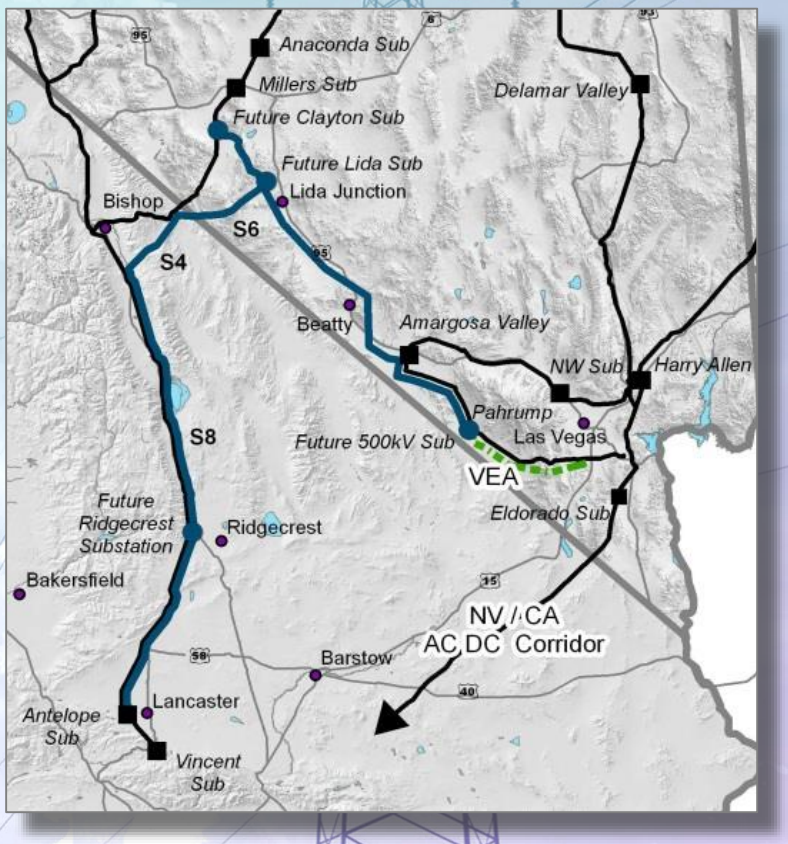
South Route Details

VEA System to Antelope (CA)

- In absence of RTI with the Construction of the Valley Electric Association 500 kV Project
- 1500 to 2000 MW for a total cost of $930,650,000



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South Route (Cont.)

South Route Benefits

- Provide incremental export out of Nevada that integrates with existing transmission in Nevada and California.
- Allow for interconnections into renewable energy zones in upper Nye County, Mineral County and west central Nevada
- Offer interconnection for California based renewable developments for the renewable energy zones in the Ridgecrest area.
- Connect with Antelope Substation to reach a less congested segment of the existing California grid.
- Avoid the electric grid constraints (electrical and physical) through the WECC Path 46 to provide enhanced system resiliency.

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Grid Impact / Preliminary Thermal Ratings

Proposed East Project – Robinson to IPP

Approximate Line Length	Voltage	Conductor Configuration	Thermal Rating	Projected Export Path Rating
167	345 kV	2 - 954 MCM	1240 megawatts	400-600 megawatts
167	500 kV	3 - 954 MCM	2690 megawatts	750-1000 megawatts

This proposed project is highly dependent on available Transmission Capacity (ATC) for potential buyers at IPP. It was proposed based on the assumption that once the California Renewable Portfolio Standard was fully implemented, many southern California buyers who hold the ATC would be interested in taking renewable energy deliveries at IPP.

Proposed West Project – Oreana to Viewland

Approximate Line Length	Voltage	Conductor Configuration	Thermal Rating	Projected Export Path Rating
126	345 kV	2 - 954 MCM	1240 megawatts	70 megawatts (1)
LMUD/WAPA Project Only				500 megawatts (2)
126	345 kV	2 - 954 MCM	1240 megawatts	1000 megawatts (3)(4)

Completion of the North Projects has significant internal grid system benefits. The proposed North Project route will reduce the collector system transmission requirements for serving the REZs in northwest Nevada and northeast California but will face heavier regulatory hurdles than the other routes.

Proposed South Project – VEA System to Antelope

Approximate Line Length	Voltage	Conductor Configuration	Thermal Rating	Projected Export Path Rating
253(1)	500 kV	3 - 954 MCM	2690 megawatts	1500-2000 megawatts (5)
174(2)	500 kV	3 - 954 MCM	2690 megawatts	Included Above
37(3)	230 kV (4)	1 - 954 MCM	410 megawatts	N/A

Proposed Project includes 230 kV transmission to tie from Anaconda Moly Substation to Clayton Substation, but the path rating will be dependent on the 500 kV from Clayton to Antelope Substation & the 500 kV from Clayton to Pahrump 500 kV Substation.

For footnoted detail, please reference NEAC Final Report

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WECC Line Rating Process

- WECC requires a three phase path rating process that is a comprehensive technical planning study to define the transfer limit that a new transmission line (or lines) can achieve without interfering with the reliability or stability of other lines in the western interconnection.

- Submittal of new project data to the Sub-Regional Groups of WECC (SSPG) initiates a portion of the regional planning process required to ultimately obtain WECC ratings.

- Submittal announces the project(s) to the regional stakeholders and facilitates market interest development for potential transmission users (i.e. renewable energy developers and other transmission users).

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WECC Line Rating Process (Cont.)

- The process requires decisions regarding specific technical parameters to support computer software based transmission modeling.
- The ultimate WECC Rating parameters will include project voltage, line length, conductor size, phase spacing, as well as transformer and shunt reactor sizing.
- **The SSPG was notified of these projects in January 2012, however, formal submittal was held pending identification of a project proponent**

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Next Steps

- **Project Proponent(s) Identified**
- **Financing approach determined**
- Federal & regional transmission monitoring & involvement
- Solidify discussions with neighboring utilities / define purchase opportunities
- WECC transmission line ratings
- Environmental Application Preparation / Permitting Initiation
- Preliminary and final design
- Property and Right-Of-Way Acquisition
- Construction
- Energization and Operation

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APPENDIX

Appendix A – Project Confidence Rating Flow Chart
Appendix B – Bio, Karen Schlichting, PE
Appendix C – Bio, Jay Campbell, PE
Appendix D – Bio, Jim Bengochea, PE

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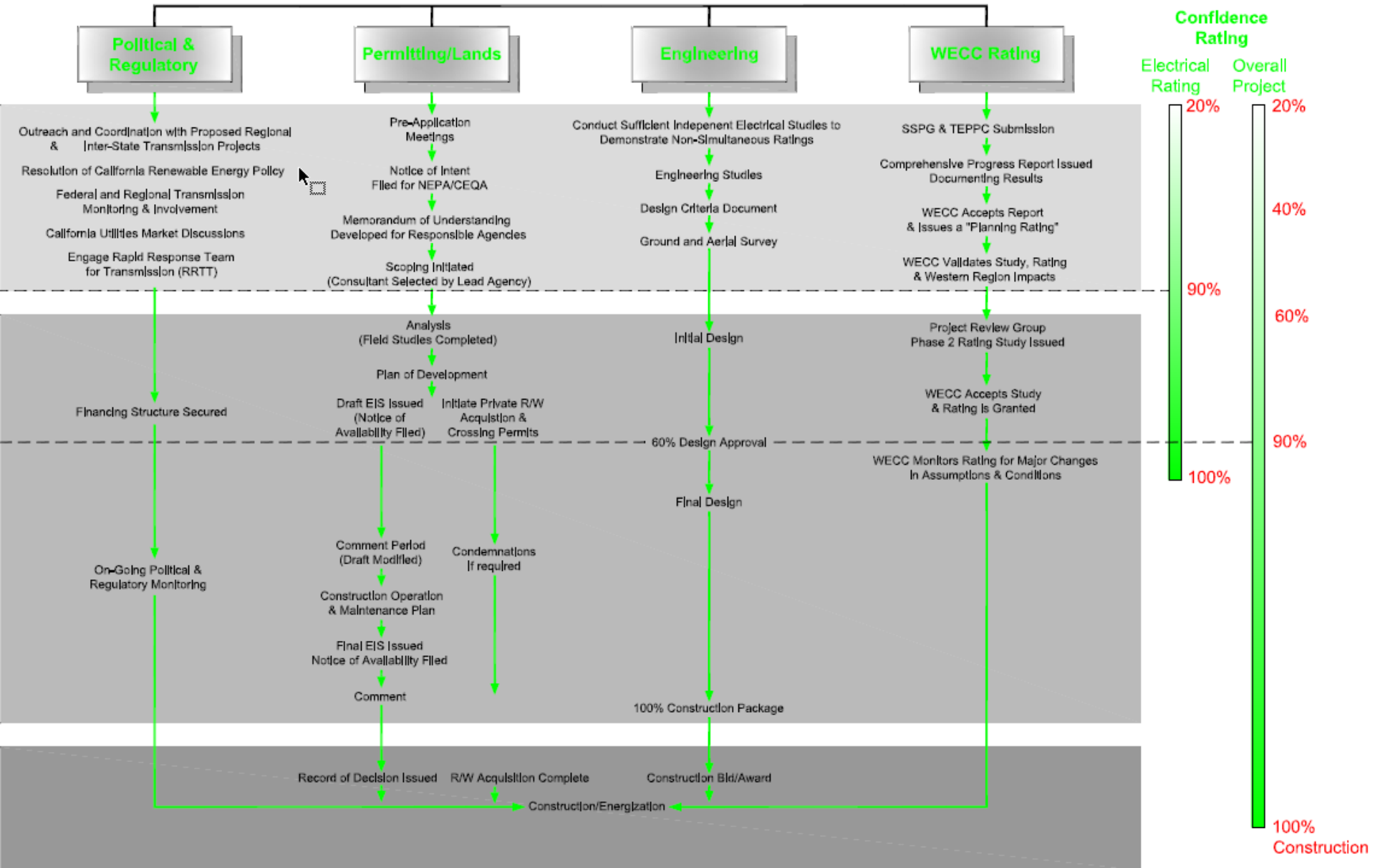
APPENDIX A – PROJECT CONFIDENCE RATING



APPENDIX B – PRESENTER BIOS

KAREN SCHLICHTING, P.E.
Principal, Tri Sage Consulting

Ms. Schlichting is the founder of Tri Sage Consulting and is responsible for the administration and operation of the firm.

Ms. Schlichting has over 28 years of professional experience in the utility industry providing project management on major transmission lines and high voltage substations. She holds her professional engineering licensing in both Nevada and California and works closely with utilities, developers and regulatory agencies in these states specific to the development of utility infrastructure. She is a strong supporter of the development of renewable energy as a component for a balanced energy portfolio throughout the western US. She brings extensive knowledge for NEPA and CEQA permitting requirements to the projects she supports. Prior to founding Tri Sage in 2003, Ms. Schlichting worked for NV Energy as a Transmission Line Design Engineer, and also as a Major Projects Manager.

In 2011 and 2012, working closely with Energy Source, she managed the NEAC Transmission Initiative Routing Study development. Following the release of this study, she has met with multiple interested parties as to the findings in this study.

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APPENDIX C – PRESENTER BIOS

JAY CAMPBELL, P.E.

Consultant, Transmission Operations & Compliance

Mr. Campbell has extensive experience within the electric utility industry specific to transmission planning and evaluations. He has worked closely with the Western Electricity Coordinating Council (WECC) while employed at NV Energy. He held multiple positions throughout the NV Energy organization, including Supervisor of Network Operations and Applications. He as worked with the California Independent System Operator (CAISO) as well as multiple other utility regulators included CPUC and PUCN regarding grid operations.

Mr. Campbell recently joined Tri Sage Consulting, providing electric system impact evaluations for developers of renewable power and transmission infrastructure. He is highly skilled with transmission planning software such as PSLF and brings a broad knowledge of the western grid to his modeling and evaluations.

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APPENDIX C – PRESENTER BIOS

JIM BENGOCHEA, P.E.
Staff Transmission Engineer

Mr. Bengochea has over 30 years of professional civil engineering experience providing project management, electric transmission line and substation design.

His most recent years of experience have been as a consultant in the utility and public works sector specializing in the civil design for electric transmission lines and renewable energy facilities. He has provided expertise to multiple sectors of renewable energy developers, including wind, solar, bio mass and most notably geothermal. In addition to supporting renewable development, he works closely with utilities throughout Nevada and California on the improvements and expansions of their transmission grid. These clients include NV Energy, Valley Electrical Association, PG&E and multiple others.

Mr. Bengochea has been with Tri Sage for over 12 years and was instrumental in the development of the NEAC Transmission Study. His expertise with substation and transmission projects and the associated process to bring these projects to fruition is invaluable to the Tri Sage clients.

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