Section 1: Executive Summary



SECTION 1: EXECUTIVE SUMMARY

1.1 SECTION PURPOSE

This report has been prepared for the Nevada Energy Assistance Corporation (NEAC), a 501(c)(3) non-profit agency; in support of the Nevada State Office of Energy's (NSOE) mission to ensure a strategically planned development of energy resources in the State of Nevada. Working for NEAC and in direct concert with the NSOE, the partnered team of Tri Sage Consulting has conducted extensive evaluation of viable projects for high voltage transmission lines for the benefit of renewable energy development and export out of Nevada. This report provides the process and details associated with this routing and evaluation effort, and it summarizes the conclusions of proposed projects to enhance renewable export for Nevada.

The team of Tri Sage Consulting, Energy Source, LLC and US Geomatics (referenced throughout this report as the "Tri Sage team") has recommended herein three preferred high voltage transmission line projects that will support the export of renewable energy transport out of the state of Nevada. The details of how the planning and routing was completed, along with assumptions, key stakeholder meetings and technical aspects are all detailed in the following sections. Presented in this section is the summary of the findings.

1.2 EXPORT OPPORTUNITY SUMMARY

The transmission system in Nevada is primarily owned and operated by NV Energy. This system can currently accommodate renewable energy export, however, the current transmission infrastructure is fully utilized by generators in and outside of Nevada to export or transmit resources through of the state Nevada. The transmission system in the north is fully subscribed on a firm basis for both import and export of energy. In the south, firm export transmission capacity is also fully subscribed and includes coal generated power transmitted from Utah, through the State of Nevada, to California.

Using the renewable energy zones established by the Renewable Energy Transmission Access Advisory Committee (RETAAC) team (RETAAC mapping shown for reference in Appendix A), and incorporating both knowledge and known renewable developments into the overall export opportunity evaluation, three areas were identified that would allow for both sufficient supply and demand to interface through new transmission line projects.

1.3 PREFERED PROJECT SUMMARIES

Three corridor level routing opportunities were identified and studied, which then allowed the team to establish multiple routing alternatives and ultimately identify three proposed high voltage transmission line export projects. These projects provide transmission access to the north, east, and south, enhancing new transmission export paths into the neighboring states of California and Utah.

Figure 1.1 - NEAC Proposed Export Route Map, provided below for reference, depicts the three proposed transmission line projects along with the RETAAC renewable energy zones and the existing major transmission lines within the state.

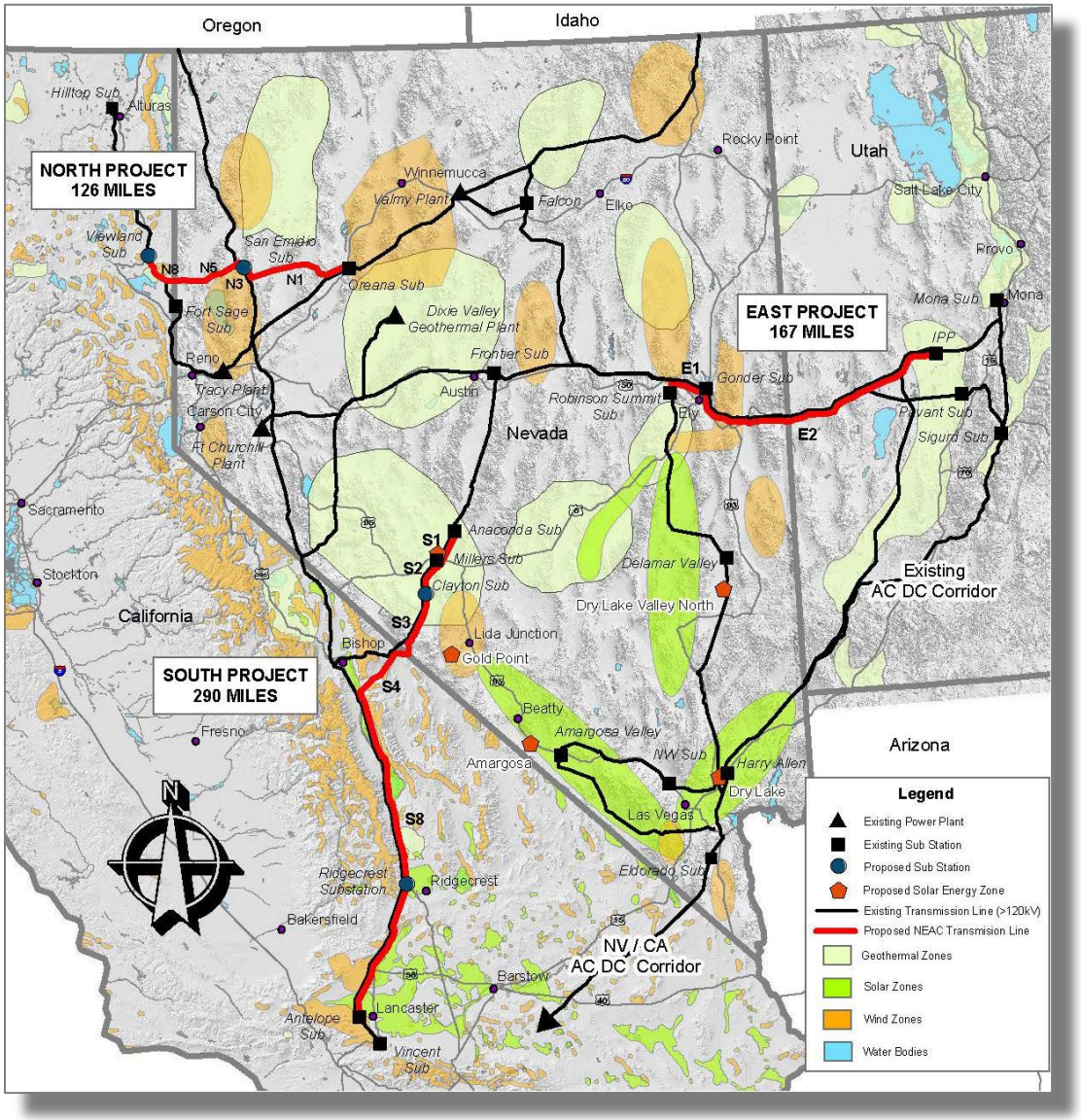

Figure 1.1 – NEAC Proposed Export Route Map

1.3.1 North Project

(500 MW incremental and 1,000 MW total with LMUD project rating, for a cost of $197,880,000)

The northern project focuses on export into the northern central California market and utilizes the proposed transmission project by Lassen Municipal Utility District (LMUD). This route is proposed as a 345 kilovolt (kV) transmission line that will interconnect into the NV Energy grid at the Oreana Substation, and will terminate into the LMUD proposed Viewland Substation; reference *Figure 1.2 – Preferred North Route (Project)*. This project is highly dependent upon the completion of the LMUD substation and transmission line, and will require immediate coordination with LMUD and the parties associated with the LMUD project.

This northern project is projected to provide 500 megawatts (MW) of incremental export capacity. Coupled with the LMUD project rating of 500 MW, the overall transmission improvements allow for 1,000 MW of total incremental export capacity and collection, and export of power from the northern region of the renewable energy zones. This project specifically will benefit renewable projects near the San Emidio area, the Tribal renewable resources, and multiple other areas rich with resources in northwest Nevada. The line route is 126 miles long and is estimated to cost $197,880,000. This is the total project cost (i.e. final design, permitting, construction) including the associated substations at each terminus. A third substation (San Emidio Substation) is proposed to be accommodated (but is not included in the cost) midway along the project to support renewable energy collection from renewable energy zones (REZs) north and south of this area.

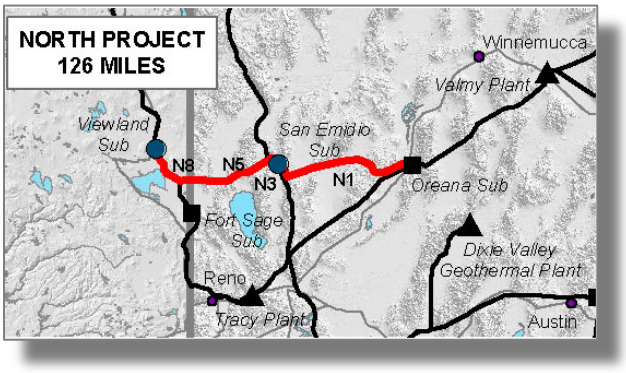

Figure 1.2 – Preferred North Route (Project)

The proposed North Project will:

- 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.

This project is highly dependent on the LMUD proposed project, and as such it is recommended that the most immediate focus be in support of, and in coordination with, the LMUD project development team.

If the Tracy–Fort Sage–Viewland 345 kV transmission project, as proposed by NV Energy's Renewable Transmission Initiative (RTI), proceeds and is completed, the North Project, as proposed herein, is duplicative in all aspects except it offers better interconnection opportunities for renewable generation locations in Northwest Nevada. The decision to proceed with the NEAC North Project will need to be made once the RTI (Tracy to Ft. Sage) outcome is known.

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 in the event that the LMUD and North Project proceed.

1.3.2 East Project

(345 kV – 400 to 600 MW for a cost of $230,570,000, and 500 kV – 750 to 1000 MW for a cost of $413,740,000)

The eastern project provides an opportunity for Nevada to move power from the north end of the NV Energy ON Line project (interconnecting at Robinson Substation) into central Utah (interconnecting at the Intermountain Power Project (IPP) Substation); reference *Figure 1.3 – Preferred East Route (Project)*. This line would allow for export from Nevada, through Utah, into the southern California utilities that have transmission rights at IPP. Currently, export through the AC (alternating current) transmission network, from IPP to Eldorado Substation in Southern Nevada, is highly constrained. However, as coal sales decrease through this path due to California initiatives to limit coal power purchases, available capacity can be utilized through this route to allow for renewable energy sales into the southern California market.

This eastern project is projected to provide a range of export capacity based on voltage; 345 kV and 500 kV have been considered. If a 345 kV voltage is used the incremental export capacity is estimated to be between 400 and 600 MW. If 500 kV is selected the range of export capacity is projected to be between 750 and 1000 MW. The proposed route would allow power to be transferred into the existing AC/DC corridor that flows into the southern California market. A

preliminary evaluation has shown that the final economic decision of line size will be dependent upon the market demand for the capacity on the line.

The line route is 167 miles and is estimated to cost a total of $230,570,000 at 345 kV and $413,740,000 at 500 kV, inclusive of substation expansion costs. The terminal at the western end of the route is the Robinson Summit Substation, which is currently under construction as part of the ON Line Project. The eastern termination is the existing IPP Substation. This IPP substation is an existing hub of power transfer from the coal generation in Utah into the California Market. No new substations, only expansions of existing substations, are proposed for this project. However, the IPP expansion allows for the opportunity to continue east and interconnect into the Mona Substation, which could allow for additional market sales (this could expand the number of southern California buyers). This option was evaluated as part of the East Project, but was not selected as the preferred terminus. Mona can be considered in the future if the market warrants.

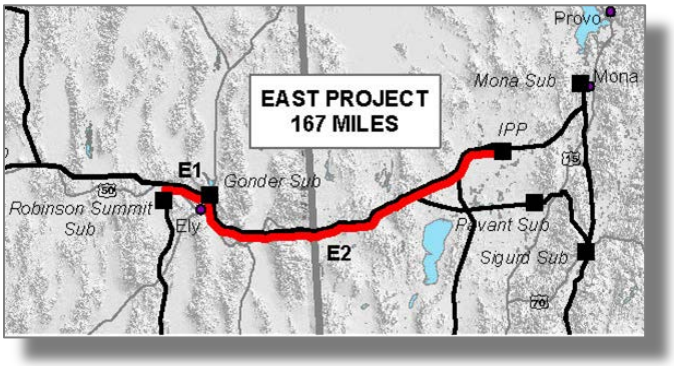

Figure 1.3 – Preferred East Route (Project)

The proposed East Project will:

- 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.
- Not require California Environmental Quality Act (CEQA) project permitting review.

The next step for moving this project forward is to further develop an understanding of the market interest of the IPP participants, as well as other California utilities with transmission rights at Mona Substation.

1.3.3 South Project
(750 to 1000 MW for a cost of $595,310,000)

The South Project is unique in that it provides incremental and new export capacity through a route that is not physically constrained and allows for improved electrical reliability. This route is proposed to be a 500 kV transmission line originating in the Tonopah, Nevada area and terminating in the Los Angeles, California area at the Antelope Substation; reference *Figure 1.4 – Preferred South Route (Project)*. This project will interconnect into the NV Energy electric grid at the existing Anaconda-Moly Substation at 230 kV voltage. The line will continue into a proposed Clayton Substation that will step up to 500 kV voltage. From this point, the line will terminate in southern California at the existing Antelope Substation.

This scenario assumes that the NV Energy RTI is not constructed. This was necessary since the RTI outcome is unknown and is not scheduled for completion until early 2012. Two other scenarios were also considered and are presented for consideration. However, at this point in time, given the status of the RTI, this is the preferred South Project alternative for this NEAC project.

This South Project electric grid connection from Nevada to southern California offers the potential to increase export out of Nevada in a location that can integrate well with existing transmission in Nevada and California, and it has a good possibility of being permitted. The strategic siting of this line allows for interconnections into renewable energy zones in upper Nye County, Mineral County, and west central Nevada. By interconnecting into the Antelope Substation area, the renewable energy export will reach a less constrained segment of the California grid, which is on the northern side of Los Angeles, and also taps into the Southern California Edison (SCE) grid. This route avoids the electrical grid and physical environmental constraints through the Eldorado Substation by establishing a new line route into California, west of the existing Western Electricity Coordinating Council (WECC) Path 46. The WECC Paths associated with Nevada are discussed in more detail in Section 4.

In addition to accommodating renewable energy export, this new transmission line would help to reduce the existing WECC “donut hole” in central Nevada; ultimately opening not only export but a new transmission interconnection with California for other transmission transactions as well.

In addition to the terminations at the north and south ends, a new substation in southern California (Ridgecrest Substation) has been proposed that can be accommodated midway along the California segment. This substation will allow for California resources (if requested) to interconnect on the line, thus functioning as a collector to facilitate additional transfer of renewable energy on the project. The cost associated with the Ridgecrest Substation is not

included in the final cost estimate since a collector substation such as this would be funded by the participating renewable energy developers. However, for reference, a cost estimate has been completed specific to this substation and is included in the project details.

This South Project is projected to provide approximately 750 to 1000 MW of capacity into the southern California market. The line length is 290 miles and is estimated to cost approximately $595,310,000, including new substation and expansion of existing substations costs.

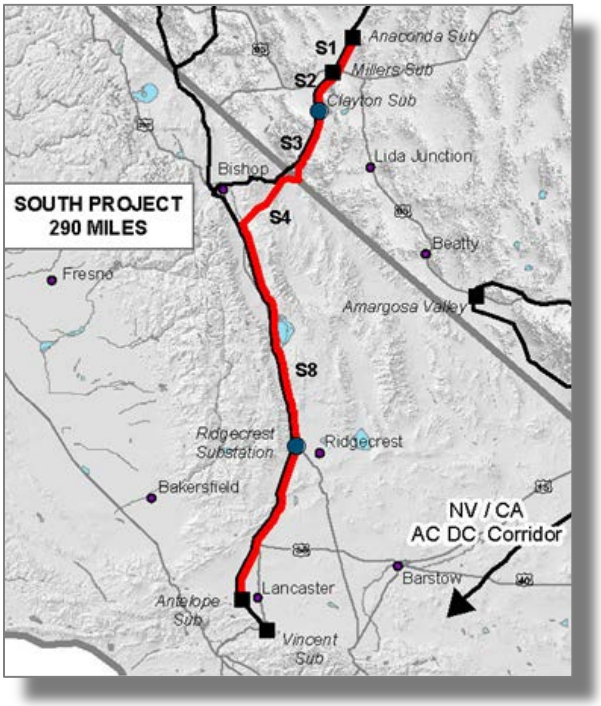

Figure 1.4 – Preferred South Route (Project)

The proposed South Project will:

- 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.

The next step for this South Project will be to facilitate meetings with all the affected transmission planning sub-regions and balancing authorities.

1.4 CONTINGENT PROJECT SCENARIOS

The proposed "preferred" project alternatives herein (North, East and South) were identified, planned and routed with the intent of integrating into the existing NV Energy transmission system, taking advantage of existing and planned grid collector lines. Full consideration was given to not only the existing system, but also to the 500 kV ON Line Project that is currently under construction, the proposed Valley Electric Association (VEA) 500 kV project, and the proposed Renewable Transmission Initiative (RTI) that is currently in the planning phase. Due to the early stages of the RTI, consideration was given for both; approval or denial of the RTI project and alternative projects were established that could be included in the southern project to off-set the delay or cancelation of the RTI projects.

Two such South Project alternatives that were identified take into consideration the following scenarios: 1) The South Project being constructed in absence of RTI, but in conjunction with the construction of the VEA proposed 500 kV project; and 2) The South Project being constructed in conjunction with the RTI. Both of these scenarios add an element for additional line work consideration and are presented below.

1.4.1 South Project 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)

In the event that the NV Energy RTI project does not proceed, but VEA does construct their 500kV project, the South Project proposed herein should be evaluated to determine if the market warrants expansion to include a 500 kV line from the NEAC proposed Clayton Substation to the VEA Pahrump 500 kV Substation. This proposed line route would utilize the 1964 U.S. Bureau of Reclamation (BOR) DC Transmission Line Alignment, which was never constructed but was mapped and recorded in the BLM archives; reference *Figure 1.5 – South Route Alternative without RTI but with VEA Project*. The Tri Sage team conducted a preliminary review of this route but did not conduct a full constraint evaluation as part of this report.

This Clayton Substation to Pahrump line would allow for the collection of renewable energy resources throughout the Nye County area. It would also tie into the Pahrump 500KV substation. This would open up additional capacity in addition to interconnecting into

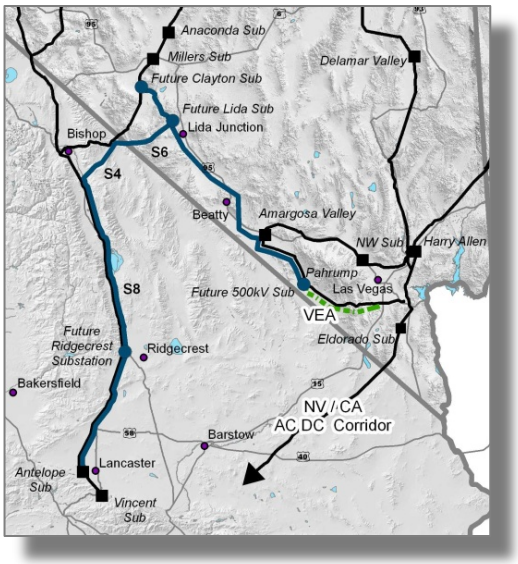

Figure 1.5 – South Route Alternative without RTI but with VEA Project

what will be a 500 kV CAISO (i.e. California Independent System Operator, also California ISO) substation in Pahrump. The total South Project line rating with this addition would potentially be 1500 to 2000 MW, potentially adding 1000 MW to the original South Project rated capacity. The total estimated cost for this expanded South Project would be $930,650,000.

The details of this South Route Alternative were evaluated to the extent possible, without performing detailed constraint mapping and routing. If this scenario is determined to be viable based on the VEA and RTI project outcomes, the next step will require complete project routing and a preliminary design.

1.4.2 South Project with RTI Built
(750 to 1000 MW for a cost of $517,430,000)

In the event that NV Energy is successful and builds the RTI southeast segment of their proposed project, the South Route should be modified to have the northern termination point at proposed Lida Substation, just north of Lida Junction; reference *Figure 1.6 – South Route Alternative with RTI*. The northern terminus could *electrically* be at either Clayton or Lida Substations. Terminating at Lida Substation offers the benefit of an overall reduced line length. The ultimate decision should be based on the coordination with the RTI location of their designated substation. Note that not only the RTI, but the National Environmental Policy Act (NEPA) process will be a determining factor. The estimated cost associated with the north terminus relocated to Lida is estimated to be $517,430,000.

The timing of this report conclusion and the release of the RTI findings did not coincide enough to warrant full evaluation of this option. Therefore, similar to the scenario presented in Subsection 1.4.1, if this routing option comes to a point of viability, the next step will require that complete project routing and a preliminary design be done. Before routing and design work can begin however, it will be critical to coordinate with NV Energy to establish the beginning terminus of the line (i.e. Lida or Clayton).

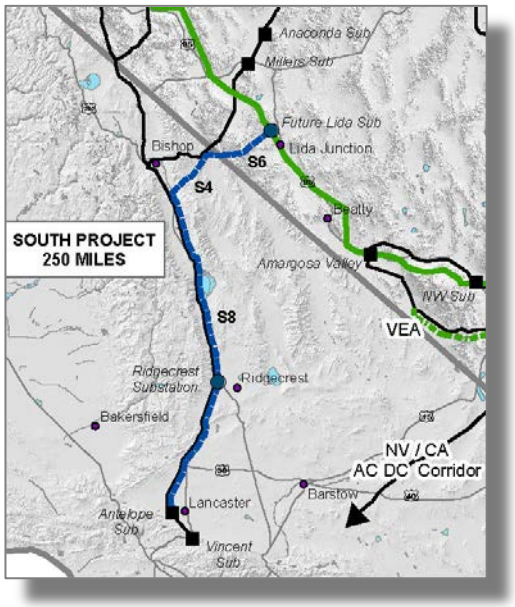

Figure 1.6 – South Route Alternative with RTI

1.5 PROJECTS COSTS AND RATINGS SUMMARY

The following *Table 1.1 – Projects Summary of Costs and Ratings*, has been provided to show a summary of each project, including alternatives that have been studied, along with costing and voltage breakout.

Table 1.1 – Projects Summary of Costs and Ratings

Project & Description		Voltage	Project Mileage	Transmission Estimated Cost[1]	Substation Names	Substation Estimated Cost[1]	Total Project Estimated Cost[1]	Average Total Estimated Cost/Mile[1]	Potential Incremental Path Rating (mw)		Total Cost per kw		Comments
									Low	High	Low	High	
North Project:													
Oreana to Viewland & No LMUD		345 kV	126	$172,880,000	Oreana Sub	$8,900,000							Assumes Viewland Sub is built from a green field site. Assumes that NVE RTI from Ft. Sage to Viewland is not constructed, but NVE RTI from Dixie Valley to Oreana is constructed.
					Viewland Sub	$16,100,000							
Assumes partial RTI only (see comments)					Phase Shifter	$3,200,000							
	Total		**126**	**$172,880,000**		**$28,200,000**	**$201,080,000**	**$1,596,000**		**70**		$2,873	
or													
Oreana to Viewland & LMUD		345 kV	126	$172,880,000	Oreana Sub	$8,900,000							This project combined with the LMUD project, have a combined 1000MW incremental path increase. Same RTI scenario as above.
					Viewland Sub	$12,900,000							
Assumes partial RTI only (see comments)					Phase Shifter	$3,200,000							
	Total		**126**	**$172,880,000**		**$25,000,000**	**$197,880,000**	**$1,570,000**		**500**		$396	
East Project:													
Robinson Summit to IPP		345 kV	167	$207,870,000	Robinson Summit	$13,000,000							
					IPP Sub	$9,700,000							
Not RTI Dependent	**Total**		**167**	**$207,870,000**		**$22,700,000**	**$230,570,000**	**$1,381,000**	**400**	**600**	$576	$384	
or													
Robinson Summit to IPP		500 kV	167	$303,840,000	Robinson Summit	$17,900,000							
					IPP Sub	$92,000,000							
Not RTI Dependent	**Total**		**167**	**$303,840,000**		**$109,900,000**	**$413,740,000**	**$2,477,000**	**750**	**1000**	$552	$414	
South Project:													
Anaconda to Clayton Substation		230 kV	37	$20,840,000	Anaconda Moly	$12,100,000							Most of the transfers must come from Tonopah area generation. High-speed transfer tripping required.
&					Clayton Sub1	$75,350,000							
Clayton to Antelope Substation		500 kV	253	$476,120,000	Antelope Sub	$10,900,000							
Assumes No RTI	**Total**		**290**	**$496,960,000**		**$98,350,000**	**$595,310,000**	**$2,053,000**	**750**	**1000**	$794	$595	
or													
Anaconda to Clayton Substation		230 kV	37	$20,840,000	Anaconda Moly	$12,100,000							Half the rating increase must be scheduled to Pahrump/Eldorado and half to Antelope. Some high-speed transfer tripping may be required.
&					Clayton Sub1	$75,350,000							
Clayton to Antelope Substation		500 kV	253	$476,120,000	Antelope Sub	$10,900,000							
&					Clayton Sub2	$17,650,000							
Clayton to Pahrump Substation		500 kV	174	$299,790,000	Pahrump Sub	$17,900,000							
Assumes No RTI & with VEA	**Total**		**464**	**$796,750,000**		**$133,900,000**	**$930,650,000**	**$2,006,000**	**1500**	**2000**	$620	$465	
or													
Lida to Antelope Substation		500 kV	251	$476,230,000	Lida Sub	$30,300,000							
					Antelope Sub	$10,900,000							
Assumes RTI	**Total**		**251**	**$476,230,000**		**$41,200,000**	**$517,430,000**	**$2,061,000**	**750**	**1000**	$690	$517	

[1] *Costs are rounded*

1.6 MARKET EXPORT OPPORTUNITY SUMMARY

Specific to California and their potential interest for import of renewable energy to meet their aggressive RPS, it will be critical for the states of Nevada and California to establish a clear understanding of this policy and how it will be implemented. Once that is addressed, the associated political barriers will begin to open and each of the Projects can be considered for moving forward and ultimately be constructed.

Each Project presented herein provides its own unique opportunity for the California markets. In addition to export opportunity to California, the South Project will facilitate the opportunity for California based renewable energy generation development along the route to interconnect at the proposed Ridgecrest Substation, located in the Ridgecrest/Owens Valley area of southern California.

The North Project provides the opportunity for interconnecting renewable generation in northwest Nevada at the proposed San Emidio Substation near Gerlach, Nevada, for export to the northeast California area.

While the East Project does not have any planned intermediate collection substations, there is opportunity to interconnect at both terminus' but also throughout the NV Energy system tying to the Gonder and Robinson Summit Substations. Moreover, the overall buying market for the East Project is the Southern California utilities utilizing their existing transmission rights at either IPP and/or Mona.

These Projects complement the overall development of renewable energy export resulting in considerable opportunities to the state of Nevada. These opportunities exist in the form of developing intellectual technology as well as actual renewable energy production. All of this is currently limited by the lack of electric transmission infrastructure reaching neighboring states, specifically the most critical market of California. California currently has a 60,000 MW coincident peak load which reflects the potential under their current RPS standard of the total renewable energy demand. Nevada will depend upon the ability to transport electricity from the north, central and southern areas of the state in order to both support the potential California renewable energy need as well as boost economic development within Nevada. This report, along with the efforts completed in support of the report, addresses California's renewable energy need and presents not only export options from Nevada to California, but also discusses the non-tangible political/economic issues facing Nevada.

1.7 BENEFITS TO NEVADA

As NEAC moves forward with the development of the project proponent team and financing structure, it will be critical to maintain clarity that these Projects will have a life expectancy of well over 50 years, and will result in an extensive tax base for the state of Nevada as well as support for the development and enhancement of the technology base for the renewable energy development within the state. These Projects, during the course of planning, design and construction, will create jobs throughout Nevada. Once completed, they will provide a key piece of infrastructure for Nevada, representing not only a new source of renewable energy export but substantially greater reliability and energy diversity for both Nevada and California.

Executive Order #2011-18, issued by Nevada Governor Brian Sandovol on November 21, 2011, was a directive for the development of a new energy industry task force that will focus on many of the issues required to fully vet the merits of renewable generation and the resulting required transmission to the state of Nevada. A copy of this executive order is included in Appendix A for reference. These Projects offer an opportunity for the task force and the State to advance renewable energy export.