



Transmission line case studies

Tri-State owns and operates over 5,600 miles of transmission lines that distribute electricity to more than 40 members' 1.3 million consumers over 200,000 miles of service territory.

In the past, transmission lines carried power from a central source of generation, like a power plant or a hydroelectric dam, to consumers. Today, with the growth of renewable resources at the utility, community and individual levels, generation is increasingly distributed, while the need to connect people to their power is the same. As we build more solar arrays and wind farms, we also need to build the additional transmission lines necessary to reliably and affordably deliver that electricity, from wherever it was generated.

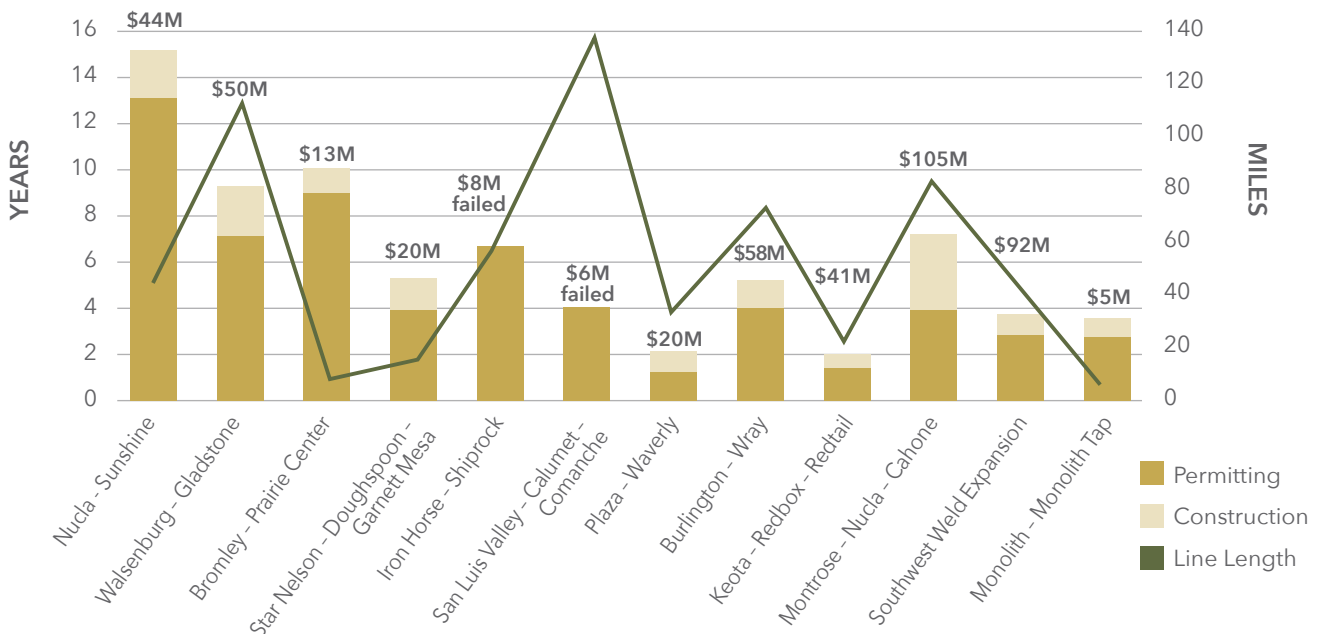
The process for siting and permitting transmission is highly variable for any given project. Factors from the number and preferences of stakeholders to the array of applicable regulations to the landscape itself dramatically affects how many years, how expensive and even how viable a given

project is. Yet the fact is that for an economy-wide energy transition to be successful, connecting new renewable projects to the grid in a timely and cost-effective way is critical for achieving the reliability and affordability that we all count on. This is only possible by expanding our transmission system.

This reference includes a series of illustrative case studies of recent transmission projects we have undertaken at Tri-State - most successful but a couple not. While there are some common threads that predict when one project might demand more time or expense than another, the ultimate commonality is that the duration, cost and outcome of siting and permitting transmission is unpredictable.

Today, as in the past, transmission siting and permitting is often a traffic jam that stalls progress. However, there are opportunities for improvements that could help make the transmission siting and permitting process work for the energy transition.

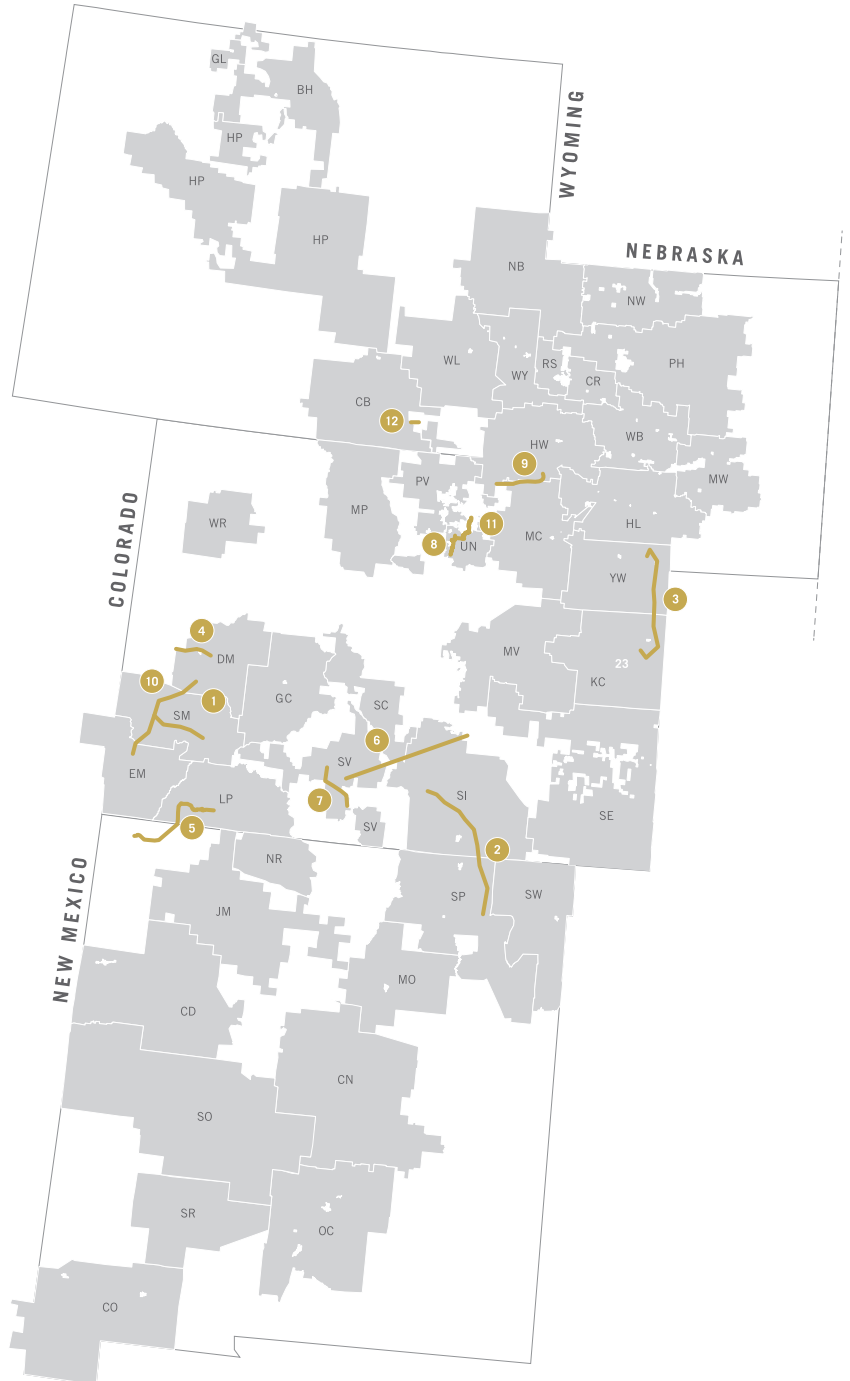
Transmission Line Project Summary: Duration, Length & Cost



	STATUS	VOLTAGE	LENGTH	COST <i>(millions)</i>	DIFFICULTY	PERMITTING - CONSTRUCTION	DESCRIPTION	NEPA / FEDERAL NEXUS	NEPA DOCUMENT	CHALLENGES
Nucla - Sunshine 1997 - 2012	Completed	115kV	48 miles	\$44 M	High	15 years	Rebuild of a 44kV line as 115kV line through a combination of rebuilding, relocating and undergrounding and associated substation modifications.	Yes: Bureau of Land Management (BLM), Forest Service (FS)	Environmental Impact Statement (EIS) / Record of Decision (ROD)	<ul style="list-style-type: none"> Line crosses highly scenic landscapes and spans difficult, high-elevation terrain. Affluent and powerful property owners formed a Coalition to challenge project. EIS was led by FS and included BLM and the Rural Utilities Service (RUS). RUS was unwilling to approve funds for a project that involved undergrounding the transmission line while county issued permit for project on the condition that 20 miles were underground. Ensuing legal challenges, appeals and delays added 7 years to project timeline before settlement reached between Coalition, TS and Member to share costs of a reduced number of underground miles (10).
Walsenburg - Gladstone 1997 - 2006	Completed	230kV	115 miles	\$50 M	High	9 years	Constructing new 230kV line on wood H-frame structures and 2 substations (Colorado - New Mexico Interconnection Project).	Yes: RUS, National Park Service (NPS)	Environmental Assessment (EA) - Finding of No Significant Impact (FONSI)	<ul style="list-style-type: none"> Project started as joint between two electric coops: Tri-State and Plains G&T (<i>Plains merged with Tri-State in 2000</i>). The project went through extensive siting process that analyzed numerous alternatives and refinements/relocations based on public and county input. Transmission line was sited to minimize visual impacts to Capulin Volcano National Monument, administered by the U.S. National Park Service. Large ranches opposed project and routing alternatives and Tri-State was unable to gain access to these lands for required surveys. Tri-State sued in District Court for the right to conduct suitability surveys and ultimately was required to condemn for the rights needed to site and construct line.
Bromley - Prairie Center 2005 - 2015	Completed	115kV	5 miles	\$13 M	High	10 years	Constructing new 115kV single-pole, steel structure line along interstate highway, large retail mall and adjacent to state park that provides sanctuary for avian species including bald eagles (<i>United Power Phase III</i>).	Yes: RUS-funded	EA - FONSI	<ul style="list-style-type: none"> County and City jurisdictions involved in the project preferred different alternative transmission alignments and had different priorities. Environmental groups opposed any route adjacent to Barr Lake State Park due to avian and visual impact issues. Crossing of interstate highway, BNSF Railway. Extensive public engagement. EA completed for RUS.
Star Nelson - Doughspoon - Garnett Mesa 2006 - 2011	Completed	115kV	19 miles	\$20 M	Medium	5 years	Constructing new 115kV line and 2 substations (<i>Delta County Transmission Improvement Project</i>).	Yes: BLM	EA - FONSI	<ul style="list-style-type: none"> Siting complicated by BLM Wilderness Study Area and presence of a federally threatened plant (<i>Colorado hookless cactus</i>). Transmission line sited in close proximity to a local airport triggering FAA review and mitigation of structures close to the runways. Challenges obtaining easements from private landowners.
Iron Horse - Shiprock 2008 - 2015 <i>(failed)</i>	Failed	230kV	65 miles	\$8 M	Medium	7 years	Constructing new 230kV line on wood H-frame structures and substations on BLM and Southern Ute Tribal Lands (<i>San Juan Basin Energy Connect Project</i>).	Yes: BLM, RUS, Bureau of Indian Affairs, Western Area Power Administration (WAPA)	EIS - ROD	<ul style="list-style-type: none"> Siting challenges with hundreds of oil and gas wells in the project study area and abundant cultural resource sites that had to be entirely avoided on tribal lands. Project required significant alternative developments that were continually modified to address various public concerns as well as resource-related issues. BLM was modifying parts of their Resource Management Plan (RMP) at the same time as the project EIS was moving forward, which resulted in delays to the project schedule. BLM acted as the lead agency for the EIS though there were numerous cooperating agencies making for complex NEPA process. Tribal Council reviews were unpredictable and the council itself was subject to turnover with bi-annual elections. Preferred route was developed after years of working through alternatives and was documented in Draft EIS but the direct benefit of the project to the Tribe was then contested by Tribal Council. Requested compensation for right of way (ROW) across Southern Ute's land ultimately was not economically feasible and the project, though nearly through EIS, was never built.
San Luis Valley - Calumet - Comanche 2009 - 2013 <i>(failed)</i>	Failed	230kV	140 miles	\$6 M	High	4 years	Approximately 95 mile double circuit 230kV San Luis Valley - Calumet transmission line; new Calumet Substation; approximately 45 mile double circuit 345 kV Calumet - Comanche transmission line; approximately 6 mile single circuit 230 kV Calumet - Walsenburg transmission line; and associated access and substation improvements.	Yes: RUS	EIS - Incomplete	<ul style="list-style-type: none"> Project justification predicated on two utilities' complementing purposes: reliable service to member for Tri-State and exporting renewables for PSCo. Proposed alignment would have crossed Trinchera Ranch owned by Louis Bacon, hedge fund billionaire, who fought the project publicly and in multiple venues including: Colorado State Public Utilities Commission (CPUC), federal NEPA process and district court. Mr. Bacon placed his ranch into a federal conservation easement, which prohibited the construction of a transmission line on his property. PSCo withdrew from the project causing irreparable damage to joint utility purpose and need. NEPA never got past the Draft EIS. Rural Utilities Service (RUS) was lead agency based in Washington. County permitting never started and project dissolved in August 2013.
Plaza Waverly 2010 - 2013	Completed	115kV	32 miles	\$20 M	Low	2 years	Rebuilding 69kV to 115kV line, constructing new substation and modifying existing substations, along BLM lands, historic wagon trail and a National Wildlife Refuge.	Yes: BLM, RUS and US Fish & Wildlife Service (USFWS)	EA - FONSI	<ul style="list-style-type: none"> The San Luis Valley is a migratory pathway for the sandhill crane and other birds, which draws an annual tourist population that provides valuable income to local communities. The transmission line spans portions of the Monte Vista National Wildlife Refuge, so avian protection was a critical component of the project. Significant wetland communities present in transmission ROW presented engineering and construction challenges.
Burlington - Wray 2011 - 2016	Completed	230kV	72 miles	\$58 M	Medium	5 years	New, single circuit 230kV line of wood pole H-frame structures and associated access and substation improvements.	Yes: RUS, NPS	EA - FONSI	<ul style="list-style-type: none"> Colorado Parks & Wildlife (CPW) notified Tri-State, several years into the project, that a portion of the transmission line that crossed state lands was acquired using federal funds (Land and Water Conservation Fund (LWCF), which created an additional federal nexus. A second EA was required that focused on the easement across the LWCF parcel. This required CPW and National Park Service approval. NPS cultural resource approval process was extensive and time-consuming. The LWCF EA required a land exchange as mitigation for the easement and a hearing with approval of the Capital Development Committee of the Colorado General Assembly. Late stage siting adjustments required for wind turbine development.
Keota - Redbox - Redtail 2013 - 2015	Completed	115kV	25 miles	\$41 M	Low	2 years	New, double circuit 115kV line on steel structures and associated access and three new substations.	No	N/A	<ul style="list-style-type: none"> Weld County 1041 Application for Areas and Activities of State Interest and Use by Special Review Permit required. CPW notified Tri-State that the originally planned route across the Chalk Bluffs was not recommended based on nesting raptor habitat. Substation design adjustments required to avoid excessive costs associated with an outage on a privately owned transmission line to nearby wind farm. Oil and gas operator purchased property proposed for substation for an oil terminal before Tri-State could acquire land rights. Stormwater permit for substation unable to be closed after 5 years due to extensive weed infestations in area.
Montrose - Nucla - Cahone 2013 - 2020	Completed	230kV	80 miles	\$105 M	High	7 years	Rebuild of existing 115kV to 230kV wooden transmission line with steel angle structures along route with associated modifications including improvement of 67 miles of access roads.	Yes: BLM, FS, USFWS	EIS - FONSI	<ul style="list-style-type: none"> Complex agency project administration: BLM (<i>Tres Rios and Uncompahgre Districts</i>) and FS (<i>Uncompahgre National Forest and San Juan National Forest</i>) with BLM leading. Project spans Montrose, Dolores and San Miguel Counties, necessitating three separate approvals. Extensive Plan of Development required by BLM State Office (<i>over 400 pages</i>). Dolores River Canyon crossing is visually sensitive recreation area. Included Gunnison sage-grouse Critical and Occupied Habitat in ROW. Third-party NEPA EA and BLM requirement to hire "Project Facilitator" followed by expensive cost recovery request. Voluntary Gunnison sage-grouse Conservation Plan for BLM, USFWS and CPW.
Southwest Weld Expansion 2013 - 2020	Completed	115kV & 230kV	42 miles	\$92 M	Medium	7 years	Siting network of 115kV and 230kV transmission lines and substations in Weld County, CO to service oil and gas loads in member service territory (<i>United Power Phases I and II</i>)	No	N/A	<ul style="list-style-type: none"> Siting challenges with active wells, extensive underground infrastructure, center-pivot agriculture, and residential development. FAA related constraints from local airstrips. Contentious Weld County permitting process due to proximity to county road construction project. Challenges obtaining easements from corporate landowners.
Monolith - Monolith Tap 2015 - 2018	Completed	115kV	2 miles	\$5 M	Low	3 years	Constructing new single pole steel 115kV structures to existing line and new substation.	No	N/A	<ul style="list-style-type: none"> Substation siting was challenging due to landowner concerns, the presence of wetlands and access issues. Difficult easement negotiations across large industrial site. Project required time-consuming agreements between WAPA and PacifiCorp.

Transmission Line Projects

1. Nucla - Sunshine
2. Walsenburg - Gladstone
3. Bromley - Prairie Center
4. Star Nelson - Doughspoon - Garnett Mesa
5. Iron Horse - Shiprock
6. San Luis Valley - Calumet - Comanche
7. Plaza - Waverly
8. Burlington - Wray
9. Keota - Redbox - Redtail
10. Montrose - Nucla - Cahone
11. Southwest Weld Expansion
12. Monolith - Monolith Tap



TRI-STATE

Tri-State's mission is to provide our member systems a reliable, affordable and responsible supply of electricity in accordance with cooperative principles.

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