

# EXHIBIT D

# GARKANE ENERGY COOPERATIVE PRELIMINARY 2023 SYSTEM STUDY & WORKPLAN

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## EXECUTIVE SUMMARY

### Purpose, Results, and General Basis of Study

The 2023 Work Plan uses present loads and projections for expected loads in the future years of 2026, 2028, 2030, and 2033 on an individual feeder basis. Historical Non-Coincidental data was utilized from 1995 thru 2022 to develop a 'least squares best fit' projections. Where there were inconsistencies in the trend period data, the projections are based on the past three years of history.

Using the analysis data described, the nameplate capacities of the various parts of Garkane's system were compared to the forecast loads. In addition, voltage measurements and projections were also checked at the equipment locations. When these checks showed that the existing facilities did not meet Garkane's established standards, projects were identified to resolve any voltage and capacity-related issues specified. Project estimates were then calculated using pricing information from Garkane's material suppliers and our current labor rates.

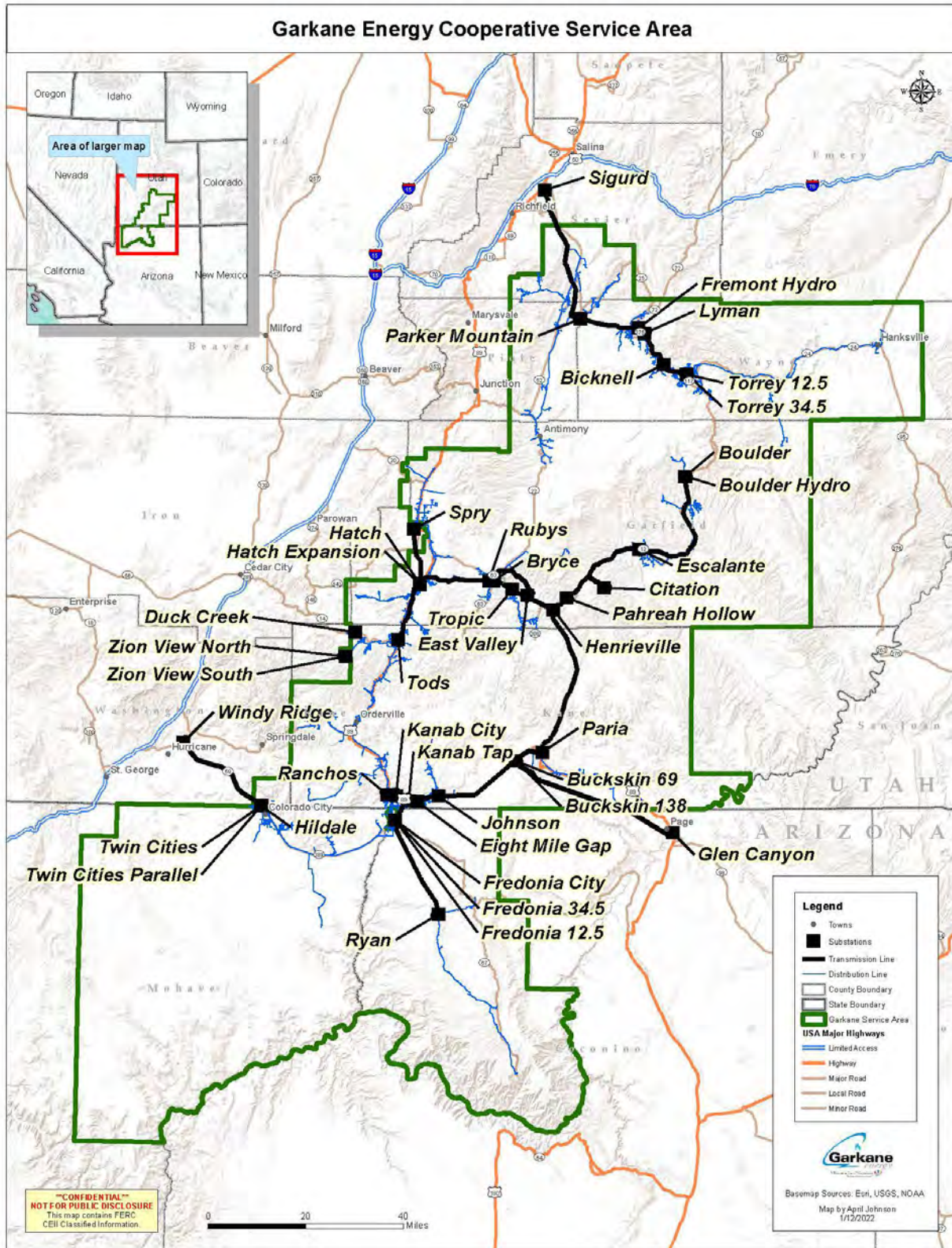
A summary of the identified projects is included in the report. In addition, estimated costs for the individual projects are included in the project summary table, along with an estimated time frame for when the project would need to be in service based on the severity of the issue.

There are also a limited number of projects that are not capacity related. These fall into three general categories. The first is related to the reliable and safe operations of the system. The second category is those projects mandated by law or contractual agreement. The third is equipment critical to the safe and reliable operation made obsolete by its manufacturer discontinuing its support/manufacturer coupled with an inability to procure replacement parts. The reason for these projects is noted in the project description.

### Service Area

Garkane Energy Cooperative, Inc. serves all or parts of six counties in South-Central Utah and two counties in North-Central Arizona, a rural area with considerable tourism. The Cooperative serves four national parks, two national monuments, a national recreation area, three national forests, and significant BLM lands. Several state parks are also served. Private lands encompass only about 10% of the Garkane's service territory of 16,000 square miles. The cooperative serves approximately 15,000 meters over 2,628 miles of distribution and transmission lines. Exhibit 1 shows Garkane's Service territory and its primary system components.

Exhibit 1, Garkane Service Territory & System Components



## Load Forecast Summary

Garkane operates and maintains 33 substations and switch yards for the transmission and distribution of electrical power across its service territory. Metering and control equipment in these facilities are used to collect load data and monitor system health in relation to Garkane's standards. The data is collected monthly and stored on computer servers. This historical data is then used to track load and voltage trends for each substation and feeder facility, making up each of Garkane's transmission and distribution systems. Exhibits 2-4 show the current load forecasts for each substation and associated feeders.

Exhibit 2, Garkane Northern Interconnect System Load Forecast

	CURRENT YEAR PEAK KW	PEAK AVERAGED OVER 3 YEARS	MAX PAST 5 YEAR PEAK KW	ESTIMATED PEAK LOAD IN 3 YEARS	ESTIMATED PEAK LOAD IN 5 YEARS	ESTIMATED PEAK LOAD IN 7 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS
<b>TOTAL SYSTEM</b>	66,051	63,379	66,051	68,715	71,374	74,032	78,020
<b>NORTHERN SYSTEM INTERCONNECT (RMP)</b>							
<b>TOTAL NORTHERN SYSTEM</b>	9,969	9,942	11,394	10,426	10,762	11,108	11,649
<b>Sigurd Substation</b>							
SIGURD (PAC) 46/60 Transformer	9,969	9,942	11,394	10,426	10,762	11,108	11,649
SIGURD (GKE) 46/69 Transformer	9,969	9,942	11,394	10,426	10,762	11,108	11,649
Sigurd to Parker Transmission Feeder, 69 kV	9,969	9,942	11,394	10,426	10,762	11,108	11,649
<b>Parker Substation</b>							
PARKER 69/12.5 kV Transformer	2,067	1,951	2,067	2,207	2,261	2,315	2,397
Parker to Fremont 69 Transmission Feeder	7,902	7,992	9,327	8,219	8,501	8,793	9,252
Grass Valley Feeder #34-1	1,838	1,820	1,838	2,029	2,098	2,168	2,272
Fish Lake Feeder #34-2	533	499	564	535	541	547	557
<b>Fremont Substation</b>							
FREMONT 2.4/69 STEP-UP TRANSFORMER	1,900	1,900	1,900	1,900	1,900	1,900	1,900
Fremont to Lyman 69 Transmission Feeder	7,892	7,982	9,317	8,209	8,491	8,783	9,242
Fremont Generator Feeder	10	10	10	10	10	10	10
<b>Lyman Substation</b>							
LYMAN 69/12.5kV TRANSFORMER	2,809	2,797	2,809	3,158	3,246	3,333	3,464
Lyman to Bicknell 69kV Transmission Feeder	5,069	5,173	6,494	5,141	5,335	5,540	5,869
Loa Feeder #36-1	2,296	2,303	2,296	2,570	2,656	2,743	2,873
Lyman Town #36-2	527	506	527	499	499	499	499
<b>Bicknell Substation</b>							
BICKNELL 69/12.5kV Transformer	1,875	2,079	1,875	2,680	2,672	2,664	2,652
Bicknell to Torrey 69kV Transmission Feeder	3,115	3,079	4,540	2,543	2,707	2,882	3,166
Bicknell Town #38-1	1,061	1,015	1,061	1,035	1,044	1,053	1,066
Teasdale #38-2	892	1,078	892	1,563	1,584	1,606	1,637
<b>Torrey Substation</b>							
TORREY Transformer 69/34.5kV	1,184	1,504	1,999	2,100	2,219	2,337	2,515
TORREY Transformer 69/12.5kV	1,207	1,554	2,083	1,869	1,940	2,010	2,115
Torrey to Hanksville 34.5kV Transmission Feeder	1,909	1,524	2,457	2,100	2,219	2,337	2,515
Torrey Town Feeder #39-1	1,010	1,216	1,570	1,500	1,562	1,625	1,718
Grover Feeder 39-2	197	338	514	487	511	535	572
<b>Hanksville Substation</b>							
HANKSVILLE Transformer 34.5/12.5 kV	1,045	908	1,045	934	971	1,009	1,065
Hanksville Feeder #40-1	1,045	908	1,045	934	971	1,009	1,065

Exhibit 3, Garkane Glen Canyon Interconnect System Load Forecast

	CURRENT YEAR PEAK KW	PEAK AVERAGED OVER 3 YEARS	MAX PAST 5 YEAR PEAK KW	ESTIMATED PEAK LOAD IN 3 YEARS	ESTIMATED PEAK LOAD IN 5 YEARS	ESTIMATED PEAK LOAD IN 7 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS
<b>TOTAL SYSTEM</b>	66,051	63,379	66,051	68,715	71,374	74,032	78,020
<b>SOUTHERN SYSTEM EASTERN INTERCONNECT (WAPA)</b>							
<b>TOTAL SOUTHERN SYSTEM</b>	56,500	52,675	56,500	53,460	55,431	57,402	60,358
Glen Canyon to Buckskin T.L. & Interconnect	45,148	43,947	45,148	48,975	50,995	53,016	56,046
<b>Buckskin Substation, #2</b>							
Buckskin to Henrieville Transmission Feeder, 138kV	17,807	17,537	18,965	19,662	20,384	21,106	22,189
<b>Buckskin 138/69 kV Transformer</b>	27,663	26,828	27,663	28,468	29,382	30,296	31,668
Fredonia Feeder (Planned Alteration to EMG Feeder 138kV)	25,467	24,519	25,467	25,737	26,455	27,173	28,251
Paria Feeder #2-4	2,433	2,413	2,509	2,358	2,399	2,439	2,500
<b>Paria Substation</b>							
Paria 69/25 kV Transformer	2,410	2,355	2,465	2,219	2,239	2,259	2,288
Big Water Feeder	2,410	2,355	2,465	2,219	2,239	2,259	2,288
<b>Johnson Substation (Retirement Planned for 2025)</b>							
<b>JOHNSON 69/12.5 kV Transformer</b>	452	753	998	556	573	591	617
Johnson Canyon (Retired From Normal Operation)	-	134	622	-	-	-	-
Canyon Country Feeder	363	393	476	426	436	447	462
Seeps Ranch Feeder (Single Phase)	142	129	142	130	137	144	155
<b>EMG Substation</b>							
<b>E.M.G. 69/12.5 kV Transformer</b>	1,297	1,232	1,297	1,952	2,087	2,237	2,493
EMG Substation to Kanab Transmission Feeder (Planned)	17,281	16,353	17,827	15,203	15,861	16,575	17,762
EMG Substation to Fredonia Transmission Feeder (Planned)	3,393	3,382	3,399	4,064	4,054	4,047	4,044
Johnson Canyon	726	726	726	726	726	726	726
Vermillion East	746	1,048	1,253	1,226	1,361	1,511	1,767
EMG Generator	10	5	10	N/A	N/A	N/A	N/A
PLX (Metering System Retirement, Alteration?)	1,791	895	1,791	N/A	N/A	N/A	N/A
<b>KANAB CITY SW (Retirement Planned 2023)</b>	12,777	12,173	12,777	12,768	13,181	13,607	14,273
<b>Kanab City Substation</b>							
<b>KANAB CITY 69/12.5 TRANSFORMER</b>	8,702	8,479	8,702	6,070	6,255	6,445	6,741
Kanab City to KCR Transmission Feeder	6,830	5,889	6,830	6,625	6,946	7,303	7,911
Kanab North	5,363	5,363	8,514	5,610	5,780	5,956	6,230
Kanab South	440	440	440	460	474	489	511
<b>Fredonia Substation</b>							
<b>FREDONIA 69 BUS</b>	3,393	3,382	3,399	4,064	4,054	4,047	4,044
Fredonia City 69 Transmission Feeder	2,946	2,985	2,946	3,051	3,096	3,142	3,212
Fredonia to Ryan Transmission Feeder	828	1,103	1,338	1,013	957	905	831
<b>FREDONIA 69/34.5 kV Transformer</b>	7,070	6,895	7,187	6,871	7,266	7,701	8,429
Fredonia to Colorado City Feeder	455	438	500	337	283	238	183
Fredonia to Orderville Feeder	6,691	5,914	6,691	6,534	6,983	7,463	8,246
<b>FREDONIA 34.5/12.5 kV Transformer</b>	302	323	331	446	506	585	754
I.R.C. Generation (Retired/Inactive)	-	-	2,781	-	-	-	-
I.R.C. Feeder	249	277	296	283	287	292	298
Kaibab Feeder	100	105	116	163	218	293	455
<b>Kanab City Ranchos (KCR) Substation</b>							
<b>KCR 69/12.5 kV Transformer</b>	6,830	5,889	6,830	6,625	6,946	7,303	7,911
KCR Feeder	3,553	3,390	4,155	3,366	3,350	3,335	3,312
KCR West Kanab Feeder	3,295	2,811	3,295	3,259	3,596	3,968	4,599
<b>Ryan Substation</b>							
<b>RYAN 69/25 kV Transformer</b>	855	1,119	1,351	1,118	1,089	1,061	1,024
Jacob Lake Feeder	242	218	248	232	241	251	267
Big Springs Feeder	709	949	1,159	887	848	810	757
<b>Orderville Substation</b>							
<b>ORDERVILLE 34.5/12.5 Transformer</b>	1,379	1,197	1,502	1,295	1,365	1,438	1,556
Orderville to Tod's 34.5 Feeder							
Orderville Feeder	1,379	1,197	1,502	1,295	1,365	1,438	1,556
<b>Boulder Substation</b>							
<b>BOULDER 2.4/12.5 kV Transformer</b>	4,736	4,532	5,083	4,318	4,181	4,049	3,858
<b>BOULDER 2.4/69 kV Transformer</b>	4,372	3,968	4,737	4,005	4,030	4,055	4,094
Boulder to Escalante Transmission Feeder	3,294	2,697	3,279	2,650	2,615	2,579	2,519
Boulder Town Feeder	1,078	1,272	1,458	1,356	1,415	1,477	1,575
Boulder East Fork Feeder	41	41	82	57	72	89	125
<b>Escalante Substation</b>							
<b>ESCALANTE 69/12.5 kV Transformer</b>	2,489	2,752	3,380	2,902	2,941	2,982	3,046
Citation to Escalante Transmission Feeder	2,757	2,845	3,433	2,902	2,941	2,982	3,046
Escalante Town Feeder	1,404	1,493	1,834	1,502	1,508	1,514	1,523
North	745	758	989	767	773	778	787
West (Vidrine)	608	593	611	633	661	689	735

Exhibit 3 continued, Garkane Glen Canyon Interconnect System Load Forecast

<b><i>Pahreah Hollow Substation</i></b>							
<b>PAHREAH HOLLOW 69/12.5 Transformer</b>	14	14	14	14	14	14	14
Pahreah Hollow Feeder	14	14	14	14	14	14	14
<b><i>Citation Oil Substation</i></b>							
Citation Tap to Citation Transmission	2,567	2,554	2,741	2,500	2,465	2,430	2,379
<b>CITATION 69/12.5 kV Transformer</b>	2,567	2,554	2,741	2,500	2,465	2,430	2,379
<b><i>Henrieville Transmission Substation</i></b>							
<b>HENRIEVILLE 138/69 kV Transformer</b>	17,807	17,537	18,965	19,662	20,384	21,106	22,189
Henrieville to Citation Tap Transmission Feeder	4,513	4,513	4,859	4,159	4,153	4,148	4,139
Henrieville to East Valley Switch Transmission Feeder	14,101	14,511	14,570	17,028	17,823	18,618	19,811
<b><i>East Valley Switch Yard</i></b>							
East Valley Switch to Rubys Switch Transmission	8,881	9,118	8,881	11,557	12,351	13,144	14,331
<b><i>Rubys Switch Yard</i></b>							
Rubys Switch Yard to Hatch Switch Yard Transmission	8,881	9,118	8,881	11,557	12,351	13,144	14,331
<b><i>Tropic Substation</i></b>							
<b>TROPIC 69/12.5 Transformer</b>	2,389	2,451	3,494	2,433	2,422	2,410	2,392
Tropic to Bryce Transmission Feeder	2,830	2,941	3,607	3,037	3,050	3,064	3,088
3 Communities Feeder	2,389	2,451	3,494	2,433	2,422	2,410	2,392
<b><i>Bryce Substation</i></b>							
<b>BRYCE 69/12.5 Transformer</b>	2,830	2,941	3,607	3,037	3,050	3,064	3,088
Bryce to Rubys Transmission Feeder							
Bryce Canyon	797	737	866	722	712	702	687
Ruby's Inn	1,774	1,680	2,187	1,731	1,766	1,802	1,856
Pink Cliffs	570	603	698	584	572	561	544
<b><i>Hatch Switch Yard</i></b>							
<b>Hatch Switch Yard Total (Incoming)</b>	7,158	7,361	9,203	9,599	10,330	11,121	12,430
Hatch Switch Yard to Todds Transmission Feeder	6,461	7,829	8,549	8,814	9,539	10,323	11,621
Hatch Switch Yard to Spry Transmission Feeder	731	774	756	784	791	798	809
<b><i>Hatch Substation</i></b>							
<b>HATCH 69/34.5 Transformer</b>	1,677	2,031	1,677	1,552	1,561	1,570	1,586
Red Canyon	532	481	548	513	535	558	595
Hatch South	1,160	1,061	1,160	1,040	1,026	1,012	991
<b>HATCH 34.5/12.5 Transformer</b>	609	617	706	627	634	641	652
Hatch Town Feeder	609	617	706	627	634	641	652
<b><i>Tod's Substation</i></b>							
<b>TOD'S 69/34.5 kV Transformer</b>	5,298	6,201	7,289	7,670	8,441	9,307	10,807
Strawberry	1,686	1,681	2,531	1,717	1,742	1,766	1,804
Duck Creek	3,738	4,986	6,195	5,953	6,700	7,540	9,003
Long Valley							
Alton	441	482	1,191				
<b>TODD'S 34.5/12.5 kV Transformer</b>	892	885	1,024	886	887	887	888
Elk Ridge	892	885	1,024	886	887	887	888
Swapp							
<b><i>Zion View Substation</i></b>							
<b>ZION VIEW ESTATES (2@2.5) 34.5/12.5 kV Transformer</b>	91	91	91	129	171	231	376
East Meter	55	55	55	95	137	198	343
West Meter	36	35	36	34	34	34	33
<b><i>Duck Creek Substation</i></b>							
<b>DUCK CREEK 34.5/12.5 kV Transformer</b>	3,768	5,131	6,138	6,468	7,132	7,870	9,132
Duck Creek Village	2,030	2,885	3,548	3,459	3,904	4,406	5,284
Color Country	1,882	2,708	3,223	3,009	3,228	3,463	3,848
<b><i>Spry Substation</i></b>							
<b>SPRY 69/12.5 kV Transformer</b>	722	731	755	819	884	953	1,068
Spry Feeder	722	731	755	819	884	953	1,068



Exhibit 4 continued, Twin Cities Interconnect and System Interconnect Load Forecast

	CURRENT YEAR PEAK KW	PEAK AVERAGE D OVER 3 YEARS	MAX PAST 5 YEAR PEAK KW	ESTIMATE D PEAK LOAD IN 3 YEARS	ESTIMATE D PEAK LOAD IN 5 YEARS	ESTIMATE D PEAK LOAD IN 7 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS
<b>TOTAL SYSTEM</b>	66,051	63,379	66,051	68,715	71,374	74,032	78,020
<b>SOUTHERN SYSTEM WESTERN INTERCONNECT (RMP)</b>							
<b>Twin Cities/Hildale Substation</b>							
TWIN CITIES HILDALE 69/34.5 KV Transformer	3,858	3,854	4,674	4,548	4,854	5,160	5,618
<b>Colorado City Substation</b>							
<b>COLORADO CITY SUB #10</b>	2,789	1,889	2,789	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Colorado City Feeder	355	291	355	Insufficient Data	Insufficient Data	Insufficient Data	Insufficient Data
Centennial Park #10-2	2,500	2,544	2,500	2,677	2,769	2,865	3,015
<b>Cane Beds Step Transformer</b>							
Cane Beds Step 34.5/12.5 kV Transformer	1,069	1,966	1,885				
Cane Beds Feeder	1,069	1,966	1,885				
<b>Twin Cities Substation</b>							
<b>TWIN CITIES INTERCONNECTION TOTAL</b>	10,574	10,443	10,617	10,391	10,560	10,729	10,983
Newell Ave Feeder	19	28	31	23	21	18	15
Utah Ave Feeder	3,148	3,093	3,352	2,900	2,778	2,661	2,495
Township Ave Feeder	3,850	3,730	3,926	3,603	3,522	3,442	3,326
Twin Cities 69/12.5 kV VT Transformer (Primary)	7,017	6,851	7,298	6,527	6,320	6,121	5,835
Twin Cities 69/12.5 kV US Transformer (Backup)	7,017	6,851	7,298	6,527	6,320	6,121	5,835
<b>Interconnection Deliveries Substation</b>							
<b>TWIN CITIES RMP DELIVERY</b>	10,035	10,263	10,617	10,391	10,560	10,729	10,983
SIGURD 69 UPL Source	9,772	9,979	11,338	11,599	12,045	12,491	13,160
GLEN CANYON 138 WAPA Source	46,368	45,261	55,285	47,561	49,159	50,811	53,393
FREDONIA CITY 69 Delivery	2,908	2,939	2,989	2,831	2,825	2,920	2,811

Power Supply Projects

Garkane Energy Cooperative is a member-owner of Deseret Power. Deseret Power is a regional generation and transmission cooperative meeting the power requirements of its five-member retail systems, selling surplus power to municipalities, power marketers, and other wholesale electric systems in five states. As a cooperative, Deseret is owned by its five-member systems: Bridger Valley Electric, Dixie Power, Garkane Energy, Moon Lake Electric, and Mt. Wheeler Power. Deseret's cooperative organization, combined with its vertical integration, positions Deseret to provide member/owners, partners, and customers of all sizes with competitive and stable power rates. Deseret owns 223 miles of transmission lines and 565 MW of existing generation and is currently constructing/planning 65 MW of additional generation resources.

Garkane takes service from Deseret at three interconnection points, Sigurd, Utah; Glen Canyon Dam, Arizona; and Hildale, Utah. Based on an analysis of existing interconnection contracts and equipment, these interconnections have sufficient capacity to serve the forecasted loads through the 2033 study period.

Transmission System Projects

Garkane owns, operates, and maintains roughly 420 miles, 69, and 138 kV transmission lines. The majority of these lines are 30 to 50 years old, and some of the components making up these structures have deteriorated to the point that requires that they be replaced. Therefore, Garkane has an annual program of inspecting all our transmission lines. Garkane's crews identify and replace failing

components based on the observations made during these inspections. Garkane budgets \$100,000.00 annually to purchase replacement materials and cover the labor cost to install them.

Transmission studies completed as part of previous work plans indicate the need to upgrade the Buckskin to Fredonia 69 kV transmission line to 138 kV before the loads on the line reach 30 MW. The 2022 peak load on the line through October was 25.5 MW. Significant construction is occurring in the area, and loads are expected to reach the 30 MW milestone soon. Spring of 2022, the 138 kV Buckskin to Seamans Wash line section was completed. As part of the permitting requirements for rebuilding at 138 kV, Garkane committed to retiring the 69 kV line. This section of the line is phase one of the multi-phase project. Three additional phases of the project remain. Completing the remaining phases of this project represents a significant portion of this work plan budget, comprising roughly 5 million dollars of the CWP budget.

Loads served by the Valley Feeder of the Fredonia Substation continue to increase year over year. Garkane is aware of significant construction plans by others to build new facilities that will accelerate the load growth rate on this feeder. As a result, it is anticipated that voltage regulation on the feeder will become an issue with the addition of roughly 2.5 more MVA for a total load of 9.5 MVA. Therefore, voltage conditions during peak loads should be closely monitored for compliance with Garkane standards. As loads continue to grow, if voltage conditions are observed to approach the ANSI C84.1 limits, work on this project should begin in earnest. Completion of this project comprises roughly 4.5 million dollars of the CWP budget.

### Substation System Projects

Garkane owns, operates, and maintains 33 substations and switch yards for the transmission and distribution of electrical power across our service territory. Equipment in these substations monitors the flow of energy across the system and de-energizes any portions of the system when a fault occurs. Substation control and relaying equipment is also used to collect operational data and monitor system health. In most cases, this equipment is operable from Garkane's SCADA system.

Garkane is in the process of a phased project to replace 40–50-year-old substation Oil Circuit Breakers (OCBs). This equipment has served Garkane well but, in general, has reached the end of its useful life. Associated with these OCBs are various Programmable Logic Controllers (PLCs), relays, and metering equipment that are no longer supported by the manufacturer and whose software can't be accessed using current computer operating system software and is vulnerable to cyber security attacks. Due to these issues, Garkane currently has no real-time load data monitoring or SCADA control to significant portions of our transmission system equipment. Garkane has completed the replacement work in our twenty-five distribution and one transmission substations, leaving four transmission substations and switch yards remaining for this project to be completed. The facilities remaining include the Sigurd, Buckskin, and Henrieville substations and the East Valley switchyard. These remaining projects make up 1.25 million dollars of the CWP budget.

The existing Tropic substation transformer has had consecutive Dissolved Gas Analysis (DGA) test results indicating the transformer core insulation is deteriorating and is experiencing some internal faulting. This condition is expected to lead to the eventual failure of the unit. The current substation bus support

structure consists of aged wood-framed components. The current location of the substation prohibits sectionalizing the loads to more than one feeder, which inhibits the reliable and efficient operation of the distribution system in the area and leads to poorer reliability indices than could otherwise be achieved. It is recommended that Garkane build a replacement substation with 138kV clearances adjacent to the East Valley Transmission Switch. Garkane previously purchased the property with this intention. The facility will initially be operated for 69 to 12.5 kV transformation. Associated with this project is the construction of 4 miles of double-circuit 12.5 kV distribution line, detailed in this report's Distribution section. This project makes up 1.58 million dollars of the CWP budget.

As part of a deal with a property owner for a long section of 138 kV transmission right-of-way and acreage for a switch yard, Garkane agreed to the retirement of the Bryce Substation when annual peak loads reached 80 percent of nameplate capacity or earlier. Garkane is aware of construction plans by others to build new facilities that will increase loads to the agreed threshold. Therefore, provided the agreed loading threshold is met, Garkane will build a replacement substation with 138 kV clearances in Ruby's switch yard. The facility will initially be operated for 69 to 12.5 kV transformation. This project makes up 1.58 million dollars of the CWP budget.

Based on this report's load forecast analysis, two existing substation transformers could become overloaded during the 2033 study period. The transformers are Tod's Substation 69/34.5 kV and Duck Creek Substation 34.5/12.5kV units. Provided the forecasted loads materialize, these transformers will be replaced with higher-capacity units. These projects make up 1.0 million dollars of the CWP budget.

The final three CWP substation projects fall into the potential project category. If required, their construction will occur near the end of the planning 2033 study period. Load growth forecasts using current trends indicate that the existing facilities will be sufficient through 2033. However, in these instances, Garkane is aware of specific potential construction projects in various planning and permitting stages that would increase loads significantly. Therefore, if these member projects are built within the planning horizon, their construction will likely necessitate these system improvements.

The first of these potential projects is the Eight Mile Gap (EMG) substation 138 kV conversion. Transmission Studies indicate the Buckskin to Kanab transmission line needs to be constructed by the time loading on the Buckskin to Fredonia line reaches 30 MW. This project is currently under construction. Completing the line will mitigate volt regulation issues for a time. However, it is estimated that at roughly 40 MW of load, voltage regulation will again become an issue and require that the line be operated at 138 kV. The project will consist of constructing a new substation bay and foundation with 138 kV clearances adjacent to the existing EMG Substation. This project makes up 2.5 million dollars of the CWP budget.

The second of these potential projects is the Valley/Mt Carmel Substation. Loads served by the Valley Feeder of the Fredonia Substation continue to increase year over year. Garkane is aware of construction plans by others to build new facilities that will accelerate the load growth rate. It is anticipated that voltage regulation on the feeder will become an issue with the addition of roughly 2.5 more MVA for a total load of 9.5 MVA. Therefore, voltage conditions during peak loads should be closely monitored for compliance with Garkane standards. If loads increase to where ANSI C84.1 voltage standards can't be maintained, it is recommended that Garkane construct a new substation in the Mt Carmel area. Build

the new substation with 138 kV clearances. The facility will initially be operated for a 69 to 34.5 kV transformation. Associated with this project is the construction of 18 miles of 69 kV transmission line, detailed in this report's Transmission section. This project makes up 2.5 million dollars of the CWP budget.

The third potential project is the construction of the Cedar Ridge Substation. Loads served by the Big Water Feeder of the Paria Substation continue to increase year over year. Garkane is aware of construction plans by others to build new facilities that will accelerate the load growth rate. It is anticipated that voltage regulation on the feeder will become an issue with the addition of roughly 1.5 more MVA for a total load of 4 MVA. If loads increase to where ANSI C84.1 voltage standards can't be maintained, it is recommended that Garkane construct a new substation on property owned by Garkane in the Cedar Ridge area south of Big Water. Build the new substation with 138 kV clearances. Associated with this project is the construction of 7 miles of 25 kV distribution line, detailed in the Distribution section of this report. The facility will initially be operated for a 69 to 34.5 kV transformation. This project makes up 1.5 million dollars of the CWP budget.

### Distribution System Projects

Garkane owns, operates, and maintains roughly 2220 miles of distribution lines. Garkane operates its distribution systems at three different voltages 12.5/7.2 kV, 25/14.4 kV, and 34.5/19.9 kV. The 12.5/7.2 kV systems are operated as a proper distribution system. The 25/14.4 kV and 34.5/19.9 kV lines are used in a hybrid sub-transmission fashion. They are utilized on long rural feeders where higher voltages are required to keep losses and voltages within acceptable limits. Many of Garkane's facilities are 30 to 50 years old, and the components making up these lines deteriorate over time. Garkane has an established inspection program to identify facilities needing replacement. Based on the observations made during these inspections, Garkane replaces failing components. Garkane budgets \$200,000.00 annually to purchase replacement materials.

Garkane regularly constructs primary line extensions as part of member service projects. In accordance with Garkane's line extension policy, the project owner pays for these projects in full. For this reason, these types of projects are not considered part of this study.

The existing Tropic substation transformer has had consecutive Dissolved Gas Analysis (DGA) test results indicating the transformer core insulation is deteriorating and is experiencing some internal faulting. This condition is expected to lead to the eventual failure of the unit. The current location of the substation prohibits sectionalizing the loads to more than one feeder, which inhibits the reliable and efficient operation of the distribution system in the area and leads to poorer reliability indices than could otherwise be achieved. It is recommended that Garkane build a replacement substation adjacent to the East Valley Transmission Switch. Garkane previously purchased the property with this intention. Associated with this project is the construction of 4 miles of double circuit 12.5 kV distribution line. This project makes up 0.74 million dollars of the CWP budget.

The potential project is the construction of the Cedar Ridge distribution line. Loads served by the Big Water Feeder of the Paria Substation continue to increase year over year. Garkane is aware of construction plans by others to build new facilities that will accelerate the load growth rate. It is anticipated that voltage regulation on the feeder will become an issue with the addition of roughly 1.5

more MVA for a total load of 4 MVA. If loads increase to where ANSI C84.1 voltage standards can't be maintained, it is recommended that Garkane construct a new substation on property owned by Garkane in the Cedar Ridge area south of Big Water. The construction of 7 miles of 25 kV distribution line is associated with this project. This project makes up 1.435 million dollars of the CWP budget.

### AMI Metering System Projects

Our current AMI system manufacturer notified Garkane Energy that the manufacturing of system components will stop in June of 2023. The manufacturer will also stop supporting and hosting all system software and data in January 2029. Garkane is contracting with a third-party consultant to identify the optimal replacement system and a replacement project roadmap. Budgetary quotes from AMI system manufacturers indicate a replacement cost of 3.5 to 5.5 million dollars.

### SCADA System Projects

Garkane is in the process of a phased project to replace 40-50-year-old substation Oil Circuit Breakers (OCBs). This equipment has served Garkane well but generally has reached the end of its useful life, and replacement parts are no longer being manufactured. Associated with these OCBs are various Programmable Logic Controllers (PLCs), relays, and metering equipment that are no longer supported by the manufacturer and whose software can't be accessed using current computer operating system software. Nor are these devices hardened for cyber security.

Due to these issues, Garkane has no real-time load data monitoring or SCADA control of our station equipment at the Sigurd, Buckskin, Henrieville, Boulder Hydro, and East Valley facilities. Garkane has completed the replacement work in twenty-five distribution and one transmission substations, leaving four transmission substations and switch yards remaining for this project to be completed. This project makes up \$465,000 of the CWP budget.

### Summary of Construction Programs and Costs

Table 1. Summary of Transmission and Distribution Line Projects

<b>Transmission Line Projects</b>	<b>Estimated Total Cost (\$)</b>
Transmission Line Maintenance (Spread Over Ten Years)	1,000,000
Buckskin To Kanab & Fredonia, Phase 1,	210,000
Buckskin To Kanab & Fredonia, Phase 2,	1,450,000
Buckskin To Kanab & Fredonia, Phase 3,	1,710,000
Buckskin To Kanab & Fredonia, Phase 4,	1,450,000
Valley/Mt Carmel 34.5 To 69 kV Feeder Upgrade	4,230,000
<b>Subtotal</b>	<b>10,050,000</b>

Table 2. Summary of Transmission and Distribution Line Projects

<b>Distribution Line Projects</b>	<b>Estimated Total Cost (\$)</b>
Distribution Line Maintenance (Spread Over Ten Years)	2,000,000
Bryce Valley Substation Distribution Line	740,000
Cedar Ridge (Big Water) 25 kV Distribution Line	1,435,000
<b>Subtotal</b>	<b>4,175,000</b>

Table 3. Summary of Substation Projects

<b>Substation Projects</b>	<b>Estimated Total Cost (\$)</b>
Sigurd Transmission Substation Overhaul	200,000
Buckskin Transmission Substation Overhaul	350,000
Kanab Switch Retirement	75,000
Henrieville Transmission Substation Overhaul	350,000
East Valley Transmission Switch Overhaul	350,000
Johnson Canyon Substation Retirement	75,000
Bryce Valley Substation Construction	1,500,000
Tropic Substation Retirement	75,000
Ruby's Substation Construction	1,500,000
Bryce Substation Retirement	75,000
Duck Creek Substation Transformer Capacity Upgrade	500,000
Tod's Substation Transformer Capacity Upgrade	500,000
Eight Mile Gap Substation 138 kV Conversion	2,500,000
Valley/Mt Carmel Substation Construction	1,500,000
Cedar Ridge (Big Water) Substation Construction	1,500,000
<b>Subtotal</b>	<b>11,050,000</b>

Table 4. Summary of AMI, SCADA, and Facilities Projects

<b>AMI, SCADA, and Facilities Projects Projects</b>	<b>Estimated Total Cost (\$)</b>
Replacement Ami System	4,500,000
Replacement Scada Hardware & Software, Transmission Substations & Boulder Hydro	465,000
<b>Subtotal</b>	<b>4,965,000</b>

Table 5. Summary Construction Work Plan Facilities Cost

<b>Construction Work Plan Projects</b>	<b>Estimated Total Cost (\$)</b>
<b>Power Supply Projects</b>	<b>0</b>
<b>Transmission System Project</b>	<b>10,050,000</b>
<b>Distribution System Projects</b>	<b>4,175,000</b>
<b>Substation System Projects</b>	<b>11,050,000</b>
<b>AMI Metering System</b>	<b>4,500,000</b>
<b>SCADA System Projects</b>	<b>465,000</b>
<b>Total</b>	<b>30,240,000</b>

## BASIS OF STUDY GARKANE POWER ASSOCIATION, TRANSMISSION & DISTRIBUTION SYSTEM DESIGN STANDARDS

The following System Design Standards will be applied to the Garkane Transmission and Distribution System design and operation. The Transmission standards shall apply to facilities energized at 34.5 kV phase to phase and higher. The Distribution standard shall apply to facilities energized at less than 34.5 kV.

1. The system shall be designed to achieve a maximum of 200 consumer outage minutes, per consumer, per year, excluding outages caused by a major event or the power supplier for the last five consecutive years. (RUS Bulletin 1724D-101B)
2. Maximum design primary voltage levels at the distribution transformer primary terminals, at any loading level or condition, is 126 volts on a 120-volt base with a 1-volt tolerance for voltage regulator bandwidth. (RUS Bulletin 1723D-113 & ANSI C84.1-2016)
3. The minimum design primary voltage level at the distribution transformer primary terminals, at peak load conditions with voltage regulators, is 118 volts on a 120-volt base with a 1-volt tolerance for voltage regulator bandwidth. (RUS Bulletin 1723D-113 & ANSI C84.1-2016)
4. Distribution systems will be designed and operated to meet the service voltage level requirements of Range A in Table 1 of RUS Bulletin 1723D-113. Service Voltage shall be measured at the meter socket. Maintaining voltage levels within Range A on all line sections of the system cannot be assured. Under peak load conditions (95% to 100% of historic peak), it will be acceptable for some service voltages that fall in Range B of Table 1 of RUS Bulletin 1723D-113 for short durations. (RUS Bulletin 1723D-113 & ANSI C84.1-2016)
5. When service voltages consistently extend into Range B during peak loading or for an extended period, they will be corrected promptly to conform to Range A requirements by using interim measures, and a permanent solution will be developed and implemented. (RUS Bulletin 1723D-113 & ANSI C84.1-2016)
6. Maximum distribution feeder voltage drop measured at the primary distribution terminals with line voltage regulators will be no more than 16 volts with no more than 8 volts drop between voltage regulators. (Substation Voltage Regulators or those immediately down line of a step transformer are not considered line regulators).
7. Voltage Regulator Line Drop Compensation settings shall be calculated to give a 6-volt rise at the projected peak load. Therefore, a voltage level of 124 volts and 2-volt bandwidth should be utilized.
8. Under normal operation conditions, overhead ACSR conductor loading will be limited to 100% of the rated current capacity at 150°F (65°C). Using an ambient air temperature of 40°C, emissivity 0.5%, and wind of 1 ft/sec for distribution and transmission facilities.
9. Under emergency operation conditions, overhead ACSR conductor loading will be limited to 100% of the rated current capacity at 167°F (75°C). Using an ambient air temperature of 40°C,

emissivity 0.5%, and wind of 1 ft/sec for distribution and transmission facilities.

10. Overhead primary lines shall be constructed using #4, #2, 1/0, 4/0, and 477 ACSR conductors wherever possible to minimize inventory of conductors, connectors, and splices.
11. New and upgraded transmission lines will include fiber optic cabling to provide a reliable communications path for system metering, data acquisition, and control equipment.
12. Table 1 shows the design sag percentages of rated breaking strength that shall be used in the design and construction of overhead lines.

**Table 6 ACSR DESIGN SAG CRITERIA**

<b>Weather Case</b>	<b>Cable Condition (PLS CADD CONDITION)</b>	<b>Percent Rated Braking Strength</b>
NESC District Loading (250B)	Initial	60
NESC Extreme Wind (250C)	Initial	80
NESC Concurrent Ice and Wind (250D)	Initial	80
NESC Tension Limit (261H1c)	Initial	35
NESC Tension Limit (261H1c)	Creep	25
AEOLIAN VIB Zone 7a Kanab -5d AAMT	Creep	17.5
GKE MAX SAGGING TENSION UNLOADED	Initial	16-20
RUS DISTRICT LOADING MAX TENSION	Initial	50
RUS HEAVY DISTRICT NO ICE OR WIND	Initial	33.3
RUS HEAVY DISTRICT NO ICE OR WIND	Load	25
GKE MAX SAGGING TENSION OPGW UNLOADED	Initial	15

DETAILS OF WEATHER CASES CAN BE FOUND IN PLS CADD.CRI FILE AT:  
E:\Vault\Garkane COO\WORK PLANS\01 GKE SYSTEM STANDARDS

13. Overhead service drop conductor shall be constructed using #2 and 1/0 ACSR TRIPLEX. Hard-drawn Copper primary lines, which are subject to increased sag and breakage due to annealing of the conductor, will be replaced with ACSR conductors.
14. The preferred URD Primary cable will be 1/0 AAC (152 max amps in conduit) for general conditions & 4/0 AAC (225 max amps in conduit) for heavily loaded feeder backbones, 133% XLP-TR Super Smooth insulation, with a full neutral, external jacket, installed in conduit.



15. The preferred URD operation voltage shall be 15 kV or less. For feeders 34.5 and 25 kV nominal voltages, a step-down transformer at the URD tap location will be the preferred design.
16. Primary URD cables which experience three faults due to insulation failure should be replaced as part of the annual cable replacement program. In addition, cables of the same vintage and general condition in the same area as the failed cable should also be replaced.
17. URD primary, secondary, and services shall be installed in conduits.
18. Secondary conductors shall be limited to a 3-volt drop under maximum expected loading conditions and shall be no more than 300 feet long.
19. Transmission system voltage levels shall be maintained between a maximum of 1.05 per unit and a minimum of .95 per unit for all expected loading levels.
20. Overhead Distribution Lines shall be designed at a minimum to meet the NESC Medium Loading District structural loadings for Grades B and C as applicable to conditions at the time of construction.
21. Overhead Transmission Lines shall be designed at a minimum to meet the NESC Medium Loading District structural loadings for Grades B and C as applicable to conditions at the time of construction. Consideration shall be given to using the NESC Heavy Loading District structural loadings in areas where historical weather conditions show that warranted.
22. Transmission and Distribution Poles less than 60 feet above ground level should be scheduled for replacement or rehabilitation when inspection shows that deterioration has reduced the structural strength to 2/3 of that required when installed for NESC District Loading. (RUS Bulletin 1730B-121)
23. Transmission and Distribution Poles greater than or equal to 60 feet above ground level should be scheduled for replacement or rehabilitation when inspection shows that deterioration has reduced the structural strength to 3/4 of that required when installed for NESC District Loading. (RUS Bulletin 1730B-121)
24. Voltage Regulator loading will be limited to 100 % of rated capacity at projected load levels.
25. Line, Mini-Sub, and Step Transformers loading will be limited to 135% of rated capacity during projected annual peak load levels. Once transformer loading reaches 100% of the rated capacity, provisions shall be made to promptly upgrade the transformer(s).
26. Substation Transformer loading will be limited to 125 % of rated capacity during projected

annual peak load levels. Once a Substation Transformer's peak annual loading reaches 95% of Forced Air rated capacity, provisions shall be made to promptly upgrade the transformer(s).

27. The following equipment shall not be thermally overloaded by more than the following percentages of the device's nameplate rating.

**TABLE 7, EQUIPMENT THERMAL OVERLOAD CRITERIA**

<b>Equipment</b>	<b>Normal Conditions</b>	<b>Emergency Conditions (4hr)</b>
Substation and Line Voltage Regulators	100%	110%
Hydraulic Oil Circuit Reclosers	70%	100%
Electronic Recloser Control	50%	75%
Line Fuses	75%	100%

28. Power factor will be maintained between 95% lagging and 95% leading under peak and light load conditions.
29. Feeder phase current balance will be maintained within 20% of the average phase loading during peak loading conditions.
30. Sectionalizing device loading will be limited to 90% of rated capacity at projected peak load conditions.
31. Sectionalizing devices will not be located so that their maximum interrupting capacity is exceeded.
32. Substation and Step Transformer Primary Fuses will be sized to provide maximum protection to the transformer and clear a phase-to-ground bus fault on the secondary side in approximately 2 seconds. The continuous rating of the fuse shall be more than two times the full load rating of the transformer, if possible, to allow for cold load pickup and inrush current. The preferred 69 kV primary transformer fuse is S & C SMD-1A Standard Speed.
33. Motor Load Equipment and Design Standard
34. Motors over ten hp must be served with three-phase power unless an engineering study demonstrates a specified larger motor will not cause power quality deviations from industry standards.
35. All motors over five hp shall have starting current limited to no more than 3 ½ times full load rating for no more than 15 seconds.
36. Motor loads with variable frequency drives may require: upgrading transformer size (pole class may have to increase), decreasing transformer impedance, increasing service wire size, decreasing service wire length and harmonic filters to reduce Total Harmonic Current Distortion at the member's meter (per IEEE Standards 519). These changes will be at the member's

expense.

37. Garkane requires equipment owners/members to provide electrical protection on three-phase motors. This protection should include: loss-of-phase, reverse phasing, and low-voltage protection (including low-voltage protection for single-phase motors). Garkane will not assume responsibility for damages related to a member's lack of effective protection.
38. Motor loads should be compensated for their reactive power usage by installing shunt capacitors. Power Factor shall be between 95% lagging and 100%. Leading Power Factor is not permitted.
39. Newly installed motors or any other load shall cause less than 3% voltage flicker (per IEEE Standard 141) at the member's meter.

## Garkane Labor & Equipment Rates

Exhibit 5: Per Hour Position Labor Rates (Effective 01/01/2023)

GENERAL FOREMEN (AREA MANAGER)	100.00	(\$/HR)
LINE FOREMEN	97.00	(\$/HR)
LEAD JOURNEYMEN	94.00	(\$/HR)
JOURNEYMAN LINEMAN	90.00	(\$/HR)
APPRENTICE LINEMAN 1 <sup>ST</sup> TO 2 <sup>ND</sup> YEAR	65.00	(\$/HR)
APPRENTICE LINEMAN 3 <sup>RD</sup> TO 4 <sup>TH</sup> YEAR	81.00	(\$/HR)
EQUIPMENT OPERATOR (EMPLOYEE POSITION MAY NOT BE AVAILABLE)	60.00	(\$/HR)
SUBSTATION TECHNICIAN	88.00	(\$/HR)
METER TECHNICIAN	85.00	(\$/HR)
STAKING/SURVEY TECHNICIAN	83.00	(\$/HR)
STAFF ENGINEER	120.00	(\$/HR)
SENIOR ENGINEER/PROJECT MANAGER	140.00	(\$/HR)

Exhibit 6: Per Hour Equipment Rates (Effective (01/01/2023))

CATERPILLAR D6 DOZER	180.00	(\$/HR)
MINI-EXCAVATOR	90.00	(\$/HR)
4x4 BACKHOE	75.00	(\$/HR)
SKID STEER	85.00	(\$/HR)
DIGGER DERRICK TRUCK	200.00	(\$/HR)
BUCKET TRUCK	200.00	(\$/HR)
CRANE TRUCK	170.00	(\$/HR)
SEMI-TRACTOR WITH TRAILER	125.00	(\$/HR)
4X4 1&2 TON FLATBED, & DUMP TRUCKS	75.00	(\$/HR)
LINE CREW 4X4 TRUCK (WITH UTILITY SERVICE BED AND LINE TOOLS)	75.00	(\$/HR)
½ & ¾ TON 4X4 WORK TRUCK	50.00	(\$/HR)
ROPE PULLER TENSIONER TRUCK	50.00	(\$/HR)
WIRE PULLER	54.00	(\$/HR)
WIRE TENSIONER BULL WHEEL	50.00	(\$/HR)
CHIPPER WITH CHIPPER TRUCK & 4 CHAIN SAWS	200.00	(\$/HR)
REEL TRAILER	40.00	(\$/HR)
POLE TRAILER	40.00	(\$/HR)
SNOWCAT WITH TRAILER	85.00	(\$/HR)
AIR COMPRESSOR TRAILER WITH ROCK DRILL	50.00	(\$/HR)
FORKLIFT	75.00	(\$/HR)
LOWBOY TRAILER	40.00	(\$/HR)
EQUIPMENT TRAILER	40.00	(\$/HR)
WELDER W/ EQUIPMENT TRAILER (CONSUMABLES CHARGED SEPARATELY)	50.00	(\$/HR)
UNDERGROUND FAULT LOCATING EQUIPMENT	125.00	(\$/HR)
METER TESTING EQUIPMENT	70.00	(\$/HR)
SNOWMOBILE	18.00	(\$/HR)
ATV/UTV	18.00	(\$/HR)

- All equipment must have a Garkane employee operator, which will be billed separately.
- Fuel provided with equipment
- Rates apply when equipment is on the project site, AND Equipment mobilized from the home port 100 miles are subject to a \$5.50/mile rate

## Distribution Line Per Foot Construction Costs

Garkane maintains records tracking the cost of materials and labor required to construct the various components of its distribution lines. Exhibit 7 summarizes the aggregated price per foot for the primary types of distribution line construction used by Garkane.

### EXHIBIT 7, ESTIMATE OF DISTRIBUTION FACILITY PER FOOT CONSTRUCTION COST

URD 15kV				
Unit	Dist/Pri Voltage	Price	w/10%	Per ft
<b>1 PHASE</b>				
LIM3-14	1,000' 1/0 15kV	\$18,191.77	\$20,010.95	\$20.01
<b>3 PHASE</b>				
LIM33	1,000' 1/0 15kV	\$46,522.50	\$51,174.75	\$51.17

URD 25kV				
Unit	Dist/Pri Voltage	Price	w/10%	Per ft
<b>1 PHASE</b>				
LIM3-14	1,000' 1/0 25kV	\$29,098.47	\$32,008.32	\$32.01
<b>3 PHASE</b>				
LIM33	1,000' 1/0 25kV	\$75,936.32	\$83,529.95	\$83.53

URD 35kV				
Unit	Dist/Pri Voltage	Price	w/10%	Per ft
<b>1 PHASE</b>				
7LIM3-14	1,000' 1/0 35kV	\$33,891.84	\$37,281.02	\$37.28
<b>3 PHASE</b>				
7LIM33	1,000' 1/0 35kV	\$90,565.84	\$99,622.42	\$99.62

OH 15kV				
Unit	Dist/Pri Voltage	Price	w/10%	Per ft
<b>1 PHASE</b>				
4 ACSR	1,400' 15kV	\$19,767.24	\$21,743.96	\$18.12
<b>3 PHASE</b>				
4 ACSR	1,400' 15kV	\$29,097.76	\$32,007.54	\$22.86
1/0 ACSR	1,400' 15kV	\$36,953.17	\$40,848.49	\$29.03
4/0 ACSR	1,400' 15kV	\$36,972.05	\$40,669.26	\$29.05
477 ACSR	1,400' 15kV	\$67,397.02	\$74,136.72	\$52.95

OH 25kV				
Unit	Dist/Pri Voltage	Price	w/10%	Per ft
<b>1 PHASE</b>				
4 ACSR	1,400' 25kV	\$19,689.81	\$21,658.79	\$18.05
<b>3 PHASE</b>				
4 ACSR	1,400' 25kV	\$29,109.52	\$32,020.48	\$22.87
1/0 ACSR	1,400' 25kV	\$36,406.83	\$40,047.52	\$28.61
4/0 ACSR	1,400' 25kV	\$36,519.36	\$40,171.29	\$28.69
477 ACSR	1,400' 25kV	\$66,944.32	\$73,638.76	\$52.60

OH 35kV				
Unit	Dist/Pri Voltage	Price	w/10%	Per ft
<b>1 PHASE</b>				
4 ACSR	1,400' 35kV	\$19,603.69	\$21,564.06	\$17.97
<b>3 PHASE</b>				
4 ACSR	1,400' 35kV	\$29,914.29	\$32,905.72	\$23.50
1/0 ACSR	1,400' 35kV	\$37,097.72	\$40,807.49	\$29.15
4/0 ACSR	1,400' 35kV	\$36,533.34	\$40,186.67	\$28.70
477 ACSR	1,400' 35kV	\$66,958.31	\$73,654.14	\$52.61

\*Note: Cost per foot does not include impact fee's or transformer fee's.

Last Updated: 11/9/2022

## Transmission Line Per Foot Construction Costs

Garkane maintains records tracking the cost of materials and labor required to construct the various components of its distribution lines. Exhibit 4 summarizes the aggregated price per foot for the primary types of distribution line construction used by Garkane.

EXHIBIT 8, ESTIMATE OF DISTRIBUTION FACILITY PER FOOT CONSTRUCTION COST

<b>ESTIMATED TRANSMISSION COST BASED ON VOLTAGE AND BASE STRUCTURE TYPE</b>		
<b>NOMIAL VOLTAGE (kV)</b>	<b>BASE TANGENT STRUCTURE</b>	<b>ESTIMATED COST (\$/FT)</b>
138	Garkane RUS TP-138	\$ 50.54
69	Garkane RUS TP-69	\$ 42.38

## Status of Previous Construction Work Plan Items Summary

### GARKANE ENERGY 2017 Work Plan Summary - Updated November 2022

Substation	Feeder	Solution	Current Status
Parker Sub	Koosharem/Antimony Feeder	1. Install 3 - 100a V Regs South of Koosharem at Section OH25613 2. Install 1 - 50a V Reg East of Monroe Mtn at Section OH25790 3. Install 1 - 50a V Reg East of Mormon Peak at Section OH32442 4. Install 3 - 100a V Regs North of Greenwich at Section OH29023	Antimony, Monroe and Angle Vregs Completed
Lyman Sub		Need to update and correct model data with correct conductor phasing and sizes.	Completed
Bicknell Sub	Bicknell Town Feeder	Need to update and correct model data with correct conductor phasing and sizes.	Completed
Bicknell Sub	Torrey Feeder	2010 Workplan Project: New Torrey Sub is being constructed and load will be transferred from Bicknell Sub to Torrey Sub. This project was started in 2010 Workplan as a reconductor of Bicknell to Torrey Line.	New Torrey Substation is energized and in service.
Torrey Sub	Torrey Feeder	Need to reconductor existing line to at least 477 or build new parallel line into Torrey town	Monitoring Conditions
Bicknell Sub	Hanksville Feeder	Add 3 - 50a V Regs on Notom Tap at Section OH27016	Completed
Eight Mile Gap Sub		Extend 4/0 approximately 2500 ft from Substation to UG24150. This will permit balancing of existing loads and moving of remaining Johnson Sub loads.	Completed
Johnson Sub			80% completed.
Fredonia Sub	Fredonia West Feeder	Install 3- 100 a V Regs on 35kV line between takeoff and Pipe Spring Step Transformer. If Mine continues operation or expands operations install 3 - 100 a Vregs on Hack Canyon Tap.	Mining operations have stopped, Regulators have been procured and scheduled for installation 2023
KCR Sub	KCR Feeder	Need to update and correct model data with correct conductor phasing and sizes.	Partially completed.
Boulder Sub	Boulder Town Feeder	Install 3 - 100a V Regs near Town OCR	Not Complete
Escalante Sub	Escalante Town Feeder	Need to update and correct model data with correct conductor phasing and sizes.	Partially completed.
Hatch Sub	Hatch South Feeder	Install 3 - 50a V Regs at Section OH17057	Completed
Tod Sub	Strawberry Feeder	Install 3 -50a V Regs at Swain Creek Step. Correct customer phasing data in model.	Partially completed.
Tod Sub	Elk Ridge Feeder	Need to update and correct model data with correct conductor phasing and sizes.	Partially completed.
Duck Creek Sub	Duck Creek Feeder	Need to correct customer phasing data in model and rerun analysis.	Partially completed.
Duck Creek Sub	Color Country Feeder	Add 400 feet 4/0 URD from end of OH45564 to the start of UG18662 and UG19408. Split URD between phases.	Partially completed.
Twin City Sub	Utah Avenue Feeder	Need to correct customer phasing data in model and rerun analysis.	Partially completed.
Twin City Sub	Redwood Road Feeder	Need to balance loads and either replace existing 4/0 URD with 500 mcm URD OR build OH line from sub to OH40425 Total distance is about 3 miles..	Partially completed.
TRANSMISSION AND SUBSTATION PROJECTS			
Tropic to Hatch Transmission		2003 Workplan Project. Construct Tropic to Hatch 138 kV line to replace the existing 44/69 kV line in Red Canyon to increase delivery capacity to Hatch and Tod Subs.	Completed
Retire Bryce to Hatch Mountain 69 kV Line		2003 Workplan. Permit requirement for Tropic to Hatch line requires the physical removal of the step transformer and yard on north side of road	Completed
East Valley Substation		2003 Workplan Project. Construct East Tropic Substation	Completed
Ruby Switching Station		2003 Workplan Project. Construct Ruby Station	Completed

Substation	Feeder	Solution	Current Status
	Retire Hatch Mountain Step Yard	2003 Workplan. Permit requirement for Tropic to Hatch line requires the physical removal of the line from Bryce to Hatch Mountain	Completed
	Buckskin to Fredonia Transmission	2010 Workplan Project. Construct 138 kV line from Buckskin to Fredonia. 31.5 miles @ \$150k/mile plus \$575k permitting costs	Partially completed.
	Cedar Ridge to Big Water Transmission	2010 Workplan Project. 138 kV line to Big Water and Substation when load grows to 3.5 MW at Paria Sub (Dec 2009 peak 2.3 MW).	Right of Way has been obtained. Project on hold until load requires construction.
	Sigurd Substation OCB Replacement	Remove existing 3 tank OCB and install single tank OCB retired from Bryce Substation after completion of Tropic to Hatch Project	Completed
	Install 69 kV tie from PAC to GKE at Spry Substation	The Emergency Services Agreement between PAC and GKE calls for the existing 12.5 kV tie to be replaced with a 69 kV tie when GKE upgrades the Spry transmission to 69 kV. This upgrade was completed in 2014. The tie will require installing a 69 kV OCB to be installed at Spry Station. Use OCB and relay panel removed from Hatch Mountain.	Partially completed, need PAC to agree to proceed

**NON CAPACITY RELATED PROJECTS (SYSTEM IMPROVEMENT ITEMS)**

Hatch	Hatch South	Approximately 8000 feet of URD cable needs to be replaced and buried to proper depths.	Partially completed.
Bryce	Barney Top Feeder	This section of cable was not installed as part of the original project due to right of way issues with the Forest Service.	Completed
Torrey	Torrey		Partially completed.
Torrey	Torrey		Partially completed.



## Historical and Projected System Data

### Annual Energy, Load, and New Member Data

Exhibit 6 provides information on the last 11 years and projections based on ten months of operations in 2022 of the annual energy sales in kWh, annual system peak, and the number of member accounts. The source of this information is Garkane's annual Form-7 Reports and the Historical Load Reports. Data analysis indicates; 1) an Annual Energy Purchased growth rate of 1.66%, 2) an Annual Energy Sales growth rate of 1.69%, 3) an Annual System Peak Load growth rate of 2.67%, and 4) an Annual New Service growth rate of 5.55%. In addition, the data shows that two variables drive annual energy and peak demand. The most prominent variable from year to year is the heat and cooling days experienced, which drives usage and demand. The second variable which has driven an overall increase in energy use and demand is the number of new services added annually.

Exhibit 9, Annual Energy Sales, Annual Peak Load, Number of Member Services

Year	ANNUAL ENERGY PURCHASED		ANNUAL ENERGY SALES		ANNUAL ENERGY LOSSES (kWh)		ANNUAL SYSTEM PEAK LOAD		ANNUAL NEW SERVICES	
	(kWh)	Growth	(kWh)	Growth	(kWh)	(%)	(kW)	Growth	(#)	Growth
2010	255,376,552	2.11%	231,437,976	2.41%	23,938,576	9.37%	51,262	14.13%	138	-39.86%
2011	260,755,489	-1.82%	237,006,723	-1.56%	23,748,766	9.11%	58,504	-12.28%	83	32.53%
2012	256,008,992	6.25%	233,314,277	6.46%	22,694,715	8.86%	51,319	17.70%	110	20.91%
2013	272,000,929	-4.28%	248,393,231	-3.47%	23,607,698	8.68%	60,401	-15.00%	133	-0.75%
2014	260,355,092	1.69%	239,773,471	0.86%	20,581,621	7.91%	51,341	-0.08%	132	15.15%
2015	264,762,690	-1.00%	241,838,346	0.26%	22,924,344	8.66%	51,299	16.06%	152	-8.55%
2016	262,110,503	-0.88%	242,459,544	-0.84%	19,650,959	7.50%	59,536	-8.23%	139	1.44%
2017	259,811,232	2.59%	240,411,862	0.92%	19,399,370	7.47%	54,639	0.26%	141	306.4%
2018	266,540,284	3.72%	242,632,250	3.01%	23,908,034	8.97%	54,783	3.53%	573	-54.10%
2019	276,455,845	-2.78%	249,947,222	3.73%	26,508,623	9.59%	56,715	-1.15%	263	18.63%
2020	268,781,632	7.89%	259,272,159	3.54%	9,509,473	3.54%	56,066	5.87%	312	8.97%
2021	289,981,303	4.06%	268,448,529	3.32%	21,532,774	7.43%	59,358	11.27%	340	7.06%
2022	<i>301,759,848</i>	<i>4.06%</i>	<i>277,348,673</i>	<i>3.32%</i>	<i>24,411,175</i>	<i>8.09%</i>	<i>66,051</i>	<i>2.67%</i>	<i>364</i>	<i>5.55%</i>
2023	<i>306,776,069</i>	<i>1.66%</i>	<i>282,032,385</i>	<i>1.69%</i>	<i>24,743,684</i>	<i>7.98%</i>	<i>67,817</i>	<i>2.67%</i>	<i>384</i>	<i>5.55%</i>
2024	<i>311,875,676</i>	<i>1.66%</i>	<i>286,795,194</i>	<i>1.69%</i>	<i>25,080,482</i>	<i>7.89%</i>	<i>69,630</i>	<i>2.67%</i>	<i>406</i>	<i>5.55%</i>
2025	<i>317,060,054</i>	<i>1.66%</i>	<i>291,638,434</i>	<i>1.69%</i>	<i>25,421,620</i>	<i>7.81%</i>	<i>71,492</i>	<i>2.67%</i>	<i>428</i>	<i>5.55%</i>
2026	<i>322,330,613</i>	<i>1.66%</i>	<i>296,563,464</i>	<i>1.69%</i>	<i>25,767,150</i>	<i>7.73%</i>	<i>73,404</i>	<i>2.67%</i>	<i>452</i>	<i>5.55%</i>
2027	<i>327,688,786</i>	<i>1.66%</i>	<i>301,571,665</i>	<i>1.69%</i>	<i>26,117,122</i>	<i>7.72%</i>	<i>75,367</i>	<i>2.67%</i>	<i>477</i>	<i>5.55%</i>
2028	<i>333,136,030</i>	<i>1.66%</i>	<i>306,664,442</i>	<i>1.69%</i>	<i>26,471,588</i>	<i>7.64%</i>	<i>77,382</i>	<i>2.67%</i>	<i>503</i>	<i>5.55%</i>
2029	<i>338,673,824</i>	<i>1.66%</i>	<i>311,843,223</i>	<i>1.69%</i>	<i>26,830,601</i>	<i>7.65%</i>	<i>79,451</i>	<i>2.67%</i>	<i>531</i>	<i>5.55%</i>
2030	<i>344,303,674</i>	<i>1.66%</i>	<i>317,109,460</i>	<i>1.69%</i>	<i>27,194,214</i>	<i>7.67%</i>	<i>81,576</i>	<i>2.67%</i>	<i>561</i>	<i>5.55%</i>
2031	<i>350,027,110</i>	<i>1.66%</i>	<i>322,464,631</i>	<i>1.69%</i>	<i>27,562,479</i>	<i>7.56%</i>	<i>83,757</i>	<i>2.67%</i>	<i>592</i>	<i>5.55%</i>
2032	<i>355,845,688</i>	<i>1.66%</i>	<i>327,910,237</i>	<i>1.69%</i>	<i>27,935,451</i>	<i>7.39%</i>	<i>85,997</i>	<i>2.67%</i>	<i>625</i>	<i>5.55%</i>
2033	<i>361,760,989</i>	<i>1.66%</i>	<i>333,447,805</i>	<i>1.69%</i>	<i>28,313,185</i>	<i>7.71%</i>	<i>88,296</i>	<i>2.67%</i>	<i>660</i>	<i>5.55%</i>
Annual Average Rate		1.66%	N/A	1.69%	N/A	8.09%	N/A	2.67%	N/A	5.55%

\*Italics indicate forecast values

## Substation, Substation Transformer, and Feeder Load Data

Garkane operates and maintains 33 substations and switch yards for the transmission and distribution of electrical power across its service territory. Metering and control equipment in these substations is used to collect load data and monitor system health in relation to Garkane's standards. The data is also used to forecast load trends. Exhibits 7, 8a, 8b, and 9 provide a summary of the load trends for each of the substation and feeder facilities making up each of Garkane's three interconnections, their nameplate capacities, individual existing and forecast loads over the next ten years. Items where the forecast loads or other known conditions require actions to mitigate deviations from Garkane standards are highlighted in yellow.

Exhibit 10. Garkane PAC Northern Interconnect Capacity Analysis

	Transformer Rating OAWFA (MVA)	Nominal Operating Voltage (kV)	Limiting Conductor Size (KCMILL)	Maximum Operating Temperature Conductor (65 C)	Emergency Operating Temperature Conductor Ampacity (75 C)	Maximum 3-ph Line Capacity Due to Ampacity / MVA	Emergency 3-ph Line Capacity Due to Ampacity / MVA	Current Voltage Measurements Meet ANSI C84.1	Based on Projected Loads Voltage Expected to Remain within ANSI C84.1 For Planning Period As Noted	Capacity Ok at Present Based on Ampacity / MVA	Operating Capacity Ok in 3 yrs Based on Ampacity / MVA	Operating Capacity Ok in 5 yrs Based on Ampacity / MVA	Operating Capacity Ok in 7 yrs Based on Ampacity / MVA	Operating Capacity Ok in 10 yrs Based on Ampacity / MVA	CURRENT YEAR PEAK KW	PEAK AVERAGE OVER 3 YEARS	MAX PAST 5 YEAR PEAK KW	ESTIMATE D PEAK LOAD IN 3 YEARS	ESTIMATE D PEAK LOAD IN 5 YEARS	ESTIMATE D PEAK LOAD IN 7 YEARS	ESTIMATE D PEAK LOAD IN 10 YEARS
<b>TOTAL SYSTEM</b>								Yes	As Noted						66,051	63,379	66,051	68,715	71,374	74,032	78,020
<b>NORTHERN SYSTEM INTERCONNECT (RMP)</b>																					
<b>TOTAL NORTHERN SYSTEM</b>	20*	20*	69					Yes	YES	See Below	See Below	See Below	See Below	See Below	9,969	9,942	11,394	10,426	10,762	11,108	11,649
<b>Sigurd Substation</b>																					
SIGURD (PAC) 46/60 Transformer	12.0	12.0	69.0	N/A				N/A	N/A	Yes	Yes	Yes	Yes	Yes	9,969	9,942	11,394	10,426	10,762	11,108	11,649
SIGURD (GKE) 46/69 Transformer	5.0	7.0	69.0	N/A				N/A	N/A	OK UNDER EMERGENCY CONDITIONS	OK UNDER EMERGENCY CONDITIONS	OK UNDER EMERGENCY CONDITIONS	OK UNDER EMERGENCY CONDITIONS	OK UNDER EMERGENCY CONDITIONS	9,969	9,942	11,394	10,426	10,762	11,108	11,649
Sigurd to Parker Transmission Feeder, 69 kV			69.0	3/0	162	204	19	24		Yes	Yes	Yes	Yes	Yes	9,969	9,942	11,394	10,426	10,762	11,108	11,649
<b>Parker Substation</b>																					
PARKER 69/12.5 kV Transformer	5.0	7.0	69.0	N/A				N/A	N/A	Yes	Yes	Yes	Yes	Yes	2,067	1,951	2,067	2,207	2,261	2,315	2,397
Parker to Fremont 69 Transmission Feeder			69.0	1/0	126	156	15	19		Yes	Yes	Yes	Yes	Yes	7,902	7,992	9,327	8,219	8,501	8,793	9,252
Grass Valley Feeder #34-1			12.5	3/0	162.00	204	4	4		Yes	Yes	Yes	Yes	Yes	1,838	1,820	1,838	2,029	2,098	2,168	2,272
Fish Lake Feeder #34-2			12.5	1/0	126.00	156	3	3		Yes	Yes	Yes	Yes	Yes	533	499	564	535	541	547	557
<b>Fremont Substation</b>																					
FREMONT 2.4/69 STEP-UP TRANSFORMER	3.0	3.0	69.0	N/A						Yes	Yes	Yes	Yes	Yes	1,900	1,900	1,900	1,900	1,900	1,900	1,900
Fremont to Lyman 69 Transmission Feeder			69.0	1/0	126	156	15	19		Yes	Yes	Yes	Yes	Yes	7,892	7,982	9,317	8,209	8,491	8,783	9,242
Fremont Generator Feeder			2.4	K350AA0	318	318	2.6	2.6		Yes	Yes	Yes	Yes	Yes	10	10	10	10	10	10	10
<b>Lyman Substation</b>																					
LYMAN 69/12.5kV TRANSFORMER	5.0	5.0	69.0	N/A						Yes	Yes	Yes	Yes	Yes	2,809	2,797	2,809	3,158	3,246	3,333	3,464
Lyman to Bicknell 69kV Transmission Feeder			69.0	1/0	126	156	15	19		Yes	Yes	Yes	Yes	Yes	5,069	5,173	6,494	5,141	5,335	5,540	5,869
Loa Feeder #36-1			12.5	266	207	260	4	6		Yes	Yes	Yes	Yes	Yes	2,296	2,303	2,296	2,570	2,656	2,743	2,873
Lyman Town #36-2			12.5	2	97	119	2	3		Yes	Yes	Yes	Yes	Yes	527	506	527	499	499	499	499
<b>Bicknell Substation</b>																					
BICKNELL 69/12.5kV Transformer	5.0	5.0	69.0	N/A						Yes	Yes	Yes	Yes	Yes	1,875	2,079	1,875	2,680	2,672	2,664	2,652
Bicknell to Torrey 69kV Transmission Feeder			69.0	477	314	414	38	49		Yes	Yes	Yes	Yes	Yes	3,115	3,079	4,540	2,543	2,707	2,882	3,166
Bicknell Town #38-1			12.5	2	97	119	2	3		Yes	Yes	Yes	Yes	Yes	1,061	1,015	1,061	1,035	1,044	1,053	1,066
Teesdale #38-2			12.5	3	97	119	2	3		Yes	Yes	Yes	Yes	Yes	892	1,078	892	1,563	1,564	1,606	1,637
<b>Torrey Substation</b>																					
TORREY Transformer 69/34.5kV	3.75	5.25	69.0	N/A						Yes	Yes	Yes	Yes	Yes	1,184	1,504	1,999	2,100	2,219	2,337	2,515
TORREY Transformer 69/12.5kV	10.0	14.0	69.0	N/A						Yes	Yes	Yes	Yes	Yes	1,207	1,554	2,083	1,889	1,940	2,010	2,115
Torrey to Hanksville 34.5kV Transmission Feeder			35.5	4HDC	139	165	9	10		Yes	Yes	Yes	Yes	Yes	1,909	1,524	2,457	2,100	2,219	2,337	2,515
Torrey Town Feeder #39-1			12.5	2	97	119	2	3		Yes	Yes	Yes	Yes	Yes	1,010	1,216	1,570	1,500	1,562	1,625	1,718
Grover Feeder #39-2			12.5	2	97	119	2	3		Yes	Yes	Yes	Yes	Yes	197	338	514	487	511	535	572
<b>Hanksville Substation</b>																					
HANKSVILLE Transformer 34.5/12.5 kV	2.5	3.5	34.50	N/A						Yes	Yes	Yes	Yes	Yes	1,045	908	1,045	934	971	1,009	1,065
Hanksville Feeder #40-1			12.50	1/0	126	156	3	3		Yes	Yes	Yes	Yes	Yes	1,045	908	1,045	934	971	1,009	1,065

Exhibit 11a, Garkane Glen Canyon Interconnect Capacity Analysis

	Transformer Rating O/V/F/A (MVA)	Nominal Operating Voltage (KV)	Limiting Conductor or Size, (AWG & KCMILL)	Maximum Operating Temp Conductor Ampacity (65 C)	Emergency Operating Temp Conductor Ampacity (75 C)	Maximum 3-ph Line Capacity Due to Ampacity / MVA	Emergency 3-ph Line Capacity Due to Ampacity / MVA	Current Voltage Measurements Meet ANSI C84.1	Based on Projected Loads Voltage Expected to Remain within ANSI C84.1 For Planning Period	Capacity OK at Present Based on Ampacity / MVA	Operating Capacity OK in 3 yrs Based on Ampacity / MVA	Operating Capacity OK in 5 yrs Based on Ampacity / MVA	Operating Capacity OK in 7 yrs Based on Ampacity / MVA	Operating Capacity OK in 10 yrs Based on Ampacity / MVA	CURRENT YEAR PEAK KW	PEAK AVERAGE D OVER 3 YEARS	MAX PAST 5 YEAR PEAK KW	ESTIMATE D PEAK LOAD IN 3 YEARS	ESTIMATE D PEAK LOAD IN 5 YEARS	ESTIMATE D PEAK LOAD IN 7 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS
<b>TOTAL SYSTEM</b>								Yes	As Noted					66,051	63,379	66,051	68,715	71,374	74,032	78,020	
<b>SOUTHERN SYSTEM EASTERN INTERCONNECT (WAPA)</b>																					
<b>TOTAL SOUTHERN SYSTEM</b>		138								Yes	Yes	26% NEEDS ATTENTION	26% NEEDS ATTENTION	26% NEEDS ATTENTION	56,500	52,675	56,500	53,460	55,431	57,402	60,358
Glen Canyon to Buckskin T.L. & Interconnect	37	37	138	266	207	260	49	62		Yes	Yes	26% NEEDS ATTENTION	26% NEEDS ATTENTION	26% NEEDS ATTENTION	45,148	43,947	45,148	48,975	50,995	53,016	56,046
<b>Buckskin 138KV Transformer</b>																					
Buckskin to Homenville Transmission Feeder, 138KV			138	266	207	260	49	62		Yes	Yes	Yes	Yes	Yes	17,807	17,537	18,965	19,662	20,384	21,106	22,189
Buckskin 138KV Transformer	30	50	69	N/A						Yes	Yes	Yes	Yes	Yes	27,063	26,828	27,063	28,408	29,382	30,290	31,668
Fredonia Feeder (Planned Alteration to EMG Feeder)			69	40 & 47	182	232	22	28		4/0 NEEDS ATTENTION	4/0 NEEDS ATTENTION	4/0 NEEDS ATTENTION	4/0 NEEDS ATTENTION	25,467	24,519	25,467	25,737	26,455	27,173	28,251	
Paria Feeder #2-4			69	40	182	232	22	28		Yes	Yes	Yes	Yes	2,433	2,413	2,509	2,386	2,389	2,439	2,500	
<b>Paria Substation</b>																					
Paria 69/25 KV Transformer	5	7	69	N/A						Yes	Yes	Yes	Yes	Yes	2,410	2,355	2,465	2,219	2,239	2,259	2,298
Big Water Feeder			25	10	126.00	196.00	5	7		Yes	Yes	Yes	Yes	Yes	2,410	2,355	2,465	2,219	2,239	2,259	2,288
<b>Johnson Substation (Retirement Planned for 2023)</b>																					
JOHNSON 69/12.5 KV Transformer	1.0	1.0	69	N/A						Yes	Yes	Yes	Yes	Yes	452	753	968	566	573	591	617
Johnson Canyon (Retired From Normal Operation)			12.5	1/0	176.00	196.00	3	3		Yes	Yes	Yes	Yes	-	134	622	-	-	-	-	-
Canyon County Feeder			12.5	3/0	162.00	204.00	4	4		Yes	Yes	Yes	Yes	383	393	478	426	438	447	462	
Seeps Ranch Feeder (Single Phase)			12.5	3	87.00	119.00	0.7	0.9		Yes	Yes	Yes	Yes	142	129	142	130	137	144	155	
<b>EMG Substation</b>																					
EMG 69/12.5 KV Transformer	5.0	7.0	69	N/A						Yes	Yes	Yes	Yes	Yes	1,297	1,242	1,297	1,952	2,087	2,237	2,484
EMG Substation to Kanab Transmission Feeder (Planned)			69	4/0	182	232	22	28		4/0 NEEDS ATTENTION	4/0 NEEDS ATTENTION	4/0 NEEDS ATTENTION	4/0 NEEDS ATTENTION	17,281	16,353	17,827	15,203	15,861	16,575	17,762	
EMG Substation to Fredonia Transmission Feeder (Planned)			69	4/0 URD	182	232	22	28		Yes	Yes	Yes	Yes	3,393	3,382	3,399	4,064	4,054	4,047	4,044	
Johnson Canyon			12.5	2/0 URD	130.00	180.00	3	4		Yes	Yes	Yes	Yes	726	726	726	726	726	726	726	
Vermillion East			12.5	1/0 URD	105.00	155.00	2	3		Yes	Yes	Yes	Yes	746	1,048	1,263	1,226	1,381	1,511	1,767	
EMG Generator			12.5	4/0 URD	185.00	235.00	4	5		Yes	Yes	Yes	Yes	10	5	10	N/A	N/A	N/A	N/A	
PLX (Microing System Retirement, Alteration?)			12.5	4/0 URD	185.00	235.00	4	5		Yes	Yes	Yes	Yes	1,791	895	1,791	N/A	N/A	N/A	N/A	
<b>KANAB CITY SW (Retirement Planned 2023)</b>																					
Kanab City Substation														12,777	12,173	12,777	12,768	13,181	13,607	14,273	
<b>KANAB CITY 69/12.5 TRANSFORMER</b>																					
Kanab City to KCR Transmission Feeder			69	477	314	414	37	49		Yes	Yes	Yes	Yes	Yes	8,702	8,479	8,702	6,070	6,255	6,445	6,741
Kanab North			12.5	477	314	414	7	9		Yes	Yes	Yes	Yes	Yes	6,830	5,889	6,830	6,825	6,946	7,303	7,911
Kanab South			12.5	477	314	414	7	9		Yes	Yes	Yes	Yes	Yes	5,363	5,363	8,514	5,610	5,780	5,856	6,230
<b>Fredonia Substation</b>																					
FREDONIA 69 BUS			69	N/A						Yes	Yes	Yes	Yes	Yes	3,393	3,382	3,399	4,064	4,054	4,047	4,044
Fredonia City 69 Transmission Feeder			69	477	314	414	37	49		Yes	Yes	Yes	Yes	Yes	2,946	2,985	2,946	3,051	3,095	3,142	3,212
Fredonia to Ryan Transmission Feeder			69	1/0	126	156	15	19		Yes	Yes	Yes	Yes	Yes	828	1,103	1,336	1,013	957	905	831
FREDONIA 69/34.5 KV Transformer	10.0	14.0	34.5	N/A						Yes	Yes	Yes	Yes	Yes	7,070	6,895	7,187	6,871	7,266	7,701	8,429
Fredonia to Colorado City Feeder			34.5	286/477	207	260	12	16		Yes (2nd Source)	Yes (2nd Source)	Yes (2nd Source)	Yes (2nd Source)	Yes (2nd Source)	455	438	500	337	283	238	183
Fredonia to Orderville Feeder			34.5	286/3/0	162	204	10	12		Yes (Voltage?)	Yes (Voltage?)	Yes (Voltage?)	Yes (Voltage?)	Yes (Voltage?)	6,691	5,914	6,691	6,534	6,983	7,463	8,246
FREDONIA 34.5/12.5 KV Transformer	5.0	7.0	12.00	N/A						Yes	Yes	Yes	Yes	Yes	302	323	331	446	506	585	754
TR C Generation (Retired/Inactive)			12.50	3/36	257	334	6	7		Yes	Yes	Yes	Yes	Yes			2,781				
TR C Feeder			12.50	3/36	257	334	6	7		Yes	Yes	Yes	Yes	Yes	249	277	296	263	267	292	298
Katbab Feeder			12.50	266	207	260	4	6		Yes	Yes	Yes	Yes	Yes	100	105	116	163	218	293	455
<b>Kanab City Ranchos (KCR) Substation</b>																					
KCR 69/12.5 KV Transformer	10.0	14.0	69	N/A						Yes	Yes	Yes	Yes	Yes	6,830	5,889	6,830	6,025	6,946	7,303	7,911
KCR Feeder			12.5	266	207	260	4	6		Yes	Yes	Yes	Yes	Yes	3,553	3,380	4,155	3,366	3,350	3,335	3,312
KCR West Kanab Feeder			12.5	477	314	414	7	9		Yes	Yes	Yes	Yes	Yes	3,295	2,811	3,295	3,259	3,398	3,998	4,599
<b>Ryan Substation</b>																					
RYAN 69/25 KV Transformer	2.5	2.5	69	N/A						Yes	Yes	Yes	Yes	Yes	855	1,119	1,351	1,118	1,089	1,061	1,024
Jacob Lake Feeder			25	1/0	126	156	5	7		Yes	Yes	Yes	Yes	Yes	242	218	248	232	241	251	267
Big Springs Feeder			25	1/0	126	156	5	7		Yes	Yes	Yes	Yes	Yes	709	949	1,159	887	848	810	757
<b>Orderville Substation</b>																					

Exhibit 11b, Garkane Glen Canyon Interconnect Capacity Analysis (Continued)

<b>ORDERVILLE 34.5/12.5 Transformer</b>	2.5	3.5	34.5	N/A															Yes	Yes	Yes	Yes	Yes	1,379	1,197	1,502	1,295	1,365	1,438	1,556	
Orderville to Tod's 34.5 Feeder			34.5	3/0	162	204	10	12											Yes	Yes	Yes	Yes	Yes								
Orderville Feeder			12.5	3/0	162	204	3.5	4.4											Yes	Yes	Yes	Yes	Yes	1,379	1,197	1,502	1,295	1,365	1,438	1,556	
<b>Boulder Substation</b>																															
<b>BOULDER 2.4/12.5 kV Transformer</b>	1.5	1.5	12.5	N/A															Yes	Yes	Yes	Yes	Yes	4,736	4,532	5,083	4,318	4,181	4,049	3,858	
<b>BOULDER 2.4/69 kV Transformer</b>	5	7	69	N/A															Yes	Yes	Yes	Yes	Yes	4,372	3,965	4,737	4,005	4,030	4,055	4,094	
Boulder to Escalante Transmission Feeder			69	3/0	162	204	19	24											Yes	Yes	Yes	Yes	Yes	3,294	2,607	3,279	2,650	2,615	2,579	2,519	
Boulder Town Feeder			12.5	1/0	126	156	3	3											Yes	Yes	Yes	Yes	Yes	1,078	1,272	1,458	1,356	1,415	1,477	1,575	
Boulder East Fork Feeder			12.5	4	75	91	2	2											Yes	Yes	Yes	Yes	Yes	41	41	82	57	72	89	125	
<b>Escalante Substation</b>																															
<b>ESCALANTE 69/12.5 kV Transformer</b>	3.8	5.3	69	N/A															Yes	Yes	Yes	Yes	Yes	2,489	2,752	3,300	2,902	2,941	2,982	3,046	
Citation to Escalante Transmission Feeder			69	3/0	162	204	19	24											Yes	Yes	Yes	Yes	Yes	2,757	2,845	3,433	2,902	2,941	2,982	3,046	
Escalante Town Feeder			12.5	3/0	162	204	3.5	4.4											Yes	Yes	Yes	Yes	Yes	1,404	1,493	1,834	1,502	1,508	1,514	1,523	
North			12.5	3/0	162	204	3.5	4.4											Yes	Yes	Yes	Yes	Yes	745	758	989	767	773	778	787	
West (Vidrine)			12.5	2	97	119	2.1	2.6											Yes	Yes	Yes	Yes	Yes	608	593	611	633	661	689	735	
<b>Pahreah Hollow Substation</b>																															
<b>PAHREAH HOLLOW 69/12.5 Transformer</b>	4.5	0.45	69	N/A															Yes	Yes	Yes	Yes	Yes	14	14	14	14	14	14	14	
Pahreah Hollow Feeder			12.5	4	75	91	1.6	2.0											Yes	Yes	Yes	Yes	Yes	14	14	14	14	14	14	14	
<b>Citation Old Substation</b>																															
Citation Tap to Citation Transmission			69	3/0	162	204	19	24											Yes	Yes	Yes	Yes	Yes	2,567	2,554	2,741	2,500	2,485	2,430	2,379	
<b>CITATION 69/12.5 kV Transformer</b>	5	7	69																Yes	Yes	Yes	Yes	Yes	2,567	2,554	2,741	2,500	2,485	2,430	2,379	
<b>Henrieville Transmission Substation</b>																															
<b>HENRIEVILLE 138/69 kV Transformer</b>	30.0	50.0	138																Yes	Yes	Yes	Yes	Yes	17,807	17,537	18,985	19,862	20,384	21,106	22,189	
Henrieville to Citation Tap Transmission Feeder			69	3/0	162	204	19	24											Yes	Yes	Yes	Yes	Yes	4,513	4,513	4,859	4,159	4,153	4,148	4,139	
Henrieville to East Valley Switch Transmission Feeder			69	477	314	414	37	49											Yes	Yes	Yes	Yes	Yes	14,101	14,511	14,570	17,028	17,823	18,618	19,811	
<b>East Valley Switch Yard</b>																															
East Valley Switch to Rubys Switch Transmission			69	477	314.00	414.00	37	49											Yes	Yes	Yes	Yes	Yes	8,881	9,118	8,881	11,557	12,351	13,144	14,331	
<b>Rubys Switch Yard</b>																															
Rubys Switch Yard to Hatch Switch Yard Transmission			69	477	314.00	414.00	37	49											Yes	Yes	Yes	Yes	Yes	8,881	9,118	8,881	11,557	12,351	13,144	14,331	
<b>Tropic Substation</b>																															
<b>TROPIC 69/12.5 Transformer</b>	3.8	4.2	N/A																Yes	No, DGA Test Results	No, DGA Test Results	No, DGA Test Results	No, DGA Test Results	2,389	2,451	3,494	2,433	2,422	2,410	2,392	
Tropic to Bryce Transmission Feeder			69	2	97	119	12	14											Yes	Yes	Yes	Yes	Yes	2,830	2,941	3,607	3,037	3,050	3,064	3,088	
3 Communities Feeder			12.5	3/0	162	204	4	4											Yes	Yes	Yes	Yes	Yes	2,389	2,451	3,494	2,433	2,422	2,410	2,392	
<b>Bryce Substation</b>																															
<b>BRyce 69/12.5 Transformer</b>	5.0	7.0	N/A																Yes	Yes, But Move to Rubys @4500 kW	Yes, But Move to Rubys @4500 kW	Yes, But Move to Rubys @4500 kW	Yes, But Move to Rubys @4500 kW	2,830	2,941	3,607	3,037	3,050	3,064	3,088	
Bryce to Rubys Transmission Feeder			69	2	97	119	12	14											Yes	Yes	Yes	Yes	Yes	2,830	2,941	3,607	3,037	3,050	3,064	3,088	
Bryce Canyon			12.5	1/0	105	155	2.3	3.4											Yes	Yes	Yes	Yes	Yes	797	737	866	722	712	702	687	
Rubys Inn			12.5	4/0	185	235	4.0	5.1											Yes	Yes	Yes	Yes	Yes	1,774	1,680	2,187	1,731	1,765	1,802	1,856	
Pink Cliffs			12.5	2	97	119	2.1	2.6											Yes	Yes	Yes	Yes	Yes	570	603	698	584	572	567	544	
<b>Hatch Switch Yard</b>																															
<b>Hatch Switch Yard Total (Incoming)</b>			69	477	314	414	37	49											Yes	Yes	Yes	Yes	Yes	7,156	7,361	9,203	9,588	10,330	11,121	12,430	
Hatch Switch Yard to Todds Transmission Feeder			69	477	314	414	37	49											Yes	Yes	Yes	Yes	Yes	6,461	7,229	8,549	8,814	9,339	10,323	11,621	
Hatch Switch Yard to Spry Transmission Feeder			69	4/0	185	235	22	28											Yes	Yes	Yes	Yes	Yes	731	774	758	784	791	798	809	
<b>Hatch 34.5/12.5 Transformer</b>																															
Hatch Canyon	10.0	14.0	69	N/A															Yes	Yes	Yes	Yes	Yes	1,677	2,031	1,677	1,552	1,561	1,570	1,566	
Hatch South			34.5	3/0	162	204	10	12											Yes	Yes	Yes	Yes	Yes	532	481	543	513	535	558	595	
<b>HATCH 34.5/12.5 Transformer</b>	1.5	1.5	34.5	N/A															Yes	Yes	Yes	Yes	Yes	1,160	1,061	1,180	1,080	1,026	1,012	991	
Hatch Town Feeder			12.5	3/0	162	204	4	4											Yes	Yes	Yes	Yes	Yes	609	617	700	627	634	641	652	
<b>Tod's Substation</b>																															
<b>TOD'S 34.5/12.5 kV Transformer</b>	7.5	10.0	69	N/A															Yes	Yes	Yes	Yes, But Plan to Replace	No	5,296	6,201	7,289	7,670	8,441	9,307	10,807	
Standby			34.5	1/0	105	155	6	9											Yes	Yes	Yes	Yes	Yes	1,689	1,881	2,331	1,717	1,742	1,706	1,804	
Duck Creek			34.5	477	314	414	19	25											Yes	Yes	Yes	Yes	Yes	3,738	4,386	6,195	5,933	6,700	7,540	9,003	
Long Valley			34.5	3/0	162	204	10	12											Yes	Yes	Yes	Yes	Yes								
Alton			34.5	3/0	162	204	10	12											Yes	Yes	Yes	Yes	Yes	441	482	1,191					
<b>TOD'S 34.5/12.5 kV Transformer</b>	5.0	7.0	12.5	N/A															Yes	Yes	Yes	Yes	Yes	892	885	1,024	886	887	887	888	
Blk Ridge			12.5	4/0	185	235	4	5											Yes	Yes	Yes	Yes	Yes	892	885	1,024	886	887	887	888	
Swapp			12.5	4/0	185	235	4	5											Yes	Yes	Yes	Yes	Yes	892	885	1,024	886	887	887	888	
<b>Zion View Substation</b>																															
<b>ZION VIEW ESTATES (2 @ 2.5) 34.5/12.5 kV</b>	5	5	34.5	4/0	185	235	11	14											Yes	Yes	Yes	Yes	Yes	91	91	91	120	171	231	376	
East Meter	2.5	2.5	12.5	1/0	105	155	2	3											Yes	Yes	Yes	Yes	Yes	55	55	55	95	137	198	343	
West Meter	2.5	2.5	12.5	1/0	105	155	2	3											Yes	Yes	Yes	Yes	Yes	36	35	36	34	34	34	33	
<b>Duck Creek Substation</b>																															
<b>DUCK CREEK 34.5/12.5 kV Transformer</b>	5.0	7.0	34.5	N/A															Yes	Yes, But Plan to Replace	No	No	No	3,766	5,131	6,138	6,468	7,132	7,870	9,132	
Duck Creek Village			12.5	2/0	143	179	3.1	3.9											Yes	Yes	Yes	Yes	Yes	2,020	2,885	3,548	3,459	3,904	4,406	5,284	

Exhibit 11c, Garkane Glen Canyon Interconnect Capacity Analysis (Continued)

Color Country			12.5	3/0	162	204	3/5	4.4			Yes	Yes	Yes	Yes	Yes	1,882	2,708	3,223	3,009	3,228	3,463	3,848
<b>SPRY 69/12.5 kV Transformer</b>	2.5	2.8	69	N/A							Yes	Yes	Yes	Yes	Yes	722	731	755	819	884	953	1,068
<b>Spry Feeder</b>			12.5	3/0	162	204	3/5	4.4			Yes	Yes	Yes	Yes	Yes	722	731	755	819	884	953	1,068

Exhibit 12, Garkane Twin Cities PAC Interconnect & System Interconnect Forecast Loads

	Transformer Rating (MVA)	Nominal Operating Voltage (kV)	Limiting Conductor or Size (AWG & KCMIL)	Maximum Operating Temp Conductor Ampacity (65 C)	Emergency Operating Temp Conductor Ampacity (75 C)	Maximum 3-ph Line Capacity Due to Ampacity / MVA	Emergency 3-ph Line Capacity Due to Ampacity / MVA	Current Voltage Measurement is Met ANSI C84.1	Based on Projected Loads Voltage Expected to Remain within ANSI C84.1 For Planning Period	Capacity OK at Present Based on Ampacity / MVA	Operating Capacity OK in 3 yrs Based on Ampacity / MVA	Operating Capacity OK in 5 yrs Based on Ampacity / MVA	Operating Capacity OK in 7 yrs Based on Ampacity / MVA	Operating Capacity OK in 10 yrs Based on Ampacity / MVA	CURRENT YEAR PEAK KW	PEAK AVERAGE OVER 3 YEARS	MAX PAST 5 YEAR PEAK KW	ESTIMATE D PEAK LOAD IN 3 YEARS	ESTIMATE D PEAK LOAD IN 5 YEARS	ESTIMATE D PEAK LOAD IN 7 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS
<b>TOTAL SYSTEM</b>								Yes	As Noted						66,051	63,379	66,051	68,715	71,374	74,032	78,020
<b>SOUTHERN SYSTEM WESTERN INTERCONNECT (RMP)</b>																					
<i>Twin Cities/Hildale Substation</i>																					
<b>TWIN CITIES HILDALE 69/34.5 kV Transformer</b>	10.0	14.0	69	N/A						Yes	Yes	Yes	Yes	Yes	3,858	3,854	4,674	4,548	4,854	5,160	5,618
<i>Colorado City Substation</i>																					
<b>COLORADO CITY SUB #10</b>	5.0	7.0	34.5	N/A						Yes	Yes	Yes	Yes	Yes	2,789	1,689	2,789	insufficient Data	insufficient Data	insufficient Data	insufficient Data
Colorado City Feeder			12.5	1/0	105	155	2.3	3.4		Yes	Yes	Yes	Yes	Yes	355	291	355	insufficient Data	insufficient Data	insufficient Data	insufficient Data
Centennial Park #10-2			12.5	1/0	105	155	2.3	3.4		Yes, But Plan to Replace	Yes, But Plan to Replace	Yes, But Plan to Replace	Yes, But Plan to Replace	Yes, But Plan to Replace	2,500	2,544	2,500	2,677	2,769	2,885	3,015
<i>Cane Beds Step Transformer</i>																					
<b>Cane Beds Step 34.5/12.5 kV Transformer</b>	1.5	1.5	34.5							Yes, But Plan to Replace	Yes, But Plan to Replace	Yes, But Plan to Replace	Yes, But Plan to Replace	Yes, But Plan to Replace	1,089	1,966	1,085				
Cane Beds Feeder			12.5	4	75	91	1.6	2.0		Yes, But Monitor	Yes, But Monitor	Yes, But Monitor	Yes, But Monitor	Yes, But Monitor	1,089	1,966	1,885				
<i>Twin Cities Substation</i>																					
<b>TWIN CITIES INTERCONNECTION TOTAL</b>	20	20	69	477	314.00	414.00	37	49		Yes	Yes	Yes	Yes	Yes	10,474	10,443	10,817	10,817	10,580	10,729	10,982
Newell Ave Feeder			12.5	3/0 URD	185.00	235.00	4	5		Yes	Yes	Yes	Yes	Yes	19	28	31	23	21	18	15
Utah Ave Feeder			12.5	500 URD	450.00	500.00	10	11		Yes	Yes	Yes	Yes	Yes	3,148	3,093	3,352	2,900	2,776	2,661	2,495
Township Ave Feeder			12.5	3/0 URD	185.00	235.00	4	5		Yes, But Monitor	Yes, But Monitor	Yes, But Monitor	Yes, But Monitor	Yes, But Monitor	3,850	3,730	3,926	3,603	3,522	3,442	3,326
<b>Twin Cities 69/12.5 kV V1 Transformer (P)</b>	15.0	28.0	69	N/A						Yes	Yes	Yes	Yes	Yes	7,017	6,851	7,298	6,527	6,320	6,121	5,835
<b>Twin Cities 69/12.5 kV US Transformer (B)</b>	7.5	10.5	69	N/A						Yes	Yes	Yes	Yes	Yes	7,017	6,851	7,298	6,527	6,320	6,121	5,835
<i>Interconnection Deliveries Substation</i>																					
TWIN CITIES RMP DELIVERY	20	20	69.00							Yes	Yes	Yes	Yes	Yes	10,025	10,263	10,817	10,391	10,580	10,729	10,982
SIGURD 69 URD Source	20	20	69.00							Yes	Yes	Yes	Yes	Yes	9,772	9,979	11,336	11,586	12,045	12,491	13,160
GLEN CANYON 138 WAPA Source	80	100	138.00							Yes	Yes	Yes	Yes	Yes	46,368	45,261	55,295	47,561	49,159	50,811	53,393
FREDONIA CITY 69 Delivery	NONE	NONE	69.00							Yes	Yes	Yes	Yes	Yes	2,808	2,839	2,969	2,831	2,825	2,820	2,811

## Voltage Measurements

Garkane operates and maintains 33 substations and 2,628 miles of transmission and distribution lines to provide electrical power across its service territory. Metering and control equipment across the system is used to monitor the voltage levels in relation to Garkane's standards. Exhibits 7, 8a, 8b, and 9 provide a summary with a limited sample of the voltages measured during the peak month across the system at peak load at the measurement equipment over the last three years. In addition, the measured voltages are compared to the ANSI C84.1 and Garkane voltage standards. Equipment recording voltage measurement these standards are highlighted in red.



SUBSTATION/FEEDER	SIGURD 99KV BUS			PARKER 69KV BUS			LYMAN 12.5 KV BUS			BICKNELL 12.5 KV BUS			TORREY 12.5 KV BUS			TORREY 34.5 KV BUS			HAWKSWILL 34.5 KV BUS					
PER UNIT MAXIMUM VOLTAGE MEASURED	1.032	1.032	1.033	1.040	1.039	1.036	1.031	1.032	1.031	1.046	1.046	1.047	1.030	1.029	1.032	1.030	1.030	1.030	1.030	1.029	1.031	1.625	1.031	
PER UNIT MINIMUM VOLTAGE MEASURED	1.013	1.012	1.008	1.015	1.006	1.004	1.006	1.005	1.005	1.018	1.019	1.020	1.006	1.004	1.008	1.007	1.005	1.006	1.012	1.012	1.012	1.012	1.010	
TOTAL TIME READINGS LESS THAN NOMINAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL TIME READINGS LESS THAN STANDARD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
NOMINAL LINE TO LINE	69000	69000	69000	69000	69000	69000	12470	12470	12470	12470	12470	12470	12470	12470	12470	34500	34500	34500	12470	12470	12470	12470	12470	
NOMINAL LINE TO GRND	39837	39837	39837	39837	39837	39837	7200	7200	7200	7200	7200	7200	7200	7200	7200	19919	19919	19919	7300	7200	7200	7300	7200	
ANNUAL PEAK MONTH	Dec-20	Jan-21	Feb-22	May-20	Dec-21	Feb-22	Dec-20	Dec-21	Feb-22	Dec-20	Dec-21	Feb-22	Dec-20	Jan-21	Feb-22	Dec-20	Jan-21	Feb-22	Jan-20	Jan-21	Feb-22	Jan-20	Jan-21	Feb-22
	MEASUREMENTS (L to L)			MEASUREMENTS (L to G)			MEASUREMENTS (L to G)			MEASUREMENTS (L to L)			MEASUREMENTS (L to L)			MEASUREMENTS (L to L)			MEASUREMENTS (L to L)			MEASUREMENTS (L to L)		
12:00:00 AM	70632	70669	70662	41295	41012	40952	7350	7350	7326	12847	12839	12874	7332	7350	7358	20343	20314	20246	12734	12688	12767			
12:15:00 AM	70758	70688	70594	41350	41098	41000	7359	7351	7323	12875	12854	12844	7346	7351	7355	20371	20317	20219	12736	12659	12759			
12:30:00 AM	70745	70734	70585	41149	41095	40945	7350	7342	7327	12861	12828	12861	7345	7356	7351	20370	20336	20230	12759	12689	12751			
12:45:00 AM	70645	70646	70730	41162	41076	41047	7351	7345	7335	12860	12834	12870	7336	7350	7370	20347	20317	20260	12777	12713	12785			
1:00:00 AM	70527	70629	70846	41128	41106	40924	7330	7340	7339	12821	12831	12895	7319	7343	7372	20302	20307	20284	12712	12696	12784			
1:15:00 AM	70445	70671	70874	41162	41052	40918	7316	7358	7354	12814	12869	12908	7307	7354	7380	20267	20327	20314	12719	12713	12803			
1:30:00 AM	70503	70806	70808	41202	41100	40943	7331	7356	7350	12822	12860	12902	7320	7368	7367	20298	20368	20288	12718	12708	12782			
1:45:00 AM	70501	70810	70960	41215	41017	40879	7337	7367	7359	12840	12868	12918	7325	7358	7389	20314	20333	20347	12734	12727	12804			
2:00:00 AM	70488	70949	70789	41254	41038	40891	7321	7372	7330	12821	12883	12878	7316	7379	7357	20296	20394	20257	12741	12714	12762			
2:15:00 AM	70539	70975	70761	41246	41046	40841	7339	7357	7335	12837	12855	12880	7326	7365	7363	20312	20398	20265	12717	12756	12744			
2:30:00 AM	70514	70994	70820	41224	40996	40837	7335	7377	7341	12840	12881	12877	7319	7368	7373	20300	20405	20282	12703	12759	12731			
2:45:00 AM	70573	70590	70710	41226	40998	40845	7338	7352	7315	12846	12853	12853	7323	7320	7357	20314	20279	20233	12728	12756	12774			
3:00:00 AM	70492	70621	70736	41238	40968	40766	7317	7348	7329	12805	12844	12874	7310	7334	7355	20272	20322	20247	12732	12673	12745			
3:15:00 AM	70533	70586	70688	41232	40995	40788	7332	7339	7306	12824	12831	12859	7319	7325	7342	20294	20286	20204	12760	12682	12720			
3:30:00 AM	70494	70639	70709	41248	40985	40722	7321	7340	7307	12825	12837	12839	7312	7342	7330	20277	20336	20181	12713	12678	12701			
3:45:00 AM	70474	70503	70683	41248	40939	40725	7327	7337	7315	12812	12830	12882	7315	7314	7346	20279	20257	20216	12706	12695	12748			
4:00:00 AM	70359	70465	70589	41239	40865	40710	7309	7331	7300	12823	12821	12860	7299	7305	7311	20250	20227	20149	12694	12679	12744			
4:15:00 AM	70339	70489	70633	41192	40799	40714	7300	7333	7303	12824	12823	12861	7290	7312	7327	20214	20244	20172	12684	12676	12687			
4:30:00 AM	70383	70413	70543	41195	40769	40541	7306	7338	7284	12826	12835	12820	7298	7298	7308	20239	20210	20113	12711	12677	12677			
4:45:00 AM	70294	70364	70523	41170	40611	40556	7280	7322	7281	12799	12808	12841	7280	7295	7316	20179	20202	20137	12713	12661	12696			
5:00:00 AM	70230	70339	70491	41130	40732	40431	7273	7311	7293	12786	12821	12831	7275	7285	7309	20179	20175	20117	12694	12694	12702			
5:15:00 AM	70312	70272	70501	41122	40625	40365	7290	7294	7283	12807	12794	12831	7281	7272	7306	20191	20138	20122	12699	12719	12680			
5:30:00 AM	70210	70287	70296	41064	40570	40475	7277	7287	7285	12787	12778	12835	7264	7276	7302	20152	20146	20125	12720	12699	12709			
5:45:00 AM	70109	70197	70293	41006	40476	40458	7253	7269	7283	12749	12725	12847	7249	7262	7308	20099	20104	20178	12711	12701	12757			
6:00:00 AM	70364	70182	70152	40959	40597	40450	7283	7288	7275	12801	12870	12796	7272	7263	7293	20169	20111	20098	12738	12712	12717			
6:15:00 AM	70295	70029	70056	40815	40696	40402	7272	7267	7269	12773	12829	12825	7261	7257	7291	20128	20013	20112	12750	12698	12754			
6:30:00 AM	70281	70352	70256	40838	40695	40447	7270	7278	7312	12804	12800	12848	7259	7291	7318	20132	20195	20141	12730	12712	12747			
6:45:00 AM	70010	70336	70170	40646	40812	40487	7264	7268	7316	12732	12813	12835	7254	7295	7310	20118	20204	20127	12730	12773	12755			
7:00:00 AM	70361	70339	70249	40733	40796	40417	7296	7284	7302	12827	12849	12847	7285	7295	7308	20216	20200	20113	12723	12690	12673			
7:15:00 AM	70486	70243	70162	40745	40828	40424	7303	7316	7294	12849	12907	12851	7303	7280	7300	20271	20166	20101	12719	12710	12698			
7:30:00 AM	70444	70319	70234	40650	40775	40424	7306	7320	7288	12845	12899	12841	7296	7291	7309	20242	20193	20102	12705	12723	12724			
7:45:00 AM	70506	70364	70251	40811	40793	40982	7320	7337	7323	12863	12927	12895	7317	7275	7312	20311	20156	20160	12668	12727	12711			
8:00:00 AM	70592	70518	70190	40865	40812	40463	7343	7324	7296	12906	12915	12852	7329	7304	7296	20343	20234	20102	12702	12724	12737			
8:15:00 AM	70511	70622	70181	40853	40800	40563	7327	7332	7302	12888	12926	12843	7322	7314	7301	20319	20265	20108	12733	12805	12705			
8:30:00 AM	70525	70789	70175	40784	40815	40521	7343	7332	7292	12893	12920	12841	7332	7342	7311	20343	20342	20113	12716	12820	12723			
8:45:00 AM	70517	70725	70120	40735	40833	40552	7348	7350	7287	12914	12950	12890	7341	7332	7284	20380	20316	20079	12721	12808	12713			
9:00:00 AM	70532	70715	70236	40789	40855	40576	7354	7349	7320	12886	12947	12871	7343	7334	7317	20341	20319	20145	12698	12767	12757			
9:15:00 AM	70636	70722	70339	40743	40852	40532	7371	7350	7342	12910	12948	12912	7358	7332	7336	20386	20315	20204	12698	12780	12783			
9:30:00 AM	70439	70550	70329	40819	40944	40591	7344	7358	7328	12869	12958	12889	7334	7326	7335	20315	20301	20179	12699	12722	12782			
9:45:00 AM	70530	70470	70321	40820	40997	40507	7367	7365	7325	12903	12929	12889	7356	7323	7341	20382	20295	20199	12700	12717	12760			
10:00:00 AM	70406	70381	70369	40809	41051	40512	7332	7371	7332	12814	12935	12897	7313	7312	7348	20301	20267	20215	12726	12740	12764			
10:15:00 AM	70292	70195	70327	40749	41089	40632	7305	7368	7344	12771	12937	12906	7289	7297	7333	20243	20223	20194	12701	12699	12785			
10:30:00 AM	70512	70164	70357	40706	41108	40642	7341	7367	7353	12827	12967	12926	7312	7308	7357	20306	20256	20241	12716	12708	12797			
10:45:00 AM	70342	70447	70212	40796	41220	40692	7329	7405	7323	12798	12928	12887	7295	7329	7337	20271	20314	20201	12732	12723	12747			

Exhibit 13, Garkane PAC Northern Interconnect Voltage Analysis

SUBSTATION/FEDER		GLEN CANYON 138KV FEED			BUCKSHIN TO HENRIEVILLE 138KV FEED			HENRIEVILLE 138KV BUS			CITATION SUB BUS			ESCALANTE SUB BUS			BOULDER SUB BUS			BOULDER SUB 69 KV BUS		
PLR UNIT MAXIMUM VOLTAGE MEASURED		1.056	1.065	1.066	1.057	1.067	1.070	1.070	1.069	1.075	1.031	1.031	1.031	1.037	1.031	1.031	1.019	1.029	1.029	0.000	1.050	1.049
PLR UNIT MINIMUM VOLTAGE MEASURED		1.004	1.017	0.999	1.006	1.024	1.010	1.010	1.015	0.999	1.005	1.005	1.004	1.013	1.007	1.007	0.967	0.975	0.956	0.000	0.997	0.997
TOTAL TIME READINGS LESS THAN NOMINAL		0	0	2	0	0	0	0	0	3	0	0	0	0	0	0	2054	661	1052	0	15	0
TOTAL TIME READINGS LESS THAN STANDARD		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GLEN CANYON LOAD AT EXHAUSTION VOLTAGE (MVA)		138000	138000	138000	138000	138000	138000	138000	138000	138000	12470	12470	12470	12470	12470	12470	12470	12470	12470	12470	69000	69000
NOMINAL LINE TO LINE		79674	79674	79674	79674	79674	79674	79674	79674	79674	7200	7200	7200	7200	7200	7200	7200	7200	7200	7200	39837	39837
NOMINAL LINE TO GROUND																						
ANNUAL PEAK MONTH		Feb-20	Dec-21	Feb-22	Feb-20	Dec-21	Jan-22	Feb-20	Jan-21	Jan-22	Mar-20	Apr-21	Sep-22	Feb-20	Oct-21	Feb-22	Dec-20	Feb-21	Dec-22	May-20	Apr-21	May-22
DAY OF Month		MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)		
Hour:Minute		MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)		
1	12:00:00 AM	143829	83297	83658	143787	143534	143657	83434	82931	84158	12660	12723	12765	12797	12797	12699	12527	12294	12570	No Readings	70121	71361
1	12:15:00 AM	143600	83789	83658	143875	143453	143699	83560	82923	84158	12657	12729	12799	12797	12813	12703	12547	12303	12575	12547	70152	71388
1	12:30:00 AM	143791	83204	83658	143559	143596	143618	83452	82899	84125	12657	12722	12759	12797	12808	12694	12541	12308	12569	12541	70156	71418
1	12:45:00 AM	144096	83483	83658	143773	143577	143735	83507	82855	84344	12658	12726	12759	12797	12813	12722	12520	12303	12599	12520	70159	71449
1	1:00:00 AM	144081	83577	83658	144004	143570	143645	83635	82786	84250	12641	12716	12759	12797	12818	12695	12517	12308	12569	12517	70160	71453
1	1:15:00 AM	143970	83491	83658	144052	143689	143699	83618	83031	84192	12637	12657	12759	12797	12830	12707	12497	12318	12582	12497	70020	71491
1	1:30:00 AM	144093	83946	83648	144059	143570	143653	83600	82939	84150	12664	12694	12771	12797	12807	12684	12492	12326	12564	12492	69973	71490
1	1:45:00 AM	144034	83779	83658	144090	143535	143509	83667	83015	84170	12658	12688	12769	12797	12810	12688	12498	12311	12554	12498	69983	71475
1	2:00:00 AM	144152	83888	83658	144099	143660	143391	83602	83087	84060	12644	12684	12759	12797	12824	12681	12310	12310	12554	12681	69909	71426
1	2:15:00 AM	143869	83243	83658	144107	143590	143566	83666	83030	84030	12641	12680	12748	12797	12827	12703	12310	12310	12542	12703	69978	71371
1	2:30:00 AM	143998	83681	83658	144072	143446	143415	83747	82780	84082	12640	12681	12754	12797	12815	12673	12484	12320	12579	12673	69933	71394
1	2:45:00 AM	144071	83215	83658	144023	143528	143276	83752	82912	84031	12637	12691	12759	12797	12806	12665	12487	12309	12527	12665	69937	71389
1	3:00:00 AM	144102	83465	83658	143998	143526	143214	83663	82893	84085	12637	12687	12748	12797	12811	12676	12488	12315	12555	12676	69982	71388
1	3:15:00 AM	143976	83157	83658	143970	143096	143218	83601	82844	83946	12632	12676	12754	12797	12807	12650	12495	12301	12514	12650	69962	71329
1	3:30:00 AM	143712	83376	83658	143792	143682	143018	83633	82848	84019	12633	12668	12771	12797	12805	12672	12498	12308	12544	12672	69986	71308
1	3:45:00 AM	143681	83347	83658	143681	143608	142981	83647	82822	83911	12628	12661	12759	12797	12802	12656	12482	12300	12543	12656	69802	71291
1	4:00:00 AM	143665	83377	83658	143685	144081	143032	83571	82745	83881	12622	12652	12759	12797	12795	12643	12448	12307	12518	12643	69661	71265
1	4:15:00 AM	143668	83607	83658	143668	143608	143262	83626	82768	83768	12626	12657	12721	12797	12802	12657	12452	12300	12527	12657	69635	71075
1	4:30:00 AM	143845	83072	83658	143704	143093	143091	83516	82639	83758	12613	12675	12794	12797	12768	12627	12450	12287	12407	12627	69491	71205
1	4:45:00 AM	143412	83189	83658	143795	143635	143133	83470	82517	83811	12606	12603	12788	12797	12751	12626	12442	12284	12507	12626	69390	71136
1	5:00:00 AM	143510	82770	83648	143554	144460	142977	83421	82506	83566	12601	12611	12788	12797	12754	12584	12411	12244	12470	12584	69350	71080
1	5:15:00 AM	143599	83108	83658	143574	144288	142806	83376	82536	83540	12603	12645	12777	12797	12712	12583	12412	12252	12459	12712	69182	71213
1	5:30:00 AM	143443	82714	83658	143443	144053	142747	83414	82505	83248	12586	12636	12759	12797	12699	12598	12406	12229	12406	12598	69096	71205
1	5:45:00 AM	143601	82466	83658	143505	143696	142457	83281	82402	83442	12582	12624	12748	12797	12685	12657	12382	12243	12428	12657	69012	71111
1	6:00:00 AM	143652	82318	83658	143567	143608	143262	83262	82334	83328	12582	12623	12688	12797	12685	12657	12382	12243	12428	12657	68935	71075
1	6:15:00 AM	143716	82061	83658	143568	143003	142149	83264	82151	83239	12565	12641	12731	12797	12666	12573	12340	12205	12427	12641	68789	71029
1	6:30:00 AM	143241	82271	83658	143497	143980	142052	83130	82173	83052	12563	12639	12759	12797	12661	12624	12345	12190	12367	12639	68818	70985
1	6:45:00 AM	143000	82039	83658	143384	142873	141819	83086	82116	83022	12567	12648	12748	12797	12641	12621	12334	12190	12367	12648	68035	70962
1	7:00:00 AM	142822	82038	83658	143135	143601	141998	82988	81939	82953	12597	12657	12742	12797	12647	12620	12321	12191	12340	12657	68001	70988
1	7:15:00 AM	143005	81742	83658	142851	142787	141637	82888	81928	82977	12596	12637	12713	12797	12673	12611	12342	12180	12363	12637	68033	70971
1	7:30:00 AM	142726	82488	83658	143033	143241	141647	82889	81840	83082	12586	12711	12679	12797	12679	12608	12332	12177	12332	12608	68383	71005
1	7:45:00 AM	142784	82513	83658	142737	143171	141375	82835	81755	82988	12593	12745	12713	12797	12688	12578	12332	12186	12311	12688	68483	71044
1	8:00:00 AM	143005	82558	83658	142815	143877	141488	82889	81854	82967	12615	12744	12742	12797	12684	12595	12373	12179	12373	12684	69637	70875
1	8:15:00 AM	143095	82908	83658	143095	143080	141421	141573	83026	83107	12639	12798	12749	12797	12682	12608	12378	12177	12377	12682	69828	70794
1	8:30:00 AM	143359	83107	83658	143119	143355	141930	83136	82099	83077	12653	12827	12748	12797	12680	12636	12390	12176	12390	12827	69969	70704
1	8:45:00 AM	143512	82985	82789	143416	144880	141927	83195	82009	83100	12665	12841	12679	12797	12690	12633	12394	12159	12354	12679	70063	70739
1	9:00:00 AM	143448	83479	82808	143525	143076	142167	83291	82190	83155	12669	12827	12690	12797	12693	12630	12404	12174	12354	12827	70272	70822
1	9:15:00 AM	143880	83788	83036	143528	143080	142086	83292	82198	83407	12672	12811	12698	12797	12693	12664	12417	12181	12400	12811	70747	70975
1	9:30:00 AM	144041	83689	83120	143933	143587	142266	83475	82232	83558	12691	12812	12580	12797	12688	12708	12449	12184	12481	12811	70306	70945
1	9:45:00 AM	144574	83444	83111	144083	143640	142300	83544	82346	83678	12689	12812	12563	12797	12705	12737	12461	12185	12481	12811	70300	70880
1	10:00:00 AM	144417	83867	83311	144551	143913	142431	83807	82983	83694	12718	12721	12640	12797	12699	12740	12481	12210	12463	12718	70223	70950
1	10:15:00 AM	144397	84106	83477	144264	143524	142594	83766	82507	83838	12724	12738	12609	12797	12695	12759	12513	12343	12485	12724	70263	70900
1	10:30:00 AM	144567	83884	83531	144524	143624	142662	83945	82570	83924	12721	12744	12575	12797	12713							

SUBSTATION/FEEDER		BUCKSKIN GLEN CANYON 138KV FEED			*BUCKSKIN TO HENRIEVILLE 138KV FEED			HENRIEVILLE 138KV BUS			EAST VALLEY SWITCH BUS			TROPIC SUB BUS			BRYCE SUB BUS		
PER UNIT MAXIMUM VOLTAGE MEASURED		1.056	1.065	1.066	1.057	1.067	1.070	1.070	1.069	1.075	1.016	1.031	1.031	1.052	1.044	1.048	1.030	1.027	1.028
PER UNIT MINIMUM VOLTAGE MEASURED		1.004	1.017	0.999	1.006	1.024	1.010	1.010	1.015	0.999	0.962	0.977	0.957	1.019	1.013	1.016	1.008	1.004	1.003
TOTAL TIME READINGS LESS THAN NOMINAL		0	0	2	0	0	0	0	0	3	2024	799	873	0	0	0	0	0	0
TOTAL TIME READINGS LESS THAN STANDARD		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GLEN CANYON LOAD AT EXCURSION VOLTAGE (MVA)																			
NOMINAL LINE TO LINE		138000	138000	138000	138000	138000	138000	138000	138000	138000	69000	69000	69000	12470	12470	12470	12470	12470	12470
NOMINAL LINE TO GRND		79674	79674	79674	79674	79674	79674	79674	79674	79674	39837	39837	39837	7200	7200	7200	7200	7200	7200
ANNUAL PEAK MONTH		Feb-20	Dec-21	Feb-22	Feb-20	Dec-21	Jan-22	Feb-20	Jan-21	Jan-22	Dec-20	Dec-21	Jan-22	Feb-20	Oct-21	Feb-22	Feb-20	Oct-21	Jan-22
DAY of Month	Hour:Minute	MEASUREMENTS (LINE TO LINE & GROUND)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)		
1	12:00:00 AM	143829	85297	83658	143787	145354	143657	83434	82931	84158	69155	70188	68567	12874	12701	12815	12669	12747	12660
1	12:15:00 AM	143600	83789	83658	143875	145453	143699	83560	82923	84156	69274	70167	68559	12881	12702	12816	12687	12757	12652
1	12:30:00 AM	143791	83204	83658	143559	145296	143618	83452	82899	84125	69237	70149	68593	12879	12698	12829	12677	12759	12664
1	12:45:00 AM	144098	83843	83658	143773	145437	143735	83507	82853	84344	69125	70183	68649	12871	12704	12829	12677	12758	12671
1	1:00:00 AM	144080	83527	83658	144224	145334	143660	83653	82836	84250	69022	70156	68577	12899	12687	12831	12707	12765	12659
1	1:15:00 AM	143970	83491	83658	144052	145689	143609	83618	83031	84192	69020	70295	68563	12899	12715	12797	12694	12770	12646
1	1:30:00 AM	144093	83946	83658	144059	145705	143653	83600	82939	84150	69005	70256	68574	12898	12716	12812	12697	12750	12653
1	1:45:00 AM	144034	83279	83658	144080	145555	143509	83687	83013	84120	69029	70145	68549	12899	12690	12798	12706	12746	12639
1	2:00:00 AM	144152	83888	83658	144099	145600	143391	83602	83087	84060	68952	70250	68414	12873	12717	12784	12692	12761	12627
1	2:15:00 AM	143869	83243	83658	144107	145290	143456	83666	83030	84040	68910	70091	68444	12898	12684	12797	12700	12765	12634
1	2:30:00 AM	143998	83841	83658	144072	145446	143415	83747	82982	84082	68899	70154	68450	12912	12690	12797	12714	12758	12633
1	2:45:00 AM	144071	83225	83658	144023	145285	143276	83752	82912	84031	68969	70107	68381	12921	12697	12786	12719	12752	12612
1	3:00:00 AM	144102	83465	83658	143998	145267	143214	83663	82899	84085	68997	70026	68310	12902	12667	12810	12695	12746	12606
1	3:15:00 AM	143976	83157	83658	143970	145096	143218	83691	82844	83946	68965	68349	68349	12903	12660	12822	12698	12742	12610
1	3:30:00 AM	143712	83376	83658	143792	145082	143018	83633	82844	84019	69028	69970	68188	12899	12668	12785	12692	12744	12587
1	3:45:00 AM	143681	83347	83658	143821	145008	142981	83647	82827	83911	68922	69971	68218	12901	12672	12789	12694	12731	12580

HATCH SUB 69 KV BUS			HATCH SUB 34.5 KV BUS			SPRY SUB BUS			TODS SUB 34.5 KV BUS			TODS SUB 12.5 KV BUS			ZION VIEW SUB 12.5 KV BUS			DUCK CREEK SUB 12.5 KV BUS		
1.022	1.041	1.036	0.957	0.958	0.958	1.048	1.048	1.022	0.987	0.988	0.993	1.037	1.037	1.037	1.028	1.028	1.027	1.030	1.044	1.033
0.956	0.964	0.949	0.933	0.931	0.931	1.023	1.024	0.999	0.953	0.963	0.962	1.005	1.007	1.005	1.006	1.006	1.006	0.983	1.008	1.006
1740	673	791	2576	2576	2576	0	0	103	2976	2976	2976	0	0	0	0	0	0	1	0	0
0	0	1				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		35.4	TAP UP	TAP UP	TAP UP															
69000	69000	69000	34500	34500	34500	12470	12470	12470	34500	34500	34500	12470.0	12470	12470	240	240	240	12470	12470	12470
39837	39837	39837	19919	19919	19919	7200	7200	7200	19918.6	19919	19919	7200	7200	7200	120	120	120	7200	7200	7200
Dec-20	Dec-21	Jan-22	Dec-20	Dec-21	Jan-22	Aug-20	Aug-21	Sep-22	Dec-20	Dec-21	Jan-22	Dec-20	Dec-21	Jan-22	Aug-20	Jul-21	Apr-22	Dec-20	Dec-21	Jan-22
MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)		
69478	70671	68430	32492	32739	32739	13058	13036	12510	33569	33399	33553	12658	12614	12638	123	122	121	12732	12664	12629
69618	70651	68401	32545	32745	32745	13047	13042	12510	33624	33474	33545	12636	12617	12636	123	122	121	12754	12691	12621
69571	70661	68473	32531	32875	32875	13054	13024	12510	33606	33472	33627	12667	12638	12667	123	123	121	12751	12702	12667
69461	70710	68519	32475	32872	32872	13015	13051	12510	33542	33554	33645	12680	12669	12680	123	123	121	12725	12740	12671
69235	70615	68464	32423	32884	32884	13023	13031	12510	33495	33486	33583	12650	12642	12650	123	122	121	12706	12709	12640
69398	70751	68398	32456	32785	32785	13046	13000	12510	33590	33558	33582	12650	12671	12650	123	123	121	12745	12735	12669
69307	70755	68431	32409	32810	32810	13048	13013	12510	33519	33520	33597	12654	12654	12654	123	123	121	12715	12720	12680
69379	70627	68341	32455	32906	32906	13021	13017	12510	33595	33490	33507	12619	12642	12619	122	123	121	12743	12709	12643
69270	70721	68188	32380	32886	32886	12987	13007	12510	33487	33557	33454	12602	12668	12602	123	122	122	12692	12749	12615
69196	70577	68230	32363	32889	32889	12975	13011	12510	33477	33464	33444	12591	12635	12591	122	122	121	12690	12704	12625
69206	70608	68245	32368	32949	32949	13007	13024	12510	33489	33462	33496	12615	12636	12615	122	122	121	12701	12695	12684
69289	70575	68225	32406	32843	32843	12999	13035	12510	33579	33475	33456	12632	12668	12632	122	122	122	12733	12706	12668
69283	70482	68112	32405	32860	32860	12981	12997	12510	33374	33383	33374	12608	12630	12608	122	121	121	12727	12653	12641
69272	70422	68200	32387	32868	32868	12992	13009	12510	33556	33358	33517	12682	12623	12682	122	122	121	12710	12654	12717
69313	70438	67985	32422	32802	32802	13013	13010	12510	33604	33390	33428	12623	12639	12623	122	122	121	12747	12671	12672

SUBSTATION/FEEDER	GLEN CANYON @ BUCKSKIN 130 KV BUS			BUCKSKIN SUBSTATION 69 KV BUS			PARIA SUBSTATION 25 KV BUS			JOHNSON SUBSTATION 12.5 KV BUS			EMG SUBSTATION 12.5 KV BUS			KANGAROO SUBSTATION 12.5 KV BUS			
PER UNIT MAXIMUM VOLTAGE MEASURED	1.056	1.067	1.066	1.063	1.088	1.077	1.040	1.042	1.040	1.030	1.014	1.018	1.030	1.014	1.019	1.070	1.074	1.073	
PER UNIT MINIMUM VOLTAGE MEASURED	1.004	1.023	0.999	1.008	1.005	0.996	1.024	1.024	1.018	0.994	0.969	0.965	0.994	0.985	0.990	0.997	0.977	0.938	
TOTAL TIME READINGS LESS THAN NOMINAL	0	0	2	0	0	4	0	0	0	105	1208	1315	105	1308	84	1	59	173	
TOTAL TIME READINGS LESS THAN STANDARD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GLEN CANYON LOAD AT EXCURSION VOLTAGE (MVA)																		44.0	
NOMINAL LINE TO LINE	130000	136000	136000	69000	69000	69000	25000	25000	25000	12470	12470	12470	12470	12470	12470	12470	12470	12470	
NOMINAL LINE TO GRND	79674	79674	79674	39837	39837	39837	14434	14434	14434	7200	7200	7200	7200	7200	7200	7200	7200	7200	
ANNUAL PEAK MONTH	Feb-20	Dec-21	Feb-22	Dec-20	Jul-21	Feb-22	Dec-20	Jul-21	Feb-22	Jul-20	Jan-21	Sep-22	Dec-20	Jul-21	Sep-22	Apr-20	Dec-21	Feb-22	
DAY of Month	Hour/Minute	MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO GROUND)					
1	1/0/00 0:00	143829	145341	144900	41786	42830	42167	14 867	14927	14926	7282	7254	7220	7282	7254	7293	7651	7688	7583
1	1/0/00 0:15	143600	145347	144858	41835	42886	42149	14 859	14933	14936	7282	7253	7223	7292	7253	7299	7660	7652	7554
1	1/0/00 0:30	143791	145375	144851	41943	42914	42116	14 862	14944	14941	7285	7245	7215	7285	7245	7288	7660	7680	7516
1	1/0/00 0:45	144098	145390	145145	41764	42897	42150	14 858	14946	14964	7269	7243	7234	7269	7243	7310	7666	7639	7548
1	1/0/00 1:00	144080	145374	145067	41669	42928	42221	14 856	14954	14954	7269	7242	7245	7269	7242	7319	7668	7625	7547
1	1/0/00 1:15	143970	145573	144942	41694	42930	42163	14 857	14958	14958	7271	7233	7237	7271	7233	7311	7669	7645	7534
1	1/0/00 1:30	144093	145596	144894	41705	42971	42139	14 854	14968	14928	7276	7239	7244	7276	7239	7322	7656	7648	7511
1	1/0/00 1:45	144034	145292	144812	41702	42953	42156	14 827	14961	14928	7275	7259	7241	7275	7259	7320	7656	7621	7538

KCR SUBSTATION 69 KV BUS			KCR SUBSTATION 12.5 KV BUS			FREDONIA SUBSTATION 69 KV BUS			ORDERVILLE SUBSTATION 12.47 KV BUS			RYAN SUBSTATION 69 KV BUS					
1.041	1.069	1.049	1.023	1.022	1.023				1.049	1.059	1.065	1.024	1.023	1.025	1.033	1.037	1.032
0.936	0.921	0.917	0.998	0.000	0.999				0.950	0.953	0.934	1.003	1.002	0.995	1.005	1.005	1.005
1060	934	784	29	229	42				454	219	247	0	0	0	0	0	0
14	190	35	0	3	0				0	0	10	0	0	0	0	0	0
<b>41.1</b>	<b>36.4</b>	<b>45.1</b>		<b>36.4</b>						<b>45.1</b>							
69000	69000	69000	12470	12470	12470				69000	69000	69000	12470	12470	12470	25000	25000	25000
39837	39837	39837	7200	7200	7200				39837	39837	39837	7200	7200	7200	14434	14434	14434
Dec-20	Jul-21	Feb-22	Dec-20	Jul-21	Feb-22				Dec-20	Feb-21	Feb-22	Dec-20	Feb-21	Feb-22	Oct-20	Oct-21	Feb-22
MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO GROUND)			MEASUREMENTS (LINE TO GROUND)					
70065	72816	70484	7282	7324	7291				71,002	70737	71686	12,644	12697	12645	25,747	25702	25562
70313	72887	70533	7,300	7336	7291				71,156	70737	71703	12,647	12643	12651	25,663	25738	25571
70253	73028	70394	7,289	7349	7286				71,063	70796	71646	12,632	12701	12643	25,655	25746	25521
70108	73053	70608	7,280	7319	7304				71,002	70788	71814	12,628	12700	12631	25,660	25761	25606
70139	73097	70562	7,267	7320	7304				70,843	70852	71823	12,615	12694	12637	25,665	25778	25613
70034	73221	70368	7,264	7319	7289				70,862	70858	71703	12,607	12721	12650	25,679	25735	25535
70102	73199	70395	7,264	7314	7291				70,854	70995	71687	12,618	12702	12634	25,680	25690	25538
69930	73232	70428	7,261	7321	7293				70,833	70874	71725	12,625	12680	12636	25,654	25639	25531

Exhibit 15, Twin Cities Interconnection at Last 3 Years Peak Load Voltage Measurements

SUBSTATION/FEEDER	TWIN CITIES SUBSTATION 69kV BUS			HILDALE YARD 69 kV BUS			COLORADO CITY 69 kV BUS			
PER UNIT MAXIMUM VOLTAGE MEASURED	1.073	1.081	1.064	1.058	1.071	1.059	0.000	1.033	1.032	
PER UNIT MINIMUM VOLTAGE MEASURED	0.946	0.963	0.991	1.012	0.942	0.991	0.000	1.009	1.007	
TOTAL TIME READINGS LESS THAN NOMINAL	446	490	64	0	657	5	0	0	0	
TOTAL TIME READINGS LESS THAN STANDARD	7	0	0	0	4	0	0	0	0	
GLEN CANYON LOAD AT EXCURSION VOLTAGE (MVA)	9.57				10.77					
NOMINAL LINE TO LINE	69000	69000	69000	69000	69000	69000	12470	12470	12470	
NOMINAL LINE TO GRND	39837	39837	39837	39837	39837	39837	7200	7200	7200	
ANNUAL PEAK MONTH	Aug-20	Aug-21	Sep-22	Feb-20	Jul-21	Feb-22	n/a	Dec-21	Feb-22	
DAY of Month	Hour:Minute	MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)			MEASUREMENTS (LINE TO LINE)		
1	12:00:00 AM	72653	72833	72411	72526	73148	72743	12696	12826	
1	12:15:00 AM	72879	72907	72142	72577	73234	72680	12698	12815	
1	12:30:00 AM	72243	72957	72178	72612	73362	72758	12696	12827	
1	12:45:00 AM	72451	73045	72215	72639	73381	72801	12706	12829	
1	1:00:00 AM	72626	73098	72323	72558	73506	72803	12699	12829	
1	1:15:00 AM	72730	73136	72368	72612	73575	72742	12698	12834	
1	1:30:00 AM	72788	73141	72435	72634	73681	72786	12704	12805	
1	1:45:00 AM	72861	73218	72486	72604	73741	72826	12702	12808	
1	2:00:00 AM	72870	73182	72495	72597	73541	72801	12702	12811	
1	2:15:00 AM	72879	73206	72406	72618	73621	72752	12697	12792	
1	2:30:00 AM	72879	73259	72432	72581	73823	72844	12691	12820	
1	2:45:00 AM	72900	73271	72524	72602	73921	72724	12675	12800	
1	3:00:00 AM	72923	73314	72458	72566	73839	72776	12683	12801	
1	3:15:00 AM	72909	73249	72532	72563	73873	72788	12680	12795	
1	3:30:00 AM	72913	73253	72564	72545	73872	72716	12682	12792	
1	3:45:00 AM	73115	73267	72543	72503	73757	72729	12684	12781	
1	4:00:00 AM	73082	73166	72545	72500	73526	72668	12675	12779	
1	4:15:00 AM	72899	73207	72561	72485	73527	72633	12665	12766	
1	4:30:00 AM	73051	73186	72528	72464	73283	72615	12653	12767	
1	4:45:00 AM	73101	73187	72464	72481	73282	72571	12646	12758	
1	5:00:00 AM	72852	73173	72377	72396	73245	72361	12637	12722	
1	5:15:00 AM	72920	73170	72391	72338	73233	72299	12617	12707	

## System Outages and Reliability

Garkane tracks the inputs to compute reliability indices. Exhibit 16 provides the SAIDI, SAIFI, and CAIDI calculations for the last five years. It is anticipated that continued replacement projects of the breakers, PLCs, and relays, in conjunction with improved coordination settings made possible with these digital controls, will continue to improve Garkane's reliability indices.

Exhibit 16, Garkane's Last 5 Years of Reliability Indices

<b>COMPANY NAME: GARKANE ENERGY COOPERATIVE, INC.</b>						
<b>SYSTEM AVERAGE INTERRUPTION DURATION INDEX (SAIDI) BY CAUSE</b>						
Year	<i>Power Supplier</i>	<i>Planned</i>	<i>All Other</i>	<i>Total Excluding Major Events</i>	<i>Major Events</i>	<i>All Events</i>
2017	17.0	20.3	223.9	261.2	60.3	321.5
2018	0.0	47.5	344.2	391.7	0.1	391.8
2019	39.6	82.1	475.7	597.4	270.2	867.6
2020	76.5	1.2	294.7	372.4	81.0	453.4
2021	11.2	33.3	97.1	141.6	3.7	145.3
Five-Year Average	28.9	36.9	287.1	352.9	83.1	435.9

<b>SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX (SAIFI) BY CAUSE</b>						
Year	<i>Power Supplier</i>	<i>Planned</i>	<i>All Other</i>	<i>Total Excluding Major Events</i>	<i>Major Events</i>	<i>All Events</i>
2017	0.23	0.23	1.52	1.97	0.70	2.67
2018	0.00	0.48	1.98	2.45	0.00	2.45
2019	0.40	0.80	2.54	3.74	0.66	4.40
2020	0.48	0.05	1.07	1.59	0.08	1.67
2021	0.11	0.44	0.68	1.23	0.02	1.25
Five-Year Average	0.24	0.40	1.56	2.20	0.29	2.49

<b>CUSTOMER AVERAGE INTERRUPTION DURATION INDEX (CAIDI) BY CAUSE</b>						
Year	<i>Power Supplier</i>	<i>Planned</i>	<i>All Other</i>	<i>Total Excluding Major Events</i>	<i>Major Events</i>	<i>All Events</i>
2017	75.2	89.8	147.6	132.7	86.4	120.6
2018	0.0	99.4	174.3	159.7	0.0	159.7
2019	100.0	102.9	187.1	159.9	408.2	197.2
2020	160.4	25.6	253.9	234.2	987.3	256.6
2021	101.3	76.1	142.5	115.3	168.2	116.1
Five-Year Average	87.4	78.8	181.1	347.2	330.0	170.0

## REQUIRED CONSTRUCTION ITEMS BASED ON ANALYSIS

### Service to New & Existing Customers

Garkane Line Extension Policy requires that project applicants pay for the line and service extension costs. This includes all facilities and equipment (including transformers and metering) constructed beyond the Cooperative's then-existing facilities reasonably required to supply electrical service to an applicant's point of delivery. In addition, a Line Extension may include necessary improvements, upgrades, and other changes to the Cooperative's existing facilities. As such, these items will not be included as part of this planning analysis.

### Transmission Lines, Distribution Lines, Substations, AMI Metering, SCADA Equipment Projects,

The 2023 Work Plan was developed using present loads and projections for expected loads in 2026, 2028, 2030, and 2033 on an individual feeder basis. Historical Non-Coincidental data was utilized from 1995 thru 2022 to develop a 'least squares best fit' projections. Where there were inconsistencies in the trend period, data projections based upon the past three years of history were looked at. A copy of the load data is provided in the report.

Projects were identified that were necessary to resolve voltage and capacity-related problems. A summary of the identified projects is included in the following exhibits. In addition, estimated cost of the individual projects is included in the project summary table, along with an estimated time frame as to when the project would need to be in service based on the severity of the issue.

Exhibit 17, Transmission Line Projects

GARKANE ENERGY 2023 WORK PLAN PROJECT SUMMARY										
TRANSMISSION LINE PROJECTS										
PROJECT	MAX PAST 5 YEAR PEAK KW	ESTIMATED PEAK LOAD IN 5 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS	LOAD (KVA) OR CONDITION REQUIRED TO PROMPT CONSTRUCTION	PROJECT NEED & SUMMARY	WORK TASK DESCRIPTION	PROJECT LEAD	PROJECTED IN SERVICE DATE	STATUS	PROJECTED COST
Transmission Line Maintenance	N/A	N/A	N/A	N/A	Garkane owns, operates, and maintains roughly 420 miles 69 and 138 KV transmission lines. The majority of these lines are 30 to 50 years old and some of the components making up these structures have deteriorated to the point that requires that they be replaced. Garkane has an annual program of inspecting all our transmission lines. Based on the observations made during these inspections Garkane's crews identify and replace failing components. Garkane budgets \$100,000.00 annually for the purchase of replacement materials and labor to install it.	Garkane has an annual program of inspecting all our transmission lines. Based on the observations made during these inspections Garkane's crews identify and replace failing components.	Transmission Crew Foreman	Annually \$100k	Ongoing	\$ 1,000,000
BUCKSKIN TO KANAB & FREDONIA, PHASE 1, (BUCKSKIN TO SEAMANS)	26,467	26,455	28,261	Energize new 138 KV line	Transmission Study indicates new line needs to be constructed by time loading on Buckskin to Fredonia line reaches 30 MW. 2013 Peakload was 27MW. Splicing of 2022 the 138 KV Buckskin to Seaman's Wash line section was completed. As part of the permitting requirements for rebuilding at 138 KV Garkane committed to retire the 69 KV line.	Retire 13 miles @ \$15k/mile plus \$16k for project environmental monitoring by a third party contractor	COO	2023	Partially completed.	\$ 210,000
BUCKSKIN TO KANAB & FREDONIA, PHASE 2, (EMG TO KANAB CITY)	26,467	26,455	28,261	COMPLETION OF PHASE 1 OF THE PROJECT	Transmission Studies indicates the Buckskin to Kanab & Fredonia transmission line needs to be constructed by the time loading on the line reaches 30 MW. Phase 1 (Buckskin to Seaman's) project is complete. Phase 2 (EMG to Kanab City) is in the initial stages of construction. Completing the project and keeping the line energized at 69 KV will mitigate volt regulation issues for a time by increasing the conductor capacity. However it is estimated that at roughly 40 MW of load voltage regulation will again become a issue and will require that the line be operated at the constructed	Construct 138 KV line from Eight Mile Gap Substation to Kanab City Substation 6 miles @ \$270k/mile. Retire 6 miles @ \$16k/mile.	COO	2023	Materials Procurement	\$ 1,400,000
BUCKSKIN TO KANAB & FREDONIA, PHASE 3, (SEAMANS TO JOHNSON)	26,467	26,455	28,261	COMPLETION OF PHASE 2 OF THE PROJECT	Transmission Studies indicates the Buckskin to Kanab & Fredonia transmission line needs to be constructed by the time loading on the line reaches 30 MW. Phase 1 (Buckskin to Seaman's) project is complete. Phase 2 (EMG to Kanab City) is in the initial stages of construction. Completing the project and keeping the line energized at 69 KV will mitigate volt regulation issues for a time by increasing the conductor capacity. However it is estimated that at roughly 40 MW of load voltage regulation will again become a issue and will require that the line be operated at the constructed	Construct 138 KV line from Eight Mile Gap Substation to Kanab City Substation 6 miles @ \$270k/mile. Retire 6 miles @ \$16k/mile.	COO	2024	Materials Procurement	\$ 1,710,000
BUCKSKIN TO KANAB & FREDONIA, PHASE 4, (JOHNSON TO EMG)	26,467	26,455	28,261	COMPLETION OF PHASE 3 OF THE PROJECT	Transmission Studies indicates the Buckskin to Kanab & Fredonia transmission line needs to be constructed by the time loading on the line reaches 30 MW. Phase 1 (Buckskin to Seaman's) project is complete. Phase 2 (EMG to Kanab City) is in the initial stages of construction. Completing the project and keeping the line energized at 69 KV will mitigate volt regulation issues for a time by increasing the conductor capacity. However it is estimated that at roughly 40 MW of load voltage regulation will again become a issue and will require that the line be operated at the constructed	Construct 138 KV line from Eight Mile Gap Substation to Kanab City Substation 5 miles @ \$270k/mile. Retire 5 miles @ \$16k/mile.	COO	2025	Materials Procurement	\$ 1,450,000
VALLEYMT CARMEL 34.5 TO 69 KV FEEDER UPGRADE	6,691	6,983	8,246	REQUIRES ADDITIONAL SYSTEM ANALYSIS. ESTIMATED AT 10 MVA ON VALLEY FEEDER	Loads served by the Valley Feeder of the Fredonia Substation continue to increase year over year. Garkane is aware of construction plans by others to build new facilities that will accelerate the load growth rate. It is anticipated that voltage regulation on the feeder will become an issue with the addition of roughly 2.5 more MVA for total load of 9.5 MVA. Voltage conditions during peak loads should be closely monitored for compliance with Garkane standards.	Rebuild line to upgrade the insulation level of the Fredonia to Valley line from 34.5 to 69 KV. Construction 10 miles 69 KV line @ \$230k/mile. Retire 10 miles @ \$5k/mile.	COO	2032 (AMEND SCHEDULE BASED ON ACTUAL LOAD GROWTH)	None	\$ 4,230,000
<b>CWP TRANSMISSION &amp; DISTRIBUTION LINE CONSTRUCTION SUBTOTAL</b>										<b>\$ 10,050,000.00</b>



Exhibit 18, Distribution Line Projects

GARKANE ENERGY 2023 WORK PLAN PROJECT SUMMARY										
DISTRIBUTION LINE CONSTRUCTION PROJECTS										
PROJECT	MAX PAST 5 YEAR PEAK KW	ESTIMATED PEAK LOAD IN 5 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS	LOAD (KVA) OR CONDITION REQUIRED TO PROMPT CONSTRUCTION	PROJECT NEED & SUMMARY	WORK TASK DESCRIPTION	PROJECT LEAD	PROJECTED IN SERVICE DATE	STATUS	PROJECTED COST
Distribution Line Maintenance	N/A	N/A	N/A	N/A	Garkane owns, operates, and maintains roughly 420 miles 69 and 138 kV transmission lines. The majority of these lines are 30 to 50 years old and some of the components making up these structures have deteriorated to the point that requires that they be replaced. Garkane has an annual program of inspecting all our transmission lines. Based on the observations made during these inspections Garkane's crews identify and replace failing components. Garkane budgets \$100,000.00 annually for the purchase of replacement materials and labor to install it.	Garkane has an annual program of inspecting all our transmission lines. Based on the observations made during these inspections Garkane's crews identify and replace failing components.	Transmission Crew Foremen	Annually \$200k	Ongoing	\$ 2,000,000
BRYCE VALLEY SUBSTATION DOUBLE CIRCUIT DISTRIBUTION LINE CONSTRUCTION	3,494	2,422	2,392	BASED ON DGA TEST RESULTS SHOWING CONTINUED DETERIORATION OF TROPIC SUBSTATION TRANSFORMER	The existing substation transformer has had consecutive Dissolved Gas Analysis test results indicating the core is insulation deteriorating with internal faulting that is expected to lead to the failure of the unit. The current substation support bus structure consists of aged wood framed components. The current location of the substation prohibits sectionalizing of the loads to more than one feeder, which inhibits the reliable and efficient operation of the distribution system in the area.	Build double circuit express feeder distribution line from the new Cedar Ridge Substation to connect the new facility to the existing distribution system. Construction 4 miles 12.5 kV line @ \$185k/mile.	COO	2024 2025	Transformer Ordered, Design Work Underway	\$ 740,000
CEDAR RIDGE (BIG WATER) 25 KV DISTRIBUTION LINE	2,465	2,239	2,288	REQUIRES ADDITIONAL SYSTEM ANALYSIS, ESTIMATED AT 4 MVA ON PARIA FEEDER	Loads served by the Big Water Feeder of the Paria Substation continue to increase year over year. Garkane is aware of construction plans by others to build new facilities that will accelerate the load growth rate. It is anticipated that voltage regulation is on the feeder will become an issue with the addition of roughly 1.5 more MVA for total load of 4 MVA. Voltage conditions during peak loads should be closely monitored for compliance with Garkane standards.	Build double circuit express feeder distribution line from the new Cedar Ridge Substation to connect the new facility to the existing distribution system. Construction 7 miles 25 kV line @ \$200k/mile. Retire 7 miles @ \$5k/mile.	COO	2032 (AMEND SCHEDULE BASED ON ACTUAL LOAD GROWTH)	Property Purchased 2015	\$ 1,435,000
<b>CWP TRANSMISSION &amp; DISTRIBUTION LINE CONSTRUCTION SUBTOTAL</b>									<b>\$</b>	<b>4,175,000.00</b>

Exhibit 19a, Substation Projects

GARKANE ENERGY 2023 WORK PLAN PROJECT SUMMARY										
SUBSTATION PROJECTS										
PROJECT	MAX PAST 5 YEAR PEAK KW	ESTIMATED PEAK LOAD IN 5 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS	LOAD (KVA) OR CONDITION REQUIRED TO PROMPT CONSTRUCTION	PROJECT NEED & SUMMARY	WORK TASK DESCRIPTION	PROJECT LEAD	PROJECTED IN SERVICE DATE	STATUS	PROJECTED COST
SIGURD TRANSMISSION SUBSTATION OCB, PLC, AND RELAY REPLACEMENT, SCADA SYSTEM UPDATE, AND COMMUNICATION HARDENING	11,394	10,762	11,649	11,394	No real-time load data monitoring or SCADA control of a critical transmission system source. The existing 3 tank OCB is physically too large for the structure. The OCB cannot be serviced due to confines of steel structure. Relays, PLC, and metering equipment is no longer supported by manufacture. Communications path for SCADA control is unreliable.	Remove existing OCB, relays, metering. Construct a replacement foundations and control cabinets. Install and commission vacuum breaker, replacement relaying, and metering. Install and commission cellular communications equipment. Commission SCADA control scheme.	Engineering/ Substation Manager	2022-2023	In Progress	\$ 200,000
BUCKSKIN TRANSMISSION SUBSTATION PLC, RELAY REPLACEMENT, NEW SCADA CONTROL SCHEME INSTALLATION AND COMMUNICATION PATH HARDENING	45,148	50,995	56,046	45,148	No real-time load data monitoring or SCADA control of a critical transmission system source. PLC, relays and metering equipment are outdated and in some cases are no longer supported by the manufacture. Relay scheme settings and station controls need to be reconfigured to allow the station to be monitored and controlled by SCADA system. Install CT/PT combo equipment on line side of station bus. Move station service to line side of station bus.	Remove existing relay, and metering equipment. Construct replacement foundations and control cabinets. Install and commission, replacement relaying, and metering. Install and commission hardened communications equipment. Commission SCADA control scheme.	Engineering/ Substation Manager	2023	Design Completed, Equipment Purchased, Foundations Constructed	\$ 350,000
KANAB SWITCH RETIREMENT	N/A	N/A	N/A	N/A	The switch yard is a relic facility of Kanab's Municipal electric utility which was purchased by Garkane several years ago. The merger of these two utility systems has removed the need for the facility and it's maintenance is a drain on resources that could be better used elsewhere.	Retire and reclaim the switch yard and equipment.	Engineering/ Substation Manager	2025	Start of project requires the completion of the Buckskin to EMG 138kV transmission line expected 2025	\$ 75,000
HENRIEVILLE TRANSMISSION SUBSTATION PLC, RELAY REPLACEMENT, NEW SCADA CONTROL SCHEME INSTALLATION AND COMMUNICATION PATH HARDENING	18,985	20,384	22,189	18,985	No real-time load data monitoring or SCADA control of a critical transmission system source. PLC, relays and metering equipment are outdated and in some cases are no longer supported by the manufacture. Relay scheme settings and station controls need to be reconfigured to allow the station to be monitored and controlled by SCADA system. Install CT/PT combo equipment on line side of station bus. Move station service to line side of station bus.	Remove existing relay, and metering equipment. Construct replacement foundations and control cabinets. Install and commission, replacement relaying, and metering. Install and commission hardened communications equipment. Commission SCADA control scheme.	Engineering/ Substation Manager	2024	Design Completed, Long Lead Time Equipment Ordered	\$ 350,000
EAST VALLEY TRANSMISSION SWITCH PLC, RELAY REPLACEMENT, NEW SCADA CONTROL SCHEME INSTALLATION AND COMMUNICATION PATH HARDENING	8,881	12,351	14,331	8,881	No real-time load data monitoring or SCADA control of a critical transmission system source. PLC, relays and metering equipment are outdated and in some cases are no longer supported by the manufacture. Relay scheme settings and station controls need to be reconfigured to allow the station to be monitored and controlled by SCADA system. Install CT/PT combo equipment on line side of station bus. Move station service to line side of station bus.	Remove existing OCB, PLC, relays, and metering, install vacuum breakers and replacement equipment. Harden communications path to SCADA.	Engineering/ Substation Manager	2024	Design Completed, Long Lead Time Equipment Ordered	\$ 350,000
JOHNSON CANYON SUBSTATION RETIREMENT	988	N/A	N/A	1,000	The substation transformers are three 333 KVA units. Loads on the 3 substation feeds will have surpassed the nameplate capacity of the station. The substation steel structure does not have sufficient space to meet NESC code requirements should larger transformers be installed. It has been determined that the most economical alternative is serve the loads using the EMG substation and retire the undersized Johnson Substation.	Retire and reclaim the substation.	Engineering/ Substation Manager	2025	Start of project requires the completion of the Buckskin to EMG 138kV transmission line expected 2025	\$ 75,000
BYRCE VALLEY SUBSTATION CONSTRUCTION	3,494	2,422	2,392	BASED ON DGA TEST RESULTS SHOWING CONTINUED DETERIORATION OF TROPIC SUBSTATION TRANSFORMER	The existing substation transformer has had consecutive Dissolved Gas Analysis test results indicating the core is insulation deteriorating with internal faulting that is expected to lead to the failure of the unit. The current substation support bus support structure consists of aged wood framed components. The current location of the substation prohibits sectionalizing of the loads to more than one feeder, which inhibits the reliable and efficient operation of the distribution system in the area.	Build a new substation with 138kV clearances adjacent to the East Valley Transmission Switch meeting industry best practices and code requirements. The facility will initially be operated for 69 to 12.5 kV transformation.	Engineering/ Substation Manager	2024-2025	Transformer Ordered, Design Work Underway	\$ 1,500,000
TROPIC SUBSTATION RETIREMENT	998	N/A	N/A	BASED ON DGA TEST RESULTS SHOWING CONTINUED DETERIORATION OF TROPIC SUBSTATION TRANSFORMER	The existing substation transformer has had consecutive Dissolved Gas Analysis test results indicating the core is insulation deteriorating with internal faulting that is expected to lead to the failure of the unit. The current substation support bus support structure consists of aged wood framed components. The current location of the substation prohibits sectionalizing of the loads to more than one feeder, which inhibits the reliable and efficient operation of the distribution system in the area.	Retire and reclaim the substation.	Engineering/ Substation Manager	2026	Start of project requires the completion of the Buckskin to EMG 138kV transmission line expected 2025	\$ 75,000

Exhibit 18b, Continued Substation Projects

GARKANE ENERGY 2023 WORK PLAN PROJECT SUMMARY										
SUBSTATION PROJECTS										
PROJECT	MAX PAST 5 YEAR PEAK KW	ESTIMATED PEAK LOAD IN 5 YEARS	ESTIMATED PEAK LOAD IN 10 YEARS	LOAD (KVA) OR CONDITION REQUIRED TO PROMPT CONSTRUCTION	PROJECT NEED & SUMMARY	WORK TASK DESCRIPTION	PROJECT LEAD	PROJECTED IN SERVICE DATE	STATUS	PROJECTED COST
RUBY'S SUBSTATION	3,807	3,050	3,088	80% X7000=5600	As part of a deal with the property owner for a long section of 138 kV transmission right of way Garkane agreed to the retirement of the Bryce Substation when annual peak loads reached 80 percent of name plate capacity or earlier. Garkane is aware of construction plans by others to build new facilities that may increase loads to the agreed threshold requiring construction of the Ruby's Substation and retirement of the Bryce Substation.	Build a new substation with 138 kV clearances in the Ruby's Transmission Switch meeting industry best practices and code requirements. The facility will initially be operated for 69 to 12.5 kV transformation.	Engineering/ Substation Manager	2026-2027	Transformer Ordered, Design Work Underway	\$ 1,500,000
BRYCE SUBSTATION RETIREMENT	3,494	2,422	2,392	80% X7000=5600	As part of a deal with the property owner for a long section of 138 kV transmission right of way Garkane agreed to the retirement of the Bryce Substation when annual peak loads reached 80 percent of name plate capacity or earlier. Garkane is aware of construction plans by others to build new facilities that may increase loads to the agreed threshold requiring construction of the Ruby's Substation and retirement of the Bryce Substation.	Retire and reclaim the substation.	Engineering/ Substation Manager	2028	None	\$ 75,000
DUCK CREEK SUBSTATION 34.5/12.5 KV TRANSFORMER CAPACITY UPGRADE TO 10/14 MVA	6,138	7,132	9,132	6,650	Loads served by the Duck Creek Substation continue to increase year over year. Based on the current growth trend it is anticipated that the peak loads will reach 95% of the substation transformer Force Air Rating in 2028.	Procure a replacement 34.5/12.5 kV 10/14 kVA transformer and retire current transformer for use else where on system. Update relaying and coordination settings.	Engineering/ Substation Manager	2028	None	\$ 500,000
TOD'S SUBSTATION 89/34.5 KV TRANSFORMER CAPACITY UPGRADE TO 10/14 MVA	7,288	8,441	28,251	9,500	Loads served by the Tod's Substation 89/34.5 kV transformer continues to increase year over year. Based on the current growth trend it is anticipated that the peak loads will reach 95% of the substation transformer Force Air Rating in 2030.	Procure a replacement 89/34.5 kV 10/14 kVA transformer and retire current transformer for use else where on system. Update relaying and coordination settings.	Engineering/ Substation Manager	2030	None	\$ 500,000
EIGHT MILE GAP SUBSTATION 138 KV CONVERSION	25,467	26,455	26,251	REQUIRES ADDITIONAL SYSTEM ANALYSIS, ESTIMATED AT 40 MVA ON TRANS. FEEDER	Transmission Studies indicates the Buckskin to Kanab transmission line needs to be constructed by the time loading on Buckskin to Fredonia line reaches 30 MW. This project is currently under construction. Completing the line will mitigate volt regulation issues for a time. However it is estimated that at roughly 40 MW of load voltage regulation will again become an issue and will require that the line be operated at 138 KV. Doing so will require the construction of a 138 KV substation bus at EMG.	Build a new substation bay and foundation with 138 kV clearances in the adjacent to the existing EMG Substation meeting industry best practices and code requirements.	Engineering/ Substation Manager	2032 (AMEND SCHEDULE BASED ON ACTUAL LOAD GROWTH)	Property Purchased 2022	\$ 2,500,000
VALLEY/MT CARMEL SUBSTATION	6,661	6,983	6,246	REQUIRES ADDITIONAL SYSTEM ANALYSIS, ESTIMATED AT 10 MVA ON VALLEY FEEDER	Loads served by the Valley Feeder of the Fredonia Substation continue to increase year over year. Garkane is aware of construction plans by others to build new facilities that will accelerate the load growth rate. It is anticipated that voltage regulation is on the feeder will become an issue with the addition of roughly 2.5 more MVA for total load of 9.5 MVA. Voltage conditions during peak loads should be closely monitored for compliance with Garkane standards.	Upgrade the insulation level of the Fredonia to Valley line from 34.5 to 59 kV. Construct a new transmission substation in the Mt Carmel/Onderville area. Build the new substation with 136 kV clearances. The facility will initially be operated for 69 to 34.5 kV transformation.	Engineering/ Substation Manager	2032 (AMEND SCHEDULE BASED ON ACTUAL LOAD GROWTH)	None	\$ 1,500,000
CEDAR RIDGE (BIG WATER) 138/25 KV SUBSTATION	2,509	2,399	2,500	REQUIRES ADDITIONAL SYSTEM ANALYSIS, ESTIMATED AT 6 MVA ON PARRIA FEEDER	Loads served by the Big Water Feeder of the Paria Substation continue to increase year over year. Garkane is aware of construction plans by others to build new facilities that will accelerate the load growth rate. It is anticipated that voltage regulation is on the feeder will become an issue with the addition of roughly 1.5 more MVA for total load of 4 MVA. Voltage conditions during peak loads should be closely monitored for compliance with Garkane standards.	Build a new 138 to 25 kV substation on property previously purchased. Build double circuit express feeder distribution line from the new Cedar Ridge Substation to connect the new facility to the existing distribution system.	Engineering/ Substation Manager	2032 (AMEND SCHEDULE BASED ON ACTUAL LOAD GROWTH)	Property Purchased 2015	\$ 1,500,000
<b>CWP SUBSTATION SUBTOTAL</b>									<b>\$</b>	<b>11,050,000</b>

## APPENDICES

**GARKANE ENERGY**  
**2015 Work Plan Summary - Updated November 2017**

Substation	Feeder	Historical Peak Load	2019 Projected Load	Issue	Solution	Workplan Projected Cost	Capital Budget Approvals	Total Approved Amount	Amount Spent to Date (Oct 17)	Project Lead	Work Order Number	Projected In Service Date	Current Status
Parker Sub	Koosharem/Antimony Feeder	2,205	2,315	1. 112v in Mormon Peak Area 2. 117v in Monroe Peak Area 3. 116v South of Greenwich	1. Install 3 - 100a V Regs South of Koosharem at Section OH25613 2. Install 1 - 50a V Reg East of Monroe Mtn at Section OH25790 3. Install 1 - 50a V Reg East of Mormon Peak at Section OH32442 4. Install 3 - 100a V Regs North of Greenwich at Section OH29023	\$ 120,000		\$ 120,000	\$ 85,000	Loa Area Manager	various	2015	Antimony, Monroe and Angle Vreigs Completed
Lyman Sub		4,887	2,801	No Load Issues in Loa or Lyman Feeders. Need to correct customer phasing data in model.	Need to update and correct model data with correct conductor phasing and sizes.	\$ 10,000		\$ 10,000		Loa Area Manager		2017	Completed
Bicknell Sub	Bicknell Town Feeder	1,441	1,513	No Load Issues in Loa or Lyman Feeders. Need to correct customer phasing data in model.	Need to update and correct model data with correct conductor phasing and sizes.	\$ 10,000		\$ 10,000		Loa Area Manager		2017	Completed
Bicknell Sub	Torrey Feeder	2,668	2,802	Line between Sub and Torrey is loaded in excess of 75% capacity. 103v in Teasdale Area. 109v in Grover Area.	2010 Workplan Project: New Torrey Sub is being constructed and load will be transferred from Bicknell Sub to Torrey Sub. This project was started in 2010 Workplan as a reconductor of Bicknell to Torrey Line.	\$ 1,500,000		\$ 1,500,000	\$ 1,411,255	Loa Area Manager	12109	2015	New Torrey Substation is energized and in service.
Torrey Sub	Torrey Feeder	2,668	2,802	117v in Teasdale Area. Need to look at phase balance at new substation. #2 ACSR Conductor on 12.5 KV line between new substation and Torrey will be loaded to 73% capacity at 25% of the substation transformer capacity	Need to reconductor existing line to at least 477 or build new parallel line into Torrey town	\$ 200,000		\$ 200,000		Loa Area Manager		2017	
Bicknell Sub	Hanksville Feeder	1,593	1,672	115v in Notom Ranch Area	Add 3 - 50a V Regs on Notom Tap at Section OH27016	\$ 42,000		\$ 42,000		Loa Area Manager		2016	Completed
Eight Mile Gap Sub		706	742	Single Circuit from Sub cannot balance load. Almost all load is on single phase. Need to move remainder of load from Johnson Sub to Eight Mile Gap Sub to permit decommissioning of Johnson Sub.	Extend 4/0 approximately 2500 ft from Substation to UG24150. This will permit balancing of existing loads and moving of remaining Johnson Sub loads.	\$ 188,000		\$ 188,000		Kanab Area Manager		2015	Completed
Johnson Sub				Retire Johnson Sub once load is transferred to Eight Mile Gap Sub.		\$ 50,000		\$ 50,000		Engineering Manager		2016	Partially completed.
Fredonia Sub	Fredonia West Feeder	5,267	5,530	107v at Moccasin and 116v at Hack Canyon	Install 3 - 100 a V Regs on 35KV line between takeoff and Pipe Spring Step Transformer. If Mine continues operation or expands operations install 3 - 100 a V Regs on Hack Canyon Tap.	\$ 90,000		\$ 90,000		Kanab Area Manager		2016	Mining operations have stopped. Regulators have been procured and scheduled for installation 2023
KCR Sub	KCR Feeder	3,944	4,141	No Load Issues on feeder. Need to correct customer phasing data in model.	Need to update and correct model data with correct conductor phasing and sizes.	\$ 10,000		\$ 10,000		Kanab Area Manager		2017	Partially completed.
Boulder Sub	Boulder Town Feeder	1,510	1,586	113 v in Lower Boulder Area	Install 3 - 100a V Regs near Town OCR	\$ 45,000		\$ 45,000		Hatch Area Manager		2015	
Escalante Sub	Escalante Town Feeder	2,702	2,573	No Load Issues on feeder. Need to correct customer phasing data in model.	Need to update and correct model data with correct conductor phasing and sizes.	\$ 10,000		\$ 10,000		Hatch Area Manager		2017	Partially completed.
Hatch Sub	Hatch South Feeder	4,400	4,630	111 v in Mammoth Area.	Install 3 - 50a V Regs at Section OH17057	\$ 42,000		\$ 42,000	\$ 40,000	Hatch Area Manager		2017	Completed
Tod Sub	Strawberry Feeder	1,690	1,994	117 V at end of Swain Creek Subdivision. Load Balance issues at Swain Creek Step.	Install 3-50a V Regs at Swain Creek Step. Correct customer phasing data in model.	\$ 42,000		\$ 42,000		Hatch Area Manager		2016	
Tod Sub	Elk Ridge Feeder	1,334	1,401	MODEL DATA??	Need to update and correct model data with correct conductor phasing and sizes.	\$ 10,000		\$ 10,000		Hatch Area Manager		2017	Partially completed.

**GARKANE ENERGY**

**2015 Work Plan Summary - Updated November 2017**

Substation	Feeder	Historical Peak Load	2019 Projected Load	Issue	Solution	Workplan Projected Cost	Capital Budget Approvals	Total Approved Amount	Amount Spent to Date (Oct 17)	Project Lead	Work Order Number	Projected In Service Date	Current Status
Duck Creek Sub	Duck Creek Feeder	2,112	2,217	117v at end of line north west portion of subdivision. Load Balance issues at Substation	Need to correct customer phasing data in model and rerun analysis.	\$ 10,000		\$ 10,000		Hatch Area Manager		2017	Partially completed.
Duck Creek Sub	Color Country Feeder	2,499	2,624	Significant load balance issue at substation.	Add 400 feet 4/0 URD from end of OH45564 to the start of UG18662 and UG19408. Split URD between phases.	\$ 17,000		\$ 17,000		Hatch Area Manager		2015	
Twin City Sub	Utah Avenue Feeder	4,197	4,406	No Load Issues on feeder. Need to correct customer phasing data in model.	Need to correct customer phasing data in model and rerun analysis.	\$ 10,000		\$ 10,000		Kanab Area Manager		2017	Partially completed.
Twin City Sub	Redwood Road Feeder	4,366	4,584	Need to correct customer phasing data in model. Phase load Balance issues out of substation. 112 V by airport and farms. 4/0 cable out of sub is at 80% CAPACITY.	Need to balance loads and either replace existing 4/0 URD with 500 mcm URD OR build OH line from sub to OH40425. Total distance is about 3 miles.	\$ 425,000		\$ 425,000		Kanab Area Manager		2016	Partially completed.
						\$ 2,831,000		\$ 2,831,000					

**TRANSMISSION AND SUBSTATION PROJECTS**

PROJECT	ISSUE	PROJECT DESCRIPTION	Workplan Projected Cost	Capital Budget Approvals	Total Approved Amount	Amount Spent to Date (Oct 17)	Project Lead	Work Order Number	Projected In Service Date	STATUS
Tropic to Hatch Transmission	Capacity and Voltage problems in Hatch and Cedar Mountain Areas	2003 Workplan Project. Construct Tropic to Hatch 138 kV line to replace the existing 44/69 kV line in Red Canyon to increase delivery capacity to Hatch and Tod Subs.	\$ 6,000,000	\$ 2,000,000	\$ 8,000,000	\$ 7,661,870	Engineering Manager	11113	2017	Completed
Retire Bryce to Hatch Mountain 69 kV Line	Permit for Tropic to Hatch Line requires removal of existing 69 kV line from Red Canyon	2003 Workplan. Permit requirement for Tropic to Hatch line requires the physical removal of the step transformer and yard on north side of road	\$ 500,000		\$ 500,000		Engineering Manager		2018	Completed
East Valley Substation	Substation needed to interconnect new Tropic to Hatch transmission line	2003 Workplan Project. Construct East Tropic Substation	\$ 1,500,000		\$ 1,500,000	\$ 1,096,640	Engineering Manager	13071	2015	Completed
Ruby Switching Station	Substation needed to interconnect new Tropic to Hatch transmission line	2003 Workplan Project. Construct Ruby Station	\$ 825,000		\$ 825,000	\$ 629,209	Engineering Manager	13072	2017	Completed
Retire Hatch Mountain Step Yard	Permit for Tropic to Hatch Line requires removal of existing 69 / 44 kV Step Bank and yard on north side of FS Road	2003 Workplan. Permit requirement for Tropic to Hatch line requires the physical removal of the line from Bryce to Hatch Mountain	\$ 112,000		\$ 112,000	\$ 343	Engineering Manager	14107	2015	Completed
Buckskin to Fredonia Transmission	Transmission Study indicates new line needs to be constructed by time loading on Buckskin to Fredonia line reaches 30 MW. 2013 Peak load was 27MW.	2010 Workplan Project. Construct 138 kV line from Buckskin to Fredonia. 31.5 miles @ \$150k/mile plus \$575k permitting costs	\$ 5,300,000		\$ 5,300,000	\$ 242,873	Engineering Manager	10018	2017	Partially completed.
Cedar Ridge to Big Water Transmission	V Drop at 117V at Church Wells with additional 1000 kW expected at Canyon Lands	2010 Workplan Project. 138 kV line to Big Water and Substation when load grows to 3.5 MW at Paria Sub (Dec 2009 peak 2.3 MW).	\$ 300,000		\$ 300,000	\$ 210,000	Engineering Manager	84116	Load Growth Dependent	Right of Way has been obtained. Project on hold until load requires construction.
Sigurd Substation OCB Replacement	The existing 3 tank OCB is physically too large for the structure. The OCB cannot be serviced due to confines of steel structure.	Remove existing 3 tank OCB and install single tank OCB retired from Bryce Substation after completion of Tropic to Hatch Project	\$ 30,000		\$ 30,000		Engineering Manager		2018	Completed

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**GARKANE ENERGY**

**2015 Work Plan Summary - Updated November 2017**

Substation	Feeder	Historical Peak Load	2019 Projected Load	Issue	Solution	Workplan Projected Cost	Capital Budget Approvals	Total Approved Amount	Amount Spent to Date (Oct 17)	Project Lead	Work Order Number	Projected In Service Date	Current Status
	Install 69 kV tie from PAC to GKE at Spy Substation			The existing 12.5 kV tie between the PAC substation at Pangutch and Spy is limited to 1 MW interchange until such time as Garkane converts 44 kV line from Hatch Mountain to Spy to 69 kV.	The Emergency Services Agreement between PAC and GKE calls for the existing 12.5 kV tie to be replaced with a 69 kV tie when GKE upgrades the Spy transmission o 69 kV. This upgrade was completed in 2014. The tie will require installing a 69 kV OCB to be installed at Spy Station. Use OCB and relay panel removed from Hatch Mountain.	\$ 125,000		\$ 125,000		Engineering Manager		2018	Partially completed.
						\$ 14,692,000		\$ 14,692,000					

**NON CAPACITY RELATED PROJECTS (SYSTEM IMPROVEMENT ITEMS)**

Substation	Feeder			Issue	Solution	Workplan Projected Cost	Capital Budget Approvals	Total Approved Amount	Amount Spent to Date (Oct 17)	Project Lead	Work Order Number	Projected In Service Date	STATUS
Hatch	Hatch South			URD Cable in Bryce Woodlands Subdivision was originally direct buried in the roadway and borrow ditch.	Approximately 8000 feet of URD cable needs to be replaced and buried to proper depths.	\$ 60,000	\$ 100,000	\$ 160,000	\$ 95,846	Hatch Area Manager	15032	2015	Partially completed.
Bryce	Barney Top Feeder			Install URD Cable from end of URD replacement project to OCR on Barney Top Road.	This section of cable was not installed as part of the original project due to right of way issues with the Forest Service.	\$ 150,000		\$ 150,000	\$ 99,982	Hatch Area Manager	15349	2015	Completed
Torrey	Torrey			Convert single phase line south of Teasdale to three phase to allow better load balance in Teasdale area				\$ -		Loe Area Manager			
Torrey	Torrey			Replace Teasdale OCR				\$ -		Loe Area Manager			
						\$ 210,000		\$ 210,000					
						\$ 17,733,000		\$ 17,733,000	Grand Totals				