2004 Wind Diesel Conference

St. Paul, Alaska Operational Experiences

September 2004

St. Paul Island, Alaska

Project Background

System: 500 kW standalone utility, combined heat and power

Composition: Vestas V27 turbine, two 150kw Volvo diesel generators.

Configuration: High penetration/no storage wind-diesel

Application: Providing electricity and space heat to industrial/airport facility

Avg. Power Generation:876,000 kWh per year – 40% capacity factor

System Composition

Operational Data

St. Paul - Poss Camp
Operations Report Summary 2004

Month	Gross KwH Generated: Diesel Plant #1	Diesel Plant #2	Diesel Plant #3	Diesel Plant #4	Diesel Plant #5	Total Diesel Gen	Wind Turbine #1	Wind Turbine #2	Wind Turbine #3	Diesel & Wind	Fuel Consum	Facility Load KwH: Thermal Tank	Station Service	Facility Usage	Total T, S & F	Net KwH: KwH Sold	Gross Efficiency: Diesel Eff Gen KwH/Gl	System Eff Gen KwH/Gl	Line Loss/Gain: KwH	%
January	1981	32413				34394	98569			132963	3167	63195	0	56349	119544	0	10.86	41.98	13419	0.101
February	0	36446				36446	85783			122229	2322	55642	0	54555	110197	0	15.70	52.64	12032	0.098
March	7673	54433				62106	38717			100823	4076	34660	0	56505	91165	0	15.24	24.74	9658	0.096
April	5916	44070				49986	56747			106733	4027	42838	0	53416	96254	0	12.41	26.50	10479	0.10
May	22315	27887				50202	56074			106276	3340	44677	0	51378	96055	0	15.03	31.82	10221	0.10
June	14321	38731				53052	22746			75798	3625	27086	0	40795	67881	0	14.64	20.91	7917	0.10
July	12985	45222				58207	24557			82764	3919	31656	0	43987	75643	0	14.85	21.12	7121	0.09
August	14937	41885				56822	23397			80219	4025	31115	0	42159	73274	0	14.12	19.93	6945	0.09
September						0				0			0		0	0	#DIV/0!	#DIV/0!	0	#DIV/0!
October						0				0			0		0	0	#DIV/0!	#DIV/0!	0	#DIV/0!
November						0				0			0		0	0	#DIV/0!	#DIV/0!	0	#DIV/0!
December						0				0			0		0	0	#DIV/0!	#DIV/0!	0	#DIV/0!
Total	80128	321087				401215	406590			807805	28501	330869	0	399144	730013	0	#DIV/0!	#DIV/0!	77792	#DIV/0!

Month	Average KW - Generated: AVG KW Diesel #1	AVG KW Diesel #2	AVG KW Diesel #3	AVG KW Diesel #4	AVG KW Diesel #5	AVG Wind Turbine #1	AVG Wind Turbine #2	AVG Diesel & Wind	Peak KW	Average Facility Load: AVG Thermal Tank KW	AVG Station Service KW	AVG Facility Usage KW	AVG Total T, S & F KW	Monthly Equipment Running Hours: Diesel Plant #1	Diesel Plant #2	Diesel Plant #3	Diesel Plant #4	Diesel Plant #5	Wind (WTG) #1	Wind (WTG) #2
January	2.66	43.57	0.00	0.00	0.00	132.49	0.00	178.71	232	84.94	0.00	75.74	160.68	56	195				588	
February	0.00	54.24	0.00	0.00	0.00	127.65	0.00	181.89	253	82.80	0.00	81.18	163.98	0	238				568	
March	10.31	73.16	0.00	0.00	0.00	52.04	0.00	135.51	180	46.59	0.00	75.95	122.53	125	489				92	
April	8.22	61.21	0.00	0.00	0.00	78.82	0.00	148.24	225	59.50	0.00	74.19	133.69	73	542				459	
May	29.99	37.48	0.00	0.00	0.00	75.37	0.00	142.84	196	60.05	0.00	69.06	129.11	298	378				366	
June	19.89	53.79	0.00	0.00	0.00	31.59	0.00	105.28	165	37.62	0.00	56.66	94.28	186	517				259	
July	17.45	60.78	0.00	0.00	0.00	33.01	0.00	111.24	179	42.55	0.00	59.12	101.67	145	536				280	
August	20.75	58.17	0.00	0.00	0.00	32.50	0.00	111.42	171	43.22	0.00	58.55	101.77	139	540				273	
September	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00							
October	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00							
November	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00							
December	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00							
Average	9.17	36.75	0.00	0.00	0.00	46.54	0.00	92.47		37.87	0.00	45.69	83.56	1022	3435	0	0	0	2885	0

Month	System Outages: Date	Time	Outage Cat.	No. Outage Hours	Cause	No. Consumers Affected	Return Service Date	Returned Time	Monthly Equipment Start Cycles: Diesel Plant #1	Diesel Plant #2	Diesel Plant #3	Diesel Plant #4	Diesel Plant #5	Wind (WTG) #1	Wind (WTG) #2
January					No Outages				9	16				155	
February					No Outages				0	17				109	
March					No Outages				20	26				174	
April	04/09/04	1:35pm	NG	10min	Paul had acidently left a cooling system	All	04/09/04	1:45pm	14	63				127	
May	05/06/04	2:30pm	NG	1 min	(D1) Paul reported a 1 minute shut down	All	05/06/04	2:31pm	8	31				132	
June					No outages				7	22				141	
July					No Outages				9	28				128	
August					No Outages				10	24				139	
September															

Operational Experiences

Wind-generated electricity production

- reduced diesel generator fuel consumption by 3,346 gallons/yr
- reduced fuel for space heating consumption by 8,940 gallons/yr

Wind turbine gearbox failures caused by design flaw downtime during peak winter wind resource.

- failure resolved by manufacturer redesign resulting in dramatic increase in wind kWh production

100% availability in 2004. Capacity factor in January 2004 was 60.49 %

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