



# **Kokhanok Wind-Diesel System Update**

John Lyons

Marsh Creek Energy Systems

AK Native Village Energy Development Workshop

April 29, 2014



**MARSHCREEK**  
ENERGY SYSTEMS  
A Division of Marsh Creek, LLC

# Kokhanok Electric Utility

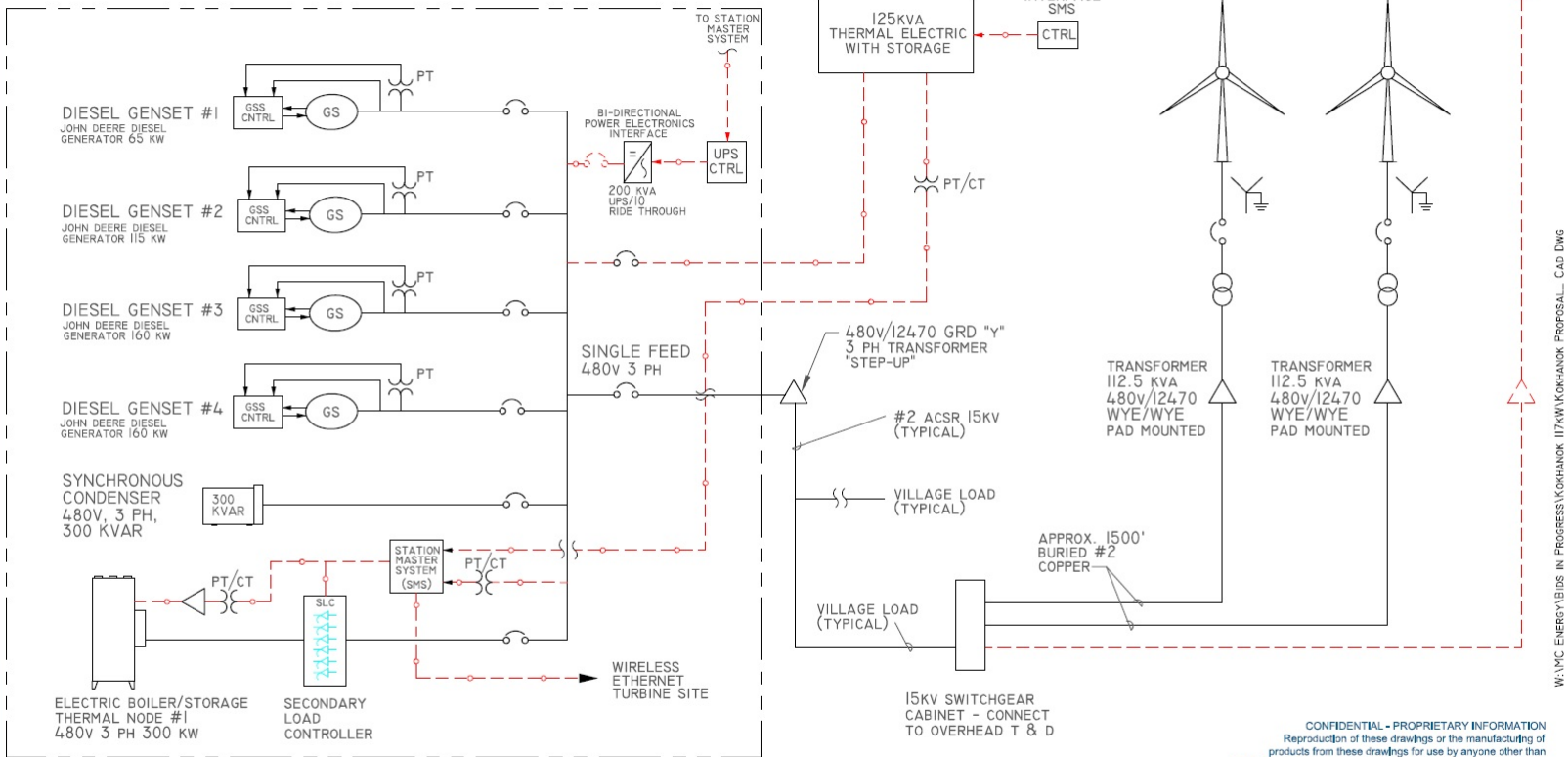
System	470 kW of diesel power 2 refurbished Vestas wind turbines rated at 90 kW each
Power Generation	459,251 kWh in 2013 (17% wind – down from 30% 2012)
Peak Demand	106 kW
Population Served	170





# System Overview

**KOKHANOK  
HIGH PENETRATION NO-STORAGE WIND-DIESEL SYSTEM  
USING SYNCHRONOUS CONDENSER  
AND SECONDARY LOAD**



W:\VC ENERGY\LEDS IN PROGRESS\KOKHANOK 117\KWK\KOKHANOK PROPOSAL - CAD DWG

CONFIDENTIAL - PROPRIETARY INFORMATION  
Reproduction of these drawings or the manufacturing of products from these drawings for use by anyone other than MARSHCREEK, LLC is strictly prohibited without written consent.

**DIESEL POWER PLANT**

**VILLAGE LOAD**

Rev.	Date	By	Description	Rev.	Date	By	Description

**MARSHCREEK**  
ENERGY SYSTEMS  
2000 E. 8th Ave. Ste. 100, Anchorage, Alaska 99507  
Phone (907) 258-0050 Fax (907) 274-9710

**KOKHANOK  
HYBRID WIND  
SYSTEM**

Drawing No.	<b>1</b>		VDR Item No.
Date	Rev.	Scale	Project No.
05/27/09	0	1:1	0000
by JGL			Purchase Order No.
			0000



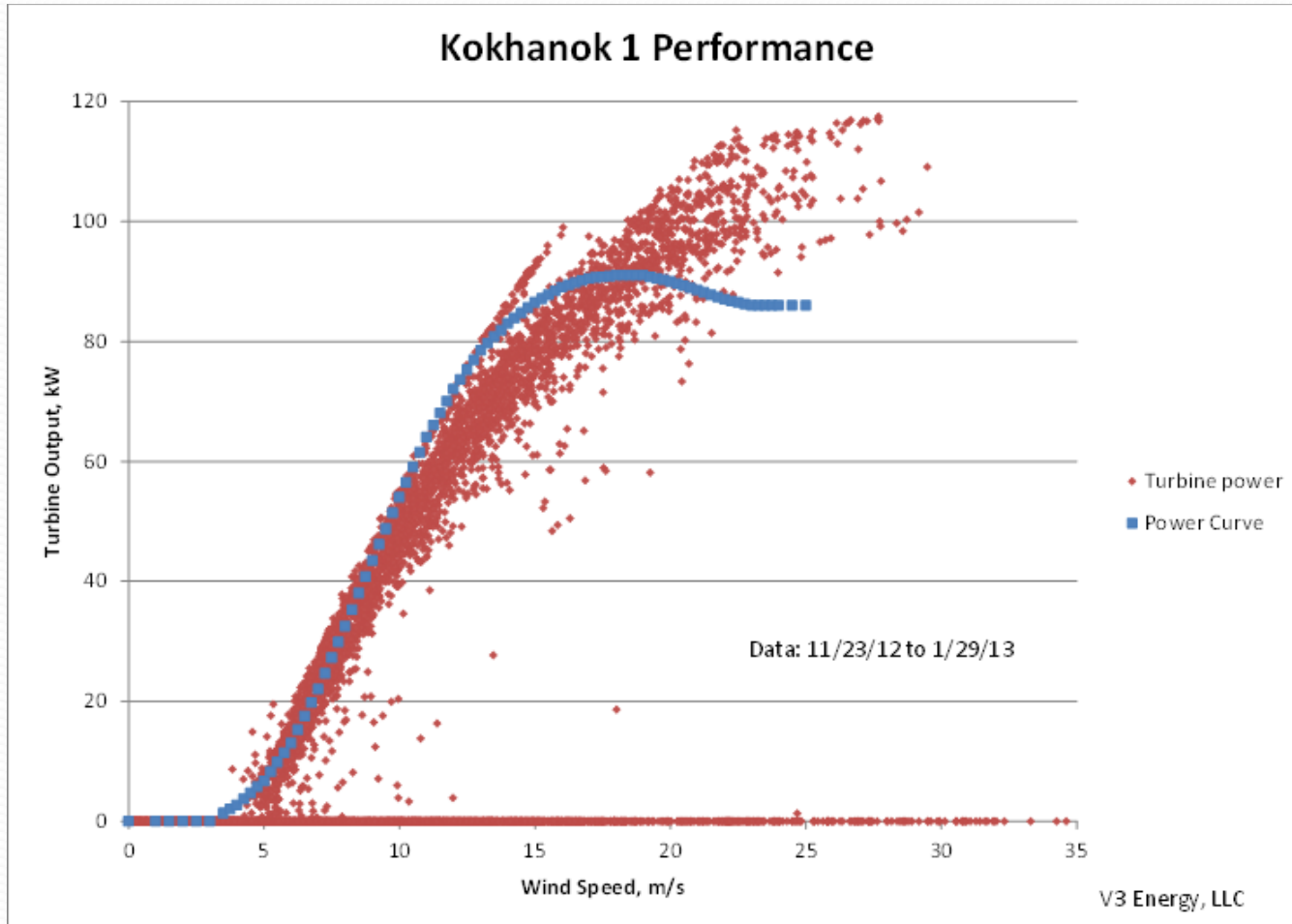
# System Overview



- Grid forming inverter
- 336 kWh nominal battery storage
- Synchronous condenser
- Thermal electric heat recovery system and secondary load control
- Two (2) Vestas V-17 turbines 90 kW each
- Four (4) Diesel Gen-sets
  - #1 - 65 kW
  - #2- 115 kW
  - #3 - 160 kW
  - #4 - 160 kW



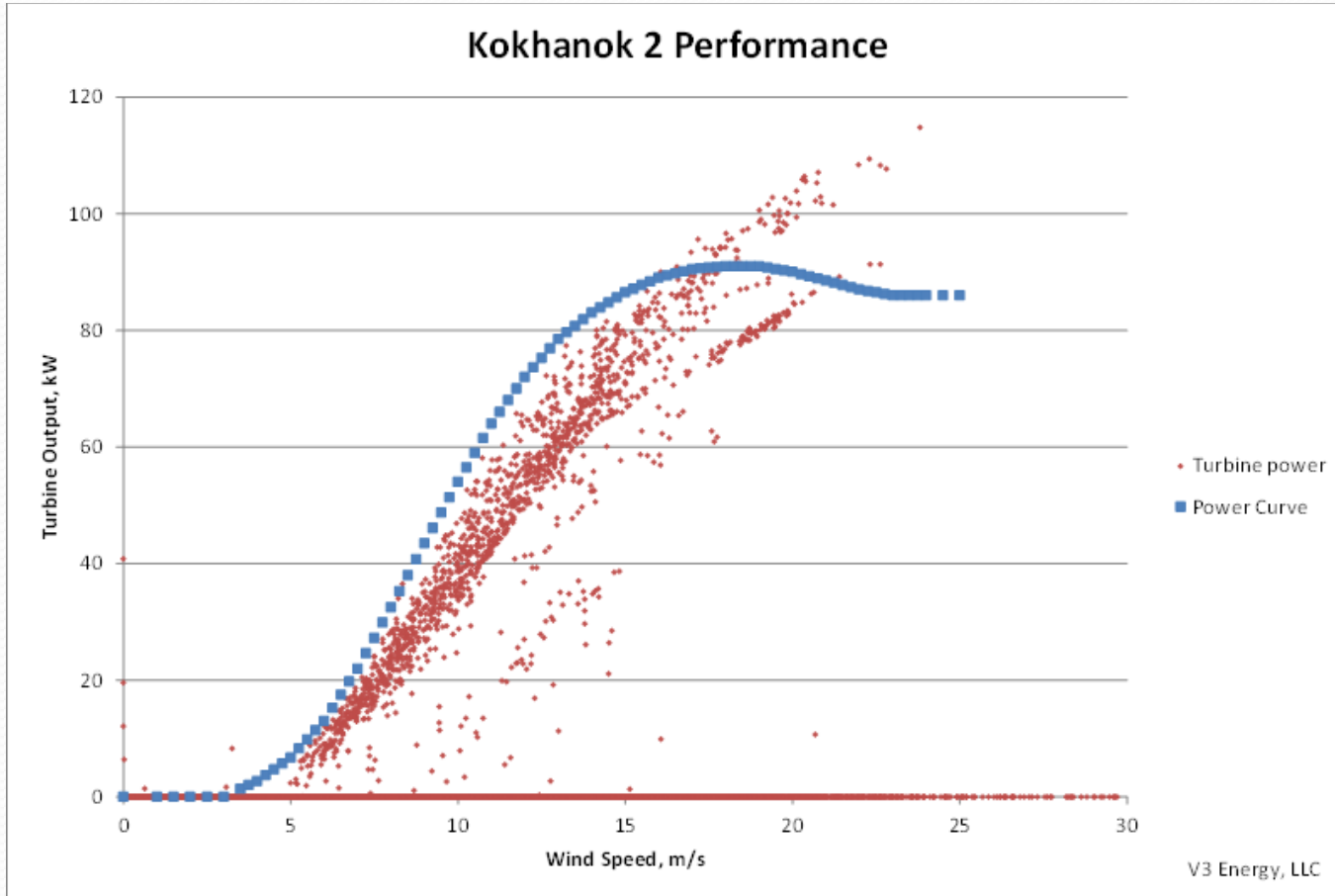
# Production Data – Turbine #1



Source: Douglas Vaught, P.E. - V3 Energy, LLC



# Production Data – Turbine #2



**Source:** Douglas Vaught, P.E. - V3 Energy, LLC



# Where are we?

- **2014 Wind Turbine Generator Production**

- WTG 1: 0 kWh      WTG 2: 0 kWh

- **Annual Wind Farm Energy Production**

- 2011: 66,449 kWh      2012: 150,396 kWh      2013: 78,854 kWh

- **School Heating Fuel Use Comparisons for Pre-Wind vs. Post Wind**

- 2010      6,577 gallons      2012      6,595 gallons
- 2011      5,451 gallons      2013      3,784 gallons

- **System Efficiency (kWhs produced per gallon of diesel burned)**

- January      2010      12.4 kWh/gallon      *3,845 gallons to produce 47,734 kWhs*
- January      2013      18.6 kWh/gallon      *3,017 gallons to produce 56,006 kWhs*
- January      2014      11.33 kWh/gallon      *3,532 gallons to produce 40,019 kWhs*



# Path Forward

- O&M Phase with the community – year 4 of 6 year agreement
  - Highly skilled local diesel technician now on board who is willing to climb and do WTG maintenance.
- Wind Farm curtailed since October and shut down since January due to lube oil contamination in coolant loop at the diesel plant.
  - Wind-Diesel Tech from Marsh Creek scheduled for site visit to put wind turbines back on line – as soon as the local diesel tech gets certified to safely climb the tower. Next class scheduled for the last week of May.
- Additional O&M Costs in 2013 requires a customer rate increase. The utility is awaiting a new PCE rate, based on 2013 costs, to implement.
- Final phase of high penetration system, the battery inverter, will be installed summer 2014. At that point the system will be able to run “diesels off” - with a trained local wind-diesel tech to watch over it.





**MARSHCREEK**  
ENERGY SYSTEMS  
A Division of Marsh Creek, LLC

# Questions?

John Lyons

[john.lyons@marshcreekllc.com](mailto:john.lyons@marshcreekllc.com)

