

# Turnkey wind-diesel power for continuous operation

In this technical article, **Soren Qvist Vestesen** of Vestesen A/S – a veteran PES contributor – further outlines the benefits of a **Danvest wind-diesel system**.

## Danvest Wind Diesel Systems

With reference to my earlier PES article from earlier this year, I should like to further describe the efficiency of the Danvest system for high wind penetration and fuel savings. I can illustrate this for a commercial operating plant, by referring to two graphs:

### Graph one

Coherence between: wind capacity of maximum consumer and wind speed

### Graph two

Coherence between: prices (Euro/kWh) and wind capacity of maximum consumer

When we have data for average wind speeds and consumer demands for a location, we can simply estimate the configuration, which gives the lowest Euro/kWh prices.

Calculations with our calculation programme will give more precise values to set up budget proposals.

## Experience from Wind-Diesel (WD) operation in Estonia

### High wind penetration with Low Load Operation (LLO) and Engine Stop function.

**Plant description:** Stand alone net for island operation

Consumers: private houses with standard installation and electric heating:

Consumption: Minimum average 40 kWe

Max. average: 80 kWe

Peaks: 100 kWe

Peaks (maximum): 110 kW

Power factor: 0.9-0.95

Consumer special:

**Saw mill:** peaks 10-30 kWe

Special operation arrangement.

WD Power Station: containerised: 127

kWe WD Gen. Set in 40ft container

based on Diesel Engine Perkins type

1006TAG2 – 1500 rpm.

Dump load: 150 kW-60 kW dynamic

dump and 3 x 15 = 45 kW fixed dump

- 45 kW for spare.

Common cooling: 150 kW - central

cooling via a 150 kW radiator cooler with

temp. frequency controller.

Wind Turbines (WT) Vestas V17: 2

x 75 = 150 kWe - refurbished special

compensated for power factor 0.97 -

0.99

SCADA system: remote set point

controlling and monitoring via internet

Stand by capacity: Existing 120 kWe

power station to be connected to the

net at WD system service. When the

WD system is ready again and started

up, it is synchronised to the net and the

existing power station stopped.

**Expected yearly fuel saving: 65 %**

## Performance guarantees

Components: standard sub suppliers guarantees

Systems guarantees: Power quality according to EU Norms 50 160 for voltage, frequency, power factor and harmonics.

Continuous power supply.

Fuel saving for the wind production.

Plant efficient: kW power production WD

+ WT – consumer - Dump = Auxiliary

(Aux)

The Danvest system with LLO, engine

stop and common cooling system

ensure a special low Aux. and high plant

efficiency in %:  $96 \pm 2$

Surplus wind energy and waste engine

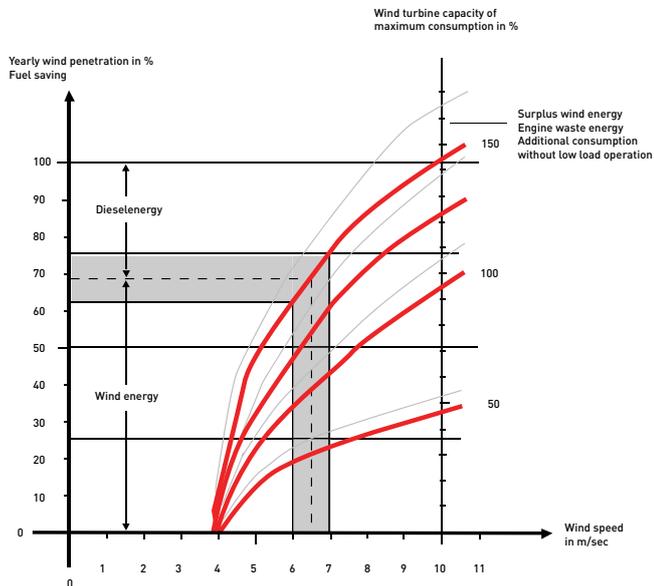
are not utilised for this plant but is

prepared for it.

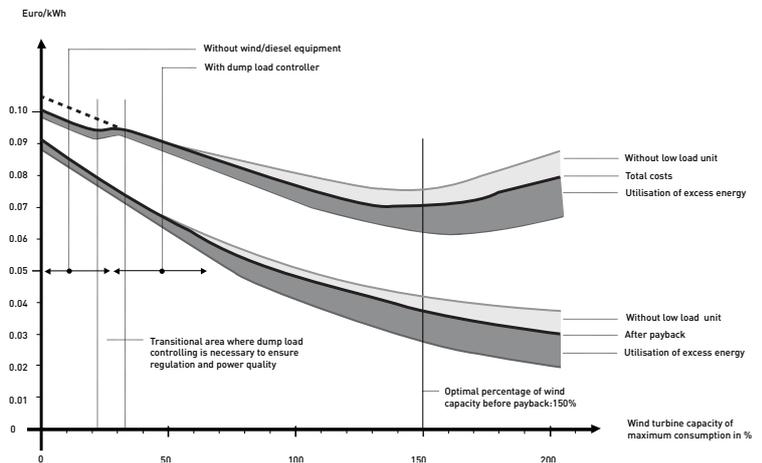
## Comments on the Estonia Plant operation

High plant efficiency is obtained with optimal combination between wind capacity and diesel capacity.

The diesel engine makes back-up from 100% power supply at no wind to 0% at 100% wind energy, where the Dynamic Dumpload Controlling takes over the frequency controlling. With a dumpload higher than 10 kW the diesel engine is clutch out and stopped.



Graph one



Graph two

The main operation time over the year, the Plant will operate with 50-100% wind penetration with very low Aux power (for pumps, air cooler, ventilation and others ) 0.5-1.0 kW over the year + app. 1.0 kW for preheating the cylinder top at LLO operation.

**Fuel consumption at LLO operation: 0.1 - 3.0 L / hour**

With the low cost for the container construction and WD equipment and low fuel consumption, the kWh price will be reduced dramatic over the year. Our remote monitor and control system can be followed by PC via the normal internet connection. As a part of our guarantee program we will follow the operation and controlling in the guarantee period both for training and guiding in adjustments of operating parameters.

### Optimal plant configurations

It is very important that optimal configuration is obtained to be able to have optimal conditions for the controlling WD engine especially for system with several WD engines, where the load will be reduced often for LLO operation, when the wind energy comes in.

### Future configurations and designing

Danvest Energy has participated in several tenders, and we have also won some of them. We often find that performers demands and power quality are not stated sufficient for setting up optimal wind diesel solutions with reference to international Norms and Standards – for example for EU: EN 50 160.

Data for the local stand alone net, which often are rather weak must be described and analysed to be prepared for automatic WD operation with continuously power supply.

Using alternative fuels as biogas or bio fuels are coming up, where we must be consulted for the optimal configuration for these fuels used at WD controlling engines.

### Desalination configurations and designing

For configurations and designing for optimal desalination combinations we have solutions where we integrate the sea water systems obtaining the lowest cost price for produced m3 fresh water. ▲

For further information, visit [www.danvest.com](http://www.danvest.com)

