



# Northwind<sup>®</sup>100



## The NorthWind100: An Arctic Turbine That Landed In A Tropical Application

Brett Pingree, Vice President, NorthWind100 Sales

Chris Haraldsen, Wind Project Manager



# Northwind<sup>®</sup>100

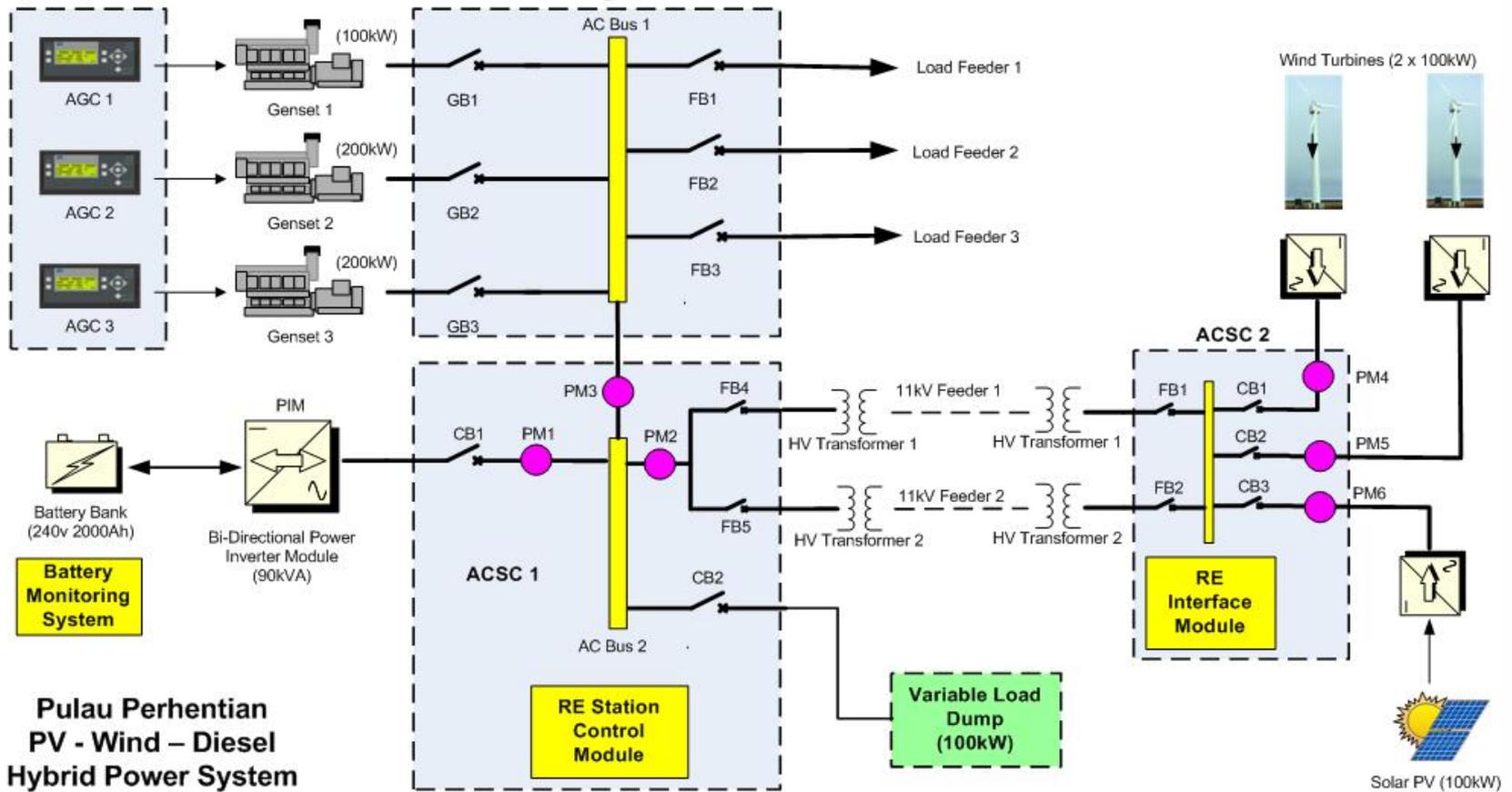
- Site Is Pulau Perhentian: Diving Resort Island
- First Wind Diesel Project in Malaysia
- Sponsored/Funded By Malay Government
- End Customer: Tenaga National Berhad
- Optimal Power Solutions Developed and Managed Project
- Hundreds of Isolated Grids in Malaysia

# Northwind<sup>®</sup>100

- Avg Load: 85 kW
- 2 X NW100's (200kW of Wind)
- 100kW of PV
- 2 X 200 1 X 150 Diesel Engines
- Wind Resource: 6.4 m/s
- Lots of Batteries (480 kWhours)
- Lots of Controls
- Installed Load Bank

# Northwind<sup>®</sup> 100

## Multi Genset Control System (MGCS)



**Pulau Perhentian  
PV - Wind - Diesel  
Hybrid Power System**  
(Sept 07)

## Wind Diesel Challenges

- Extremely High Penetration
- Integrator Lacked High Pen Experience
- Remote Site
- Difficult Logistics
- Extreme Weather Conditions
- Cultural Barriers



# Northwind<sup>®</sup> 100



08/09/2007 23:18

# Northwind<sup>®</sup> 100



08/09/2007 04:08

# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



08/06/2007 21:31

# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



08/07/2007 00:49

# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



# Northwind<sup>®</sup> 100



08/10/2007 03:16

## High Penetration Solutions

- **Intertie Villages or Isolated Loads**
- **Power Set point Control**
- **Employ Fast Switching Controls (Dump Load Response)**

## Wind Diesel Solutions

- **Strong Regional Partner Is Essential**
- **Hire Rugged Personal**
- **Deploy Dependable Equipment**
- **Plan In Advance**
- **Synchronize Projects for Economies of Scale**
- **Size Generating Devices Appropriately for Size of System**