



Wind-Diesel: Global Markets

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Presentation Overview



- Wind-Diesel Global Market
 - Drivers
 - Challenges
 - Opportunities

Market Drivers



- Rising Cost of Diesel
 - Retail cost \$4.15/gallon (US average)
 - Increasing \$0.16/yr (US 20yr average)
 - Increasing demand across numerous industries
 - Limited refining/production capacity
 - Increasing taxation and environmental costs
- Renewable Portfolio Standards
- Carbon Tax / climate control initiatives

Market Drivers



- High cost of energy
 - Expensive electricity generation from diesel generators
 - \$0.20 - \$0.46/kWh (2011 AVEC COE range from 48 villages in AK)
 - Up to \$2.00/kWh in extreme locations
 - Remote locations increase delivery cost
 - Supply chain vulnerability/dependency
 - Maintenance
 - Future availability and cost uncertainty
- International and federal programs
 - Tax equity/credits
 - Global development aid/investment
 - USAID
 - UN
 - World Bank
 - Charitable foundations

Market Drivers



- Large number of isolated/remote grids worldwide with very high energy costs
- Technology advancement
 - Turbine performance, and reliability
 - Storage
 - Secondary load controls and switch gear
 - Diesel generator efficiency
 - Foundation designs
 - Monitoring/control software
 - Lower cost per installed kW and lifetime cost of energy
- Job creation

Challenges



- Financing, financing, financing
 - Project development (risk mitigation)
 - Construction financing
 - Gap/bridge funding
 - Debt financing
 - Equipment collateralization
 - Tax equity
 - Floors and ceilings/economy of scale
 - Ownership structures
 - Insurance

Challenges



- Construction cost and logistics
- Experienced designers and operators
- System integration
- Technology availability/cost
- Storage
- Siting/permitting
- Successful high penetration projects
- High cost of energy (\$0.88/kWh on average in AK)
- Creditability and history
- Education

Market Opportunity



- Island grids
- Military
 - Remote bases
 - Mission critical
 - UPS
- Remote communities/villages
- Arctic applications
- Mining and remote industrial operations
- Telecomm
- Residential off-grid

Market Opportunity



- Developing nations
- Rural electrification
- Larger diesel grids
- Water pumping and desalinization
- Portable power
- Distributed applications / DSM
 - Schools
 - Municipalities
 - Agriculture
 - Prisons
 - WWTP

Conclusion



- Diesel generators are making electricity all over the world!
- There are growing global markets in numerous industries and market niches
- There are some supportive policies and programs, but more are needed as they are necessary to the viability of most markets
- We have the technology, but we still need more education
- Financing is still a hurdle, but can be overcome
- Wind-diesel can be a viable, proven, and effective solution to meet the growing global demand for providing electricity to those without it and reducing expensive and polluting diesel consumption with clean, renewable wind energy



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