

# *Distributed Generation – Benefits and Barriers*

- David Ryan P.E.



# *Small is Beautiful*

- ã NCAT – Appropriate Technologies are Small, Local, Sustainable
- ã Rocky Mountain Institute – Small is Profitable – 207 Reasons for Distributed Generation



# *Counting Carbons*

## ã Comparison:

ã Average Home - 28,643 pounds of Carbon Dioxide Annually

ã My House – 11,011 pounds of Carbon Dioxide Annually

## ã How?

ã Energy Efficient Appliances, Keeping Lights and Appliances Shut Off When Not in Use, Being Keenly Aware of Energy Waste.

ã Solar Electric and Solar Water Heat



# *Electric Generation Efficiency*

- ã Hydroelectric Power Plant – 86-90% Efficient
- ã Coal fired Power Plant - 35% Efficient
- ã Natural Gas Peaking Plant – 12-20% Efficient



# *Electric Generation Efficiency*

- ã Coal fired Power Plant - 35% Efficient
- ã Line Losses - 10%
- ã Overall Coal Fired Generation Efficiency - 31.1%
- ã Combustion/ fuel Cell Distributed Generation Efficiency  
(With Combined Heat and Power) – 65% - 75%



# *DG Technologies*

- ã Fossil Fuels (Need to Move Away From)– *CHP*
- ã Renewable Fuels – Pelletized Wood Waste, Straw *CHP*
- ã Methane from Animals, Waste Water, Landfills *CHP*
- ã Wind
- ã Solar
- ã Storage Technologies
- ã Capacity from KWs to MWs



## *DG Vision*

- ã Everyone Generates their own Electric Energy
- ã Everyone is Interconnected Through Power Grid
- ã High Efficiency
- ã Clean



# *Why We Need the Electric Utility*

- ã DGWeb – It Works for Computers, Why not Power?
- ã If my Generator isn't Generating, my Neighbor's is.
- ã Utility Provides “Storage” by Allowing High Saturation of Generation
- ã Infrastructure Already There



# *Why the Electric Utility Doesn't Need DG*

- ã *Business as Usual – Don't Doctor A Well Horse*
- ã *Someone Might Get Hurt – We Have to Shut Off all Those Generators to Work on the Line*
- ã *Cross Subsidization - Non Generating Customers Subsidize Generators*



# *Changing Electric Utility Thinking About DG*

- ã Need to Change Business as Usual – Because of need for Higher Efficiency and Less Environmental Impact
- ã No one has been Hurt – 12,000 distributed generators in California – No, they don't shut them all off to work on a line, they disconnect themselves.
- ã Cross Subsidization – Rate Design Problem – Rates don't work for DG



# *Real Electric Utility Problems with DG*

ã Metering and Billing Hassles Caused by Backward Rotation

ã *Use Electronic Meters with Dual Registers*

ã *Use Two Meters*



## *Policy to Help DG*

- ã PURPA – 1978 – Cogenerators, Alternative fueled Generators – Purchase at “Avoided Cost”
- ã Net Metering – Effective purchase at Bundled Distribution Rates
- ã Renewable Portfolio Standard – Purchase Percentage of Supply from Renewable Generators



## *Policy to Help DG - Falls Short*

- ã PURPA – Amended by 2005 Energy Policy – in FERC hands.
- ã Net Metering
  - ã Improper to Use Bundled Rate, but Utility Improperly Keeping Saleable Environmental Attributes
  - ã Size Limits Improper – One Size Does Not fit All
- ã Renewable Portfolio Standard – Ignores Value of Environmental Externalities, Includes a Firming Penalty



## *Breaking Down DG Barriers*

- ã Get Uniform Utility Policy for DG – Size, Interconnection Requirements, Fuels
- ã Take Environmental Benefits Into Account
- ã Set Workable Rates for PURPA Qualifying Generators
- ã Renewable Portfolio Standard – Purchase Percentage of Supply from Renewable Generators Recognizing Environmental Benefits and Appropriate Firming Costs



# *Breaking Down DG Barriers*

## ã Fix Rates for Net Metered Generators

ã Customer-Generator pays Net Distribution Based upon Supply Voltage

ã Utility Pays Customer-Generator Supply Rates

ã Utility Pays Customer-Generator for Avoided Line Losses

ã Utility Pays Customer-Generator for Renewable Energy Credits



## *Example DG Supply Rates*

ã Generator Rates for Distributed Renewable Fueled Generators (Residential)

ã \$0.049923 /kwh Supply

ã \$0.00499 /kwh Losses

ã \$0.015 /kwh Renewable Energy Credit

ã Total - \$0.069803 /kwh



## *Example DG Customer Rates*

ã Generator Rates for Distributed Customers (Residential)

ã \$0.049923 /kwh Supply

ã \$0.033412 Trans/Dist

ã Total - \$0.083335 / kwh



# *Time Value of DG*

- ã Solar Electric is On Peak in Summer
- ã Wind Power is On Peak in Winter
- ã Storage Technologies
  - ã Methane – Hard to Store But it Can Be Done
  - ã Pumped Storage
  - ã Compressed Air Energy Storage



# *Swan Song – Final Elbow*

- ã Distributed Generation is Cleaner
- ã Distributed Generation is More Efficient
- ã Policies Exist but Don't Work
- ã Utilities and Regulators Need to Re-Think Rates
  - ã PURPA QFs
  - ã Net Metering
  - ã Time of Use Rates

