POLICY facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Strategic Center for Natural Gas

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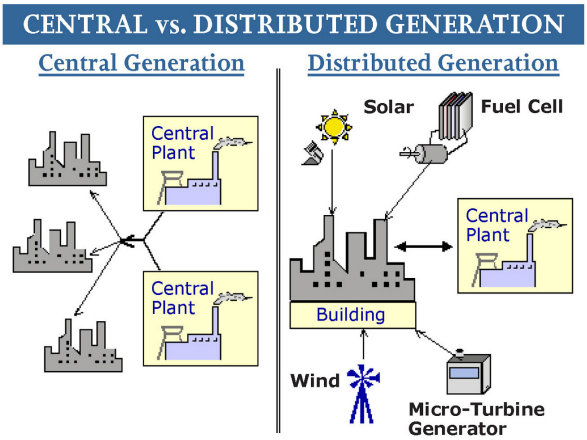
DG: BOON OR BUST TO THE ENVIRONMENT?

Description

Distributed generation (DG) is predicted to play an increasingly important role in meeting future power generation needs. The term distributed generation (DG), also referred to as distributed resources, is typically defined as power generation at or near the electric consumer site and includes small gas turbines, diesel generators, microturbines, fuel cells, wind, and photovoltaics. Applications for DG vary widely and include baseload continuous power for off-grid locations, combined heat and power (CHP) applications to supply both electric power and heat at the source of generation, peak power to avoid higher power rates, emergency back-up, stand-by power, premium power, grid support applications, and to eliminate or reduce the need for transmission and distribution upgrades. DG can be used stand-alone as a replacement for grid-supplied power, or it can be used to supplement the power generated at central power plants, even selling power back to the grid at times.



Courtesy of the National Fuel Cell Research Center

Background

In some circumstances, DG provides customers with cost-effective energy solutions. Unfortunately, many DG technologies that offer lower capital and fuel costs emit a disproportionate amount of pollutants. Conversely, the DG technologies that are the most environmentally friendly, or provide higher power quality or reliability than conventional solutions, are not currently cost-effective. Much of the DG capacity in the U.S. today is used in combined heat and power applications where the value of recovered heat tips the economics in favor of on-site generation. Gas turbines and combined cycle units account for a majority of this capacity, with reciprocating engines making up the largest number of installations. Diesel generators dominate the market for emergency back-up power. With an expected increase in the use of DG to meet future power demand, it is essential that the environmental impact of deploying DG be understood. For fossil-fired DG technology, there are 2 key areas of concern: *(a)* NO_x and carbon monoxide (CO) on local /regional air quality and *(b)* greenhouse gas emissions (primarily CO_2) on global climate change.

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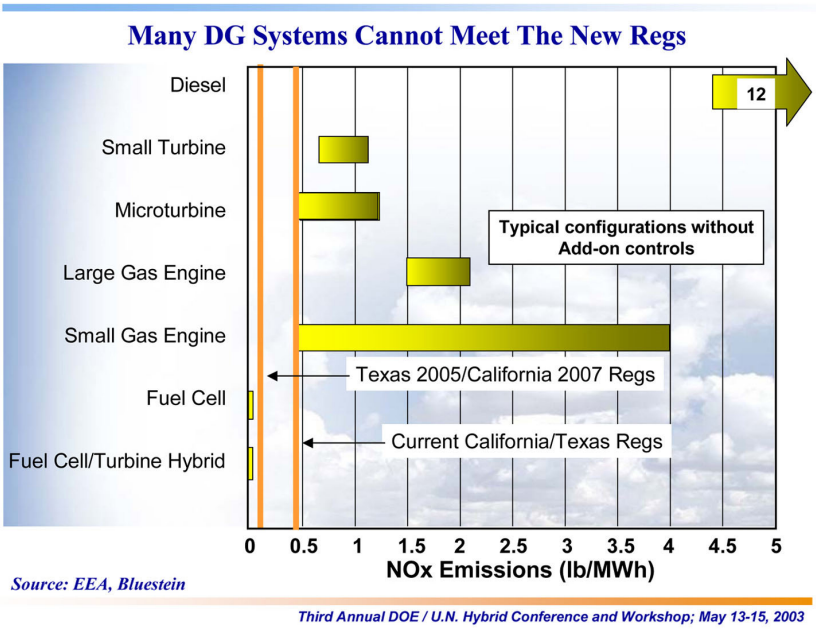
Significance/Potential Impacts



Because DG is located near the customer and emissions are close to ground levels, it is possible that the environmental impact of emissions from DG compared to the same emissions from central generation could be more significant. The trend toward increased use of DG also has the potential to undercut air quality gains for NOx emissions and other pollutants achieved by central power plants. To avoid this, cleaner DG technologies must be deployed, and the more polluting technologies carefully regulated. There are currently no uniform, achievable national air emission standards for DG. Some states plan to implement more stringent regulations for the amount of emissions allowed from DG units in the near future. Fuel cells are the only technology currently capable of meeting proposed more stringent air pollution regulations. Unfortunately, their high capital cost makes them uneconomical for most applications. DOE's Solid State Energy Conversion Alliance (SECA) research and development program is addressing the issue of cost reduction.

How NETL/SCNG Is Addressing the Issue

Technology Solution

In response to two key energy and environmental initiatives: The Clear Skies Initiative and the Global Climate Change Initiative, SCNG is developing cleaner DG technologies (fuel cells, turbine, advanced reciprocating engines). SCNG expects that the low emissions and high efficiency of these technologies will provide technical solutions that mitigate any negative impact of DG on the environment.

Policy Solution

SCNG initiated a one-year study, starting in July 2003, to determine the environmental impact of DG technologies. In this study, a capacity dispatch model will be employed to predict market penetration of currently available DG technologies in a competitive market place at various DG costs and for several fuel price scenarios. SCNG's DG technologies will be added to the mix, and the two cases will be compared to determine how pollutant emissions are affected.

The goal is to provide regulators and policy makers with information that will contribute to the development of strategies and policies that will encourage the use of clean DG. The results will also validate the cost and performance goals set for SCNG's DG technologies ensuring that public health is protected while at the same time providing for the Nation's future energy needs.

Relevant Data in the Literature

As part of this effort, a literature review was conducted to identify relevant information about DG and its environmental impact. The information obtained is being used in the detailed modeling and analysis to quantify emission rates and air quality based on predictions of DG market penetration.

DG & Environment Literature Study Report http://www.netl.doe.gov/scng/policy/refshelf/istributedGenerationSurveyTaskSummary_rev1.pdf

DG & Environment Literature List http://www.netl.doe.gov/scng/policy/refshelf/Survey_Results.pdf