Future of DG

Electric capacity requirements in the United States are projected to increase by over 2% annually. Almost $180 billion in new power generation assets may be needed by 2010 to meet the growing consumer needs for electricity. The Environmental Protection Agency (EPA) and the United States Department of Energy (DOE) have committed to doubling the U.S. share of electricity generated by DG by 2010.

According to the San Diego Regional Energy Infrastructure study, all large non-nuclear generation plants serving the San Diego region will be retired by 2015. Therefore, more than 1,600 MWs of generation will be required just to replace the existing systems.

All new power generation systems will be required to have enhanced environmental performance increases. Public policy, reflecting concerns over global climate change and pollution, is providing incentives for DG that offer high efficiency and use of renewable power generation technologies. DG may be able to provide the answer.

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SDERC

Distributed Generation

San Diego REGIONAL ENERGY OFFICE

Technology Description:

Distributed generation (DG) is defined as "electric generation connected to the distribution level of the transmission and distribution grid usually located at or near the intended place of use." Simply put, it is producing electricity close to where it is consumed.

It is different than the traditional model of electric power generation and delivery which is based on construction of large, centrally located power plants. Central plant power is brought to the user through the power grid.

DG Technologies:

DG technologies can either be renewable fueled or fossil fueled.

Renewable Fueled DG

- Photovoltaics (PV)
- Wind
- Digester gas
- Landfill gas

Fossil Fueled DG

- Internal Combustion (IC) Engines
- Microturbines
- Fuel Cells
- Gas Turbines

Distributed Generation

Advantages of DG:

Distributed generation offers a variety of value-added solutions:

- Cost-effective source of new peak demand power.
- Improves power quality and reliability (voltage support, source of reactive power, and power factor correction).
- Reduces energy ($/kWh) and electric demand ($/kW) charges.
- In combination with a combined heat and power (cogeneration) application, is a source of energy-efficient thermal energy.
- Reduces pollutant emissions.
- Is a potential source of high-reliability power when coupled with uninterruptible power supply (UPS) systems.
- Increases self-reliance as it is a potential source of emergency or standby power.
- Allows potential deferral of new capital investments in transmission and distribution (T&D) systems for the utility.
- Reduces T&D electrical line losses for the utility.

Strategies for Deploying DG:

Self-generation:
Self-generation refers to clean distributed generation technologies - installed on the customer's side of the utility meter to provide electricity for a part or all of a customer's electric load.

Micro-grid:
An electrically isolated set of generators that supply all of the demand of a group of customers. Advantages include:

- The ability to provide service where there is no utility.
- May have a lower cost than the existing utility service.
- Increase energy efficiency through combined heat and power.

Power Parks:
High-tech industries like Internet server farms and computerized banking systems demand a much higher reliability than currently provided by electric utilities. Power parks are an alternative. They may include uninterruptible power supplies, such as battery banks, ultra-capacitors, or flywheels. They typically include an on-site power source to increase reliability.

Operational Strategies:

DG strategies can include Combined Heat and Power, Standby Power, Peak Shaving, Grid Support, and Stand Alone (Grid Isolated) technologies.

Combined Heat and Power (CHP):
CHP systems recover waste heat for use in meeting a thermal load, such as domestic hot water needs for space heating or laundry. Recovering and using waste heat makes CHP systems more cost effective, with a better return on investment and more efficient use of scarce natural resources.

Peak Shaving:
Power costs fluctuate hour-by-hour depending upon demand and generation availability. These variations are converted into seasonal and daily time-of-use rate categories such as on-peak, mid-peak, and off-peak. Customer use of DG during relatively high cost on-peak periods is called peak shaving and can be used with Combined Heat & Power to improve economics of operation.

Grid Support:
The power grid is an integrated network of generation, high voltage transmission, substations, and local distribution. Strategic placement of DG can provide system benefits and may reduce the need for expensive upgrades.

Standby Power:
This is for customers who cannot tolerate interruption of service for either public health and safety reasons, or where outage costs are unacceptably high. Stand-by generators are installed at locations such as hospitals and manufacturing facilities.

Stand Alone:
Grid isolated DG isolates the user from the grid either by choice or circumstance, for example, where electricity is needed in a remote location. Stand Alone DG in remote locations can be much less expensive than building new transmission and distribution lines.