With the drive for ever-greener energy in full force, cogeneration, or combined heating and power (CHP), systems are gaining in popularity in building design due to the reduced environmental impact when compared with conventional, stand-alone methods for heating and powering buildings. Designers of residential apartment blocks around the world are implementing CHP systems to minimize energy loss through escaping heat and reduce their expenditure on utility power for additional heating systems.

In many developed economies, burning natural gas to generate electricity is more cost-effective than energy supplied by the utility grid. Many properties use gas-powered generators in the basement of the block to provide heating and hot water, which is sent upwards through a network of pipes to a heat exchange on the roof, heating the living areas and water as it moves through the structure. However, captive power plants generate electricity as well as heat and this can be harnessed to power the building for lighting, telecommunications systems and appliances, amongst other items.

Using the by-product of one energy generation method as the fuel for another enables property developers to deliver all the home comforts associated with up-market residential and commercial blocks at a fraction of the cost of obtaining power and heating supply from alternate sources.

**A new application**
IntelliGen, a supplier of computer-aided process design technology based in New York City, provides its property developer customers with cogeneration systems that utilize a combination of both utility power and power generated on site by the organisation itself. IntelliGen’s cogeneration system uses natural gas powered generators to offset (real) power demand from utility.

In this application, at a residential apartment block in New York, incoming utility is monitored and regulated such that, regardless of building load, the incoming supply is maintained at a constant 30 kW, the minimum level required by the utility. Any additional load is offset or absorbed by the cogeneration installation. For example if there is 150 kW of building load, generators will supply 120 kW on top of the utility-supplied 30 kW.
The application utilizes two of ABB’s PCS100 Static Frequency Converters (SFC) as a means of regulating the building load, as seen by the grid, to a constant 30 kW with additional power factor correction. As building load varies, the PCS100 SFCs operate in constant power mode at a level set by the cogeneration system’s Programmable Logic Computer (PLC).

The PLC measures the incoming utility supply and regulates this to 30kW by sending (real and reactive) power references to the PCS100 SFC systems. The PCS100 SFCs then inject kW and kVar power back into the grid to offset building load accordingly. The electrical energy is fed back onto the utility grid in constant power mode such that regardless of building load, only 30kW of load is sourced from utility.

The installation consists of generators capable of sourcing up to 150 kW each, and two PCS100 SFC systems rated at 250kVA each. Other installations are now in the planning stage which consist of up to five PCS100 SFC systems and the associated generators for a single application. The ability to accurately share total load (across multiple SFC systems) in a stable manner is another PCS100 feature that enables system integration of this complexity.

ABB’s PCS100 SFC product was chosen as the ideal solution to meet IntelliGen’s requirements due to the comprehensive technical features of the unit, along with high efficiency rating and a reputation of high reliability. ABB’s installation technical experts continue to work with IntelliGen to optimize the operation of the overall installation and take advantage of the functionality provided by the PCS100 SFC platform.

The concept of cogeneration itself is not new, however this application provides some valuable additional features that are only possible due to the technology and capability of the PCS100 platform. High efficiency and the ability to tightly regulate both real and reactive power as seen by the utility are key differentiators of ABB’s PCS100 SFC product.

Uninterruptible power
A feature not yet activated in this installation (but designed for) is the ability to operate in island mode whereby the cogeneration system will continue to fully support building load in the event of loss of utility power. Ultimately the system will also be able to export power out of the building too, should such a function appeal to the utility company.

Eventually a 30 kW minimum utility supply limit will be introduced wherever a cogeneration system is in use. IntelliGen’s overall goal is to provide a scalable turnkey solution to suit different end user requirements, and the PCS100 platform is well suited to achieving this.

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