The Feasibility of Re-Powering KeySpan's Long Island Electric Generating Plants To Meet Future Energy Needs

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INTRODUCTION

The existing Keyspan steam electric plants can be grouped into three categories by size; 100MW, 175MW and 375 MW. The facilities within these categories are essentially identical, each using turbine-generators manufactured by General Electric. In light of the continued growth in demand for electricity on Long Island and the difficulties in licensing new greenfield facilities and providing transmission interconnections, these older, less efficient plants will continue to remain in service for the foreseeable future. This is the case whether they are re-powered or simply operated in their present configurations. To ensure that these existing plants operate reliably and are available during the periods of highest demand for electricity, KeySpan should continue to provide each of these facilities with the appropriate maintenance and repair for "life extension".

The re-powering of each of these older units entails the abandonment or removal of the boiler and the integration of modern combustion turbines and heat recovery steam generators with the existing turbine generator. This fairly straight forward and well proven "combined cycle" technology uses the exhaust gases from combustion turbines in heat recovery steam generators to operate the turbine generator carried over from the existing plant. The output from the existing generator is combined with the generation from the new combustion turbines. As such the total output of the converted unit is about two and a half to three times the original nameplate capacity, depending on the specifics of the facility converted. The nearly doubling in efficiency of the re-powered unit as compared to the existing unit comes from the fact that the exhaust from the combustion turbines, which normally would be a waste product, is utilized to make the steam used by the existing turbine–generator. In addition to the turbine generator many other components from the existing unit are retained, including the cooling system.

In addition to re-powering the existing steam electric plants, it would also be possible, as natural gas becomes available, to convert the existing 240 MW simple cycle combustion turbines at the Wading River (Shoreham) Site to combined cycle.

The environmental benefits of re-powering are compelling. Improvement in efficiency from about 35% to close to 60% in the conversion of fuel to electricity can be achieved. The resulting reduction in fuel burned for a given amount of generation will be significantly less nitrogen oxides and carbon monoxide emitted. Modern combined cycle units have state of the art emission control systems in contrast to the older steam electric units with no such controls. The re-powered units achieve emission reductions immediately since they replace higher emitting, older units that would likely continue to operate in an expansion program of new greenfield projects.

To support the contention that the re-powering of the existing KeySpan steam electric facilities and the Wading River Combustion Turbines is a very favorable option to building new generation at greenfield sites, the following site specific conceptual designs were developed to examine the feasibility of re-powering at each existing power station:

CONCEPTUAL DESIGN FOR E. F. BARRETT

The Island Park site for the E. F. Barrett Steam Electric Plant is large enough in size and is configured in a way to make it one of the best candidates for combined cycle re-powering. A conceptual design has been developed in which, initially, one of the two 175 MW units is converted to combined cycle operation. Two new 175 MW combustion turbines would be integrated with the existing steam turbine generator to produce 525MW or 350 MW more than the existing unit. Figure 1 is a heat balance diagram showing the significant operating parameters including heat rate (amount of energy required to produce a KWH of electricity), fuel