

Lessons Learned From the 1998-2004 US Pirelli-Detroit Edison Cable Demonstration

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Abstract—American utilities paid close attention to the possible application of superconductivity to power deployment throughout the decade following the Bednorz-Mueller-Chu discoveries of superconducting materials (HTSC) eventually operating above the boiling point of liquid nitrogen. Several previous attempts (1960s and 70s) to demonstrate power applications, especially focusing on cables, had been carried out using “low” temperature (liquid helium) materials successfully applied to hadron colliders, magnetic resonance imaging (MRI), and laboratory instrumentation; however, no serious attempts to commercialize such efforts were undertaken. We focus on the first project in the United States to explore the practicalities, both technical and economic, to attempt utilization of HTSC cables in an operating utility. This challenge was initiated by Pirelli Cables, then and historically the major supplier of underground transmission cables in the US, and Detroit Edison, the largest Michigan municipal electric utility, with technical advisement and assessment from the Electric Power Research Institute and the Los Alamos National Laboratory. American Superconductor was chosen by Pirelli to be its wire supplier. It is important to point out that the partnership was driven by private initiative, and not by state or federal subsidies. The “business cases” were 1) for Pirelli the development of “triple capacity” ac transmission cables deploying current rights-of-way unique to US utilities, and 2) for Detroit Edison the expectation of a possible load doubling in central Detroit to service commerce expansion arising as a side effect of emerging legalized gambling in nearby Windsor, Ontario. Although the project encountered technical difficulties during cable testing at a Detroit Edison substation, these were minor in nature, and the project did not go forward as result of deregulation (breakup of Detroit Edison) and the decision by Pirelli that projected return-on-investment, not only in the United States, but internationally, would be too small to pursue. Although the American electricity enterprise is based on the concept of investor-owned private utilities (> 160), as opposed to Europe, these “lessons learned” may prove useful as the European Union continues its mostly government-sponsored, and well-focused, initiatives to bring the benefits of HTSC “to the people.”

Keywords (Index Terms) — High-temperature superconducting cable, utility, rights-of-way.