A utility client requested IMCORP to proactively assess their cables in a downtown area feeding a convention center. A nationally televised event was coming to town so naturally the reliability of the downtown power grid and avoiding an image-damaging power outage was of utmost importance.

The IMCORP Factory Grade® technology provided a meter-by-meter profile and pinpointed many issues with the cable systems feeding the convention center. The utility was surprised with how many components did not meet the cable and accessory manufacturers’ minimum performance standards. While the utility was greatly concerned and intended to make repairs prior to the upcoming event, they decided to get a second opinion with a different type of test called a VLF tan delta (tangent delta, TD) test. To the utility’s surprise, the VLF TD test reported everything was okay with the cable systems. Not completely understanding the difference between the TD and Factory Grade® test results, the utility extracted some substandard components pinpointed by the Factory Grade® technology and sent them to two independent laboratories.

The pictures below are a sampling of the issues found during the laboratory dissection and root cause analysis. Many severe issues were found in various states of deterioration with most originating from installation errors. The dissections provided evidence including insulation surface erosion, contaminating fluids, jagged/non-radial semicon cutbacks, and electrical (carbon) treeing more than halfway through the insulation. All of these issues were associated with substandard partial discharge (PD) activity! Through this experience, the utility learned 5 lessons. Unlike a Factory Grade® PD test, VLF TD tests: (1) cannot locate defects, (2) only detect issues associated with conduction and losses which, may be more common in legacy paper insulated (PILC) cable systems but are rare in modern solid dielectric (plastic and rubber) systems, (3) are not effective at finding installation issues and are likely to provide a false sense of security to installers, (4) can only provide an average measurement for the whole cable system and even gross aging defects such as the electrical tree (carbon path) in the right most picture below cannot be detected, and (5) cannot be calibrated in the field so the results are inherently unreliable.

Not only were there significant educational benefits to this study, the utility’s experience with the power grid is a positive story too. The utility made numerous repairs, placed the system back in service, and the nationally televised event took place without incident. In fact, the utility claims they have had no outages 6 years after the event.