



Nova Energy Specialists, LLC

Providing Innovative Energy Consulting, Analysis and Training Services

BIOGRAPHY FOR:

PHILIP P. BARKER

FOUNDER AND PRINCIPAL ENGINEER

NOVA ENERGY SPECIALISTS, LLC

Summary of Experience

Mr. Barker has worked as a consulting engineer in the electric power industry for over 30 years. His experience includes 14 years with Power Technologies, Incorporated (PTI), 3 years with the Electric Power Research Institute's Power Electronics Applications Center (EPRI PEAC), and 15 years leading Nova Energy Specialists, LLC, a consulting firm he founded providing analytical services related to power systems, distributed generation, and energy technology research.



PTI

From 1987 until 2000 he was employed by PTI in Schenectady, NY where he distinguished himself by leading studies in the areas of power distribution, power quality, distributed generation and lightning protection. He was the lead project engineer for a study that statistically characterized lightning surge waveshapes on overhead distribution lines based on measurements performed around the country. He was the PTI project leader responsible for development of a Rocket-Triggered Lightning Test Center in Florida. This center, which continues operation to this day under University of Florida management, has been featured internationally on several televised science documentaries including PBS and Discovery Channel. He studied the effects of lightning surges on overhead power lines, underground cables, distribution transformers, and lightning surge arresters. His extensive work also included power system modeling with EMTP to study the behavior of transient overvoltages on underground cables and overhead power lines. He worked with various utility clients to evaluate lightning protection practices including arrester sizing, placement, grounding requirements, and line insulation requirements needed to achieve specific levels of line flashover mitigation and reliability. He received a patent on a control system for high speed cameras that automatically record lightning strikes to power lines. The camera system was used in conjunction with fault recorders to study flashovers of operating utility distribution and transmission lines.

In addition to lightning, Mr. Barker worked in several other areas. He studied high impedance distribution system faults, measuring the harmonic spectrum and high frequency noise bursts associated with conductor contact with dirt, asphalt, concrete, grass and various types of trees. He evaluated the effectiveness of a prototype high impedance fault detecting relay device, performing field tests with arcing downed conductors energized at 13.2 KV. Mr. Barker also led power quality (PQ) monitoring projects measuring power waveforms and conditions associated with interruptions, voltage sags, voltage swells, voltage flicker, voltage regulation variations, harmonics, and switching surges. The impact of these disturbances on loads and power equipment was evaluated and solutions applied. Mr. Barker performed studies that coordinated the measurement of PQ conditions at multiple locations (customer facilities, distribution feeder circuits and distribution substations) tracking the origins of disturbances and identifying solutions. Solutions such as SVC units, upgraded feeder configurations, specialized reclosing and protections schemes, custom power devices, and other upgrades were considered as utility side solutions where appropriate. On the customer side, UPS devices, static switches, and other approaches were investigated based on their suitability. In the area of distributed generation, Mr. Barker helped PTI create new business activities in research and consulting. He performed studies that investigated the use of strategic placement of PV and other forms of distributed generation for T&D system support. He promoted the development of improved interconnection strategies for DG that would reduce system impacts. He developed an innovative 125-kVA photovoltaic power conditioning device that lumped into a single unitized service entrance connected device a PV inverter, full-building UPS and the needed utility interface relaying. While at PTI he developed and taught distributed generation courses as well as several other training courses related to distribution systems, lightning protection and power quality.

EPRI Power Electronics Application Center (2000-2003)

In 2000, Mr. Barker joined the Electric Power Research Institute Power Electronics Application Center (EPRI PEAC) which is based in Knoxville, Tennessee. He established a new branch consulting office of EPRI PEAC in Schenectady, NY. The office of up to four engineers, which was under his direction, performed power system studies in topic areas that included reliability, power quality, distributed generation, renewable energy, bulk power plant interconnection, and lightning protection. During his employment with EPRI PEAC he performed studies evaluating the application and technical feasibility of distributed generation technologies including photovoltaics, wind turbines, combustion turbines, advanced-reciprocating engines, small-scale hydro, and emerging small-scale energy storage concepts. He investigated the implementation of these technologies in stand-alone, micro-grid, or utility-grid connected configurations applied as base-load units, peak shavers, power quality/reliability enhancers, and cogeneration plants. He evaluated the economic performance of various distributed generation, cogeneration and heat recovery concepts, and studied the transmission and distribution system support offered by distributed generation, including the impact on voltage regulation, power system losses, overcurrent protection, and power quality. He investigated the technical and economic feasibility of various energy storage technologies for power system support applications. These included small scale pumped-hydro, batteries, ultracapacitors, advanced flywheels, and compressed air energy storage. He complemented his previous training experience by developing and teaching various training courses in topics related to transmission, distribution, and distributed generation.

Nova Energy Specialists, LLC (2003 to the Present)

Mr. Barker founded *Nova Energy Specialists, LLC* in late 2003 and has served as its director and principal engineer since then (for 15 years). Nova is a consulting firm specializing in power distribution, distributed generation, and energy technology consulting. Nova's client base includes electric utilities, manufacturers, and energy research organizations. Through Nova, Mr. Barker has completed numerous distributed generation interconnection and scoping studies for utility clients ranging from small projects under 1 MW up to large systems approaching 20 MW in rating. Technology experience includes PV, wind, hydro, ICE, and small CT units. Analytical areas include overcurrent protection, voltage regulation, voltage flicker, harmonics, resonances and transient overvoltage, islanding protection, and effective grounding compatibility. Mr. Barker utilizes a variety of techniques for assessing the power system impacts of DG including EMTP modeling methods. In addition to interconnection studies, Mr. Barker has performed research projects delving into various strategies for deploying distributed energy resources, distributed energy storage, advanced power system architectures and power grid enhancements needed for 21st century power systems. For example, he participated in a study for the U.S. DOE to evaluate power system design upgrades needed for large scale penetration of photovoltaic energy sources on the U.S. power system. He also performed several studies to evaluate future potential DC power system architectures that could be used to enhance system reliability and power quality. Mr. Barker's most recent work has included various interconnection studies of multi-megawatt scale PV facilities, application of energy storage to filter PV power fluctuations, effective grounding studies of DG facilities, participation in the design/development of a 10 MW microgrid and investigation of several innovative techniques to help mitigate transient overvoltage caused by distributed generators. He has also been assisting several utilities in the development of interconnection strategies and policies for DG at the state PUC level.

Mr. Barker currently offers through Nova Energy Specialists several engineering seminars and short courses related to power distribution, distributed generation, power quality and lightning protection. Over the course of his career he has instructed well over 2000 engineering professionals in these topic areas.

Professional Society Activities and Education

Mr. Barker is a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE). He participated in the development of the original IEEE-1547 distributed generation interface standard. He helped several states in their development of first generation DG interconnection requirements. He contributed to the IEEE C62.22-1997 metal oxide surge arrester application guide, and participated in the development of both the IEEE transmission and distribution lightning protection standards (IEEE Standards 1243-1997 and 1410-1997). Mr. Barker received the IEEE PES Excellence in Power Distribution Engineering Award in 2010. He received his BS Degree in Electrical Engineering from Clarkson University, Potsdam, NY in 1985 and his MS Degree in Electrical Engineering with a concentration in Power Systems from the same university in 1986. He is the author of 36 technical papers and articles.

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