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K1: Welcome & Opening Keynote

"Power Electronics, Smart Grid and Grid Modernization"

As we move forward to transform the current grid from electrical and electromechanical to electronic, electrical, and electromechanical, power electronics will bring a vast reservoir of knowledge in electronic and active control to bear in integrating renewable energy into utility grid. Specific areas where power electronics will make a difference will be discussed in detail. The role of structured microgrids will also be presented as the fundamental building blocks for future grids. Batteries are the last missing piece in grid modernization. Together with solar and wind, it is quickly becoming the preferred peaking reserves for many operators with huge technical and economic benefits for both the utility industry and system operators. Substation modernization will transform the way we deliver electricity in rural and remote areas.

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L24: Lunch

K2: Keynote

"Lessons learned from the July 2019 Ridgecrest, CA earthquakes, changes how we determine seismic risk in buildings"

Active fault mapping in the Ridgecrest/China Lake area (Roquemore and Zellmer, 1986), was conducted with 1:12,000 scale low sun angle aerial photography and field mapping. Obvious traces of the Little Lake (LLF) and Airport Lake faults (ALF) were plotted on 1:24,000 scale maps and were later (1989) incorporated into the California Alquist-Priolo earthquake fault zone maps, typically used for construction planning. The LLF and ALF faults experienced earthquakes (E. Hauksson, L. Jones, J. Mori, S. Hough, G. Roquemore, 1995), accompanied by surface rupture, in 1982 (M4.9), and in 1995 (M5.4 and M5.8). Earthquake hazards planning in Indian Wells Valley (IWV) has been centered on the LLF and ALF.

On July 4th, a foreshock magnitude 6.4 occurred at the south end of IWV along a short EW trending left-slip fault. On July 5th, a mainshock occurred within IWV with a magnitude of 7.1. The M7.1 event was along a previously unrecognized fault to the east of the LLF and ALF. Unlike the segmented traces of the LLF and ALF, this new rupture was linear and fairly continuous. The 2019 M7.1 Ridgecrest Earthquake was California's largest in more than 20 years and caused $1 Billion in damage. Faults with the most obvious surface traces may not be the ones that produce the next damaging earthquake.

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S6: Water Resources Management

K3: Keynote

"Challenges of the Connected Vehicle Revolution"

There is currently much on-going activity in the research and design of systems to enhance the safety of vehicular traffic on roads and highways. These include vehicle-to-vehicle based and vehicle-to-infrastructure based electronics systems with extension to personal devices. These systems need to work collaboratively with acceptable latencies in an intelligent and reconfigurable network environment. This is characterized by multiple localized and dynamically changing motion control loops which include each individual vehicle driver (and pedestrian). Systems will comprise a mix of existing and new technologies such as laser, imaging, computer vision, radar, cellular, WiFi, GPS, millimetric Waves, and others. A range of products and systems will compete for market entry from diverse developers and nations and the need for standardization is paramount. The behavior of an autonomously driven vehicle and how it could indeed improve accident rates compared to an intuitive human under diverse conditions is a contentious issue. The cost of failure is high as human life is in the loop. Replacing the intuition-driven human with multiple pre-programmed computing engines and sensor and actuator platforms will present a significant system and software engineering challenge. Not least because the transition from human to computer will not occur overnight.

A significant challenge exists in validating real time software-driven prototypes, final systems, and maintaining performance while in operation. The major players in this traffic evolution will be the government (legislative entity), the insurance companies (risk managing entities) and vehicle manufacturers and their technology partners (product developers). This will create new watersheds in the industry. The customers are vehicle drivers of all kinds: automobiles, trucks, tractors, vehicles with trailers, two-wheeled motorized vehicles, bicycles, and pedestrians. This presentation overviews some of the challenges and offers some directions for this burgeoning industry. A spotlight will be shone on lessons learnt from the aviation industry.

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Pomona, USA)

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L25: Lunch

K4: Keynote

"Orbit Options for Near-Term Space Solar Power"

Studies of space solar power (SSP) for the commercial grid have usually considered transmitting power from geostationary orbit (GEO), via microwaves at frequencies below 10 GHz, where the atmosphere is relatively transparent. Due to beam divergence from that distance at such frequencies, system sizes must be large, leading to power levels of 1000 MW or more. However, the scale of the systems, and the need to develop low-cost routine access to space, make competing with traditional energy sources challenging in the near-term. More recently, studies by the US Naval Research Laboratory have considered SSP for nearer-term niche uses in remote locations. At such locations, providing power by conventional means can be challenging. Many remote locations are typically powered by generators, which depend on fuel delivered at great cost, often through hazardous environments. Power requirements for such users range from a few hundred kilowatts to several megawatts. Furthermore, some remote facilities are at high latitudes, which are inaccessible from geostationary orbit. This presentation will consider alternative orbits. Examples of such orbits are highly inclined orbits, which may be sun-synchronous, or have a repeating ground track, or both. In addition, elliptical orbits may be considered which have relatively long dwell times over ground sites that are beneath their apogee. Since non-GEO orbits do not remain over their intended ground sites, systems or constellations, of satellites must be designed, in which beam handoffs can provide a given ground site with power much of the time, while making maximum use of the satellites as multiple satellites serve multiple ground sites.

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