

## Energy Automation, Sustainability and Digital Lighting Technology – Innovator and Entrepreneur

Successful achievements throughout more than 40 years of product innovation in automation, energy, lighting, multi-media and information technology. Current focus on Energy Conservation, Intelligent MicroGrids, Lighting Automation and Sustainable systems. Proven ability to create, communicate and commercialize new concepts and business strategies.

Conceived, developed and manufactured technology that has enjoyed significant worldwide market impact, including:

- Developed and patented energy conservation and automation systems for digital control of lighting in 1972-75;
- Developed and patented entertainment systems combining automated lighting and spatially-distributed audio systems that helped drive the worldwide “discotheque music phenomenon” in the 1970s and 1980s;
- Developed and installed computerized interactive building lighting automation in the 1975-77;
- Conceived and led the launch of first US video music network “StarStream” , through a partnership with Billboard Magazine in 1977-80;
- Developed and produced a series of advanced building automation, energy and lighting management and communications systems throughout the 1970s, 80s and 90s;
- Since the mid-1990s, Mr. Silverman has focused on developing internet-based energy and grid automation technology utilizing advanced M2M communications and adaptive artificial intelligence techniques for energy consumers and community utilities, to deliver mass-deployable user-friendly software, applications and system to conserve energy and water.

### Energy Automation Technology

Led co-development effort with Raytheon Co. for Demand-side Energy Management technology during 1993-97 at LightMedia Corporation. The resulting ECS-2000 system was used by utilities including Central and SouthWest, Southern Co., Detroit Edison and others, as well as the Wisconsin Bell Div. of Ameritech.

This work was continued with the Electric Power Research Institute (EPRI) in 1997-2000, in the Energy Network Computer (“en|c”) project, a collaboration between EPRI and Oracle’s Network Computer group. Demonstration systems were fielded with several utilities including PECO and DTE Energy. Other non-utility projects during this period included the design and engineering of integrated systems for the estates of the co-founder and former Chairman of Apple Computer, and for the Seattle home of a co-founder of Microsoft.

Mr. Silverman founded Broadband Energy Networks Inc. in April 2002 to develop commercial technology leveraging the convergence of broadband networks and electricity distribution. GRIDPLEX NETWORKS LLC was formed in 2009 to apply Broadband Energy’s web-based, customer centric automation to “Smart Grid” and “Intelligent Micro-Grid” deployments.

Several patents and copyright applications are currently pending that cover recent development work in the Internet, communications, energy automation and information technology fields.

A visual overview of his professional career is available on the web at [www.lawrencesilverman.com](http://www.lawrencesilverman.com).

### Professional background

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| 1971-1977 | <b>Digital Lighting Corporation</b> , NY, NY – founder and President – interactive lighting control and automation systems. Technology acquired by Lightolier Inc. (Div. Genlyte) in 1977 as the foundation for Lightolier Controls, now a Division of Philips BV.   |
| 1977-1979 | <b>Starstream Productions, Inc.</b> , NY, NY – founder and Executive Producer – first US video music network – partnership with Billboard Magazine to develop worldwide video music network; precursor to MTV in 1982.   |
| 1980-1993 | <b>Transtek International Ltd.</b> , NY, NY, London UK and Mexico City Mexico – founder and President – developer, systems integrator and building system installation for large-scale international projects in hotels, conference centers and cruise ships worldwide. Full-scale integrated building communications and automation systems in over 40 major projects, many of which used automation technology developed by Mr. Silverman. |
| 1992-2002 | <b>LightMedia Corporation</b> , Upper Darby PA – founder & CEO – systems and applications for automation in buildings and homes; energy management systems and software ( <a href="http://www.lightmedia.com">www.lightmedia.com</a> ). Technology licensed to GRIDPLEX NETWORKS LLC.  |
| 1999-2001 | <b>Buyline.net, Inc.</b> , Upper Darby PA – founder and CEO; Chief Strategist –B2B application services (ASP) delivered over the Internet. Acquired in 2000 by a Washington DC investment firm.  |

- 2002-2008      **Broadband Energy Networks Inc.** – founder and President – interoperable energy and information systems to manage energy and other resources – see [www.broadbandenergynetworks.com](http://www.broadbandenergynetworks.com)
- 2009-date      **GRIDPLEX NETWORKS LLC** – Chairman and Chief Scientist – automated web-based interoperable “EnergySmart” software and web-supported network applications for **Conservation of Energy and Water to empower Sustainable Green Communities Worldwide.** [www.gridplexnetworks.com](http://www.gridplexnetworks.com).
- 2012-date      **ZUMO ENERGY LLC** – Chairman and Chief Scientist – advanced technology LED Lighting equipment and systems incorporating “EnergySmart Inside” automation software and controls provided by GridPlex Networks.
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**Education:**      Graduated Phillips Exeter Academy, Exeter New Hampshire in 1963; entered MIT at 16 in Physics and Computer Science/Cybernetics (1963-67). MIT varsity wrestling team – New England Championship. Pursued supplemental studies in electronic media, visual arts and communications at the New School University in NYC 1968-69.

**Personal:**      Married to Nancy Lea Buxton of Charlottesville VA since 1974. Two children: Katharine and Alexander.

### **Special Expertise**

- **Technology Development and Manufacturing** - machine-to-machine communications and networking, embedded monitoring and control automation systems and software
- **Building Control and System Interoperability** – integration of new automation control and communications technology with legacy systems
- **Consumer Products and Systems** – energy information portals and consumer-centric conservation applications
- **Advanced Meter Designs** - standards and communications for innovative smart meters and related equipment
- **Integrated Intelligent Systems** – including extension of “Smart Grid” and integration of “Intelligent Micro-Grid”, DG and DR, and extensions of “Smart Grid” technology to enable end-users and sustainable communities to reduce consumption of electricity, water, natural gas and consequent carbon emissions
- **Problem-solving** – solutions to complex problems requiring innovative cross-disciplinary approaches to energy conservation and sustainability
- **Development of intuitive User-Interfaces** incorporating Artificial Intelligence and novel business logic and strategies.

### **Contact:**

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## **Detailed Professional Background**

### **Digital Lighting Corporation, NY, NY (1969-77), Founder & President**

Founded company, incorporated in 1969. Developed and patented a computerized multimedia lighting and energy control system, installed in high profile projects throughout the US. Systems used in architecture and design, film, theater, entertainment and building energy management. Operated 40-person manufacturing facility for company's products, including UL testing and certification. Established distribution and rep network, as well as OEM programs with major lighting manufacturers. Digital Lighting originated the concept for the LyteMode products and systems that are sold today by Lightolier (Div. Genlyte-Thomas) as their premium architectural lighting control system. Sold company in 1978 to Lightolier-Genlyte; operates today as Lightolier Controls, a Division of Philips Lighting.

Co-holder of US Patent 3,869,699 issued Mar. 4, 1975 for digital lighting automation and control systems.

**Digital Lighting products** — Design and development of modular commercial, architectural and entertainment lighting control products and systems distributed internationally.

Products designed and manufactured by Digital Lighting under Mr. Silverman's direction included:

- **PDC 6x9 Programmable Lighting Controller** – Interactive Control System User Interface (UL and NYC listed)
- **PDC – D2.4kW Programmable Dimmer Control** - power module and rack (UL and NYC listed)
- **LM System II Programmable PreSet Controllers** – including preset mastering system, remote preset panels, special effects panels, assignor panels and automatic inputs from timeclocks, photocells and sensors
- **PDC-3 System** – integrated programmable control system and power unit (UL). Sold by Altman Stage Lighting as "Galaxy" and by Swivelier as "StarTron".
- **Autofade** (for Lightolier) – programmable control unit – retrofit lighting automation product for Lightolier's industry-leading track lighting system. First product in what became Lightolier Controls
- **Video Replay and Display System** – Scoreboard control system for Cleveland Stadium (Cleveland OH) in co-development project with GE Lighting. Digital Video-to-Analog computerized lighting control system array used two Digital Equipment PDP-11s in parallel with Digital Lighting 16-level digital dimmers connected to a 20,480 B+W lamp display. Included sensors to adjust display contrast to compensate for brightness of sunshine. One of the first instant-replay scoreboards in the US.
- **LyteMode** – original designs and specifications for the LyteMode programmable architectural lighting control network. LyteMode became the top-of-the-line architectural lighting control system sold by Lightolier Controls (now a division of Philips Lighting).

**Digital Lighting Projects** — Digital Lighting automation technology used in projects in 1971-1977 including:

- **Broadway musicals** — New York City. Custom electronic lighting systems and controls for **Chicago, Pippin, Dancin', Jesus Christ Superstar, Hair.**
- **Independence Hall** — Philadelphia, PA. Automated Light & Sound spectacular for the 1976 US Bicentennial.
- **General Electric Lighting Institute** — Nela Park, Ohio. Computerized lighting and energy management system at G.E. Lighting headquarters, Nela Park, Cleveland OH.
- **Cleveland Stadium Scoreboard** — Cleveland, Ohio. One of the world's first digital video computerized scoreboards capable of instant replays. Automated digital control system to control 22,400 lamps for digital video display 240x80. Collaboration with GE Lighting (1977-79).
- **Windows on the World** — Lighting systems and automated controls for the facilities at the top of the World Trade Center, New York, NY.
- **Tavern-on-the-Green** — Lighting controls and design for the facility in Central Park, New York, NY.
- **Studio 54** — NY, NY. Interactive electronic lighting control system for the most sensational discotheque in the world.
- **Saturday Night Fever** – Robert Stigwood Productions; lighting consultant for original NYC production. Film won Academy Award for Best Actor (1977).
- **Thank God It's Friday** – Columbia Pictures; lighting consultant for Los Angeles production. Film won Academy Award for Best Song (1978).
- **Playboy Club** — Multimedia entertainment systems throughout facility, New York, NY.
- **Hollywood Palace** — Founded and developed concept for multimedia music TV theater & club, LA
- **Lightolier, Inc.** — Design of the LyteMode™ and Autofade™ Architectural lighting control products and systems.
- **Swivelier Inc.** — Design of the StarTron™ Architectural lighting control system.
- **Altman Stage Lighting** – Design of the Altman XE-Series of Entertainment Strobe lighting and Galaxy Lighting Controls.

## Awards

- **Illuminating Engineering Society of North America (IESNA) — Outstanding New Product** recognition from the IESNA in 1974 and 1975, and featured in LD+A, the Journal of the Illuminating Engineering Society
- **Illuminating Engineering Society (IESNA) —** nominated for the 1977 IES Lumen Award, the highest recognition in the lighting industry, for the development and use of programmable lighting automation systems.

## Articles and Publications

- **1972 - Interior Design Magazine**, computerized lighting controls featured in “Home of the Future” special issue
- **1974-1975 – LD+A – Journal of the IESNA** - Outstanding New Products of 1974 and 1975 – Digital Lighting controls
- **1976 - LD+A – Journal of the IESNA** – cover story “An Architectural, energy-conserving electronic dimming system”
- **1976 - Newsweek Magazine**– featured in Nov, 1976 cover story “The Disco Whirl”
- **1976 – Forbes Magazine** – featured in June, 1976 article on “Discomania”
- **1977 - Business Week** – featured in July 1977 Market Observer column
- **1977 - LD+A – Journal of the IESNA** – June 1977 cover story “Lighting Controls program Entertainment”
- **1977 – Interiors Magazine** – cover story on Studio 54 design and lighting
- **1978 – Cleveland Plain Dealer-** “STADIUM FACTS” feature on innovative computerized instant-replay scoreboard

## Industry committees:

- **Illuminating Engineering Society of North America (IESNA)** - Member of the Progress Committee of the IESNA for Electronic Controls from 1975-80.

## **Starstream Productions, Inc., NY, NY (1977-79), Founder & Executive Producer**

**Starstream Video Music Network** — Conceived and developed the world’s first Video Music Network – “Starstream” – established in partnership with Billboard Magazine in 1977. Mr. Silverman was the founder and Executive Producer. Originated and developed the TV video music entertainment format and secured, negotiated and licensed content from record and film companies. Also responsible for the design and development of StarStream<sup>a</sup> music video system, including satellite, stereo synthesis and video playback systems.

Starstream led to the formation of the **MTV Network** by Warner-AMEX in 1981. The **Hollywood Palace** in Los Angeles, which today is the leading entertainment venue for live performances, dance and music-video productions in LA, was originally developed to become the anchor production studio for production of StarStream music videos.

Pioneering Video Music programs produced by StarStream included performances by Rod Stewart, Queen, Blondie, Meatloaf, Village People, Donna Summer and numerous others.

## Articles and Publications

- **1990 - The History of MTV** – StarStream, co-developed as a joint venture with Billboard Magazine, was recognized by author, Tom McGrath, as the first Video Music network in the US, and the precursor to MTV

## **Transtek International Ltd., NY, NY (1980-1993), President**

Large-scale integration of diverse systems and automation controls for international projects in hotels, corporate and convention centers and other public facilities. Projects included design, engineering, specification and supply of energy management, lighting and communications systems.

**1980 Winter Olympic Games** — Lake Placid, New York. Official Consultant Olympic Village.

**Televisa Networks** — Mexico City Studios – Computer Automation Systems for Studios and Productions

**Hotel Fiesta Americana Hotels** — 5-star hotels in Guadalajara, Cancun, Tijuana, Mexico.

**Pemex Tower** — Mexico City, Mexico.

**Sheraton International Hotels** — Mexico City, St. Maarten, Rio de Janeiro, Cancun, Ixtapa

**Hyatt International Hotels** — Gibraltar

**Hilton International Hotel** — Barcelona, Spain

**Scott Paper Headquarters** — Philadelphia, PA

**Pennsylvania State House** — House and Senate Majority Caucus Rooms, Harrisburg, PA

**Franklin Institute Science Museum** — Philadelphia, PA

**Cunard Lines** — Luxury cruiseliners including Cunard Princess, Countess, Sagafjord and Vistafjord

**Nikko Hotel — Japan Air Lines** - Mexico City, Mexico. Award-winning lighting, communications and entertainment systems throughout 40-story market-leading flagship hotel in Mexico.

**The Hollywood Palace** — Hollywood, CA

**Kings Mountain Estate** — Woodside, CA

**QOR Technology Inc.** – the Manufacturing subsidiary of Transtek International from 1985-1991, QOR developed and produced Automated Architectural Lighting Controls. Mr. Silverman designed these advanced automation and control systems that were installed in many Transtek projects listed above. Products developed and manufactured under Mr. Silverman's direction include:

- **LightMatrix™ - DMR 2400x4** – 2kW Digital Dimmer and integrated 10kW Power Control pack
- **LightMatrix™ - PGM 4x4 and REMx4** - User Interface programming and control panel

#### Awards

- **Lake Placid 1980 Winter Olympics** – honorary sponsorship in recognition of design and installation of lighting and entertainment systems in the Olympic Village and special shows to celebrate US Hockey Team victory
- **International Lighting Design** – 1986 **Edwin F. Guth International Illumination Design Assn. (I.I.D.A.) Award of Excellence** - Illuminating Engineering Society and the American Assn. of Interior Designers
- **International Hotel Design Magazine Award** for lighting – 1988 award from the AIA (Am. Institute of Architects)
- **American Society of Interior Designers (ASID) Award for Lighting Design** – 1988 Hotel Lighting
- **Philadelphia Chamber of Commerce - Exporter of the Year** – 1990
- **Pennsylvania Governor's Small Business Award – Exporter of the Year** – 1991
- **Philadelphia 100** – recognition by the Philadelphia Business Journal as one of the Philadelphia region's fast growth companies – 1992
- **U.S. Small Business Administration - "Exporter of the Year"**– PA/MD region 1992

#### Articles and Publications

- **1983 – Designers West Magazine** – feature article on “The Palace” in Hollywood CA.
- **“Best of Lighting Design”** – projects published in the 1992 compendium of best lighting installations from around the world, edited by lighting critic, Wanda Jankowski.
- **1991 LD+A** – Journal of the Illuminating Engineering Society of N. America (IESNA) – cover story on the automated lighting system in the Train Room of the Franklin Institute in Philadelphia

#### **LightMedia Corporation, Upper Darby PA (1992-2000), President**

- **Echelon LON-based Systems designed, manufactured and installed as the original test-bed of the LONWorks technology at the Residence of Founder and Chairman Mike Markkula (also Vice Chairman of Apple Computer), Kings Mountain Project** — Woodside, CA – 1992-94. Design, engineering and development of systems and controls for Mike Markkula, founder of Echelon Corporation and co-founder and former Chairman of Apple Computer. This project provided the original test-bed for the Echelon control and communications technology, and included development of a LONWorks dimming system:
  - **LightMatrix-LON™** – Echelon-based LONworks Integrated Lighting and Equipment preset controls
  - **LON Controls** for curtains, windows and other motorized devices.
- **Neuron-based LONworks Automation Control Systems and Software** — 1992-94. Collaboration with RCA (Div Thomson) that developed an integrated hardware and software platform for interactive home and building automation, hospitality and healthcare. Prototyped TV-based user-interface in collaboration with RCA for use in hotels and hospitals as universal system user-interface through a TV.
- **Ameritech** — Wisconsin Bell – 1993-94. Design and engineering of energy management and control systems using LONWorks™ technology in a Building Automation project to demonstrate remote network control of building systems.
- **Lakeside Residence** — Medina, WA – 1993-94. Development work for the "people-tracking" system, an RF smart card system for the residence of one of the founders of Microsoft, as the primary input to the home automation and control system (not for public disclosure).
- **OpenHouse™** — 1995-96. OpenHouse™ - PC-and-TV-based Integrated broadband Home Information and Control system software for residential gateways - developed as a project with Central and SouthWest electric utility.
- **Utility Demand-side Energy Management Networks** – 1994-97. Led co-development with Raytheon of Energy Management and Communications Systems for electric utilities, the ECS-2000. User-interface and software design team developed a small-scale Energy Management and Intelligent Information System installed in thousands of residences and businesses by energy utilities around the US, including Central & SouthWest (TX) – 800 home and small business DSEM deployment for Automated Demand Response; Detroit Edison Intelligent Link (Detroit MI), Southern Co. (Atlanta GA), PECO (Philadelphia PA) “Utility of the Future” and other projects.

The ECS-2000 Energy Management System delivered control signals, information and messaging over existing electric wiring and documented peak reduction of up to 30% and overall consumer usage by 12-15%. Personally developed the user-interface platform for the Raytheon ECS-2000 User Interface Module (UIM). Managed the overall technology and software development effort. First implementation of consumer-centric “CCC” – the EnergySmart Consumer Choice and Control platform.

**Collaboration with Electric Power Research Institute (EPRI) and Oracle Network Computer Inc. (NCI) Div. — 1997-99.** Conceived, prototyped and demonstrated Universal Gateway™ interface software - BusinessLinc™ and NeXTV™ - Internet-based platforms delivering value-added applications and services for information appliances, aimed at small-to-medium business and homes. Developed business and revenue model to support deployment of services to Internet-based user community. Conceived unique graphical user-interface and navigation system, using the NCI-OS protocol for interactive “thin-clients”, including information appliances and set-top boxes. Patent applications pending on several Internet-based communications, messaging and energy applications included. Concept for Internet-based Information and Commerce Networks explored in demonstration projects with energy utilities around the US, including Detroit Edison, PECO, and Central SouthWest, for residential and commercial use.

#### Articles and Publications

- **1994 - Delaware County Times** – Aug. Business Section feature “Making a House a Smart Home”
- **1996 – Annual Report of the Electric Power Research Institute (EPRI)** – special section on Information Systems and Telecommunications in the electric Industry – “The Energy Network Computer”
- **1997 - Philadelphia Inquirer** – tech.life June 97 - feature article on future of computerized community networks

#### Industry committees

- **Standards Committee** of the **Electronic Industry Assn. (EIA)** to define and standardize the **Consumer Electronics Bus (“CEBus”) Committee** (1988-90)
- **Echelon LonMark® Committee** establishing standards for network operating protocols and device profiles for system interoperability (1993-94),

#### **Buyline.net Inc., Upper Darby PA (1999 – 2002), Founder & President**

Developed online electronic commerce platform for business-to-business by embedding RFP/RFQ capability in online Yellow Pages and business directories (one of a suite of online services for small-to-medium businesses). Co-founded company; led development and strategic partnership programs.

In 2000 sold majority interest to Washington DC investment group that installed CEO and management team. Company relocated to Arlington, VA; subsequently acquired by U.S. Technologies Inc.

#### **Broadband Energy Networks Inc., Upper Darby PA (2002– 2008), Founder & President**

Networked energy, information and automation services.

In Dec., 2002, acquired assets of Coactive Networks Inc., venture-backed leader in residential gateways, with original cost over \$42M. Also acquired selected assets of Motorola’s PowerCom Prepaid Metering Division (LON-based meter with remote read-out) in 2004. Developed C2k Utility Automation Computer – a multi-protocol universal gateway including LON, ModBus, ZWave, Zigbee & gateway for IP integration with PLC, RF and wired media based on original Coactive Connector 2000.

Broadband Energy licensed LightMedia’s algorithms for customer-centric user-interface and applications.

Provided End-User systems for IBM installed for CenterPoint Energy Smart Grid BPL Demonstration Laboratory in Houston TX in 2005-6, including AMR, AMI and Customer Service systems and applications. Automated Demand Response demonstration systems installed in a 2006 EPRI-funded project at Rochester Public Services, Rochester MN.

In 2009, Mr. Silverman founded GridPlex Networks LLC, to focus on new applications around automated energy systems and “intelligent microgrids”.

The mission of the company is to utilize Smart Energy and related artificial-intelligence-based automation technology to benefit energy end-users in government, institutions, commercial and residential applications, empowering them to achieve their goals for energy conservation and sustainability.

#### Awards

**Best Management Team 2006** – Ben Franklin Partnership of SE PA, Philadelphia PA

### Articles and Publications

- **2006- Philadelphia Business Journal** – Technology Section – Focus on Energy – Nov. 2006 feature article on Broadband Energy Networks
- **“Perfect Power”** – included in people and companies to watch, in the ground-breaking 2009 book by Robert Galvin Jr., former Chairman and CEO of Motorola, and Kurt Yeager, former head of the Electric Power Research Institute (EPRI), the “think-tank” of the electric industry, about the reinvention of the electric power industry.

### Industry Presentations

Invited Speaker and Presenter at the following Industry Conferences:

- Distributech 2004 “Vision of the Utility of the Future” – joint presentation with Motorola
- **CleanTech Conferences** - 2006-8 in Washington DC, San Francisco CA and Shanghai China
- **Broadband Utility Conferences** – BPL Hong Kong 2007 and 2008
- **Grid InterOp** – Policy and Technology Presentation – 2008

### **GRIDPLEX NETWORKS LLC, Upper Darby PA (2009 – present), Chairman and Chief Scientist**

GRIDPLEX NETWORKS LLC was founded in March 2009 to apply automated Smart Grid technology “on the other side of the meter” – to develop and provide software tools and applications to enable energy end-users to create and manage “intelligent microgrids” and related systems.

Intelligent microgrids have the ability to generate, store and supply electricity using a combination of renewable as well as convention grid-based electric under the control of the end-user, using artificial intelligence to automate operation to achieve the economic and environmental goals of users across a wide range of customers.

The Company licensed technology developed or acquired by Mr. Silverman as a foundation for advanced energy systems to provide Conservation Applications and Systems for Energy and Water and “Empower Green Communities” around the globe.

Developed complete customer-centric system for “Intelligent MicroGrids” that Empower Consumers and the Smart Grid – an integrated solution including small-scale local renewable generation, storage and energy automation. Each GridPlex Intelligent MicroGrid provides Consumer-centric Conservation of Energy and Water while reducing Greenhouse Gas Emissions. At the users’ option, it can also supply the local utility with Demand Response (DR) and advanced grid management capabilities.

The Company is developing a unique, patent-pending series of embedded software and web-enabled applications designed for universal deployment to “Green Communities” worldwide.

Pending Patents: “(1) Variable Incentive System and Virtual Market” technology (filed May 2009); (2) Bundling of Sales of a Commodity with Incentives not to use it”, and (3) Smart-phone based Conservation; additional patents in progress.

### Projects

- **Presidio Landmark Project – Belles Street Community “most sustainable community in the San Francisco area”**

### Articles and Publications

**Smart Grid Today** – featured in multiple issues in 2009-2011

### Industry Presentations

- **CleanTech Conferences** – invited speaker in 2006-8 in Washington DC, San Francisco CA and Shanghai China
- **Broadband Utility Conferences** – invited speaker in Hong Kong Conferences 2009 and 2010
- **4<sup>th</sup> Annual “Smart Grid and Demand Response Conference”** – Chicago IL Dec. 2011
- **World Green Energy Symposium** – invited presenter on “Policy and Technology” – Washington DC June 2012

### Industry Committees

- **GridWise Architecture Council (US Dept of Energy)** – adjunct member of technology group recommending standards to the US DOE

### **ZUMO ENERGY LLC, Upper Darby PA (2012 – present), Chairman and Chief Scientist**

Co-founded ZUMO ENERGY to brand and commercialize Intelligent Lighting by developing a series of advanced LED lighting products, equipment and systems that incorporate sensors, networked communication applications, as well as embedded GridPlex automation software.