

## **ESTABLISHED TRACK RECORD**

### **DAVID A. KELLY**

**Applied Physicist; B.Sc., Honors Physics –University of Waterloo**

#### **SUMMARY**

Serial entrepreneur with years of R&D management experience with a Canadian Division of a USA military/commercial contractor in the field of new electronics, new technology development and manufacturing. Management training included countering corporate espionage that valuable technology attracts. Setup and worked for a number of small companies and startups. Focus is on the development of new technologies with new large exclusive markets. Holds a number of allowed and pending patents in diverse technical fields. Four have no prior art in mature fields of technology. Applied Physicist, graduated from the University of Waterloo (Ontario, Canada) with an Honours BSc in Physics. Expertise from computer programming, power electronics, solid state physics and applied advanced physics.

The combination of 36 years of business experience and an extremely diverse technological background produced Mr. Kelly's finely honed skill to recognize designs capable of financial and technical success from those that work well but are likely financial failures.

Established a reputation in Canada and the USA by combining solutions from different scientific and engineering fields that move many different technologies to the forefront of their field with the latest advanced electronics equipment. A number of corporations seek Mr. Kelly out to solve technical problems beyond the scope of their teams or when they need solutions beyond standard engineering approaches.

Able to develop many unique accurate designs in short periods of time because the technology is first designed and simulated in his mind. He is gifted with having an engineering work station in his head more so than an idyllic memory. This ability in combination with past clearance for military projects hastens development with attention to high security.

#### **BUSINESS HONORS & INVENTIONS**

**Honors:** Nominated for Tech Innovation Award in the Austin Texas Business Journal, September 2010 for inventing and developing a new ultra-capacitor technology.

**Patents:** Various patents covering differing subjects and industries. (Extensive list [www.VagarySI.com](http://www.VagarySI.com))

##### **Hacker-Proof Smart Grid Distributed Energy Storage Hardware** (Nickname 'Home E', CA granted)

The invention involves an inexpensive hacker-proof distributed grid energy storage technology with a number of firsts. It integrates locally generated green energy such as solar, wind or co-generation for use by the customer to reduce their electric utility power usage and bypasses the denial of a grid-tie connection by Utilities. The system is multilevel capable and provides active grid support i.e. frequency, voltage and reactive power etc. either interactively with the Utility or standalone. Smart grid compatible with a unique safety feature such that DC stored power has a reduced risk of a fire during a fault condition. The invention will support multiple units operating together in an isolated micro-grid and optional DC power distribution.

##### **Safe Method Of Design Of Electrical Energy Storage Systems** (Nicknamed 'Safety', CA pending)

This invention defines the safe method of designing battery or similar electrical energy storage systems such that a single electrical fault will not result in electrical fires. The technology would be of

considerable value to the design of electric or hybrid vehicles. The patent provides a simple method of inter-connecting multiple electrical energy storage systems together in such a way that a charge balancing power supply is not necessary.

### **New Capacitor Fabrication Technology & Structure** (Nicknamed 'G', granted in Canada)

The invention involves a number of technical firsts mentioned earlier such as: self-healing multi-layer ceramic capacitor and a self-healing capacitor that can use as its dielectric ceramic polymer or polymer materials with poor to no mechanical strength. Additional technical firsts are transfer printable self-healing electrodes and the use of dielectric enhancement of ceramic polymer or polymer blends that increases the energy density to 13 times their normal value *in many circumstances*. Scavenger electrodes are now able to absorb free radicals that are released over the life of the capacitor, allowing the use of less expensive polymers. It developed a new transfer printing process that can print metal layers (used to apply the electrode layer) a few nanometers thick on the capacitor dielectric or other surfaces. Metal of this thickness is partly optically transparent and the fabrication process is easily automated. Research on dielectrics for the new capacitor construction is expected to achieve the same energy density as some battery technology. The project involved 6,000 man-hours and review of prior art, technical and white papers.

### **Universal Personal Electric Device** (Nicknamed 'UPED')

This invention was a spin-off of the manufacturing process developed for the self-healing ceramic polymer ultra-capacitor technology. It was a prediction of where it was possible to take the smart phone in forms not yet known, various applications (over 240) and advanced capabilities. To date it has been 6 years since patent application was filed and large multi-nationals such as Microsoft, Google etc. have only this year brought out products or its advanced applications that were disclosed. The patent application remains an accurate prediction of where smart phone technology is evolving to. There remains considerable IP still undisclosed by VSI. One major item yet to be developed by another company, remains part of VSI's undisclosed portfolio, is an inexpensive, high resolution low power very thin smart screen (electronic paper) to accompany the smart phone. The UPED was not intended to have a large screen but users had the option of rolling out a sizable sheet when they needed a large display for work. The sheet could be part of the phone case or a separate roll depending on the size the user wishes to use.

## **OUTSTANDING TECHNICAL FIRSTS AND CAREER ACCOMPLISHMENTS**

### **1971-72 (Teen years)**

- Proposed a missile (early long range cruising) based on a combination rocket/ram jet engine combination. When cruising speed was achieved the rocket fuel switched automatically over to an oxygen starved propellant which then served as the fuel source for the ram jet engine. This combination would greatly extend the range of a conventional interception missile and support supersonic interception speed. Around the age of 14 to 15 at the time filed the idea with a 'patent-your-invention' company. The technology remains relevant today and is applicable to newer hypersonic missile technology under development.

### **1974 (Teen years)**

- Programmed the high school's IBM 1130 computer to play checkers against an opponent using fully the limited computers hard drive and limited memory
- Demonstrated the manufacture of an amorphous silicon solar cell by doping the silicon during deposition. (1980 Physics undergrad project University of Waterloo)

## 1983-1993

- Developed a method of construction was later adapted by a significant part of the oil exploration industry in Ontario: Raised the capital and performed all the engineering work for the geological exploration for the drilling of three Silurian and two Devonian exploratory wells in South Western Ontario. The effort produced one oil well that was placed into production, one oil well abandoned due to excessive amounts of water production, and one gas show.
  - First to use unique swamp matting as the base for the access road to the oil tank when setting up the storage tank battery.
- First to demonstrate (mid 1980's) that the synthetic resistance measurement technique for rock strata used for geophysical exploration would work equally well to locate oil and gas deposit traps at a fraction of the cost of conventional seismic surveying. This technology was used to identify unique features of the Oil Springs West (part of the oldest oil field in Canada). Drilled a new well in the field identifying oil reserves that remained to be tapped. The technology was applied to exploration of odd single targets in the Silurian strata. A successful producing well was developed with unique sweet crude, paraffinic and specific gravity of 41.7, burned aggressively colorless and without smoke. This remains a unique well for the basin and this specific geological formation. All wells were located in the South Western Ontario.
- Successful in getting approval for stimulation of an oil well by preparing background research and representing my limited partnership for approval with the Ontario Energy Board against Union Gas (now part of Enbridge). They opposed any form of well stimulation within a specific distance of their gas storage fields.
- Extended the precision of numerous metrology equipment manufactured by a company known as Guildine. Designed a number of lab grade precision potential & current transformers, made improvements to their AC/DC transfer standard and wrote design circuits and software for the state of the art thermal wattmeter for Guideline.
- Improved the design and focusing ability of a TWT magnetic structure. Responsible for the manufacture of a number of reflex klystrons which operated from a few GHz through to 220 GHz – at a large multi-national company, as a production engineer.
  - Developed a new lower cost TWT manufacturing process wherein it would resolve the cooling problem of the helix structure and would have extended the capability well into high power and mm microwave region of operation. -it was never produced by the manufacturing group.
  - Managed the Electronics Services Group and designed new high voltage test equipment for the microwave tube manufacturing groups and redesigned existing equipment to improve safety and reliability.
  - Became the manager of mm Subsystems at what is now known as CPII and designed custom power supplies and systems for University research and mm radar applications for advanced weapon system research of all shades of grey.
  - First in the world to design a commercial TWT power supply using the LVI control mechanism.
  - Simplified the technology to a variation of the forward converter, well suited for the construction of High Voltage Power supplies.
- Developed a pink noise power supply control technique where power supply tones are no longer detectable by a spectrum analyzer and are observed not to interfere with many different electronic devices.

- Developed the first PFC well-regulated fly-back power supply using a single Mosfet and an off-the-shelf inexpensive PWM control IC.
- Demonstrated how the ‘Winslow Effect’ dramatically increased the performance of a ceramic polymer capacitor and how the capacitor’s unique properties of a slow dielectric were ideally suited for use in electrical energy storage.
  - First to develop a self-healing multi-layer ceramic capacitor manufacturing technology.
  - Developed a self-healing capacitor that can use as its dielectric, ceramic polymer or polymer materials with poor to no mechanical strength.
  - Developed four new and unique capacitor structures/manufacturing processes some of which have the potential to replace batteries as the lowest cost of electrical energy storage.
- Developed a technology that is unique and represents a major breakthrough in what is normally thought of as a mature field of technology. It is a new high energy density capacitor and other technology for the Renewable Energy market -the IP is free in all countries except for Canada.
- Designed various hardware based Smart Grid Applications related to energy storage, safety and providing hacker proof grid support for green energy integration without the need for high speed two-way communication with customers.
- Proposed safe method of designing DC storage systems such that they are less likely to catch fire or self-destruct. The technology was applicable to electric cars, trucks and large arrays of batteries.
  - The technology also demonstrated unique technology required for the development of a **hybrid transport truck, primarily intended for operation in mountainous terrain or city** where stop and go dominates.

**Note:** It was flattering to have some aspects of my technologies copied and put into production by major global companies such as Google, Microsoft, General Electric, EESTOR, University of Queens (Kingston, Ontario) etc. The amount of 3<sup>rd</sup> party interference was too great to consider proceeding further with the completion of any of the various technologies developed during this time. It appeared there was greater interest in ‘managing’ the technology rather than funding.

### **BUSINESS AND MANAGEMENT EXPERIENCE**

- Mentored in management and engineering design within the extremely aggressive military complex.
  - This involves intelligent use of miss direction and how to avoid copying of key technology by 3<sup>rd</sup> parties.
  - Well versed in how to avoid having technology copied and to what extent companies will go to in attempts to get an edge over the competition.
  - Skilled at how to get technology development funded by the government and how to legally make a profit from this work.
- Set up partnerships and have many years of managing a company conducting exploration for oil and gas, regulatory compliance and dealing with various vendors and land owners.
- Worked in both R&D as well as production engineering, management of service and R&D departments.
- Hands on experience with startup companies, am well aware of what will work and what won’t.
- Principal in the negotiation process with Russian/Belarus JVC interested in developing the ultra-capacitor technology with 12 million funding available.

## **ENTREPRENEUR HISTORY:**

### **President Vagary Solutions International Inc.**

June 2011 - Present

This company was created from the amalgamation of CI Corporate Instincts Ltd. -Alberta, 1st Lighten The Load Inc. (Canada) and Stonepath Power Systems Ltd. (Canada) in June 2011. It was setup to continue over the long term to develop the technologies of the amalgamating companies as well as pursue new technologies. It conducts consulting for various BC industries as well as service/design custom electronics equipment for various companies and Universities within North America.

### **President 1st Lighten The Load Inc. Canada**

Dec 2009-June 2011

President of the company set up to raise capital to take a new ultracapacitor technology from the lab sample stage to manufacturing. Performed various engineering and managerial functions related to the writing of business plans, presentations and product development. To date not successful in raising the necessary capital due to unfavorable market conditions. A number of funding offers were rejected because of unacceptable valuations. The technology is highly disruptive with a projected manufacturing cost of \$50/kWh excluding overhead.

### **CTO Stonepath Power Systems Limited**, (Sole Proprietor Consulting) Dec 2001-Dec 2009

Stonepath specialty is providing leading edge, advance designs contract work for various companies. Clients brought technical problems that puzzled their Engineering Teams to resolve. Raytheon Technical Services requested a quote for a very high voltage DC to low voltage DC converter that was for a bid they were preparing for the US Navy Solicitation Request # N00164-09-C-WS16. The power converter was to be airborne and convert a high voltage DC source >5 kV at almost 10kW to a 28Vdc output with energy density greater than 120W/cubic inch. A number of the technical details remain restricted. The contract was won by one of the 13 companies bidding against Raytheon.

A number of unique power converter technologies that solved client problems were developed. The product range was: A 600W 28 Volt power supplies that were capable of being isolated to over 20kV, A 700W high voltage power supplies >25Kv.

A high speed modulator switches that were capable of switching 2.5kV @ 200 amp in 50ns that were short circuit proof (basically indestructible) and a number of other lesser power converters. 75% of the designs were done with single PCB revisions without prototyping and the remainders PCBs required a second revision to include new features requested by the client.

### **President LTL IP Inc.** (USA Texas 'C' Corp)

Dec. 2009 – Sept. 2011

Holding company for Intellectual Property (written by 1st Lighten The Load Inc. CA) and file patents. Put together a management team for a startup company called 1st Lighten the Load Inc. (Texas 'C' Corp.). Promoted the technology with prospect Venture Capital companies. Conducted presentations and answered technical questions about the technology. Remained the primary technical expert in the technology and further developed its capabilities by identifying methods to further reduce its cost of manufacture. Negotiated with prospective investors, licensees and other business agreements. Further developed the technology decreased the product manufacturing cost of the energy storage ultra-capacitor technology by over 50% using various. 3<sup>rd</sup> party interference was too great to consider proceeding further.

Set up manufacture LTL IP's technology. Funding was not raised.

### **SUMMARY OF HIGHLIGHTS AND SKILLS**

Innovative, pro-active, results oriented Applied Physicist with a 34-year track record in new product development; problem solving, management: leading edge power supply design: digital/analog hardware and embedded DSP/micro programming.

Serial entrepreneur with over 34 years of experience in R&D management roles and small startup companies or operations.

Quickly identify practical solutions from those that are less cost effective and avoid common errors that lead to unreliable products or program cost overruns.

Design a level of technology that will either equal if not be superior to –that of your competition. On a number of occasions the competition was forced to revise their products in order to remain competitive.

Management representative on an Employee Health and Safety Board and successfully minimized all management and corporate responsibility for accidents.

### **Broad Background That Extends To a Number of Technical Fields:**

- Understand general Patent processes/concepts and what is required to design IP workarounds
- Many years of experience developing new printed capacitor technologies
- Solid state theory as applied to materials used in passive electronic components
- Developing high energy density dielectric inks compatible with many methods of deposition
- Extensive knowledge in capacitor technology and their applications
- Years of experience at designing high precision laser cut components
- Power supply design, PFC corrected, familiar with VDE, UL, CSA standards
- Magnetics, high frequency switch mode >200kHz, poly-phase quasi-resonant converters
- High speed analog and digital, FPGA, VHDL, embedded microprocessor and DSP design
- Embedded micro controller design; Languages; C, Visual C++, Unix, Assembler, Ethernet
- Simulation engineering tools such as PSPICE,
- User interfaces, remote telemetry and system control etc.,
- CAD software; Protel 99SE, ORCAD, TANGO, mechanical layout etc.
- Thermal analysis and mechanical/environmental packaging
- Excellent knowledge of polymers and their application in protecting/encapsulating electronics,
- ISO 9000, QFD, JIT, SPC Quality Systems, Lean Manufacturing Experience
- Held Secret Level Security Clearance in the past

### **HIGHLIGHTS OF PAST –PROJECTS, RESPONSIBILITIES AND EXPERIENCE**

**Senior Hardware Engineer:** Responsible for the development of new hardware capable of operating Windows CE 3.0 and accepting various WLAN PC cards for remote communication with the customers' WLAN. Responsible to develop new hardware based on Texas instruments C5402 DSP as well as coding to enhance the ability of the Remote Transceiver to receive data that used inverse

differential Manchester modulation. The purpose of the enhancement was to reject high levels of interference that were comprised of tones from electronic lamp ballast.

Performed various Spice and DSP Simulations to analyze the performance of various processing algorithms.

**Senior Design Engineer:** Responsible for the design of a high volume commercial switch mode power supply used for charging of smart battery systems. The low cost design was for a volume of up to 60,000 per year. Responsible for the mechanical and thermal design as well as the control logic with microprocessor control and software definition.

**Department Manager, Senior Power System Engineer, Project Manager:** Development of high Power microwave transmitters, designed to UL standards. One transmitter was for LMCS/LMDS and the second for High Power DAB Broadcast (digital radio). Both power supplies used Forward Converter Technology. The first supply was 900 watts, Universal 90 to 265 Vac input, with PFC input. The second was an 18 kW poly-phase switcher, with fault tolerant design. Both systems used a micro controller to operate the system and allow for remote control of the transmitter. Supervised three Junior Engineers on the project and was responsible for all aspects of project planning, scheduling, specifications etc. Designed the microprocessor-based controller, programmed using C, for remote access, via RS232/485 external interface and control of the Transmitters. Worked with all vendors and wrote the specifications of major purchased components (>\$500,000 US).

**Electronic Hardware Design Engineer:** Worked on power supplies used to operate EL flat panel displays. Designed high-speed Programmable Logic and driver circuits. The displays used the Motorola single chip 68HC11 microprocessor. These displays were for high end Commercial and Military use in highly variable ambient lighting conditions.

**Manager of mm Subsystems & the department Chief Power Supply/Modulator Engineer:** Supervised the mm Subsystems Department and designed numerous compact Power Supplies, based on different topologies. For example, one was for a high altitude airborne Military Radar Research Program. The Power Supplies were from 10W to 2kW. Maintained a Secret Level Security Classification. Conducted Internal, Customer and Military product design reviews. Held the responsibility for personnel discipline and the hiring of department staff. Developed vendor relations, made presentations to customers, proposals and program schedules.

**Supervisor, Design Engineer:** Responsible for all activities within the Electronic Services Department some of which included the design of new hardware for manufacturing and servicing of equipment. Responsibilities were the design, construction, commissioning and maintenance of Power Supplies, test equipment, automation programs and systems for the purposes of manufacturing, test and quality control for a wide variety of electronic products. Successfully minimized all management and corporate responsibility for accidents as Management's Representative on an Employee Health & Safety Board.

**Digital Designer, Programmer:** Designed the hardware and software for the Digital Logic Analyzer for Thalamus's component tester. Wrote additional microprocessor programs and evaluation fixtures as required for testing modules installed in Thalamus's component tester.

**Production Engineer:** Production Engineer responsible for a number of TWT and Reflex Klystrons (microwave tubes). Managed a number of products, field return analysis, product yield improvement etc. Designed microwave test sets for millimeter Reflex Klystrons.

**Electronics, Software Design Engineer:** Designed laboratory test and measurement instrumentation. Wrote microprocessor programs in assembler and designed digital/analog based hardware, for the Thermal Wattmeter Project, RMS Transfer Standard. Prepared technical proposals, interfaced with research staff at the National Research Center, supplied technical support to marketing.

## **EDUCATION AND ADDITIONAL CAREER DEVELOPMENT**

### **Education**

B.Sc., Honors Physics, 1980, University of Waterloo

Area of Specialization: Applied Physics for Industry

i.e. Solid State Physics, Electronics, Computer Programming and Renewable Energy

### **Career Development**

- ISO 9000
- Quality Function Development and Quality Improvement Workshop
- Encapsulation of Electronic Devices and Components
- Interaction Management (managing subordinates in a work environment)
- Just In Time (JIT) re: Design Function vs. Production
- Product Design for Manufacturability
- Industrial Accident Prevention Association
- SPC - Statistical Process Control
- How to Conduct the Appraisal Discussion