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- - - Please see **www.ChrisCampbell.org** for the pitch! - - -

SUMMARY

Electrical engineer with 20+ years of experience, most recently in RF communications, monitor and control systems, and engineering ops in general, but **excited to now shift focus to energy / power engineering.**

Extremely productive, able to develop a deep understanding of complex technologies, excellent communications skills (both internal and external). **Please see** www.ChrisCampbell.org **for full details.**

ENERGY AND POWER – familiarity with technologies and jargon in the energy / power sector:

Electric vehicles and charging technologies: battery architecture (cell vs pack), thermal management systems (TMS), DCFC standards (Chademo, SAE Combo / CCS, Tesla Supercharging), Wh/mile performance trends in EV market, EVSE technology and market (and why an "EVSE" is not a "charger"), V2G integration (e.g. peak shaving), EV load aggregation (e.g. JuiceBox / PGE pilot)

Battery basics: SOC percentage, life cycle impact of low SOC including the time factor, 18650 cells vs prismatic cells, battery chemistries, battery structure basics, cell vs module vs pack, charge and discharge curves, kW vs kWh (!), battery C rate, trends in cost ($/kWh) and energy density (Wh/kg)

Solar power / photovoltaics: string inverters vs microinverters, maximum power point trackers (MPPT), I-V curves, NREL PVWatts calc, mono vs poly tradeoffs, balance of system (BOS) costs and trends, cosine losses, temperature effects (efficiency and aging), net metering, avoided cost

Energy storage systems: battery storage, dispatch, pumped hydro, phase change materials, compressed air, supercapacitors, spinning and non-spinning reserve, price arbitrage

Grid jargon: duck curve, load shifting, dynamic pricing, power factor, CA Rule 21, substations, microgrids and islanding, frequency droop, dispatchable load, peaker plants, back-to-back conversion, AC/DC conversion, roundtrip efficiency, TOU rate plans, demand pricing, peak shaving, HVDC, ERCOT, NERC, FERC, three letter acronyms (TLAs): PSC, IRP, ASI, PPA, RPS

SYSTEMS ENGINEERING

20 years of experience in system engineering: building new systems, rapidly absorbing new technology, properly integrating components and subsystems, streamlining operations

Particularly skilled at: taking chaotic situations and creating order that is sustainable and scalable; developing an understanding of deeply complex systems and making them run smoother; troubleshooting difficult problems.

Building information frameworks, typically starting with a wiki, to capture knowledge and experience of other engineers. If that framework already exists then leverage it, but also experienced in building one up from scratch. Enabling teams to work smarter.

Basic Project Management skills: keeping track of who owes us what, and following up, both internally and externally; connecting vendors with each other as needed, pushing things along if necessary; keeping up with to-do lists / punchlists and communicating those to project partners; watching out for future choke points (i.e. critical path); advertising project status to partners and management; projecting engineering operations overseas.

ENGINEERING BACKGROUND AND SCIENCE FUNDAMENTALS

Two degrees from Georgia Tech: a Bachelor of Aerospace Engineering and a Bachelor of Electrical Engineering. 20+ years of intense experience in system, project and operations engineering. Specific experience in communications engineering (especially RF and satellite) and data communications protocols (IP, SNMP, obscure old serial formats).

Many years architecting, building and maintaining a massively complex monitor and control (M+C) system used for business critical transmission assets and news gathering assets. See below for details.

General literacy in physics, chemistry and mathematics as expected from GT engineering degrees. Chemistry knowledge refreshed by current interest in two fields: battery technology and astrobiology.

Exposed to advanced mathematics (calculus, trigonometry, statistics, etc.), basic mechanical engineering (statics, kinematics), signal analysis (non-linearities, harmonic distortion). Comfortable with the jargon of science and data analysis — SI units, isotopes, hysteresis, etc.

Personal interests in engineering and science: astrobiology / exoplanets, LHC / CERN and particle physics, space launch systems and market, propulsion tech including both classical chemical rockets and solar electric propulsion (SEP), robotic exploration of solar system, both current and planned missions; methane on Titan, perchlorates on Mars, brown gunk on Pluto …

OPERATIONS / COMMUNICATIONS / OUTREACH

Streamlining operations, in particular via information resources that assist operators and provide engineers with quick reference tools. Explaining complex technology solutions (or underlying science) to lower-skilled staff, e.g. for onboarding of new staff or for outreach purposes. Evangelizing of new systems and processes to team members. Writing internal communications that are articulate and direct. Performing internal outreach, explaining to other employees and departments what we do, what our value to the company is. Performing informal external outreach, explaining to visiting customers and vendors what we do, participation in regional professional societies and occasional industry conferences.

ORGANIZATIONAL EXPERIENCE

Have worked in a variety of environments: 6000-person global corporation, 200-person division, 50-person technology contracting firm, ranging from rigorous engineering with federal oversight to seat-of-pants rapid engineering. **Please see** www.ChrisCampbell.org **for full details.**

TECHNOLOGY EXPERIENCE

Monitor and Control Systems

- 15 years of intense experience building a mammoth M+C system
- Monitoring: systems that must be trustworthy, no false positives or false negatives
- Control: systems that do what you tell them to ASAP, and provide feedback
- Integration of equipment from dozens of vendors, 100+ models of gear
- Extreme uptime requirements, upgrade rollout planning, engineered redundancy
- Operator issues: cognitive loading, clean UI design, alarm management
- M+C basics: alarm assertion, acknowledgement and logging; trending/reporting of parameters

Data Communications / Computing Systems

- Communications over RF and wireline
- Communications engineering: dB, Shannon, link budgets, crosstalk, PHY, etc.
- Extensive experience in design, implementation and test of IP data networks. TCP/UDP, DNS, multicast/IGMP, ARP, DHCP, troubleshooting at physical, link and transport layers.
- Vast, direct experience in SNMP specifications, interfaces and troubleshooting
- Serial data protocols: ridiculously familiar with serial data interfacing (sync and async), including RS-232, RS-422, RS-423, RS-449, RS-485, RS-530 and V.35.
- 25+ years of practical experience with computing, including various Linux platforms (including Ubuntu, Red Hat, CentOS) and Unix-like platforms (Solaris, QNX).
- Experienced with XML, PHP, Perl and programming languages in general

RF / Project Engineering Experience

- Closely involved with many RF chain buildouts
- Implementation of C-band and Ku-band satellite RF systems, including converters, amplifiers (from 0.8 Watts up to 3000 Watts) and a range of fixed and motion-controlled antennas (from 0.95m VSATs up to 11m Gateways).
- Digital modulation types (QPSK, 8PSK, QAM, DVB-S2)
- Integration, installation and operation of two-way satellite voice and data networks, typically $1M to $3M in scale. Projects were worked from simple block diagram down to finest implementation and configuration details. Technical lead for each project, directing small team of in-factory technicians and overseas field engineers.

Video Compression and Transport

- MPEG transport streams (broadcast and backhaul)
- high speed data interfaces: SDI, HD-SDI, ASI, Multicast
- compression algorithms (MPEG2, MPEG4/H.264, JPEG2000)
- studio systems (playout, event triggering, tally)

EDUCATION / CERTIFICATION

Georgia Institute of Technology, Atlanta, Georgia
- Bachelor of Electrical Engineering, 1996
- Bachelor of Aerospace Engineering, 1990

EE studies focused on transistor circuits, RF design, control systems, network protocols, computer architectures and structured programming languages. Involved in prototype earth remote sensing project funded by NASA grant. GPA of 3.5 / 4.0 in EE coursework (Dean's List every quarter).

Licensed as Professional Engineer (Georgia license 27026, issued July 2001, maintained)

IEEE Member since 1994. IEEE Power Engineering Society member since 2009. IEEE Power Electronics Society member since 2016. Active member of SMPTE and SSPI organizations.

NABCEP PV Installer certification in work (40-hour Advanced PV System Design course completed).

OSHA 10-hour certification, completed in 2017.

Conversational knowledge of German.

EMPLOYMENT HISTORY

2002 – 2018 : Turner Broadcasting / CNN

Architect and lead engineer of massive, deeply customized monitor and control system that allows staff to M+C Turner's satellite infrastructure, used for two business critical operations: linear TV distribution and CNN newsgathering. Equipment M+C'd includes 100+ different models from dozens of different vendors. System is based on a network of Linux servers at equipment locations, serving connections to Windows clients at staff locations, including at news bureaus around the globe. Constant growth and maintenance requires close coordination with Turner staff, with satellite equipment vendors, and with the supplier of the underlying M+C system platform.

Daily leveraging of satellite technology and video transport experience, from antenna controllers to video crosspoint switchers to IRDs to multicast MPEG transport streams. Extremely rapid cycles of new technology development and implementation.   Constant interaction with vendor technical staff.

Builder and maintainer of online documentation system (wiki) that captures lessons learned by other engineers. Rigorous feedback and updates (keeping an ear to the ground) ensures that the wiki stays relevant, and helps engineers solve problems in minutes rather than hours.

1996 – 2001 : ViaSat Satellite Networks (formerly a division of Scientific Atlanta)

Systems Engineer for satellite networks that provided voice telephony and circuit-switched data connectivity in a mesh (not star) configuration. Technology maximized satellite bandwidth via "DAMA" frequency management, voice compression algorithms and TDMA-based communications. Systems were built in Atlanta and then shipped out to customer sites and reassembled, typically in third world locations underserved by terrestrial communications. Performed detail design of satellite earth stations ranging from 1.8 meter VSAT terminals up to 11 meter "B station" telephony gateways. Implemented earth station controller systems for monitor and control (M+C) of local assets via serial links and remote assets via satellite links. Led Design Review meetings and conducted ad hoc training of both internal junior staff and external customers.

Frequent work with international customers and occasional travel to exotic locations to complete system build-out and to perform customer presentations, training and site acceptance testing.

Occasional work with R+D to isolate product flaws and flesh out new product offerings, including an asymmetric broadband delivery platform that leveraged DVB satellite carriers.

1992 – 1995 : nuclear power generation

Prior to EE degree, employed as Mechanical Engineer at several nuclear power plants, conducting diagnostic and performance testing. Used proprietary test equipment to measure performance and diagnose problems in fluid flow subsystems in operational commercial nuclear power plants. Contracted by utilities to visit plants during "outages" and spend 6-8 weeks racing through diagnostics work mandated by federal regulations to ensure that critical nuclear safety systems were meeting their design basis requirements. When back in Atlanta (not working a plant outage) worked with R+D teams to prototype new measurement systems.

Please see website for references: www.ChrisCampbell.org