

Biographical Sketch
Raymond H. Byrne, Ph.D.

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(1) Education

University of Virginia, Charlottesville, VA; Electrical Engineering; B.S.E.E., 1987
University of Colorado, Boulder, CO; Electrical Engineering; M.S.E.E., 1989
University of New Mexico, Albuquerque, NM; Electrical Engineering; Ph.D., 1995
University of Chicago, Chicago, IL; Financial Mathematics (Financial Engineering); M.S.F.M., 2009

(2) Appointments

2021–present: **Manager, Power Electronics and Energy Conversion Systems**, Sandia National Laboratories, Albuquerque, NM
2017–2021: **Manager, Electric Power Systems Research Department**, Sandia National Laboratories, Albuquerque, NM
2007–2017: **Distinguished Member of the Technical Staff**, Sandia National Laboratories, Albuquerque, NM
1999–2007: **Principal Member of the Technical Staff**, Sandia National Laboratories, Albuquerque, NM
1996–2001: **Adjunct Professor, Electrical and Computer Engineering**, University of New Mexico, Albuquerque, NM
1995–1999: **Senior Member of the Technical Staff**, Sandia National Laboratories, Albuquerque, NM
1989–1995: **Member of the Technical Staff**, Sandia National Laboratories, Albuquerque, NM
1987–1988: **Graduate Teaching Assistant**, University of Colorado, Boulder, CO
1986–1986: **Student Intern**, Texas Instruments, Dallas, TX

(3) Selected Publications/Patents

1. F. Wilches-Bernal, **R. H. Byrne** and J. Lian, “Damping of Inter-Area Oscillations via Modulation of Aggregated Loads,” in *IEEE Transactions on Power Systems*, vol. 35, no. 3, pp. 2024–2036, May 2020, doi: 10.1109/TPWRS.2019.2948116.
2. D. M. Rosewater, D. A. Copp, T. A. Nguyen, **R. H. Byrne** and S. Santoso, “Battery Energy Storage Models for Optimal Control,” *IEEE Access*, vol. 7, pp. 178357–178391, 2019. doi: 10.1109/ACCESS.2019.2957698.
3. T. A. Nguyen, D. A. Copp, **R. H. Byrne** and B. R. Chalamala, “Market Evaluation of Energy Storage Systems Incorporating Technology-Specific Nonlinear Models,” in *IEEE Transactions on Power Systems*, vol. 34, no. 5, pp. 3706–3715, Sept. 2019, doi: 10.1109/TPWRS.2019.2909764.
4. B. J. Pierre, F. Wilches-Bernal, D. A. Schoenwald, R. T. Elliott, D. J. Trudnowski, **R. H. Byrne** and J. C. Neely, “Design of the Pacific DC Intertie Wide Area Damping Controller,” in *IEEE Transactions on Power Systems*, vol. 34, no. 5, pp. 3594–3604, Sept. 2019, doi: 10.1109/TPWRS.2019.2903782.

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5. R. Baxter, I. Gyuk, **R. H. Byrne** and B. R. Chalamala, "Engineering Energy-Storage Projects: Applications and Financial Aspects," *IEEE Electrification*, vol. 6, no. 3, September 2018. doi: 10.1109/MELE.2018.2849834
 6. J. F. Ellison, L. Rashkin, J. Serio, **R. H. Byrne**, "The benefits of grid-scale storage on Oahu," *Journal of Energy Storage*, vol. 15, pp.336-344, 2018.
 7. **R. H. Byrne**, T. A. Nugyen, D. A. Copp, B. R. Chalamala, I. Gyuk, "Energy Management and Optimization Methods for Grid Energy Storage Systems," *IEEE Access*, vol. 6, pp. 13231-13260, 2018.
 8. **R. H. Byrne**, R. Concepcion, and C. A. Silva-Monroy, "Estimating potential revenue from electrical energy storage in PJM," in *Proceedings of the 2016 IEEE Power and Energy Society (PES) General Meeting*, Boston, MA, July 2016. (Prize paper award)
 9. J. C. Neely, J. Johnson, **R. H. Byrne**, and R. T. Elliott, "Structured optimization for parameter selection of frequency-watt grid support functions for wide area damping," *International Journal of Distributed Energy Resources and Smart Grids*, vol. 11, no. 1, pp. 69–94, 2015.
 10. A. Clauset, H. G. Tanner, C. T. Abdallah, and **R. H. Byrne**, "Controlling across complex networks; emerging links between networks and control," *Annual Reviews in Control*, vol. 32, pp. 183–192, 2008.
 11. **R. H. Byrne**, D. R. Adkins, S. E. Eskridge, J. J. Harrington, E. J. Heller, and J. E. Hurtado, "Miniature mobile robots for plume tracking and source localization research," *Journal of Micromechatronics*, vol. 1, no. 3, pp. 253–262, 2002.
 12. **R. H. Byrne**, C. T. Abdallah, and P. Dorato, "Experimental results in robust lateral control of highway vehicles," *IEEE Control Systems Magazine*, vol. 18, no. 2, pp. 70–76, April 1998.
 13. **R. H. Byrne** and C. T. Abdallah, "Design of a model reference adaptive controller for vehicle road following," *Mathematical Computer Modelling*, vol. 22, no. 4-7, pp. 343–354, 1995.

(4) **Research and Development Leadership**

1. **2021-present, Manager, Power Electronics and Energy Conversion Systems Department:** Responsible for managing a \$7M power electronics research portfolio. Focus areas include: improving the reliability, safety, performance, and cost of energy storage systems; developing medium voltage direct current circuit breakers; and developing next generation inverter technologies with grid forming capability.
2. **2017-2021, Manager, Electric Power Systems Research Department:** Responsible for managing a \$10M advanced grid modeling research portfolio. Focus areas include: power system dynamic performance; power system planning, operations, and economics; power system protection; threat and impact modeling; resilience metrics and modeling; and artificial intelligence and data analytics.
3. **2011-present, Team Lead, Sandia Energy Storage Analytics Program:** Responsible for managing a \$5M energy storage analytics research portfolio. Focus areas include: energy storage valuation; grid integration of energy storage; energy storage policy; and energy storage management systems.
4. **2009-2017, Image Processing Researcher:** Led a team that developed algorithms to analyze satellite image data.
5. **2001-2008, Radiation Hardened Fiber Optic Links:** Led a team that developed radiation hardened fiber optic links for spacecraft applications. At the time they were the fastest fiber optic links developed for spacecraft applications.

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- 6. 1989-2007, Robotics Researcher:** Mobile robotics researcher, including teleoperated vehicles, miniature mobile robots, hopping robots, robotic boats, self-driving cars, and cooperating robots for plume tracing. Received the 2001 Time Magazine Invention of The Year Award for a miniature mobile robot. Several robots were inducted into the Smithsonian American History Museum in 2011 (<https://insider.si.edu/2011/06/sandia-interior-robot/>).

(5) Leadership and Professionalism: Synergistic Activities

- 1. 2012-present, UNM Sigma Xi Chapter President:** provided leadership for a vibrant Sigma Xi Chapter with a strong history of community engagement through the Science and Society Distinguished Lecture Series (co-sponsored by Sigma Xi, the Albuquerque IEEE Section, and the UNM Physics and Astronomy Department); an excellent record of recognizing undergraduate and graduate research through annual awards; and a track record for recognizing research excellence through initiating new members to Sigma Xi.
- 2. 2017-present, IEEE ABET Program Evaluator:** contribute to the electrical engineering profession through annual engineering program evaluations that improve the quality of technical education.
- 3. 1993-present, Albuquerque IEEE Section Leadership:** contribute to the electrical engineering profession through active leadership in the Albuquerque IEEE Section. 1991-1992 Vice-Chair, 1993 Chair, 1995 Treasurer, 1996-1999 Secretary, 1999-2003 Treasurer, 2004-2005 Secretary, 2006-2006 Vice-Chair, 2007-2008 Chair, 2010-2011 Chair, 2012-2013 Treasurer, 2014-2015 Secretary, 2016-present Professional Activities, 2017-2019 Vice-Chair.
- 4. 2017-present, Resilience Week Organizing Committee:** co-chair of the community resilience track.
- 5. 2017-present, IEEE Innovative Smart Grid Technologies (ISGT) Conference Organizing Committee:** publications committee co-chair, 2021-present.
- 6. 2019-2021, Sigma Xi Committee on Nominations:** led the Treasurer search committee in 2021 which identified Marija Strojnik (president-elect) as a candidate for president.
- 7. 2018-present, Sandia National Laboratories:** corporate recruiter for the University of Colorado, Boulder.

(6) Commitment to Diversity and Inclusiveness

Student intern hiring: *Sandia National Laboratories:* Demonstrated commitment to diverse and inclusive hiring practices through participation in several minority programs: the Consortium for Research And Education in Power And Energy Systems (CREPES); the DOE Minority Serving Institutions Partnership Program (MSIPP); and interns from Tribal Colleges and Universities. Hired 11 summer student interns in 2022, 8 summer student interns in 2021, and 15 student interns in 2020. Many students participated in the above mentioned programs.

Staff hiring: *Sandia National Laboratories:* since 2019, 9 out of the last 17 staff hires have been a minority or member of an under-represented group.

(7) Mentoring

Student intern hiring: *Sandia National Laboratories:* Since 2020 I have hired 34 student interns, identified mentors and appropriate projects, and provided mentoring.

Promotions: *Sandia National Laboratories:* Since 2017 I have mentored and promoted 9 staff members (does not include Distinguished Level promotions).

Distinguished Level Promotions: *Sandia National Laboratories:* I have mentored and served as a nominator or reference for 6 staff members that were promoted to the Distinguished Level (limited to 10% of the technical staff population).

(8) Major Awards, Fellowships, Invited Lectureships, and Honors

- 1. 2017, R&D 100 Award:** Control System for Active damping of Inter-Area Oscillations.
- 2. 2017, IEEE Fellow:** elevated to the IEEE Fellow grade, which is limited to 0.1% of the IEEE membership, for “contributions to miniature robotics and grid integration of energy storage”.
- 3. 2016, IEEE Power and Energy Society General Meeting Prize Paper Award:** R. H. Byrne, R. Concepcion, and C. A. Silva-Monroy, “Estimating potential revenue from electrical energy storage in PJM,” in *Proceedings of the 2016 IEEE Power and Energy Society (PES) General Meeting*, Boston, MA, July 2016, pp. 1-5.
- 4. 2011-present, Equitable Regulatory Environment Thrust Area:** Team lead/principal investigator for the Equitable Regulatory Environment Thrust Area (also referred to as energy storage analytics) of the Sandia National Laboratories Energy Storage Program, current award: \$5M/year.
- 5. 2001, Time Magazine Invention of the Year:** Best Inventions of 2001, Mini Autonomous Robots; Inventors: Ray Byrne, Ed Heller and Doug Adkins; Sandia National Laboratories.
- 6. 2000, IEEE Millennium Medal:** Recipient of the IEEE Millennium Medal (May 2000).

(9) Major Career Contributions and Legacy

The development of miniature mobile robots that were inducted into the Smithsonian American History Museum in 2011 as well as groundbreaking research into optimal operation of grid energy storage to maximize revenue and/or grid benefit.