EDGAR VIRGÜEZ, Ph.D.

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Education

DUKE UNIVERSITY, Nicholas School of the Environment — Durham, NC, United States
Doctor of Philosophy, Environmental Sciences and Policy (GPA: 3.97/4.00) — January 2022
Master of Arts, Environment (Energy and Environment) (GPA: 3.97/4.00) — July 2018

Select Scholarships: Provost Fellow (2020-2021); Energy Transition Fellow (2020); Energy Doctoral Student Fellow (2019-2021); Bass Digital Education Fellow (2019-2020); Energy Data Analytics Ph.D. Fellow (2018-2019); Rodolfo Llinas Fellow (2016-2020); Nicholas School Ph.D. Scholar (2016-2022)
Select Awards: Duke University 2022 Commencement Student Speaker (finalist) (2022); Duke's LatinX Awards: Excellence in Activism Award (2022), American Association of Geographers EESG' Best Student Paper Award (2022) and Advancing Diversity and Inclusion Award (2021); Forever Duke Student Leadership Award (2021); Graduate/Professional Academic Wizard of the Year (2021); Graduate School Dean's Award for Excellence in Teaching (2021); K Patricia Cross Future Leader Award (2020); Columbia University's 13th Annual Energy Symposium competition (2018); The Economist's Which MBA? & NRG Energy People Choice Award (2017)
Select Leadership Roles:
Board of Trustees: Board Member (Young Trustee) (2022-2025); Resources Committee (2019-2021); Strategic Task Force: Activating the Global Network (2018-2019)
Institutional Search Committees: Senior Associate Dean for International Students (2021-2022); Executive Vice President (2019-2020); Assistant Vice President for Student Affairs (2020)
Institution-wide Committees: Carbon Offsets Advisory Committee (2021-2022); Racial Equity Advisory Council (2021-2022); Graduate and Professional Students' Housing Working Group (2021); International Students Support Committee (2021)
Graduate School Committees: Graduate and Professional Student Advisory Board (2020-2021); Graduate Student Affairs Advisory Committee (2018-2021); NSOE Doctoral Programs Advocacy Council (2017-2021)

UNIVERSIDAD DE LOS ANDES (Uniandes), School of Engineering — Bogotá, Colombia
Master of Science, Environmental Engineering (GPA: 4.7/5.0) — December 2010
Bachelor of Science, Environmental Engineering (GPA: 4.2/5.0) — May 2009
Bachelor of Science, Chemical Engineering (GPA: 4.2/5.0) — May 2009

Select Scholarships and Awards: Maximum Distinction for Graduate Studies (2011); Procter & Gamble Prestige Award (2008); Expoandes, Best Social Development Project & Best Project Presentation, Uniandes (2003).

Overall: awarded nine scholarships and fellowships, adding to $795,945; received twenty-two professional honors and awards with associated prizes of $34,365; and participated in twenty-five research or consultancy projects with a combined value of $26,312,024.

Professional, Research & Teaching Experience (last five years)

STANFORD UNIVERSITY — Stanford, CA
Energy Science & Engineering Department, Stanford Doerr School of Sustainability
Managing Director and Research Engineer — February 2025 (Currently)
• Selected to serve as the inaugural Managing Director of the EARNEST Consortium, playing a central role in establishing its governance structure, research coordination protocols, and multi-institutional partnerships during the program's formative phase.
• Led the preparation of strategic reports and briefings for the U.S. Department of Energy, synthesizing technical milestones, scientific impact, and alignment with national energy system goals.
• Supervised administrative and operational teams responsible for financial reporting, compliance oversight, and logistics, ensuring efficient execution of Consortium activities and adherence to DOE requirements.

• Designed and implemented structured communication mechanisms to align over 125 Consortium members with external stakeholders and DOE program officers, supporting effective coordination and collaborative decision-making. Initiated and oversaw two seminar series: i) a Consortium-wide series open to the public, featuring senior researchers from partner institutions, and ii) the Rising Scholar Seminar, which highlights the work of graduate students and postdoctoral researchers. The public series has received over 1,000 registrations and engaged more than 750 unique attendees across its first ten installments, reflecting strong interest both within and beyond the Consortium.
• Recognized for exemplary management of a complex multimillion-dollar project spanning multiple universities, industry organizations, and federal stakeholders, with its practices and results highlighted by Stanford's Office of Sponsored Research as a model for other major initiatives at the university.
• Distinguished for advancing high-impact research and intellectual leadership in energy systems and decarbonization, recognized by:

- the American Geophysical Union (AGU) with the 2025 Science for Solutions Award, a prestigious honor from the world's largest Earth and space science society, representing more than 60,000 members globally, recognizing significant contributions to the application of Earth and space science to address complex societal challenges;
- Institute of Physics (IOP) Publishing with the 2026 Editorial Excellence Award – Environment and Energy, a selective distinction recognizing outstanding intellectual leadership and sustained excellence in peer review and editorial stewardship on the Executive and Editorial Boards of Environmental Research: Energy (EREN), elevating the quality and impact of research informing the global energy transition.

• Recognized for advancing research and thought leadership in energy systems and decarbonization, invited by:

- Duke University's Nicholas School of the Environment to serve on its Board of Visitors, providing strategic and governance-level guidance to advance the school's research, education, and external engagement priorities;
- Schmidt Sciences' Climate Institute to serve as an expert reviewer for proposals to the 2025 Decarbonization and Energy Virtual Institute (DEVI) in both the initial and final evaluation rounds, assessing projects requesting up to $10 million in funding;
- International Energy Agency (IEA) to peer review a flagship report on pathways to net zero emissions in Colombia, developed in consultation with the Government of Colombia and the Inter-American Development Bank (IDB);
- Macro-Energy Systems (MES) Society to serve on its Board and act as the chair of the 2025 Community Meeting Planning during the AGU Annual Meeting, leading a technical program comprising two oral sessions and a poster session focused on interdisciplinary approaches and community-building to advance shared understanding and shape the society's future research directions.

DUKE UNIVERSITY Durham, NC
Trustee (Board Member) July 2022 - June 2025

• Acted as a university fiduciary responsible for procuring Duke's long-term health, overseeing and aligning its strategic direction, educational policy, finances, and operations with its mission.
• Appointed as one of the forty-one members of Duke University's highest governing body, the Board of Trustees, from July 2022 to June 2025, among distinguished leaders like Adam Silver (Commissioner of the NBA), David Taylor (former CEO of P&G), J.B. Pritzker (Governor of Illinois), Lisa Borders (former President of the Women National Basketball Association), Mary Barra (CEO of General Motors), Tim Cook (CEO of Apple), and William Kaelin (Nobel Prize laureate).
• Recognized as an individual of outstanding character, ability, and vision from the current ~10,000 graduate and professional student body and ~8,000 graduate or professional alums of Duke's Class of 2021 and 2022. Identified as an emerging leader with the qualities necessary to act as a university fiduciary. Selected as the 22nd Young Trustee from the graduate and professional community in the institution's history (~100 years).
• Appointed to the Board of Trustees:

- Graduate and Professional Education and Research Committee from 2022 to 2023 as one of the nine trustees (including a Nobel Prize laureate) on the committee, along with three ex officio members (including Duke's former Provost, Sally Kornbluth, now President of MIT).
- External Engagement Committee from 2023 to 2025 as one of the nine trustees on the committee, acting as a strategic forum to review, assess, and advance issues related to the university's external relations (including its upcoming multi-billion-dollar philanthropic campaign).

- Committee on Honorary Degrees from 2023 to 2025 as one of the five trustees (including a Nobel Prize laureate), awarding honorary degrees to affirm the university's vital interest in and connection with excellence in any valued aspect of human endeavor.
- Young Trustee Nominating Committee from 2022 to 2025 (including being named Committee Chair) overviewing the screening, interviewing, assessment, and nomination process of the Graduate/Professional Young Trustee candidates to provide a recommendation on one Young Trustee to Duke University's President.

• Appointed to Duke's strategic philanthropic committees as one of the:
- Fourteen members of the Duke University Climate Commitment Task Force tasked with analyzing and assessing the scope, scale, feasibility, timing, and structure of the university-wide campaign initiative on climate change.
- Thirteen inaugural members of the Duke University Climate Commitment Campaign Advocates Board tasked with advising Duke's Vice President and Vice Provost for Climate and Sustainability and the Alumni Engagement & Development leadership on strategies to achieve fundraising and engagement goals for the university-wide campaign initiative on climate.

CARNEGIE SCIENCE (STANFORD UNIVERSITY)
Biosphere Sciences & Engineering Division Stanford, CA
Deputy Group Leader
Research Scientist and Postdoctoral Research Scientist February 2022 – February 2025

• Designed, implemented, analyzed, and summarized innovative research to inform climate and energy decision-making.
• Disseminated research findings (16 published papers and 3 under review) in high-quality scientific journals, including (the rank corresponds to the most recent Science Citation Index Expanded (SCIE) ranking by journal impact factor):
- Energy & Environmental Science: ranked 3rd/170 in SCIE's Energy & Fuels category (top 2%);
- One Earth: ranked 7th/385 in SCIE's Environmental Sciences category (top 2%);
- Environmental Science & Technology: ranked 18th/358 in SCIE's Environmental Sciences category (top 5%);
- Applied Energy: ranked 11th/170 in SCIE's Chemical Engineering category (top 10%);
- Advances in Applied Energy: ranked 13th/170 in SCIE's Energy & Fuels category (top 10%);
- Proceedings of the National Academy of Sciences of the United States of America: ranked 14th/137 in SCIE's Multidisciplinary Sciences (top 10%).

• Published op-eds and scientific letters in high-impact media like Science (including one letter featured on the main cover, one letter highlighted in Science's weekly podcast, and one letter featured as one of the top downloaded articles), Nature Cities, and Inside Higher Ed, promoting work environments that facilitate scientific production.
• Appointed as an Executive Editorial Board member of the Environmental Research: Energy journal. Recognized as a prominent scientist in the energy field, tasked with giving the journal its scientific authority, providing the publishing team with intelligence on the latest scientific and technological developments, and advocating for the journal within scientific communities.
• Acted as the deputy group leader, coordinating strategic hiring, supervising the group logistics, and procuring for medium- and long-term sustainability by overseeing the annual budget.
• Co-designed, planned, and executed the first three strategic research and development planning sessions (including research collaborators from the California Institute of Technology (Caltech) and the University of California, Irvine). Sessions were designed around three components: a) strategic research, b) team building, and c) manuscript writing.
• Selected to the eight-member Carnegie Task Force: Additive Brand Refresh, tasked with clarifying the institution's brand strategy and story to increase the understanding of its unique position and the differential value from peer organizations. Recognized as an exemplary researcher from the Department of Global Ecology, tasked with representing early-career researchers in the 2022 annual meeting of Carnegie's Board of Trustees.
• Identified as an emerging higher-education leader and rising energy scholar invited by the:
- Earthshot Prize (led by Prince William of Wales) as a member of the Expert Advisory Panel tasked with reviewing Earthshot nominations for their impact potential, uniqueness, and innovation;
- National Academy of Sciences, Engineering, and Medicine (NASEM) and the Association of American Universities (AAU) to discuss the state and future of graduate mentorship in higher education;
- Sloan Foundation and Resources for the Future (RFF) to inform decision-making on the intersection of energy and climate policy.

DUKE UNIVERSITY Durham, NC

Research Associate, Nicholas School of the Environment (NSOE) August 2016 - January 2022

• Programmed three analytical tools simulating: i) the production-cost process (day-ahead unit commitment and real-time economic dispatch models) to serve electricity demand of a service region including thermal generation assets, hydroelectric dams, and battery energy storage; ii) an availability and suitability analysis of utility-scale photovoltaic projects that account for zoning ordinances (including a user-friendly ArcGIS Pro siting tool); and iii) the geospatial and temporal evolution of generators' outages during ERCOT's energy crisis. Published research findings from their application in six journal papers and one conference proceeding.

• Awarded scholarships for more than $250,000 (external resources) to complement the internal scholarship received by the Nicholas School of the Environment. Designated as a Rodolfo Llinas Scholar, an Energy Data Analytics Fellow, an Energy Doctoral Student Fellow, a Bass Instructional Fellow, and a Provost Fellow.

• Selected as a board member (Young Trustee) of Duke University's highest governing body, the Board of Trustees. Recognized as an individual of outstanding character, ability, and vision from the current ~10,000 graduate and professional student body and ~8,000 graduate or professional alums of Duke's Class of 2021 and 2022. Identified as an emerging leader with the qualities necessary to act as a university fiduciary responsible for procuring Duke's long-term health, overseeing and aligning its strategic direction, educational policy, finances, and operations with its mission.

• Served in multiple leadership positions at the school level (e.g., Nicholas School Ph.D. Advocacy Council Co-President serving ~7% of all Duke Ph.D. Students) and institutional level (e.g., Board of Trustees Resources Committee), promoting the enhancement of the educational experience at Duke. Appointed to the search committee for three senior positions at the central administration, including the search committee for the Executive Vice President (Duke University's Chief Administrative and Financial Officer).

• Mentored undergraduate and graduate students who self-identified as members of minority groups (e.g., Latinos) and early-career practitioners in the energy and environment field. Designed a guide to establish or refine a structure to support peer-to-peer mentoring for doctoral students at Duke. Nominated (~27 nominations) for Duke's highest mentoring award for graduate students, the Graduate School Dean's Award for Excellence in Mentoring.

• Promoted an increased interaction between domestic and international students, founding member of the Nicholas School Global Connections Initiative. Proposed and accompanied the design and implementation of a collaborative agreement between Fundación para el Futuro de Colombia (COLFUTURO) and the Nicholas School of the Environment to foster cooperation through the provision of resources for Colombian graduate students (being this just the second school-specific agreement with a Latin American country).

• Represented the university at two national study-case energy competitions, achieving a 100% success rate by winning a top prize in both participations.

Instructor of the Record, NSOE and Trinity College of Art & Sciences 2017-2020

• Redesigned a course to introduce two pedagogical strategies for achieving vibrant inclusiveness in classroom settings with diverse student populations: a) enabling engagement through authentic assessments, and b) introducing global learning that draws on students' cultural heritage (service-learning components). Following positive student reception after the course redesign, the university launched new course sections in three additional languages (i.e., Chinese, French, and German).

• Published recommendations from the course redesign in two book chapters that provide practical pedagogical tips for graduate students and analyze the role of language and culture in the broader discussion of education for sustainability.

• Rated as one of the best teachers (top 5%) in undergraduate programs at Duke in Fall 2020 (4.57/5.00 instructor rate). Recognized as a next-generation instructor exemplifying the characteristics of effective college teaching impacting the experience of undergrad and graduate students, receiving awards for contributions to teaching and higher education: Duke's most distinguished teaching award for graduate students, the Graduate School Dean's Award for Excellence in Teaching, and the prestigious K. Patricia Cross Future Leader Award by the Association of American Colleges and Universities (AAC&U).

• Advocated for projects that support an enhanced experience for underrepresented groups (e.g., first-generation students) and promote inclusive pedagogical practices. Authored a university-wide resolution adopted by the Graduate and Professional Student Council to remove the GRE as a mandatory admission requirement. Co-sponsored the addition of a new bylaw to prevent hate and bias actions in the student body.

Recent Publications (selected over the last years)

***Equally contributing first authors**

- Chen, S., Lu, X., Hao, J., **Virguez, E.**, Caldeira, K., & Davis, S. (2026). The effect of land costs on the economic and sustainability performance of solar photovoltaics in China. Proceedings of the National Academy of Sciences of the United States of America. **Journal Article**. https://doi.org/10.1073/pnas.2512930123
- Wongel, A., Freese, L., **Virguez, E.**, Davis, S., & Caldeira, K. (2025). Economic development, air conditioning and adaptation to warming. *Environmental Research Letters*. **Journal Article**. https://doi.org/10.1088/1748-9326/ae1f2a
- Carlino, A., Wongel, A., Duan, L., **Virguez, E.**, Davis, S., Edwards, M., & Caldeira, K. (2025). Variability of technology learning rates. *Advances in Applied Energy*. **Journal Article**. https://doi.org/10.1016/j.adapen.2025.100252
- Ruggles, T.*, **Virguez, E.***, (et al.), & Caldeira, K. (2024). Planning reliable wind- and solar-based electricity systems. *Advances in Applied Energy*. **Journal Article**. https://doi.org/10.1016/j.adapen.2024.100185
- Covelli, D., **Virguez, E.**, Caldeira, K., & Lewis, N. (2024). Oahu as a case study for island electricity systems relying on wind and solar generation instead of imported petroleum fuels. *Applied Energy*. **Journal Article**. https://doi.org/10.1016/j.apenergy.2024.124054
- Kumar, A., Ruggles, T., & **Virguez, E.** (2024). Disproportionate energy disruptions afflicted rural Hispanic households during winter storm Uri. *Environmental Research: Energy*. **Journal Perspective**. https://doi.org/10.10188/2753-3751/ad6a1d
- **Virguez, E.** (2024). Copy-and-paste fixes can't decarbonize Global South cities. *Nature Cities*. **World View**. https://doi.org/10.1038/s44284-024-00096-8
- Li, A.*, **Virguez, E.*****, Dowling, J.*, (et al.), & Caldeira, K. (2024). The influence of regional geophysical resource variability on the value of single- and multi-storage technology portfolios. *Environmental Science & Technology (ES&T)*. **Journal Article**. https://doi.org/10.1021/acs.est.3c10188
- Antonini, E., **Virguez, E.**, Ashfaq, S., Duan, L., Ruggles, T., & Caldeira, K. (2024). Identification of reliable locations for wind power generation through a global analysis of wind droughts. *Communications Earth & Environment*. **Journal Article.** https://doi.org/10.1038/s43247-024-01260-7
- **Virguez, E.** (2022). How I balanced my Ph.D. research with opening doors for others. *Science*. **Op-ed.** https://doi.org/10.1126/science.abq8440
- **Virguez, E.**, Wang, X., & Patiño-Echeverri, D. (2021). Utility-scale photovoltaics and storage: Decarbonizing and reducing greenhouse gases abatement costs. *Applied Energy*, 282, 116120. **Journal Article.** https://doi.org/10.1016/j.apenergy.2020.116120

Overall publications: twenty-six peer-reviewed journal papers (six more under review and thirteen more under preparation), four peer-reviewed conference proceedings, one book, three book chapters, and thirteen feature articles, op-eds, or scientific letters

Citations (Google Scholar): 1,015 h-index (Google Scholar): 16 i10-index (Google Scholar): 20
Average impact factor of journals at the time of publication: 10.07

Certificates and Professional Programs

- **Certificate in college teaching**. 2022. Graduate School, Duke University
- **Emerging leaders institute.** 2019. Graduate School, Duke University
- **Geospatial analysis certificate program**. 2018. Nicholas School of the Environment, Duke University
- **Applying research for sustainable and inclusive growth: linking universities, industry, and government**. 2015. Department of Economic Development, Jobs, Transport and Resources, Australian Government
- **Innovating with sense.** 2015**.** Proa Consulting. Bogota, Colombia

Affiliation to Professional Associations

Air & Waste Management Association (A&WMA), American Association of Geographers (AAG), American Geophysical Union (AGU), Association of American Colleges & Universities (AAC&U), Institute for Operations Research and the Management Sciences (INFORMS), Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS).

Skills

Languages: Spanish (Native), English (Proficient – C1), French (Beginner - A1)
Software: ArcGIS, ArcGIS Pro, Aspen Plus, Crystal Ball, Homer, IBM ILOG Cplex, Matlab & Microsoft Office
Programming Languages: C, C++, OPL, Python, SQL & Visual Basic