



BERKELEY CLIMATE MAP — ELECTRIC POWER GENERATION JUNE 2025

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California has made more progress in reducing carbon pollution from electricity sector than any other part of the state's GHG pie. However, we still have a long ways to go to meet the State's 2030 and 2045 climate goals which will require significantly more solar, wind, geothermal and energy storage. California's continued progress on renewables replacing fossil fuels and the electrification of our homes, cars, industries and more will provide a great benefit to similar efforts in all other countries. Berkeley faculty and staff are working on a number of the biggest challenges to the fight to electrify *everything*, including:

- Offshore and on-land wind power
- Rooftop, community and utility-scale solar
- Advanced batteries and other energy storage
- Traditional and advanced geothermal
- Equitable electricity pricing
- Pricing strategies and regulations
- Grid impacts from EVs and home electrification
- Economics of renewable energy
- Heat pumps and other home electrification
- Decarbonizing the grid
- Tax credits and other green subsidies
- Grid management practices
- The California transition to clean energy
- Eco-Block (Oakland)
- Energy materials
- Berkeley campus electrification
- Local clean healthy microgrids

Research for the electrical power system is being conducted today primarily within 7 entities — School of Engineering, Rausser College of Natural Resources, College of Chemistry, Haas School of Business, Lawrence Berkeley Lab, College of Environmental Design, L&S Physical Sciences. Off-campus partners include the State of California, City of Oakland, PG&E, and others.

First	Last	Primary Affiliation	Summary	Selected Projects/Reports/Classes
M. Reza	Alam	Engineering	Research interests include Ocean and Coastal Waves Phenomena, Ocean Renewable Energy (Wave, Tide and Offshore Wind Energy), Nonlinear Dynamical Systems, and Fluid Flow Control.	
Max	Auffhammer	RCNR - Agricultural & Resource Economics	Environmental and resource economics, energy economics and applied econometrics. CEEJ Affiliate	The visual effect of wind turbines on property values is small and diminishing in space and time Private and External Costs and Benefits of Replacing High-Emitting Peaker Plants with Batteries. Climate Adaptive Response Estimation: Short And Long Run Impacts Of Climate Change On Residential Electricity and Natural Gas Consumption.
Nitash	Balsara	Engineering	Balsara Lab works on the development of polymer electrolytes that enable the rapid transport of lithium ions between the battery electrodes. Our work encompasses materials design, synthesis, characterization, and performance evaluation in applications . We have developed microphase separated block copolymer electrolytes wherein one of the microphases is soft and ion-conducting, while the other is a rigid insulator. This design enables independent control over the electrical and mechanical properties of the electrolyte. We combine electrochemical characterization with	Based on our patents, group alumni have cofounded two battery start-up companies: Seeo (founded in 2007) and Blue Current (founded in 2014) .

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			advanced characterization methods such as synchrotron hard X-ray microtomography, X-ray photon correlation spectroscopy, and atomic-scale cryogenic electron microscopy to determine the molecular underpinnings of our observations. While we mainly focus on fundamental studies that are published in peer-reviewed journals, we also publish patents when we perceive that our work may have direct societal impact.	
Alex	Bayen	Engineering - Electrical Engineering and Computer Science	<p>Director of CITRIS.</p> <p>Works on smart grid technologies and energy-efficient infrastructure</p> <p>The intersection of control, optimization, and machine learning.</p>	Self-Driving Trucks
	Berkeley Power and Energy Center	Engineering	The mission of the Berkeley Power and Energy Center (BPEC) is to further research and education in the power and energy area through engagement with industry. We seek to create an ecosystem where leading academic researchers and top industry partners can share and exchange ideas in pre-competitive research areas, advance the frontier of technology, and help educate the next generation of technology leaders.	
Severin	Borenstein	Haas - Energy Institute at Haas	Faculty Director, Energy Institute at Haas. Climate change, energy policy, electricity deregulation, energy markets, economics of renewable energy and more.	Current projects include the economics of renewable energy, economic policies for reducing greenhouse gases, and alternative models of retail electricity pricing.

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				Can Data Centers Flex Their Power Demands? Designing Electricity Rates for an Equitable Energy Transition (with Fowlie, Sallee)
	California Institute for Energy & Environment		<p>Carl Blumstein, Executive Director. Part of the CITRIS Climate initiative.</p> <p>CIEE's projects span an ambitious scope of topics, with a common thread: to intelligently apply cutting-edge technologies in service to society.</p> <p>From managing extensive studies on California's climate vulnerability to developing smart energy solutions and deploying them in the field, CIEE brings together researchers, inventors and stakeholders to accomplish what none could do alone.</p>	<p>Oakland Eco-Block</p> <p>"Eight Key Challenges for California's Energy Future."</p> <p>Involve the Youth: CIEE Postdoctoral Scholar Dr. Miriam Aczel recently co-published a commentary in Elementa: Science of the Anthropocene that highlights the potential benefits of youth-oriented citizen science research in informing climate change research.</p>
Duncan	Callaway	RCNR - ERG, Energy Institute @Haas	<p>Chair, Energy Resources Group.</p> <p>Focuses on energy systems analysis, grid decarbonization, and the integration of renewable energy into power systems.</p> <p>His research group focuses on emerging energy technologies by quantifying their impacts on power system operations and developing control, optimization and data analysis tools to facilitate their integration into power systems technologies.</p> <p>CEEJ Affiliate</p>	Data Environment and Society ENERES 131 001 (Fall 2023)

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Gerbrand	Ceder	Engineering	Ceder Group does cutting-edge research that has led to record-breaking battery materials and identification of new frontiers.	Ceder Group at Berkeley and LBL
	Center for Environmental Public Policy	Goldman	David Wooley , Executive Director. Synthesizing scientific, economic, technical, social, financial, and political understanding, CEPP collaborates to support the creation and implementation of sound public policies. CEPP's primary focus is on climate change, the key environmental challenge of our time.	<p>2035 and Beyond: Abundant, Affordable Offshore Wind Can Accelerate Our Clean Electricity Future.</p> <p>Overall 2035 Project – All 4 reports – Reconductoring, Offshore Wind, Transportation and Electricity</p> <p>The US can reach 90 percent clean electricity by 2035, dependably and without increasing consumer bills</p> <p>California 100 Releases First Round of Policy and Scenario Reports Focused on State's Infrastructure Future</p> <p>Lead author: The Future of Energy, Environment and Natural Resources for the California 100 Project</p> <p>Berkeley Carbon Trading Project</p> <p>UCOP \$100M Climate Action LOI lead – January 2023 - Keeping California Climate Funding in California: Piloting Local Climate Action Funds -- Seed (Invite)</p>

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Fotini	Chow	Engineering	Environmental fluid mechanics, with applications in wind energy and atmospheric boundary layer flows.	Her current research projects include studies of wind turbine interactions with boundary layer dynamics over steep terrain, urban dispersion modeling, improved numerical turbulence techniques, topography representation, and grid nesting.
Lucas	Davis	Haas	Davis's research focuses on energy and environmental markets, and, in particular, on electricity and natural gas regulation, pricing in competitive and non-competitive markets, and the economic and business impacts of environmental policy.	How Effective is Energy Efficient Housing: Evidence from a Field Experiment in Mexico The Economic Determinants of Heat Pump Adoption What Matters for Electrification? Evidence from 70 Years of U.S. Home Heating Choices Transmission Impossible? Prospects for Decarbonizing the U.S. Grid Who Will Pay for Legacy Utility Costs? Air Conditioning and Global Inequality
	Energy and Resources Group (ERG)	RCNR	Duncan Calloway, ERG Chair. ERG is a collaborative community of graduate students, core faculty, nearly 200 affiliated faculty and researchers across the campus, and over 600 alumni across the globe. Our students work across disciplines and departments to create potentially transformative knowledge for the planet. ERG is a world-renowned program with a 50-year history of outstanding research, education and outreach to	Research at ERG 9 labs and initiatives <ul style="list-style-type: none"> • Critical Ruralities • Harte Lab • Water Group • Kueppers Lab • EMAC • Climate and Carbon Sciences Program • RAEL • Climate Futures Lab

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			government, industry, and civil society at the state, national and international levels.	<ul style="list-style-type: none"> ERG Economics Lab
	Energy Institute at Haas	Haas	<p>Andrew Campbell, Executive Director. Supports current and future energy sector leaders with training and research.</p> <p>Train the business and policy leaders of tomorrow on market, policy, and technology commercialization challenges in the energy industry.</p> <p>Produce research and analysis backed by rigorous empirical evidence and the frontiers of economic research so that energy and environmental policy and business decisions are based on sound economic and business principles.</p>	<p>Energy Institute Blog</p> <p>The Energy Institute Working Paper Series presents new research on energy and environmental topics authored by our faculty affiliates and graduate students.</p>
Meredith	Fowlie	RCNR - Agricultural & Resource Economics, Energy Institute @Haas	<p>Faculty director, Energy Institute at Haas. Co-directs the National Bureau of Economic Research (NBER), Environmental and Energy Economics Program. Co-Chair Academic Senate Task Force on climate.</p> <p>Fowlie has worked extensively on the economics of energy markets and the environment. Her research investigates market-based environmental regulations, the economics of air pollution, electricity market regulation, and incomplete GHG regulations.</p>	<p>Negotiating the Clean Energy Transition: California's Experiment in Progress (video)</p> <p>Organized National Bureau of Economic Research conference "Measuring and Reporting Corporate Carbon Footprints and Climate Risk Exposure – Fall 2021"</p> <p>Climate Policy, Environmental Justice and Local Air Pollution(2020)</p>

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				Designing Electricity Rates for an Equitable Energy Transition (link) 2023 UCOP Proposal: Designing Climate Policy for an Equitable and Effective Clean Energy Teaching: ENVECON 147 Economics of the Clean Energy Transition (SPRING 2023)
Marta	Gonzalez	CED - City and Regional Planning	Statistical Physics of Complex Systems and Network Science. Spatial AI, digital traces, and Environmental data. Her recent research uses billions of mobile phone records to understand the appearance of traffic jams and the integration of electric vehicles into the grid , smart meter data records to compare the policy of solar energy adoption and card transactions to identify habits in spending behavior.	Teaching: Data Science for Smart Cities; Fall: Human Mobility and Network Science.
Ali	Javey	Engineering	Research centers on advanced photovoltaic materials and devices, including nanomaterials for solar energy conversion.	Better Solar Power for the Masses?
Chris	Jones	RCNR - Energy and Resources Group	Chris Jones is Director of the CoolClimate Network , a university-government-industry partnership, and part of team for UCOP Climate Action project supporting local communities' climate planning.	CoolClimate Calculator: California Local Government Policy Tool: https://coolclimate.org UCOP Climate Action Award: Climate Action Planning Tools: Empowering Equitable

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			<p>Carbon footprint analysis, the design of behavior-based programs and regional climate policy. In 2005, Jones published the first comprehensive carbon footprint calculator, which accounts for the greenhouse gas emissions of all transportation, energy, food, goods and services purchased by U.S. households.</p> <p>Faculty lecturer in the Haas School of Business, and Program Chair (13th year) of the Behavior, Energy and Climate Change</p>	<p>Transitions for CA Communities FUNDED</p> <p>Cool Campus Challenge and the CoolCalifornia Challenge</p> <p>MBA/EWMBA 292T.14 - Carbon Footprint Analysis for Innovation FALL 2022</p>
Dan	Kammen	RCNR - Energy Resources Group, Goldman	<p>Focuses on renewable energy systems, climate policy, and global decarbonization strategies.</p> <p>Director, Center for Environmental Public Policy (Goldman).</p> <p>Founding Director, Renewable and Appropriate Energy Laboratory (RAEL)</p> <p>CEEJ Advisory Council</p>	<p>Co-PI, Eco Block Project</p> <p>UCOP Proposal: Climate Action Planning Tools: Empowering Equitable Transitions for CA Communities FUNDED</p> <p>Accelerating the Timeline for Climate Action in California (2022)</p> <p>Driving Research Opportunities at RAEL – California’s electric grid and the move to all EVs</p>
Robert	Kostecki	LBNL - Energy Storage & Distributed Resources	<p>Director, Energy Storage and Distributed Resources Division at LBNL.</p> <p>ESDR enables and accelerates the development and adoption of new advanced</p>	

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			<p>technologies for sustainable transportation, renewable power and energy efficiency.</p> <p> Grid Integration Energy Storage Energy Conversion Laser Technologies Thermal Science Applied Energy Materials </p>	
Javad	Lavaci	Engineering	Power systems: nonlinear power optimization problems (optimal power flow, unit commitment, state estimation, etc.), distributed control of renewable energy, smart grid	
Jiang	Lin	LBNL - Energy Technologies Area	<p>Energy and climate policy, energy and emissions pathways with a focus on non-CO2 GHGs (methane, F-gas, etc.), electricity market and planning, low-carbon economic transition, and appliance efficiency issues in China.</p> <p>Formerly co-Director of the Berkeley-Tsinghua Joint Research Center on Energy and Climate Change.</p> <p>Formerly, Lin was the Director of the Energy Foundation's China Sustainable Energy Program (2007-2013) and Senior Vice President for Strategy and Analysis (2014-2016) where he managed the growth of Energy Foundation China into one of the largest international NGOs</p>	

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			devoted to promoting clean energy and climate solutions in China.	
Philip	Marcus	Engineering - Mechanical Engineering	Wind energy, water desalination, strongly rotating and/or stratified flows, vortices and vortex dynamics and their applications in engineering, atmospheres, oceans, and astrophysics.	UCOP \$100M Climate Action Proposal lead – A Comprehensive Climate Solution: Microgrids with Wind & Solar Power & Pumped Water Energy Storage -- Matching
Simo	Markiharju	Engineering	Ocean renewable energy	
Scott	Moura	Engineering - Civil and Environmental Engineering	Advanced batteries, vehicle electrification, distributed energy resources. PI for the ecal Lab . Urban electrified transportation, increased energy demand and new storage opportunities. CEEJ Core Faculty	
	Office of Sustainability and Carbon Solutions	Campuswide	Serves as a leader for sustainability initiatives on campus. Berkeley is committed to surpassing the carbon reduction mandates set by California state regulations by achieving at least a 90% reduction in total emissions (scopes 1,2, and 3), relative to a 2019 baseline, by 2045.	Berkeley Clean Energy Campus For decades, Berkeley has led the world in climate solution technology and policy research. Now, the campus will begin transitioning to an energy system that sets the standard in sustainable, resilient infrastructure. With target dates of 2028 for phase one and 2030 for phase two, Berkeley will replace their natural gas powered cogeneration plant

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				with a new clean and green resilient energy system. This initiative will phase out fossil fuel use for powering, heating, and cooling campus. The new reproducible, scalable Berkeley Clean Energy Campus system will demonstrate state-of-the-art technologies and exemplify creative financing such that other campuses and public institutions can replicate .
Shmuel	Oren	Engineering	Work focuses on 'Market Engineering', using optimization technology along with price and incentive mechanisms for coordination of decentralized complex systems. My main domain of interest is planning, operation and regulation of electric power systems including generation, transmission and distribution.	
Kristin	Persson	Engineering	Lithium-ion Batteries, multivalent batteries, organic electrolytes, polar materials, datamining of materials properties for energy applications. Directs the Materials Project	Directs the Materials Project Huge multi-national project to support scientists worldwide discover new materials for clean energy storage and more.
Kameshwar	Poolla	Engineering	Research interests include applications of control theory to power grids, renewable energy systems, and energy markets.	

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Ravi	Prasher	LBNL	Research on energy storage solutions critical for balancing solar and wind energy supply with demand.	
Joseph	Rand	LBNL	Energy Policy Researcher in the Energy Markets and Policy Department. Conducts research and analysis on renewable energy, including: renewable energy policy, cost, and market analysis; spatial data analysis; and research related to social impacts and grid interconnection of energy.	
	Renewable and Appropriate Energy Lab (RAEL)	RCNR - Energy and Resources Group, Goldman	<p>Daniel Kammen, Director Unique research, development, project implementation, and community outreach facility based at the Energy and Resources Group.</p> <p>RAEL focuses on designing, testing, and disseminating renewable and appropriate energy systems.</p>	
Jim	Sallee	RCNR - Agricultural & Resource Economics, Energy Institute @Haas	Public economist specializing in environmental and energy economics. His research analyzes policy design and market behavior in transportation and electricity.	<p>Retiring Old Capital to Foster Decarbonization</p> <p>Designing Electricity Rates for an Equitable Energy Transition (link)</p> <p>A New Charge is Coming to Your Electric Bill. Will it Make California Rates More Affordable?</p>

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				<p>The Potential of and Problems with Carbon Markets in US Agriculture Retiring Heavy-Duty Trucks</p> <p>Price Regulation, Incidence, and the Clean Energy Transition</p>
Kenichi	Soga	Engineering		Soga Group Investigates Geothermal for Campus Clean Energy Project
T. Don	Tiley	Chemistry	Renewable energy, solar fuels, inorganic, organometallic, polymer and materials chemistry, transition metal compounds, catalysis, new chemical transformations, advanced solid state materials	
Evan	Variano	Engineering - Civil and Environmental Engineering	Environmental fluid dynamics	<p>2023 UCOP Proposal: Empowering California to Access Water Savings from Floating Solar</p> <p>Environmental Fluid Mechanics CE200B Spring 2024</p>
Alexandra	Von Meier	Engineering	Electric grids and power distribution, with emphasis on smart grid issues and integration of distributed generation.	
Steven	Weissman	Goldman	<p>Energy and climate policy</p> <p>Former Administrative Law Judge at the CPUC.</p>	<p>Why Doesn't PG&E Bury the Power Lines to Prevent Wildfires? (KQED 2020)</p> <p>California Must Prepare Its Electric Grid for Complex Climate Risks (SF Chronicle, 2020)</p>

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				California Needs Clean, Healthy and Safe Local Energy Systems – Microgrids
Ryan	Wiser	LBNL	<p>Senior Scientist in and Senior Advisor to the Energy Markets and Policy Department.</p> <p>Helps lead a 60-person department that seeks to inform public and private decision making within the U.S. electricity sector through research on electric system planning, reliability and regulation as well as on energy efficiency, renewable energy, and demand response.</p>	Manages a research program on renewable electricity systems, including on the costs, benefits, impacts and market potential of renewable electricity sources; on electric grid operations and infrastructure impacts; on public acceptance and deployment barriers; and on the planning, design, and evaluation of renewable energy programs.
Eli	Yablonovitch	Physics	Yablonovitch introduced the $4(n^2)$ (“ <i>Yablonovitch Limit</i> ”) light-trapping factor that is in worldwide use, for almost all commercial solar panels. His mantra that “a great solar cell also needs to be a great LED”, is the basis of the world record solar cells: single-junction 29.1% efficiency; dual-junction 31.5%; quadruple-junction 38.8% efficiency; all at 1 sun.	
Peidong	<u>Yang</u>	Chemistry	<p>The Yang research group is developing materials and systems for the purpose of fixing CO₂ using sunlight.</p> <ul style="list-style-type: none"> • <i>Solar-driven CO₂ fixation</i> • <i>Artificial photosynthesis</i> • <u>Nanowires for Solar to Fuel Conversion</u> 	Liquid Sunlight: The Evolution of Photosynthetic Biohybrids