

Dr. Uday Varadarajan, Ph.D.

Uday is a Principal in the Carbon-Free Electricity Practice at RMI and a Precourt Energy Scholar at the Sustainable Finance Initiative (SFI) at Stanford University, where his work focuses on how to use cutting edge data and financial, policy, and regulatory analysis to help drive a just transition to clean energy. Prior to moving to RMI and SFI, Uday was a Principal at Climate Policy Initiative (CPI) Energy Finance, managing their San Francisco team. At CPI, he led the development of innovative financial, regulatory, and policy data analytics and tools that are helping consumers, utilities, and communities in states across the US (including New York, Colorado, Missouri, Minnesota, Utah, and South Carolina) realize the benefits from a just and equitable transition from uneconomic dirty resources to clean energy. Prior to joining CPI, Uday was a program examiner in the U.S. White House Office of Management and Budget (OMB), where oversaw the \$2 billion budget for U.S. Department of Energy (DOE) energy efficiency and renewable energy programs and the cost assessment and approval of the first \$8 billion in DOE loans to automakers, including loans to Tesla and Nissan to build electric vehicles. Prior to joining OMB, Uday was a AAAS Science and Technology Policy Fellow, working first as an advisor on carbon sequestration programs and then on detail to the staff of the U.S. House of Representatives, Appropriations Committee. Prior to coming to Washington, Uday was a postdoctoral fellow in theoretical physics at the University of Texas at Austin. He received his Ph.D. in physics from the University of California at Berkeley, and his undergraduate degree in physics from Princeton University.

EXPERIENCE

Sustainable Finance Initiative at Stanford University

Precourt Energy Scholar

July 2018 – Present

San Francisco

Rocky Mountain Institute

Principal

July 2018 – Present

San Francisco

I lead the Utility Transition Financing team in the Carbon-Free Electricity Practice at RMI, and work with students, faculty, and staff at Stanford's Sustainable Finance Initiative on funding a just transition in the US through financial markets. The broad theme underlying all of my work is around how to use cutting edge data and financial, policy, and regulatory analysis to help drive an equitable and just transition to clean energy. This has included:

- Development of the [Utility Transition Hub](#), a tool aimed at key utility stakeholders to help them chart a path to an equitable and affordable energy transition by surface and manage the less visible forces that drive future emissions outcomes in the electricity sector.
- Publication of [How to Retire Early](#), a plant-by-plant analysis of the global coal fleet that demonstrated that while in theory nearly 40% of coal generation could be economically phased out and replaced with clean energy with storage, in practice financial tools like securitization were necessary to avoid inequitable transition burdens on coal customers, workers, and communities for over 90% of that fleet.
- Development of a [new approach to carbon pricing](#) that uses carrots rather than sticks to align the incentives of carbon intensive industries, workers, and energy customers with rapid decarbonization as a [key element](#) of [a sustainable recovery from the COVID crisis](#).
- Testimony and reports filed in [Iowa](#), [Minnesota](#), [Colorado](#), and [South Carolina](#) describing how new utility financing and business models can align customer and utility investor interests with accelerated decarbonization.

- Providing analysis and thought leadership around the use of [securitization](#) to help finance a just transition from fossil generation to clean energy in regulated utilities across the US. This ongoing work has inspired the passage of securitization bills by legislatures in seven states ([CO](#), [NM](#), [MT](#), [KS](#), [MO](#), [IN](#), [MN](#)), the use of existing securitization bills to mitigate the rate impact of \$1.5 billion of capital costs of retired coal assets in three states ([WV](#), [NM](#) - including \$40 million in just transition financing, [MI](#)), the introduction of securitization bills in two other states ([SC](#), UT) and utility and stakeholder engagement towards action in several additional states (AZ, NC, FL, VA, KY, WV).

Climate Policy Initiative

Principal

2010 – July 2018

San Francisco

I led a team of five consultants and analysts based in San Francisco focused on developing innovative financial, policy, regulatory, and business structures to catalyse the efficient transition to clean energy resources.

- **Leading CPI Energy Finance’s US Utility Capital Recycling program**, a \$1.1 million effort in partnership with advocates and other stakeholders in four states, supported by nearly a dozen non-profit and governmental entities aimed at developing and deploying regulatory, financial, and policy tools (such as ratepayer-backed bond securitization) to recycle regulated utility capital locked up in expensive dirty plants into cheaper, cleaner generation. Regulatory and legislative action inspired in part by this work is underway in Colorado, Minnesota, Missouri, New Mexico, and Utah. The program has received support from TomKat Foundation (\$150k), Heising Simons Foundation (\$445k), Hewlett Foundation (\$100k), Energy Foundation (\$240k), McKnight Foundation (\$48k), National Resources Defense Council (\$64k), Minnesota Clean Energy Advocates (\$20k), Western Resource Advocates (\$20k), HEAL Utah and three Utah municipalities (\$37k).
- **Leading an engagement with NYSERDA to efficiently transition to clean energy**, \$200k in consulting to provide detailed financial and economic modeling to support the design of: mechanisms to procure over 700MW of oshore wind by 2022 and 2.4 GW of offshore wind by 2030, NY Green Bank loans to community PV projects, and development of a roadmap to deploy 1.5GW of storage by 2025.
- **Led the development of the [Clean Energy Investment Trust \(CEIT\)](#)**, a financial vehicle for renewable investment designed to address the [shortcomings of the the YieldCo business model](#). This new, low-cost investment vehicle for long-term ownership of renewable assets was designed based on rigorous statistical analysis of historical risks and cash flows of modern North American wind farms to optimally [address the barriers to institutional invesment in renewable energy](#).
- **Led a team to develop a vision for the transition to low-carbon electricity** under a \$75k contract for Swedish Growth Analysis, resulting in a report discussing potential shifts in policies, market structures, and business models needed to [cost-effectively drive a transition to a low-carbon electricity grid dominated by variable generation sources](#).
- **Developed key project and portfolio financial analysis tools** to assess the impact of new policy support structures, regulatory mechanisms, market structures, and business models (such as YieldCos and Master Limited Partnerships) on the cost of capital for renewable energy in the U.S. and E.U.
- **Developed a proposal to reform US tax credits** that would [reduce their cost to government by 40% while providing the same level of benefit to wind developers and investors](#).

Executive Office of the President, Office of Management and Budget (OMB)

Program Examiner in the Energy Branch

2008 – 2010

Washington, DC

I was responsible for reviewing the Department of Energy’s Office of Energy Efficiency and Renewable Energy’s (EERE) budget submission to OMB and providing my recommendation to OMB’s leadership regarding their

funding for inclusion in the President's annual budget submission to Congress. I was also the examiner responsible for oversight of the Advanced Technology Vehicles Manufacturing Loan Program (ATVM).

- **Lead for OMB approval process for ATVM Loans to Nissan, Tesla, Ford, and Fisker** – As the first examiner for the ATVM program, I worked with DOE to develop and approve the credit subsidy model for the program, as required by the Federal Credit Reform Act. This model is being used to estimate the cost to the government of providing up to \$25 billion in Federal direct loans to auto manufacturers. Worked with DOE to review and approve the subsidy cost for \$8.4 billion in loans to Nissan, Tesla, Ford, and Fisker. Received an OMB division-level award for my work on this model and the program.
- **Supported OMB approval process for DOE Loan Guarantees** – Supported OMB review and assessment of cost to government of several loan guarantees made by the U.S. DOE Title XVII Loan Program, including loans to Solyndra, First Wind, Shepherd's Flat Wind, Abengoa's Solana CSP, and Ivanpah CSP.
- **Supported Obama transition team energy proposal development** – Worked with the Presidential Transition Team, providing analysis to inform their submissions to Congress regarding renewable energy and energy efficiency items for inclusion in the American Re-investment and Recovery Act
- **Oversaw OMB review of plans for \$16.8 billion in Recovery Act EE and RE spending** – Subsequent to the passage of the Recovery Act, worked with EERE to review and approve their detailed project and program plans for nearly \$16.8 billion in renewable energy and energy efficiency spending.
- **Developed energy tax incentive models to support budget development** – Worked with other examiners to use EIA data to model the impact of Federal tax incentives and loan programs on the cost of electricity from various sources to inform budget decision-making.
- **Worked with DOE to develop President's Budget for EE and RE for FY 2010 and 2011** – Reviewed the FY 2010 and FY 2011 EERE budget submissions, and worked with DOE to review and approve their budget justifications to Congress. Continue to work with EERE to track program performance and execution in support of the Administration's energy policy objectives.

AAAS Science and Technology Policy Fellowship

Fellow

2006-2008

Washington, DC

2008: I was sent on detail from the Department of Energy (DOE) to the Majority Staff of the Committee on Appropriations, House of Representatives, Subcommittee on Energy and Water Development, where I supported development of the appropriations bill to fund the Department of Energy.

- I provided the Subcommittee with input, analysis, and advice in support of crafting the Committee's FY 2009 Energy and Water Appropriations bill and committee report, which fund the Department of Energy and other agencies. My primary responsibility was to address issues relevant to the DOE Office of Science, and serve as support on issues relevant to the DOE Fossil Energy, Energy Efficiency and Renewable Energy, and Energy Transmission and Distribution programs.
- Built an Access database, forms, and reports to allow quick & easy access to the Congressional requests made to the Subcommittee by the 435 members of the House of Representatives regarding the bill and used the database to analyze these requests and support decision-making.

2006-2008: I advised the Under Secretary on science issues relevant to the applied energy technology programs, particularly the fossil energy program and the scientific issues surrounding carbon dioxide capture and sequestration.

- **Lead for DOE basic and applied R&D coordination review** – Played a leading role in a review of the DOE R&D portfolio which resulted in the identification of six key opportunities for accelerating innovation through better coordination of R&D budgets in the basic and applied science and technology programs

across the department. The President's FY 2009 budget funded requests across the department identified by our analysis as relevant to these six opportunities and presented integrated budgets for these areas for the first time.

- **Developed action plan for integrated basic and applied carbon storage R&D plan** – Led the creation of an action plan to implement an integrated basic and applied science program in support of the geological storage of carbon dioxide emissions from coal power plants. Worked with science and technology program staff to begin the implementation of this plan
- **Led development of a new DOE High Energy Physics website** – Leading the creation of a new web page for the Office of High Energy Physics at DOE, as well as a public outreach web portal for the field of high energy physics.
- **DOE lead staff for high energy density physics report** – Was the lead support staff in editing, producing, and rolling-out the [Report of the Interagency Task Force on High Energy Density Physics](#), outlining a Federal strategy to support this emerging field of science with promising applications to fusion energy.

String Theory and Theoretical High Energy Physics

Graduate Researcher and Post-Doctoral Fellow

2001-2006

Berkeley, CA and Austin, TX

I was a postdoctoral fellow in the Weinberg Theory Group at UT Austin from 2003-2006, and before that, a graduate researcher in the Physics Division of Lawrence Berkeley Labs from 2001-2003. I worked on a range of topics within String Theory, a candidate "theory of everything". For instance, with Prof. Horava and collaborators, we suggested that a novel feature of string theory (holography) may exclude the possibility of time travel (for a popular account, see The New Scientist, Sep 20th, 2003, p.28).

Experimental Condensed Matter Physics - Carbon Nanotubes

Graduate Researcher

1997-1999

Berkeley, CA

I was a graduate researcher in the Material Science Division of LBNL, where I synthesized carbon nanotubes (long, thin tubes - just nanometers in diameter- each made up of a single, one atom thick layer of graphite). I also worked to characterize the materials at the National Center for Electron Microscopy and Berkeley Microlab using TEM, SEM, and AFM techniques. I further explored the electronic properties of tangles of tubes as well as individual tubes using nanodevices we fabricated using electron-beam lithography.

Other Physics Research (Princeton Undergraduate)

Undergraduate Researcher

1993-1996

Princeton, NJ

- **Biophysics:** [Senior Thesis](#) w/ C. Callan - a model for DNA stretching. (1995-1996)
- **High Energy Experiment:** Simulation of a HERA-B pretrigger. (Summer 1995)
- **Plasma Physics:** DOE Fellowship at PPPL - numerical Poisson Solver.(Summer 1994)
- **Nuclear Physics:** Simulation of the Borexino Neutrino Detector. (1993-1994)

EDUCATION

University of California at Berkeley

Ph.D., Physics

2003

Berkeley, CA

- Advisor: Bruno Zumino
- [Dissertation: "Geometry, Topology and String Theory"](#)

University of California at Berkeley

1998

M.A., Physics

Berkeley, CA

- Advisor: Alex Zettl
- Focus: Synthesis and Characterization of Carbon Nanotubes

Princeton University

1996

A.B. (Magna Cum Laude), Physics

Berkeley, California

- Certificates in Mathematical Physics and Engineering Physics (1996)
- Thesis Advisor: Curtis G. Callan
- Senior Thesis: "The Role of Solitons in the Overstretching of B-DNA"
- Allen G. Shenstone Prize in Physics, Princeton University (1996)
- Kusaka Memorial Prize in Physics, Princeton University (1995)

OTHER

Foreign Languages

Spanish (competent), Tamil (basic).

Computer Skills

Office Software: MS Office (Access, Excel, Word, Powerpoint), Google Docs, Sheets, and Forms.

Programming Languages: Python, Excel and Access VBA, SQL, Google Apps Script, Java, C, C++, Pascal, Fortran, HTML, SPARC Assembly.

Mathematical Packages: Numpy, Stata, R, Mathematica, Maple.