Vijay Modi

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Vijay Modi is a Professor in Columbia University's Departments of Mechanical Engineering and Earth & Environmental Engineering, and in the Climate School. He directs the Quadracci Sustainable Engineering Laboratory.

He received his Ph.D. from Cornell University in 1984 and after post-doctoral work at MIT from 1984 to 1986 joined the Mechanical Engineering Department of Columbia University as an Assistant Professor. Prof. Modi's areas of expertise are energy resources, conversion technologies and thinking of energy systems, transformation for access and economic growth (particularly in emerging markets), or for a transition to a lower cost affordable supply (whether in emerging markets or otherwise, rural or urban). His laboratory, the Quadracci Sustainable Engineering Lab (QSEL), has been responsible for technologies such as "SharedSolar", "Acacia" and widely used tools such as "Network Planner" and FormHub (today Kobo) and field survey tools to assess electricity demand and growth potential.

He early experience was in applying known science to advance thermal power generation, gas turbines, grid and mini-grids technologies, with particular focus on solar, wind, gas power. In the last decade, his laboratory has carried out pioneering work in digital mini-grids that integrate electricity supply/demand monitoring, dynamic allocation of energy/power resources to individual customers and the use of IoT for system, battery, customer commercial account management with integration of communication and controls. His laboratory has developed network expansion tools for electric utilities in low-resource settings and data-driven analysis of such utilities for demand estimation and forecasting. Developing data-driven models for electrification of heating and transport. Much of this effort involves modeling tools that aim to replicate the key features of the supply, demand, transmission, reserves, regulatory and market systems. Current effort looks at how distribution network capacities, upgrades and costs are impacted by decarbonization and how to quantify financing requirements of the energy transition (1) at the state agency level (2) utility or energy service providers and (3) consumers for purchase of end-use equipment. Current interests include the Global South: understanding their constraints to economic growth, the role of infrastructure and energy services in supporting livelihoods, data and analytics at high spatial resolution to identify local gaps and opportunities and how geographies can benefit from leap frogging in the energy transition; and, in higher income geographies:

Past activities

Between October 2011 and 2012, he was a member of the U.N. Secretary General's high-level task force on "Sustainable Energy for All" and he currently leads the U.N. Sustainable Development Solutions Network working group on Energy Access for All. He has since supported the efforts of SE4All, World Bank, Vienna Energy Forum and UN agencies.

His early work was on computational fluid dynamics applied to optimal design of thermofluid systems, design and use of micro-electro-mechanical systems for flow measurements and use of heat/mass transfer analysis/measurements for electrochemical applications.

He is currently working closely with city and national agencies/utilities to understand how energy services can be more accessible, more efficient and cleaner. His recent project on minigrids is providing a unique understanding of consumer behavior, demand for energy, and business models for deploying energy solutions and energy efficiency.