Kevin Novan

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DATE OF BIRTH: 7/2/1983 **SEX:** M **CITIZENSHIP:** U.S.

GRADUATE STUDIES: University of California, San Diego

DATES: August 2005 - present

THESIS TITLE: The External Benefits of Renewable Electricity

EXPECTED COMPLETION DATE: Spring 2012

REFERENCES:

Richard Carson (Chair) Department of Economics University of California, San Diego 9500 Gilman Drive La Jolla, CA 92093-0508 (858) 822-2262 rcarson@ucsd.edu	Kerry Smith Department of Economics W.P. Carey School of Bus. Arizona State University P.O. Box 879801 Tempe, AZ 85287-9801 (480) 727-9812 kerry.smith@asu.edu	Mark Jacobsen Department of Economics University of California, San Diego 9500 Gilman Drive La Jolla, CA 92093-0508 (858) 822-7767 m3jacobs@ucsd.edu

DESIRED TEACHING AND RESEARCH:

Primary Fields: Energy/Environmental, Industrial Organization

Secondary Fields: Public, Applied Econometrics

UNDERGRADUATE STUDIES:

B.A., Economics and Mathematics, Western Washington University, *Magna Cum Laude*, June 2005

HONORS, SCHOLARSHIPS, AND FELLOWSHIPS:

2011: University of California Energy and Environmental Economics Grant (with Joshua Graff Zivin)
2011: CEESP Pre-Doctoral Fellowship, Arizona State University
2010: University of California Energy and Environmental Economics Grant (with Richard Carson)
2010: Teaching Assistant Excellence Award, UCSD
2005: Outstanding Graduate in Economics, WWU
2005: Gus Mattersdorff Undergraduate Paper Award, Pacific Northwest Regional Economic Conference

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TEACHING EXPERIENCE:

2011, Summer: Instructor, University of California, San Diego
(Undergraduate level, Microeconomics)

2005-present: Teaching Assistant, University of California, San Diego
(Energy Economics, Environmental Economics, Economics of Ocean Resources, Microeconomics, Econometrics, Public Economics, Economic Development)

CONFERENCE PRESENTATIONS:

2011: Applied Microeconomic Seminar, UC San Diego
Graduate Student Economics Conference, NYU
NBER EEE Summer Institute Research Sketch, Boston
International Energy Workshop, Stanford University
UC Conference on Energy and Environmental Economics, UC Berkeley
Resource Economics Seminar, Arizona State University

2010: Applied Microeconomic Seminar, UC San Diego
12th Occasional Workshop on Environmental and Resource Economics, UC Santa Barbara

RESEARCH PAPERS:

Valuing the Wind: Renewable Energy Policies and Air Pollution Avoided *(Job Market Paper)*

This paper estimates the variation over time in the quantity of pollution avoided by renewable electricity. Taking advantage of the natural experiment presented by changes in hourly wind speeds, I identify the amount of CO_2, NO_X, and SO_2 reduced by electricity supplied from wind turbines in the Texas electricity market. The results provide clear evidence that renewable generation in the region offsets significant amounts of each of the pollutants examined. However, because different conventional generators are on the margin at different levels of demand, I find the amount of pollution avoided by a unit of renewable electricity varies substantially with the quantity of electricity demanded. As a result, renewable generators in separate locations, producing electricity at varying points in time, will provide very different reductions in pollution. By failing to account for these differences in the emissions avoided, policies subsidizing each unit of renewable electricity equally will not ensure efficient investment decisions are made.

The Economics of Bulk Electricity Storage with Intermittent Renewables (with Richard Carson)

Efforts to reduce emissions from the electricity sector are driving a shift towards greater use of intermittent, renewable sources such as wind and solar energy. Motivated largely by the belief that electricity storage technologies are a vital complement to these intermittent renewables, states have begun implementing requirements that will dramatically increase the amount of bulk storage capacity (e.g. batteries, compressed air energy storage, pumped hydroelectric storage). This paper analytically and empirically demonstrates that, in contrast to the environmental objectives of expanding renewable generation, adding bulk storage capacity will generally increase the short-run level of emissions. Only after renewable capacity becomes large enough that the renewable sources are frequently on the margin does the introduction of bulk storage reduce the level of emissions. In addition, contrary to the view that bulk storage and renewables are necessarily complements, increased storage is shown to make solar less attractive and typical wind sites more attractive. As a result, in regions with substantial solar potential, and minimal wind generation potential, bulk storage expansions may in fact reduce the optimal renewable capacity.

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RESEARCH IN PROGRESS:

The Paradox of Renewable Electricity Investments

Justifying substantial investments in intermittent renewable electricity is viewed as difficult given the large fixed costs of renewable generators. However, if the marginal returns to renewable capacity are increasing, substantial investments may be necessary in order for the social benefits to outweigh the costs. In an empirical examination of a regional electricity market, I demonstrate the pollution avoided by installing an additional wind turbine increases as the renewable capacity grows. At low levels of intermittent capacity, small, erratic quantities of renewable output are created. Rather than pushing fossil fuel generators offline, the volatile renewable electricity simply forces the marginal generators, often clean natural gas fired units, to operate at less efficient levels. However, as capacity increases across a wider range of locations, intermittent renewable output changes in two ways. First, by diversifying across locations, aggregate renewable generation becomes less volatile. Instead of operating at low, inefficient levels, fossil fuel units on the margin begin to shut down. Second, the aggregate level of renewable output increases. As a result, generation farther down the dispatch order, often from emission intensive coal fired units, is reduced. The empirical results reveal that over a wide range of renewable capacities, the pollution avoided by an additional wind turbine is increasing in renewable capacity. The findings further suggest that wind capacity has to be deployed on a fairly large scale to justify the magnitude of the current subsidies in place.

Gasoline Taxes and Revenue Volatility: An Application to California (with Michael Madowitz)

This paper examines how different combinations of gasoline excise and sales taxes impact the volatility of state tax revenues. Unlike many commodities which have sales taxes levied on them, gasoline has a unique combination of two key features. First, prices are very volatile. Second, demand for gasoline is extremely inelastic. As a result, there is substantial variation in the total expenditures on gasoline over time. Tying state revenue to these variable fuel expenditures, as is the case with a sales tax, results in a volatile stream of revenue which imposes real costs on agents in an economy. On July 1, 2010, California enacted Assembly Bill 6, the "Gas Tax Swap", which increased the excise tax and decreased the sales tax on fuel purchases. While the initial motivation behind the revenue neutral tax swap was to provide the state with greater flexibility within its budget, we point out that this temporary change has had an overlooked benefit; it reduces tax revenue volatility. Simulating the monthly fuel prices and tax revenues under alternative tax policies, we quantify the potential reductions in revenue volatility. The results reveal that greater benefits can be achieved by going beyond the tax swap and eliminating the gasoline sales tax entirely.