JOB OPPORTUNITIES FOR THE GREEN ECONOMY:

A STATE-BY-STATE PICTURE OF OCCUPATIONS THAT GAIN FROM GREEN INVESTMENTS

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SUMMARY

This report provides a snapshot of what kinds of jobs are needed to build a green economy in the United States. We focus on six key strategies for attacking global warming and highlight some of the major "green jobs" associated with each of these approaches.

The six green strategies we examine here are: building retrofitting, mass transit, energy-efficient automobiles, wind power, solar power, and cellulosic biomass fuels. We show that the vast majority of jobs associated with these six green strategies are in the same areas of employment that people already work in today, in every region and state of the country. For example, constructing wind farms creates jobs for sheet metal workers, machinists and truck drivers, among many others. Increasing the energy efficiency of buildings through retrofitting relies, among others, on roofers, insulators and building inspectors. What makes these entirely familiar occupations "green jobs" is that the people working in them are contributing their everyday labors toward building a green economy. We therefore consider and refer to the strategies examined in this report as green investments, in addition to global warming solutions.

We present data on employment conditions in 12 separate states: Florida, Indiana, Minnesota, Missouri, Nebraska, New York, Ohio, Oregon, Pennsylvania, Tennessee, Virginia, and Wisconsin. For each of the 12 states, we report the number of people who are employed in each of the occupations that will be affected by our six green economy strategies, and what the average wages are in each state for each of these job types. We then also provide data on the national employment picture for each of the job categories we examine.

What is clear from this report is that millions of U.S. workers—across a wide range of familiar occupations, states, and income and skill levels—will all benefit from the project of defeating global warming and transforming the United States into a green economy.

JOB OPPORTUNITIES FOR THE GREEN ECONOMY

Fighting global warming and transforming the United States into a green economy is a massive and defining challenge for our time. It is the work of a generation, and specifically, the work of millions of people, performing the jobs needed to build the green economy.

This report provides information on what kinds of jobs are needed to fight global warming and build a green economy in the United States. A green economy is based on the efficient use of energy, reducing polluting emissions, and the use of renewable sources of power. A green economy uses these investments to create new opportunities, good jobs, and stronger communities. The term "green jobs" has spread rapidly over the past year. We seek to make the term concrete by highlighting many—but by no means all—of the occupations that will play a central role in building the green economy.

We do not attempt here to estimate how much growth there is likely to be in any area of green investments or green jobs in the United States. Our aim is much

more modest: to simply provide a snapshot of some of the key industries and occupations that will experience increasing growth through green investments. In work that is forthcoming later this summer with the Center for American Progress, we will provide a detailed study on what employment growth could be in the United States under various green economy scenarios.[1]

We focus here on six key strategies for attacking global warming and highlight some of the major occupations associated with each of the strategies. In the table below, we provide a list of the six green economy strategies that we examine—building retrofitting, mass transit, energy-efficient automobiles, wind power, solar power, and cellulosic biomass fuels—and a list of representative occupations that will be needed for advancing each of these strategies.[2] In the detailed tables that follow, we present data on total employment in each state for each of the occupations and the average wage workers earn in these occupations.

JOBS THAT WILL BUILD THE GREEN U.S. ECONOMY AND FIGHT GLOBAL WARMING

Strategies for Green Economy Investments	Representative Jobs
Building Retrofitting	Electricians, Heating/Air Conditioning Installers, Carpenters, Construction Equipment Operators, Roofers, Insulation Workers, Carpenter Helpers, Industrial Truck Drivers, Construction Managers, Building Inspectors
Mass Transit	Civil Engineers, Rail Track Layers, Electricians, Welders, Metal Fabricators, Engine Assemblers, Production Helpers, Bus Drivers, First-Line Transportation Supervisors, Dispatchers
Energy-Efficient Automobiles	Computer Software Engineers, Electrical Engineers, Engineering Technicians, Welders, Transportation Equipment Painters, Metal Fabricators, Computer-Controlled Machine Operators, Engine Assemblers, Production Helpers, Operations Managers
Wind Power	Environmental Engineers, Iron and Steel Workers, Millwrights, Sheet Metal Workers, Machinists, Electrical Equipment Assemblers, Construction Equipment Operators, Industrial Truck Drivers, Industrial Production Managers, First-Line Production Supervisors
Solar Power	Electrical Engineers, Electricians, Industrial Machinery Mechanics, Welders, Metal Fabricators, Electrical Equipment Assemblers, Construction Equipment Operators, Installation Helpers, Laborers, Construction Managers
Cellulosic Biofuels	Chemical Engineers, Chemists, Chemical Equipment Operators, Chemical Technicians, Mixing and Blending Machine Operators, Agricultural Workers, Industrial Truck Drivers, Farm Product Purchasers, Agricultural and Forestry Supervisors, Agricultural Inspectors

[1] To be more specific, the authors of the forthcoming study with the Center for American Progress are Robert Pollin, Heidi Garrett-Peltier, James Heintz, and Helen Scharber.

[2] These six strategies are of course by no means exhaustive. For example, a 2007 study by McKinsey and Company, "Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?" discusses five broad clusters of approaches to reducing greenhouse emissions, including improving energy efficiency in buildings and appliances; increasing fuel efficiency in vehicles and reducing carbon intensity of transportation fuels; improving efficiency in energy-intensive industrial production; expanding and enhancing carbon sinks; and reducing the carbon intensity of electrical power production. Within these five broad clusters, they identify a total of 41 strategies that, in combination, are capable of significantly reducing greenhouse emissions at no net cost to the economy.

As we show, new job activities will certainly be created in building the green economy and implementing global warming solutions, such as installing solar panels and researching new ways to build efficient biofuel engines. But the vast majority of green jobs are in the same areas of employment that people already work in today, in every region and state of the country. For example, constructing wind farms creates jobs for sheet metal workers, machinists and truck drivers, among many others. Increasing the energy efficiency of buildings through retrofitting relies, among others, on roofers, insulators and building inspectors. Expanding mass transit systems employs civil engineers, electricians, and dispatchers. So green jobs don't just mean new jobs—they can also mean greater job security for people who already work in these fields.

What makes these entirely familiar occupations "green jobs" is that the people working in them are contributing their everyday labors toward environmental solutions. Put simply, a green job is one that is contributing to fighting global warming and building a green economy. Train operators who currently deliver furniture may one day deliver wind turbine component parts, meaning that their work will be contributing to a green economy that solves global warming and builds healthier communities. This same green economy is creating new employment in rail transportation.

At the same time, it is important to link the idea of green jobs with *decent* employment opportunities: jobs that pay at least a living wage, and offer career ladders, training opportunities and some measure of security. A green economy should be one that is sustainable along two equally important dimensions: for the environment itself, of course; but also in terms of people's ability to live at a decent material standard and to enjoy basic rights and opportunities at their workplaces. From the data in this study it is clear that pursuing solutions to climate change can produce good jobs that are broadly based throughout our economy.

COMPILING THE DATA

In the tables that follow, we consider employment conditions in 12 separate states: Florida, Indiana, Minnesota, Missouri, Nebraska, New York, Ohio, Oregon, Pennsylvania, Tennessee, Virginia, and Wisconsin. For each of the 12 states, we report the number of people who are employed in each of the occupations that will be affected by our six global warming strategies, and what the average wages are in each state for each of these job types. We then also provide data on the national employment picture for each of the job categories we examine.

To compile these data, we began by consulting the 2005 industrial census of the Bureau of Economic Analysis, U.S. Department of Commerce. This enabled us to see which industries would be actively involved in advancing the six green investment strategies. These include, for example, the construction industry for building retrofitting, manufacturing for building wind turbines, and agriculture and forestry for producing biomass fuels from switchgrass or wood chips—so-called "cellulosic" biomass.

Once we identified the major industrial categories for each solution, we then drew on both the industrial census and specific occupational listings from the Bureau of Labor Statistics of the U.S. Department of Labor to identify the 10 job categories that are listed in each of the tables. The Bureau of Labor Statistics' database provides the detailed information on the employment levels and average wage rates for each of the 12 states.

The Methodology section in the back of the report provides a fuller technical explanation as to how we compiled the information in the tables. But it is important to emphasize here a few key features of our approach.

First, as mentioned above, the 10 job categories that we have listed for each strategy are by no means meant to be an exhaustive list. They are rather a representative grouping of some of the jobs that will be most actively engaged by each of the green investment strategies.

Second, some jobs are included under more than one of the solutions. This is because they play a prominent role in more than one of the green investment strategies. For example, electricians play a prominent role both in retrofitting buildings and in improving mass transit systems, and are listed under both strategies. Welders are important in assembling energy-efficient cars as well as trains and buses for mass transit. Industrial truck drivers will be in demand to transport wind turbines as well as switchgrass and woodchips for biofuels.

Third, all of these green energy strategies engage a normal range of service and support activities, including accountants, lawyers, office clerks, human resource managers, cashiers and retail sales persons. We have not included these and related occupations in our tables because these jobs are not directly linked to any of our six green economy strategies. At the same time, new opportunities will certainly also open up in these areas as a result of a growing green economy.

GOING TO THE NUMBERS

We report a large amount of detailed information here. But there is also a straightforward picture that emerges.

For example, let's come back to the sheet metal workers who could be building high-performance wind turbines over the next decade. There are about 168,000 sheet metal workers now employed throughout the country. Roughly 10,000 are in Florida, 5,000 in Ohio, 1,000 in Nebraska, and 3,000 in Oregon. Depending on where they work, they are now earning, on average, between about $15.50 (Tennessee) and $27.00 (New York) per hour. A push to dramatically increase the country's supply of wind energy will mean increased demand for these workers. Rising demand could also lead to rising average wages.

Consider some other stories that we can take from the data tables. Producing affordable solar energy will increase employment for electrical engineers, of whom there are presently about 150,000 employed throughout the United States. The 590 electrical engineers now working in Nebraska earn about $35 an hour. The roughly 1,900 employed in Tennessee are now making, on average, more than

$36 an hour. Opportunities for these workers will also grow. An expanding solar energy industry will also employ thousands of equipment operators, budget analysts, laborers, and office clerks. The tables that follow show the number of people employed in these jobs and their average wages.

Welders will certainly play an important role in the green economy, in constructing solar equipment, energy efficient cars, trucks, and trains, and other areas. The 10,000 welders in Missouri now earn about $15.00 an hour. The 8,700 welders in Minnesota are paid, on average, $17.51. There are nearly 386,000 welders now employed in the country as a whole.

Industrial truck drivers will be in demand throughout the green economy. They will be moving equipment and materials both within the 12 states we have listed, and throughout the country. As our tables show, there are now about 24,000 truck drivers employed in Florida, earning an average of $12.12 an hour. Another 22,000 truck drivers are employed in Indiana, 10,000 in Oregon and nearly 34,000 in Pennsylvania, with hourly wages ranging between $12 and $14. For the country as a whole, nearly 1.7 million people are now working as truck drivers.

Overall, in considering our six areas of green investments, we provide information on 45 representative occupations that, throughout the country, are employing over 14 million people today. That is roughly nine percent of today's total U.S. workforce of 154 million people. The percentage of total U.S. employment involved in green jobs could be expanded dramatically if we had reported the various service and support occupations that will be needed for each of the six green investment areas. And of course, if we increased the number of green investment approaches beyond the six we have included, the listing of *representative* occupations—again, still not attempting an exhaustive list—would need to expand further.

What is clear from this report is that millions of U.S. workers—across a wide range of occupations, states, and income levels—will all benefit from the project of defeating global warming and transforming the United States into a green economy.

EFFICIENCY STRATEGY: BUILDING RETROFITTING

1. Jobs by occupation and state with average wage, May 2007

	Florida	Indiana	Minnesota	Missouri	Nebraska	New York	Ohio	Oregon	Pennsylvania	Tennessee	Virginia	Wisconsin
Electricians												
# Employed	44,140	15,000	11,570	11,850	5,230	34,340	25,560	7,480	23,280	12,020	19,760	12,440
Average Wage	$17.51	$23.87	$27.49	$23.77	$19.18	$28.19	$22.20	$28.16	$23.59	$18.78	$20.13	$24.04
Heating/Air Conditioning Installers												
# Employed	24,560	5,990	2,640	4,970	2,270	17,980	9,230	3,210	12,710	6,290	10,470	5,200
Average Wage	$16.97	$18.24	$23.33	$18.41	$17.90	$21.18	$17.94	$18.53	$19.42	$14.53	$17.32	$19.86
Carpenters												
# Employed	68,570	23,860	18,920	25,200	8,020	53,830	29,370	17,240	44,920	11,770	29,200	20,630
Average Wage	$15.61	$17.70	$19.78	$20.25	$14.55	$21.88	$17.33	$17.47	$18.31	$14.54	$16.77	$18.32
Construction Equipment Operators												
# Employed	22,020	10,050	9,330	8,900	2,860	14,640	11,540	4,070	16,320	7,240	12,760	8,790
Average Wage	$15.24	$20.25	$23.70	$20.98	$16.13	$26.34	$22.49	$20.98	$19.84	$14.73	$16.46	$23.60
Roofers												
# Employed	15,670	2,920	1,550	2,920	540	4,420	4,430	2,250	4,510	1,910	3,280	2,540
Average Wage	$14.63	$16.41	$24.06	$19.78	$14.05	$17.55	$16.31	$14.53	$18.33	$14.09	$15.09	$18.56
Insulation Worker												
# Employed	1,240	550	410	630	340	1,050	1,140	540	650	513	860	270
Average Wage	$14.35	$13.99	$18.82	$15.22	$17.45	$17.05	$14.52	$15.06	$15.85	$14.92	$14.75	$15.51
Carpenter Helpers												
# Employed	7,310	1,480	1,450	1,810	790	8,170	1,270	1,030	4,050	1,510	5,460	1,020
Average Wage	$11.52	$11.85	$11.78	$13.68	$11.14	$11.40	$11.29	$12.09	$12.10	$10.84	$12.30	$12.37
Industrial Truck Drivers												
# Employed	24,220	21,550	10,030	17,030	2,530	19,130	30,860	10,140	33,540	19,140	15,890	16,500
Average Wage	$12.16	$14.14	$15.67	$12.96	$13.61	$14.92	$13.72	$14.46	$14.29	$12.95	$12.70	$14.46
Construction Managers												
# Employed	19,560	3,830	2,710	3,140	1,630	13,140	5,450	3,600	5,120	4,440	5,570	2,730
Average Wage	$37.36	$36.71	$39.86	$33.02	$29.48	$52.73	$39.21	$37.44	$37.58	$26.63	$39.95	$38.40
Building Inspectors												
# Employed	6,680	1,140	1,670	2,090	310	5,670	3,580	1,270	5,120	1,160	3,620	1,140
Average Wage	$23.57	$18.66	$25.85	$21.91	$19.96	$23.79	$20.82	$26.73	$20.39	$19.26	$23.88	$24.25

Sources: May 2007 State Occupational Employment and Wage Estimates, Bureau of Labor Statistics; IMPLAN input-output modeling system, Bureau of Economic Analysis 2005 Annual Input-Output Accounts. See Methodology section for details.

EFFICIENCY STRATEGY: MASS TRANSIT

2. Jobs by occupation and state with average wage, May 2007

	Florida	Indiana	Minnesota	Missouri	Nebraska	New York	Ohio	Oregon	Pennsylvania	Tennessee	Virginia	Wisconsin
Civil Engineers												
# Employed	14,640	2,780	3,460	5,390	1,620	11,890	6,250	3,750	10,470	2,560	8,070	4,250
Average Wage	$34.33	$30.75	$33.75	$31.93	$31.93	$34.58	$32.03	$32.98	$31.21	$32.89	$35.74	$30.26
Rail Track Layers												
# Employed	410	210	470	360	570	710	640	210	600	380	380	180
Average Wage	$21.72	$24.33	$21.08	$21.19	$21.80	$21.25	$21.84	$20.63	$20.73	$19.87	$20.78	$20.62
Electricians												
# Employed	44,140	15,000	11,570	11,850	5,230	34,340	25,560	7,480	23,280	12,020	19,760	12,440
Average Wage	$17.51	$23.87	$27.49	$23.77	$19.18	$28.19	$22.20	$28.16	$23.59	$18.78	$20.13	$24.04
Welders												
# Employed	14,090	12,010	8,710	10,310	4,000	9,410	15,710	5,570	17,520	9,530	8,000	12,900
Average Wage	$15.48	$15.06	$17.02	$14.69	$13.95	$16.23	$15.26	$15.79	$16.14	$14.76	$16.96	$16.26
Metal Fabricators												
# Employed	3,790	4,380	1,000	1,830	960	3,260	2,660	2,220	6,360	2,320	2,330	3,330
Average Wage	$14.04	$15.49	$17.51	$14.65	$13.12	$15.42	$15.08	$16.11	$15.46	$15.04	$13.94	$16.88
Engine Assemblers												
# Employed	750	1,230	260	2,240	490	710	4,030	390	1,030	1,600	1,000	1,820
Average Wage	$12.44	$14.80	$16.76	$12.79	$11.81	$15.84	$17.40	$15.38	$16.92	$12.13	$15.10	$16.71
Production Helpers												
# Employed	19,470	17,450	9,870	11,480	3,310	18,700	30,450	5,200	28,130	20,480	8,350	14,920
Average Wage	$ 9.94	$10.47	$11.03	$10.00	$11.06	$ 9.60	$10.92	$11.43	$11.00	$ 9.88	$10.08	$11.56
Bus Drivers												
# Employed	9,650	1,940	2,760	2,860	700	19,530	8,550	1,830	13,960	3,140	3,760	2,870
Average Wage	$14.06	$13.75	$15.18	$14.54	$11.82	$21.80	$18.76	(8)-	$13.80	$ 9.20	$13.99	$18.52
First-Line Transportation Supervisors												
# Employed	11,930	5,550	4,910	3,700	1,440	12,670	9,030	3,270	9,480	6,070	6,160	4,780
Average Wage	$23.65	$23.21	$22.36	$24.66	$23.41	$26.60	$23.65	$21.82	$24.09	$21.24	$24.46	$24.05
Dispatchers												
# Employed	10,500	4,510	3,200	4,320	1,760	12,280	6,880	2,530	6,650	4,520	4,220	3,220
Average Wage	$14.83	$15.73	$18.81	$15.27	$16.97	$15.30	$16.37	$16.06	$15.82	$16.09	$16.11	$15.84

Sources: May 2007 State Occupational Employment and Wage Estimates, Bureau of Labor Statistics; IMPLAN input-output modeling system, Bureau of Economic Analysis 2005 Annual Input-Output Accounts. See Methodology section for details.

EFFICIENCY STRATEGY: ENERGY-EFFICIENT AUTOMOBILES

3. Jobs by occupation and state with average wage, May 2007

	Florida	Indiana	Minnesota	Missouri	Nebraska	New York	Ohio	Oregon	Pennsylvania	Tennessee	Virginia	Wisconsin
Computer Software Engineers												
# Employed	12,300	2,600	8,580	6,220	1,940	17,960	8,080	2,300	8,950	2,900	24,940	2,200
Average Wage	$38.67	$35.56	$43.54	$37.12	$34.66	$45.30	$39.20	$44.04	$38.90	$34.78	$47.98	$37.24
Electrical Engineers												
# Employed	7,430	2,470	3,210	2,590	590	8,480	4,170	1,380	6,330	1,860	7,140	3,490
Average Wage	$36.00	$34.75	$37.99	$36.58	$35.27	$38.45	$32.36	$36.82	$36.15	$36.38	$38.70	$34.83
Engineering Technicians												
# Employed	3,460	1,290	2,310	840	160	3,090	4,300	1,550	2,080	490	2,590	810
Average Wage	$24.74	$26.41	$24.99	$25.71	$24.59	$22.91	$27.66	$25.23	$29.55	$26.19	$33.12	$25.11
Welders												
# Employed	14,090	12,010	8,710	10,310	4,000	9,410	15,710	5,570	17,520	9,530	8,000	12,900
Average Wage	$15.48	$15.06	$17.02	$14.69	$13.95	$16.23	$15.26	$15.79	$16.14	$14.76	$16.96	$16.26
Transportation Equipment Painters												
# Employed	3,130	1,520	750	1,500	170	990	1,420	1,070	2,170	1,610	1,630	1,030
Average Wage	$16.32	$15.49	$16.90	$21.29	$14.93	$15.33	$17.33	$17.10	$18.71	$22.51	$17.48	$17.14
Metal Fabricators												
# Employed	3,790	4,380	1,000	1,830	960	3,260	2,660	2,220	6,360	2,320	2,330	3,330
Average Wage	$14.04	$15.49	$17.51	$14.65	$13.12	$15.42	$15.08	$16.11	$15.46	$15.04	$13.94	$16.88
Computer-Controlled Machine Operators												
# Employed	2,290	7,100	5,120	3,570	1,090	4,230	11,620	2,520	7,760	2,600	1,720	8,340
Average Wage	$13.61	$15.04	$17.24	$14.00	$15.00	$14.82	$15.89	$17.02	$15.76	$15.67	$16.08	$16.11
Engine Assemblers												
# Employed	750	1,230	260	2,240	490	710	4,030	390	1,030	1,600	1,000	1,820
Average Wage	$12.44	$14.80	$16.76	$12.79	$11.81	$15.84	$17.40	$15.38	$16.92	$12.13	$15.10	$16.71
Production Helpers												
# Employed	19,470	17,450	9,870	11,480	3,310	18,700	30,450	5,200	28,130	20,480	8,350	14,920
Average Wage	$ 9.94	$10.47	$11.03	$10.00	$11.06	$ 9.60	$10.92	$11.43	$11.00	$ 9.88	$10.08	$11.56
Operations Managers												
# Employed	55,860	24,930	31,930	27,940	5,880	95,580	47,090	19,010	35,150	45,760	32,720	24,830
Average Wage	$41.52	$41.94	$42.25	$40.87	$40.91	$53.76	$41.30	$41.44	$40.57	$34.27	$51.15	$41.84

Sources: May 2007 State Occupational Employment and Wage Estimates, Bureau of Labor Statistics; IMPLAN input-output modeling system, Bureau of Economic Analysis 2005 Annual Input-Output Accounts. See Methodology section for details.

4. Jobs by occupation and state with average wage, May 2007

	Florida	Indiana	Minnesota	Missouri	Nebraska	New York	Ohio	Oregon	Pennsylvania	Tennessee	Virginia	Wisconsin
Environmental Engineers												
# Employed	2,680	520	570	1,230	230	3,770	1,700	440	2,580	1,040	1,770	1,040
Average Wage	$31.35	$31.60	$35.41	$32.83	$33.21	$35.64	$35.45	$35.11	$36.50	$37.20	$33.75	$33.48
Iron and Steel Workers												
# Employed	3,120	1,970	650	1,830	710	4,040	2,760	400	2,880	1,040	1,970	1,370
Average Wage	$19.17	$23.46	$27.84	$24.09	$19.36	$34.79	$25.82	$22.24	$22.48	$18.39	$17.44	$27.04
Millwrights												
# Employed	1,430	2,700	1,200	1,020	260	1,160	4,120	1,670	1,850	1,890	1,020	1,610
Average Wage	$17.82	$25.70	$26.77	$22.79	$15.22	$24.42	$29.09	$19.89	$19.13	$20.50	$19.29	$24.95
Sheet Metal Workers												
# Employed	9,750	5,160	3,730	4,620	1,040	6,120	5,330	3,340	4,760	3,600	5,360	4,060
Average Wage	$16.07	$19.51	$25.99	$20.34	$22.29	$26.59	$22.00	$19.82	$21.60	$15.49	$17.33	$23.84
Machinists												
# Employed	9,230	14,630	9,020	10,880	2,110	14,480	29,610	3,970	21,190	11,600	6,820	16,580
Average Wage	$16.05	$17.05	$18.79	$14.94	$15.35	$17.29	$16.39	$19.41	$17.15	$17.12	$17.51	$17.38
Electrical Equipment Assemblers												
# Employed	11,650	5,910	5,810	4,570	1,340	14,670	7,820	6,920	9,320	3,660	4,350	6,910
Average Wage	$11.84	$10.72	$12.90	$13.16	$13.00	$12.73	$12.96	$12.95	$13.51	$11.34	$12.63	$12.16
Construction Equipment Operators												
# Employed	22,020	10,050	9,330	8,900	2,860	14,640	11,540	4,070	16,320	7,240	12,760	8,790
Average Wage	$15.24	$20.25	$23.70	$20.98	$16.13	$26.34	$22.49	$20.98	$19.84	$14.73	$16.46	$23.60
Industrial Truck Drivers												
# Employed	24,220	21,550	10,030	17,030	2,530	19,130	30,860	10,140	33,540	19,140	15,890	16,500
Average Wage	$12.16	$14.14	$15.67	$12.96	$13.61	$14.92	$13.72	$14.46	$14.29	$12.95	$12.70	$14.46
Industrial Production Managers												
# Employed	2,980	6,310	4,350	2,260	1,010	5,490	8,690	2,670	6,180	3,470	2,370	4,930
Average Wage	$40.40	$35.84	$39.31	$38.56	$34.56	$42.38	$36.94	$36.99	$36.96	$31.10	$39.35	$35.61
First-Line Production Supervisors												
# Employed	20,780	25,270	15,280	10,790	4,280	27,640	38,360	8,890	29,320	18,080	13,610	21,220
Average Wage	$23.61	$22.65	$23.86	$22.89	$22.35	$24.75	$23.23	$23.13	$24.38	$20.56	$23.54	$23.57

Sources: May 2007 State Occupational Employment and Wage Estimates, Bureau of Labor Statistics; IMPLAN input-output modeling system, Bureau of Economic Analysis 2005 Annual Input-Output Accounts. See Methodology section for details.

5. Jobs by occupation and state with average wage, May 2007

	Florida	Indiana	Minnesota	Missouri	Nebraska	New York	Ohio	Oregon	Pennsylvania	Tennessee	Virginia	Wisconsin
Electrical Engineers												
# Employed	7,430	2,470	3,210	2,590	590	8,480	4,170	1,380	6,330	1,860	7,140	3,490
Average Wage	$ 36.00	$34.75	$37.99	$36.58	$35.27	$38.45	$ 32.36	$36.82	$ 36.15	$36.38	$38.70	$34.83
Electricians												
# Employed	44,140	15,000	11,570	11,850	5,230	34,340	25,560	7,480	23,280	12,020	19,760	12,440
Average Wage	$ 17.51	$23.87	$27.49	$23.77	$19.18	$28.19	$ 22.20	$28.16	$ 23.59	$18.78	$20.13	$24.04
Industrial Machinery Mechanics												
# Employed	9,080	10,040	6,850	5,330	1,570	9,410	12,280	4,270	16,210	7,640	7,410	7,270
Average Wage	$ 19.39	$22.41	$21.40	$19.81	$17.59	$20.85	$ 22.51	$21.30	$ 19.42	$17.93	$20.37	$21.43
Welders												
# Employed	14,090	12,010	8,710	10,310	4,000	9,410	15,710	5,570	17,520	9,530	8,000	12,900
Average Wage	$ 15.48	$15.06	$17.02	$14.69	$13.95	$16.23	$ 15.26	$15.79	$ 16.14	$14.76	$16.96	$16.26
Metal Fabricators												
# Employed	3,790	4,380	1,000	1,830	960	3,260	2,660	2,220	6,360	2,320	2,330	3,330
Average Wage	$ 14.04	$15.49	$17.51	$14.65	$13.12	$15.42	$ 15.08	$16.11	$ 15.46	$15.04	$13.94	$16.88
Electrical Equipment Assemblers												
# Employed	11,650	5,910	5,810	4,570	1,340	14,670	7,820	6,920	9,320	3,660	4,350	6,910
Average Wage	$ 11.84	$10.72	$12.90	$13.16	$13.00	$12.73	$ 12.96	$12.95	$ 13.51	$11.34	$12.63	$12.16
Construction Equipment Operators												
# Employed	22,020	10,050	9,330	8,900	2,860	14,640	11,540	4,070	16,320	7,240	12,760	8,790
Average Wage	$ 15.24	$20.25	$23.70	$20.98	$16.13	$26.34	$ 22.49	$20.98	$ 19.84	$14.73	$16.46	$23.60
Installation Helpers												
# Employed	8,600	2,430	2,600	1,720	400	9,230	3,810	1,560	7,100	3,240	5,000	2,020
Average Wage	$ 10.42	$11.45	$11.28	$11.31	$10.48	$13.57	$ 10.43	$12.00	$ 11.50	$11.41	$11.93	$10.27
Laborers												
# Employed	128,330	70,040	35,150	45,250	14,770	92,180	122,830	27,180	109,580	82,600	50,050	52,500
Average Wage	$ 9.85	$10.86	$11.83	$10.70	$10.94	$11.14	$ 10.74	$11.31	$ 11.26	$ 9.77	$10.58	$11.39
Construction Managers												
# Employed	19,560	3,830	2,710	3,140	1,630	13,140	5,450	3,600	5,120	4,440	5,570	2,730
Average Wage	$ 37.36	$36.71	$39.86	$33.02	$29.48	$52.73	$ 39.21	$37.44	$ 37.58	$26.63	$39.95	$38.40

Sources: May 2007 State Occupational Employment and Wage Estimates, Bureau of Labor Statistics; IMPLAN input-output modeling system, Bureau of Economic Analysis 2005 Annual Input-Output Accounts. See Methodology section for details.

6. Jobs by occupation and state with average wage, May 2007

	Florida	Indiana	Minnesota	Missouri	Nebraska	New York	Ohio	Oregon	Pennsylvania	Tennessee	Virginia	Wisconsin
Chemical Engineers												
# Employed	350	480	450	550	90	1,450	1,800	310	1,060	900	790	320
Average Wage	$35.88	$37.42	$34.89	$36.74	$27.20	$40.06	$37.74	$40.56	$35.69	$39.89	$42.48	$34.13
Chemists												
# Employed	2,220	2,230	1,690	1,580	320	5,190	3,800	490	4,900	1,030	1,740	1,800
Average Wage	$23.93	$24.77	$30.57	$28.38	$22.91	$31.95	$28.62	$26.06	$30.12	$29.37	$35.09	$25.17
Chemical Equipment Operators												
# Employed	800	1,020	280	500	210	1,140	2,770	540	4,220	1,580	670	850
Average Wage	$19.15	$21.85	$15.87	$20.27	$14.48	$20.74	$20.11	$19.99	$20.54	$20.60	$18.62	$21.22
Chemical Technicians												
# Employed	1,800	1,810	890	680	230	3,200	3,210	380	4,490	1,250	970	1,750
Average Wage	$16.95	$16.84	$18.95	$19.75	$16.48	$19.64	$19.24	$17.25	$19.40	$21.24	$21.53	$17.60
Mixing and Blending Machine Operators												
# Employed	7,150	3,920	2,210	3,980	1,460	10,830	8,380	880	6,180	2,950	3,350	4,130
Average Wage	$12.82	$15.47	$15.81	$15.58	$13.93	$16.80	$16.23	$14.19	$16.11	$13.78	$15.06	$15.75
Agricultural Workers												
# Employed	30,550	8,192	14,000	8,175	5,903	11,738	10,047	19,388	13,547	7,948	8,499	14,706
Average Wage	$ 8.85	$10.77	$10.56	$ 9.83	$11.92	$10.04	$ 9.43	$ 9.08	$10.29	$ 8.37	$ 9.15	$10.03
Industrial Truck Drivers												
# Employed	24,220	21,550	10,030	17,030	2,530	19,130	30,860	10,140	33,540	19,140	15,890	16,500
Average Wage	$12.16	$14.14	$15.67	$12.96	$13.61	$14.92	$13.72	$14.46	$14.29	$12.95	$12.70	$14.46
Farm Products Purchasers												
# Employed	360	350	420	450	340	640	320	340	490	220	130	520
Average Wage	$24.27	$25.41	$26.54	$19.69	$24.81	$35.25	$23.68	$24.27	$21.13	$20.45	$30.48	$17.77
First-Line Agricultural and Forestry Supervisors												
# Employed	1,050	190	270	250	160	300	310	670	450	180	480	230
Average Wage	$19.55	$18.14	$20.51	$21.83	$18.68	$19.30	$21.02	$20.17	$23.31	$16.31	$21.77	$22.11
Agricultural Inspectors												
# Employed	490	200	300	370	320	350	410	190	350	350	340	240
Average Wage	$17.64	$18.75	$20.08	$18.16	$19.88	$22.60	$20.35	$15.12	$19.75	$16.62	$21.10	$19.86

Sources: NA = Data not available. May 2007 State Occupational Employment and Wage Estimates, Bureau of Labor Statistics; IMPLAN input-output modeling system, Bureau of Economic Analysis 2005 Annual Input-Output Accounts. See Methodology section for details.

TOTAL UNITED STATES EMPLOYMENT IN ALL SELECTED OCCUPATIONS, MAY 2007

occupation	# employed
Agricultural Inspectors	14,510
Agricultural Workers	482,950
Building Inspectors	95,890
Bus Drivers	189,050
Carpenter Helpers	96,180
Carpenters	969,670
Chemical Engineers	28,780
Chemical Equipment Operators	52,620
Chemical Technicians	64,450
Chemists	79,860
Civil Engineers	247,370
Computer Software Engineers	349,140
Computer-Controlled Machine Operators	140,380
Construction Equipment Operators	403,620
Construction Managers	216,120
Dispatchers	190,190
Electrical Engineers	148,800
Electrical Equipment Assemblers	216,470
Electricians	624,560
Engine Assemblers	41,100
Engineering Technicians	78,140
Environmental Engineers	51,210
Farm Products Purchasers	12,930
First-Line Agricultural and Forestry Supervisors	20,860
First-Line Production Supervisors	666,850
First-Line Transportation Supervisors	223,710
Heating/Air Conditioning Installers	262,570
Industrial Machinery Mechanics	266,550
Industrial Production Managers	152,870
Industrial Truck Drivers	1,693,590
Installation Helpers	153,320
Insulation Worker	29,660
Iron and Steel Workers	65,100
Laborers	2,363,440
Machinists	410,900
Metal Fabricators	107,830
Millwrights	49,360
Mixing and Blending Machine Operators	139,370
Operations Managers	1,655,410
Production Helpers	524,440
Rail Track Layers	14,050
Roofers	123,180
Sheet Metal Workers	167,730
Transportation Equipment Painters	51,260
Welders	385,740
Total employment for all listed occupations:	**14.3 million**

Sources: May 2007 National Occupational Employment and Wage Estimates, Bureau of Labor Statistics; IMPLAN input-output modeling system, Bureau of Economic Analysis 2005 Annual Input-Output Accounts. See Methodology section for details.

Identifying Green Occupations. We used the following procedure to determine which occupations would be affected by increasing investment in each clean-energy strategy.

We used the 2005 Bureau of Economic Analysis (BEA) annual input-output accounts (www.bea.gov/industry/index.htm#annual) to determine how employment in each industry involved in a particular strategy would be affected assuming a $1 million increase in investment. Specifically, we used BEA input-output tables at the 65-industry level of detail to determine how output across these industries would change given an increase in investment in a particular clean-energy strategy. We then used BEA Gross-Domestic-Product-by-Industry Accounts data (www.bea.gov/industry/gpotables/gpo_list.cfm?anon=70418&registered=0) to derive employment multipliers for each industry, i.e., the factor by which an industry's employment would change given a change in output. We used the employment multipliers to determine the total change in employment across the 65 industries given a $1 million increase in investment in a particular clean-energy strategy, as well as what each industry's share of this total employment increase would be. We then identified which industries would experience the largest shares of the overall employment increase required to meet the needs of the increased investment in a particular clean-energy strategy. This list of "most affected" industries guided our selection of occupations.

To identify the occupations needed to meet the increased employment demand due to increased investment in a particular clean-energy strategy, we identified which occupations comprise the "most affected" industries using IMPLAN's occupation-by-industry matrix. This matrix provides occupation profiles for each industry.

Employment and Wages by Occupation. Nearly all of the median wage and employment estimates that we provide in our tables are taken directly from the data reported in the May 2007 Occupational Employment and Wage Estimates tables of the Occupational Employment Statistics (OES) of the Bureau of Labor Statistics (BLS) (state data: www.bls.gov/oes/current/oessrcst.htm; national data: www.bls.gov/oes/current/oes_nat.htm). Throughout the main text, we use the term "average wage" to refer to a median wage.

We imputed estimates for three occupations. First, we imputed insulation worker employment data for Tennessee. The OES reports employment data for carpenter helpers in Tennessee but not insulation workers. We assume the average ratio of carpenter helpers to insulation workers is the same in Tennessee as that in the other eleven states. To impute the employment figure for Tennessee, we apply this ratio to the number of carpenter helpers in Tennessee. Second, we used an analogous procedure to impute the average wage for agricultural inspectors in Pennsylvania. In this case, we had the average wage for "Inspectors, Testers, Sorters, Samplers, and Weighers" in Pennsylvania but not for "Agricultural Inspectors." We applied the average wage ratio of "Inspectors, Testers, Sorters, Samplers, and Weighers" to "Agricultural Inspectors" in the other eleven states to the average wage reported by the OES for "Inspectors, Testers, Sorters, Samplers, and Weighers" in Pennsylvania. Third, because reliable data for agricultural workers by state is unavailable from public data sources we used a combination of the following sources, in addition to the OES state data, to impute this data: 1) Local Area Unemployment Statistics program of the BLS (www.bls.gov/lau/home.htm; 2) State Fact Sheets, U.S. Department of Agriculture (USDA), Economic Research Service, Released May 9, 2008 (http://www.ers.usda.gov/StateFacts/); 3) Farm Labor reports (May 18, 2007; Aug. 17, 2007, Nov. 16, 2007; Feb. 15, 2008) of the National Agricultural Statistics Service, Agricultural Statistics Board, USDA (http://usda.mannlib.cornell.edu/MannUsda/homepage.do). Details on this imputation can be provided upon request.

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