

THE JOBS IMPACTS OF TACKLING CLIMATE CHANGE



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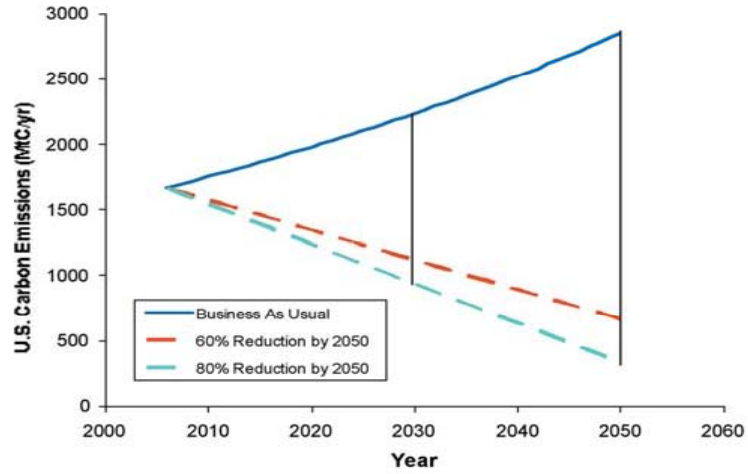


CLIMATE CHANGE MITIGATION & JOBS

- In January 2007, ASES published *Tackling Climate Change in the U.S.: Potential Carbon Emissions Reductions From Energy Efficiency and Renewable Energy by 2030* (TCC)
- Report illustrated how energy efficiency (EE) and renewable energy technologies (RE) can provide emissions reductions required to address global warming.
- It analyzed EE and 6 RE technologies: Concentrating solar power, photovoltaics, wind, biomass, biofuels, and geothermal
- Findings indicated that these technologies could displace 1.2 billion tons of carbon emissions annually by 2030
- However, report did not estimate the jobs impacts of TCC
- Jobs issue has become increasingly important
- Here we estimate the jobs impacts through 2030 of TCC

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U.S. FOSSIL FUEL CARBON REDUCTIONS REQUIRED BY 2030



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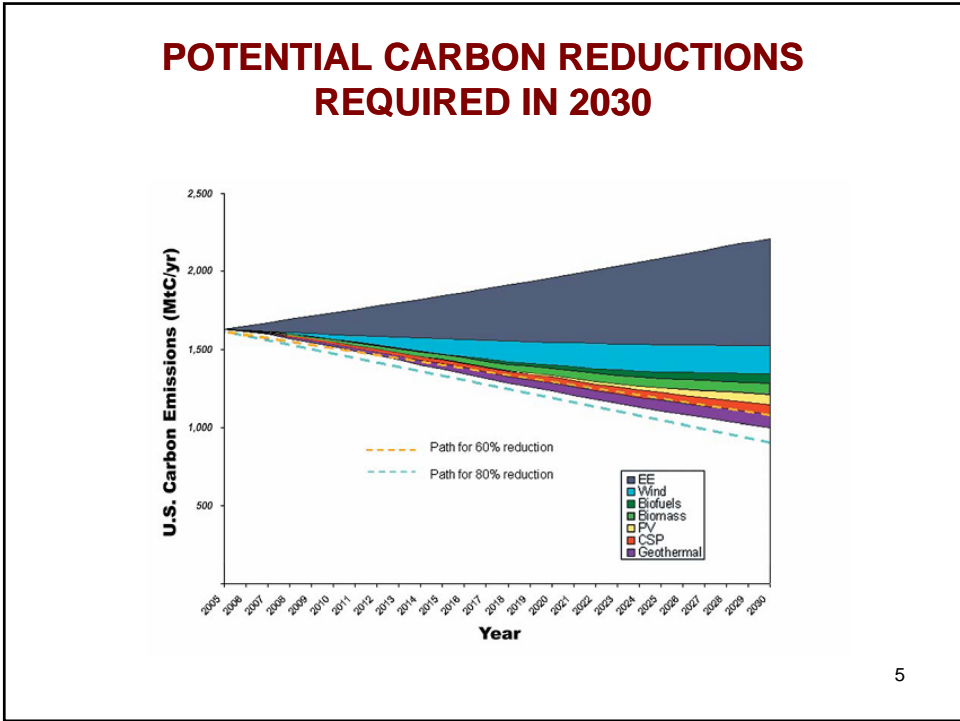
POTENTIAL CARBON REDUCTIONS

Application	Potential Carbon Reductions (MtC/yr.)
Energy Efficiency	688
Concentrating Solar Power	63
Photovoltaics	63
Wind	181
Biofuels	58
Biomass	75
Geothermal	83

Source: American Solar Energy Society, 2007.



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THE JOBS ISSUE

- Issue of jobs impact of climate change mitigation is contentious
- Some studies contend mitigation will harm economy & destroy jobs
- However, deploying TCC technologies will result in net savings to economy of > \$82 billion
- These investments & energy savings will help grow RE&EE industries and create jobs
- We estimated impact on **net jobs**: Job gains minus job losses
- Annual net costs were derived for 2010, 2020, and 2030
- Net impacts by industry for each technology were used to estimate total number of net jobs gained & lost

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NET COSTS & JOBS FROM TCC

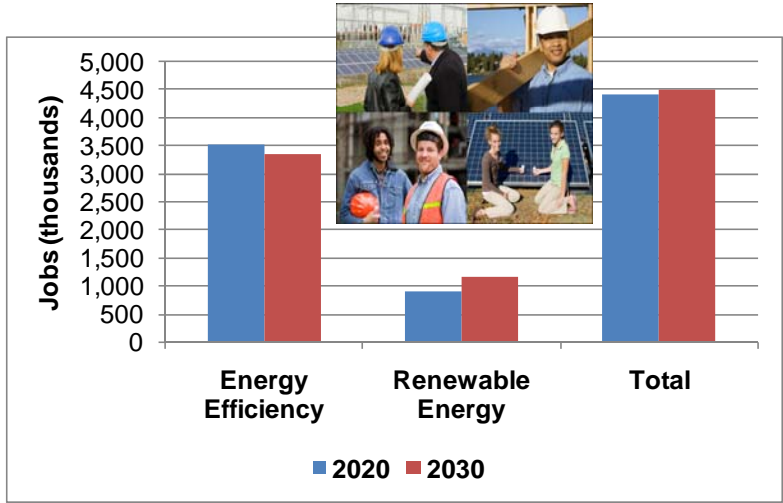
	Net Costs			Net Jobs	
	Annualized	2020	2030	2020	2030
	billion 2005 dollars			thousand FTE	
Energy Efficiency	-\$107.9	-\$84.8	-\$17.4	3,533	3,360
Wind	\$0.0	\$0.3	-\$0.4	149	93
Biofuels	\$9.2	-\$0.5	-\$7.6	261	257
Biomass	\$2.6	\$3.3	\$4.5	122	172
Photovoltaics	\$4.7	\$5.3	\$16.0	105	340
Concentrating Solar	\$6.6	\$5.2	\$2.2	156	147
Geothermal	\$2.5	\$4.0	\$6.7	93	144
Total	-\$82.3	-\$67.2	\$4.0	4,419	4,513

Source: ASES and MISI, 2009.

TCC will create > 4.5 million net jobs

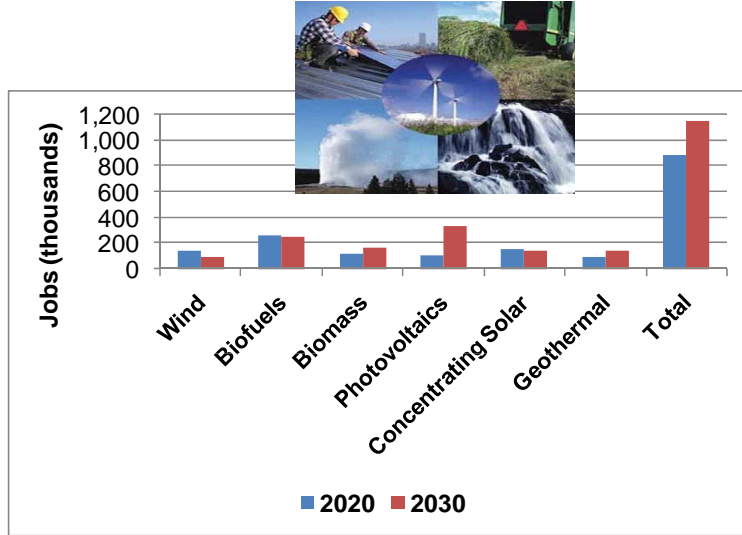
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RE&EE JOBS CREATED BY TCC



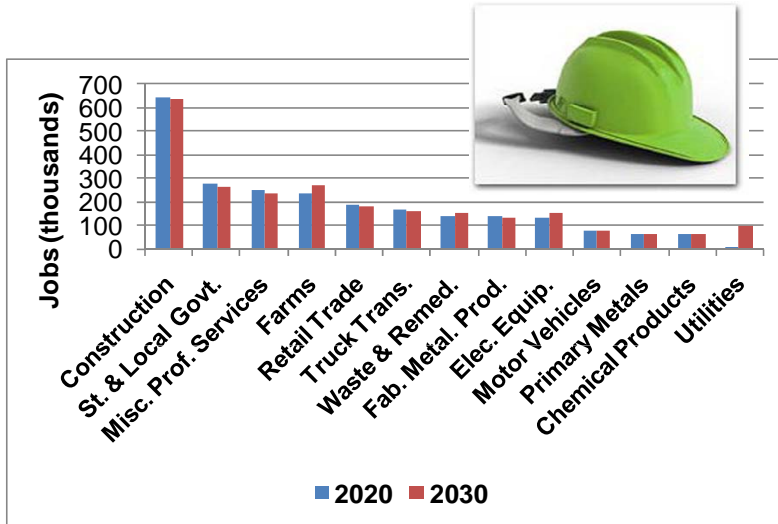
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RE JOBS CREATED BY TCC



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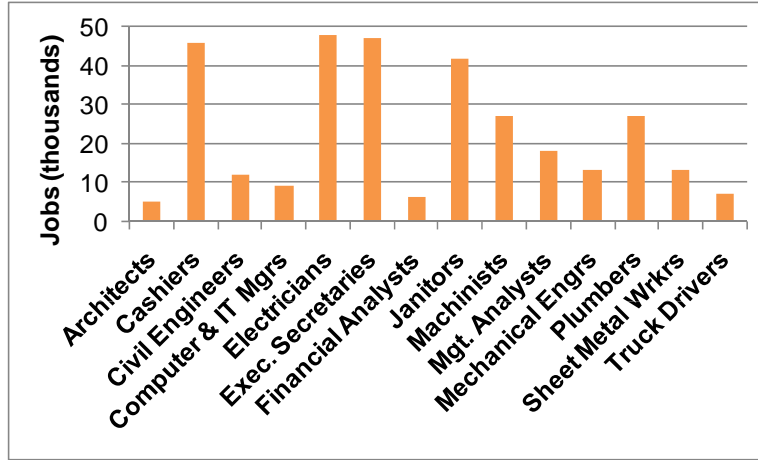
NET JOBS BY INDUSTRY GENERATED BY TCC (Selected Industries)



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NET JOBS BY OCCUPATION GENERATED BY TCC IN 2020

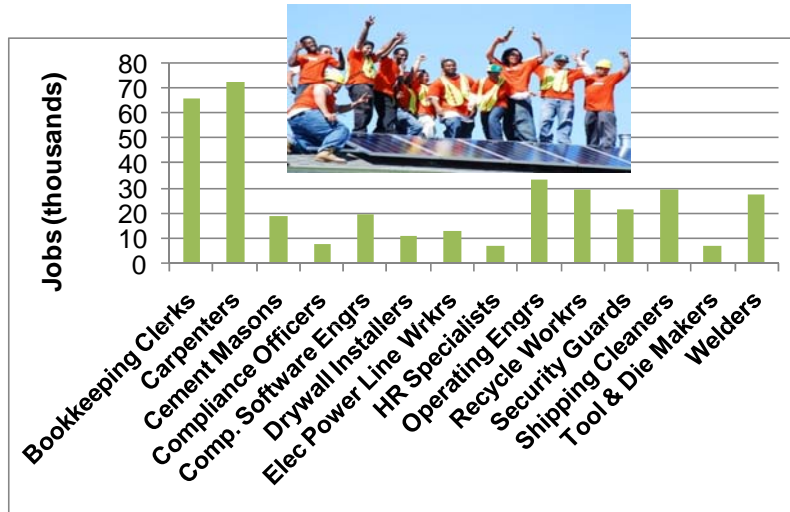
(Selected Occupations)



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NET JOBS BY OCCUPATION GENERATED BY TCC IN 2030

(Selected Occupations)



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RE&EE OCCUPATIONS: WAGES, EDUCATIONAL REQUIREMENTS, & GROWTH FORECASTS (Selected Occupations)

Occupation	10 year % Growth Forecast	Median Salary	% With Bachelor's Degree	Education
Materials Scientists	8	\$75,800	94	Bachelor's
Physicists	7	93,300	92	Doctoral
Microbiologists	17	64,600	96	Doctoral
Biological Technicians	17	37,200	60	Associate
Conservation Scientists	6	54,800	88	Bachelor's
Chemists	7	64,800	94	Bachelor's
Chemical Technicians	4	40,900	27	Associate
Geoscientists	6	74,700	94	Doctoral
Natural Science Managers	14	101,000	90	Bachelor's
Environmental Eng. Technicians	24	42,800	18	Associate
Soil and Plant Scientists	20	59,100	64	Bachelor's
Mechanical Eng. Technicians	12	47,400	18	Associate
Environmental Sci. Technicians	16	39,100	47	Associate
Biomedical Engineers	31	76,900	60	Bachelor's
Chemical Engineers	11	80,800	92	Bachelor's
Mechanical Engineers	10	78,600	88	Bachelor's
Electrical Engineers	12	77,700	83	Bachelor's
Environmental Engineers	14	76,000	82	Bachelor's
Computer Scientists	26	95,900	67	Doctoral
Life & Physical Sci. Technicians	20	46,100	50	Associate
Utility Plant Operatives	4	54,100	10	OJT
HVAC Technicians	12	38,300	14	OJT
Energy Audit Specialists	18	40,300	18	OJT
Forest & Conservation Workers	6	27,500	8	OJT
Refuse & Recycling Workers	5	26,400	2	OJT
Insulation Workers	6	\$30,800	2	OJT

Source: Management Information Services, Inc. and U.S. Bureau of Labor Statistics, 2008.

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TCC OFFERS DEVELOPMENT OPPORTUNITIES FOR STATES

- **Employment growth in RE&EE varies among sectors:** Growing sectors include A&E, R&D, ESCO, environmental technologies, bio-fuels, power technologies, industrial processes, distributed generation, computer controls & systems, HVAC systems, and others
- **RE&EE creates a variety of high-paying jobs, many of which take advantage of state new energy initiatives**
- **States can recruit RE&EE companies** to take advantage of their skilled workforces for wind turbine manufacturing, biofuels production, etc.
- Wages in many RE&EE sectors are higher than the U.S. average, and EE&RE requires a wide mix of occupations
- RE&EE occupations include many jobs that require associate's degrees, on-the-job training, or trade certifications and which pay high wages
- **RE&EE is a realistic target for job creation in most states:** State & local communities can build clusters around industry sectors
- **Many entrance points makes RE&EE market easier to penetrate if state can utilize its strengths** in workforce, tech, mfg., R&D, education, etc.

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RE&EE CREATE SKILLED, WELL-PAYING JOBS NOT SUBJECT TO FOREIGN OUTSOURCING

- RE&EE can create many **jobs in two categories** that all states are eager to attract and retain:
 1. **College-educated professional workers**, many with advanced degrees
 2. **Highly skilled, technical workers**, with advanced training & technical expertise, many of them in manufacturing
- RE&EE thus generate jobs that are disproportionately for highly skilled, well-paid, technical and professional workers, who provide the foundation for entrepreneurship and economic growth. **These are the high-skilled, high-wage, technical and professional jobs that all states and regions seek to attract**
- **However, any single state is in competition with other states for these new energy economy jobs**

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IMPLICATIONS

- **Climate change mitigation can be a net job creator**
- **TCC initiatives will create 4.5 million net new jobs**
- TCC creates many jobs at all levels of skill, training, & salaries
- **Data presented can help estimate impact of green jobs stimulus**
- **Most jobs created** are for occupations such as accountants, welders, factory workers, truck drivers, computer analysts, etc. – **not “solar energy specialists”**
- Per dollar of expenditure, TCC can create relatively large numbers of jobs compared to other initiatives
- **Time is of the essence:** Initiatives take time to ramp up, and if U.S. is to achieve ambitious climate mitigation job goals, aggressive programs must be started immediately
- **Bottom line: Addressing climate change is good for the environment, good for the economy, & good for jobs**

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