



# The Vast Potential for Renewable Energy in the American West

## Developing Wind, Solar, and Geothermal Energy on Public Lands

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### Introduction

Arizona, California, Colorado, Nevada, New Mexico, and Utah—the “Four Corners” states plus their western neighbors—are home to some of the best renewable electricity potential in the country. These states have consistently sunny skies for solar power, wind-blown plains and deserts for turbines, and underground heat perfect for geothermal energy. They also have incredible potential for smaller-scale technologies like rooftop solar panels and energy efficiency improvements.

Our analysis shows these states can house clean energy projects that could realistically provide more than 34 gigawatts of solar, wind, and geothermal energy over the next two decades. This development could stimulate more than \$137 billion in investment in the renewable energy sector, create more than 209,000 direct jobs, and provide electricity for 7 million homes. With supportive federal policies, these renewable electricity goals can be met and surpassed.

Already, the American West leads the way in construction of clean and renewable electricity projects on the ground, spurred forward by policies including state renewable electricity standards and government investments in clean technologies. A recent Bureau of Labor Statistics study<sup>1</sup> reflects this success, determining that in 2010, “green goods and services” accounted for:

- 49,717 jobs in Arizona
- 338,445 jobs in California
- 72,452 jobs in Colorado
- 17,254 jobs in Nevada
- 21,267 jobs in New Mexico
- 27,948 jobs in Utah

This comes to 527,083 jobs altogether in these six states.

Such projects and employment reinforce westerners' perspective that renewable energy is a key component of their states' economic future. A poll this year by the Colorado College "State of the Rockies Project" found that two-thirds of voters polled said "increasing the use of renewable energy sources like wind and solar power will create new jobs" in their states.<sup>2</sup>

And when it came to comparing fossil fuels and renewables, western voters were far more likely to encourage more wind and solar power over coal and oil. In response to the question "which one of the following sources of energy would you want to encourage the use of here in [your state]?", respondents answered overwhelmingly in favor of clean energy. (see Figure 1)

**FIGURE 1**  
**"Which one of the following sources of energy would you want to encourage the use of here in your state? And which would you next most want to encourage the use of?"**

Westerners prefer clean energy over coal and oil in Colorado College poll, combined choice ranked by total

Solar power	61 percent
Wind power	49 percent
Natural gas	26 percent
Energy efficiency exports	23 percent
Oil	11 percent
Coal	9 percent
All/combination	8 percent

Source: Colorado College State of the Rockies Project, "Conservation in the West Poll: 2012 Western States Survey" (2012), available at [http://www2.coloradocollege.edu/stateoftherockies/Conservation\\_West\\_Survey/CWSOverallData.pdf](http://www2.coloradocollege.edu/stateoftherockies/Conservation_West_Survey/CWSOverallData.pdf).

The clean energy revolution in these western states is already under way, and federal lands offer significant opportunity for continued and increased investment in clean electricity. The West is home to hundreds of millions of acres of federally managed public lands, which are mostly under the purview of the Department of the Interior and the Forest Service. Lands open for energy development do not include millions of acres of national parks, national monuments, wilderness areas, and other places protected by law.

Much of the energy development on public lands occurs on areas managed by the Department of the Interior's Bureau of Land Management. This agency oversees a large amount of the acreage in all six states: about 17 percent of Arizona, 15 percent of California, 12 percent of Colorado, 68 percent of Nevada, 17 percent of New Mexico, and 43 percent of Utah.<sup>3</sup>

Taxpayer-owned lands are already a part of our country's clean energy revolution. In fact, dozens of solar, wind, and geothermal projects sited on public lands are either currently providing electricity or have been permitted to do so and are ready to be built. A report from the National Renewable Energy Laboratory<sup>4</sup> elaborated that:

*With 5,200 MW of [renewable energy] authorized or approved [on Bureau of Land Management Land], and approximately 8,000 MW of additional 2011 and 2012 high priority projects, the BLM appears to be on track to meet the [Energy Policy Act of 2005] requirement of approving 10,000 MW of RE on public lands by 2012.*

This is just the beginning, and many more installations could be responsibly sited and built in these states over the next 20 years, bringing economic development and job creation to the West. Additional policies are essential to turn these opportunities into reality.

To capture the full economic, energy, and public health benefits from this opportunity, the federal government should adopt four essential policies:

- A national clean energy standard of 80 percent by 2035, with 35 percent for renewables
- A clean resources standard for public lands and waters
- Renewable energy zones
- Comprehensive electricity transmission reforms to rehabilitate our aging system

Our report identifies the vast opportunities for renewable energy installations on public lands in the West, but this does not imply that we endorse their deployment on every acre. Some places are not appropriate for energy development, and instead should be managed for multiple uses including hunting, fishing, recreation, wildlife, and other such essential values.

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## How much clean energy, jobs, and investment could western public lands generate?

We assessed the federal government's "reasonably foreseeable development scenarios" for the likelihood of renewable energy development on public lands in Arizona, California, Colorado, Nevada, New Mexico, and Utah. These analyses examine the economic and policy conditions in the six states to determine how much renewable energy on public lands could realistically be generated over 20 years. These results are shown in Figure 2.

**FIGURE 2**  
**Clean energy potential**

How much renewable energy could be developed on western public lands over 20 years

State	Solar (megawatts)	Wind (megawatts)	Geothermal (megawatts)	Totals
Arizona	2,424	31	50	2,505
California	15,421	1,462	4,703	21,586
Colorado	2,194	85	50	2,329
Nevada	1,701	701	2,280	4,682
New Mexico	833	199	170	1,202
Utah	1,219	256	620	2,095
Totals	23,792	2,734	7,873	34,399

Note: Figures for solar and wind are for Bureau of Land Management lands; figures for geothermal are for Bureau of Land Management and Forest Service lands. Solar outlook to 2030; wind and geothermal outlooks to 2025.

Source: Bureau of Land Management, [http://solareis.anl.gov/documents/supp/Supplement\\_to\\_the\\_Draft\\_Solar\\_PEIS.pdf](http://solareis.anl.gov/documents/supp/Supplement_to_the_Draft_Solar_PEIS.pdf), <http://windeis.anl.gov/documents/fpeis/maintext/Vol1/Vol1Ch5.pdf>, [http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS\\_\\_REALTY\\_\\_AND\\_RESOURCE\\_PROTECTION\\_energy/geothermal\\_eis/final\\_programmatic.Par.95063.File.dat/Geothermal\\_PEIS\\_final.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_energy/geothermal_eis/final_programmatic.Par.95063.File.dat/Geothermal_PEIS_final.pdf)

As seen in the chart above, public lands in these six states could reasonably be the location for the development of 34,399 megawatts (or 34.4 gigawatts) of wind, solar, and geothermal energy over the next 20 years. This is enough electricity to power more than 7 million homes,<sup>5</sup> or about equivalent to the number of homes in the Four Corners states.<sup>6</sup>

It is important to note that these figures are what the Department of the Interior considers to be realistic development, which is different than renewable energy potential on public lands in the West which is much greater. Our goal is to encourage the achievement of this outlook and to go beyond it.

It is difficult to determine how many acres this development might entail for the six states that we studied due to lack of data for geothermal energy. But the same reasonably foreseeable development scenarios that we relied on for megawatt estimates found that on public lands in all of the western states surveyed, together about 214,000 acres of solar and 160,100 acres of wind could likely be developed over two decades. While the government’s analysis is less clear on the number of acres that could be disturbed for geothermal development, it estimates that about 133 additional geothermal power plants could be built by 2025, which would cover an average of up to 367 acres each.<sup>7</sup> So we can guess that approximately 48,811 acres at most could be used for geothermal energy.

The development of renewable energy on public lands in the six states that we examined could create hundreds of thousands of direct jobs through project construction, installation, and operation and maintenance. According to the Electric Power Research Institute,<sup>8</sup> each megawatt of wind energy creates about 2.9 direct jobs, solar creates about 6.6 direct jobs,<sup>9</sup> and geothermal creates about 5.7 direct jobs.

Under these assumptions, and using the development scenarios in Figure 2, we find that more than 209,000 direct jobs could be created by building these 34.4 gigawatts. These results can be seen in Figure 3.

**FIGURE 3**  
**Clean power creates jobs**

Estimated direct jobs created from renewable energy development on western public lands over 20 years

State	Solar jobs	Wind jobs	Geothermal jobs	Totals
Arizona	15,986	89	284	16,358
California	101,701	4,181	26,666	132,549
Colorado	14,469	243	284	14,996
Nevada	11,218	2,005	12,928	26,151
New Mexico	5,494	569	964	7,027
Utah	8,039	732	3,515	12,287
Totals	156,908	7,819	44,640	209,367

Additionally, building these projects will create direct investment in the six states. Many large financial institutions plan to invest in clean energy. Wells Fargo & Co., Goldman Sachs Group Inc., and Bank of America Corp. have pledged to invest a combined \$120 billion in the clean energy technologies sector over the coming years.<sup>10</sup> Responsibly developing clean energy projects on America’s eligible public lands can help attract these investments, particularly in more rural areas that would benefit from the jobs and economic opportunity that the new projects can bring.

To calculate the investment in renewable energy development that public lands might help stimulate, we looked at average investment in the renewable energy sector per megawatt by determining the costs to install the projects. According to data from the Energy Information Administration,<sup>11</sup> the average installed costs for utility-scale solar are \$4,667 per watt (\$4.667 million per megawatt),<sup>12</sup> \$2,403 per kilowatt (\$2.403 million per megawatt) for wind, and \$2,482 per kilowatt (\$2.482 million per megawatt) for geothermal. In total, we estimate that \$137 billion of investment in the renewable energy sector could be stimulated by reasonably foreseeable development on public lands in the West. (see Figure 4)

**FIGURE 4**  
**Bringing in billions of dollars**

Potential direct investment in the renewable energy sector from development on western public lands

State	Solar investment (billions \$)	Wind investment (billions \$)	Geothermal investment (billions \$)	Total (billions \$)
Arizona	11.3	.74	.12	11.5
California	72.0	3.5	11.7	87.2
Colorado	10.2	.20	.12	10.6
Nevada	7.9	1.7	5.7	15.3
New Mexico	3.9	.48	.42	4.8
Utah	5.7	.62	1.5	7.8
Totals	111.0	6.6	19.5	137.1

Note: Numbers may not add up exactly due to rounding.

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## Making clean electricity from western public lands a reality

Several important policies are necessary to ensure that we meet the realistic projection to build 34 gigawatts of renewable energy on appropriate public lands over the next two decades, and to eventually exceed that goal. Policies are also needed that account for the impacts of any industrial development on air and water quality, and landscapes. Specifically:

- A national clean energy standard
- A public lands clean resources standard
- New energy zones
- Electric transmission policy reforms

Let's examine each of these proposals briefly in turn.

### National clean energy standard

President Barack Obama proposed a clean energy standard of 80 percent by 2035 that includes low-pollution electricity generation such as wind, solar, geothermal, natural gas, coal with carbon capture and storage, and nuclear power.<sup>13</sup> This standard would require utilities to ensure that 80 percent of the electricity that they deliver is low carbon by 2050.

We support this proposal because of the jobs and market certainty that it would provide, but also urge that the standard include a requirement that at least 35 percent of electricity be generated by wind, solar, geothermal, other renewables, and efficiency by 2035 to ensure continued investment in these technologies.<sup>14</sup> This would help energy development on public lands by stimulating a strong market for renewable energy across the country.

## Public lands clean resources standard

The president also should use executive authority to establish a “clean resources standard” for energy resources from eligible public lands.<sup>15</sup> This would require that 35 percent of the electricity generated from resources mined, drilled, or otherwise extracted from public lands and waters be renewable by 2035. Similar to President Obama’s proposed clean energy standard designed to increase the amount of renewable electricity that utilities sell, this policy is designed to boost development of renewable electricity from public lands.

Currently, 66 percent of electricity generated from resources from public lands and waters is from coal, while only 1 percent is from solar, wind, and geothermal combined.<sup>16</sup> This shows that the use of our public lands for electricity generation heavily favors coal, and it neglects the contribution that our public lands could make toward development of low- and no-carbon electricity.

## New energy zones

Siting large-scale renewable energy development on public lands across the country must take into account other values including hunting, fishing recreation, clean water, clean air, wildlife habitat, and scenery in accordance with the Bureau of Land Management’s multiple use mandate.<sup>17</sup> One way to ensure that renewable energy development on public lands respects these values is for the Department of the Interior to build upon its program to establish incentivized zones for solar development on public lands. This program allows for incentives such as streamlined permitting, lower fees, and prioritized transmission capacity to be put in place for solar projects that are sited in designated zones.<sup>18</sup> The zones will also have been screened for wildlife and other environmental conflicts to ensure that they will be minimal.

On July 24, 2012, the Department of the Interior released the final Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States.<sup>19</sup> It designates 17 solar zones covering approximately 285,000 acres, and also opens up an additional 19 million acres to the possibility of solar energy development. A final decision approving the Programmatic Environmental Impact Statement will be made by Secretary of the Interior Ken Salazar in the next few months.

In addition to fine-tuning and finalizing the solar energy zones, this policy should also be extended to wind projects to ensure that they too will have more certainty and fewer legal challenges when it comes to siting on public lands.

## Electric transmission policy reforms

A major challenge to the deployment of large-scale renewable energy on public lands is the lack of adequate electrical transmission capacity to transmit this clean electricity to communities that need it. This process should be reformed, which could be accomplished in a variety of ways. As CAP previously wrote in 2010:

*Transmission reform is urgent. ... [we need to] create a system for effectively siting new transmission. Such a system will likely combine [Federal Energy Regulatory Commission] oversight with a clearly defined role for state regulators, balancing the need for regional and national planning with respect for state and local conditions.*<sup>20</sup>

This policy would lead to the construction or improvement of transmission lines by clarifying and streamlining the siting and permitting process. Additionally, federal authority to plan, site, and allocate costs for the construction of new transmission lines should be strengthened in the case that states do not work together to upgrade transmission capacity. The implementation of the Federal Regulatory Commission's Order Number 1000 should be supported to help achieve these goals.<sup>21</sup>

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## Conclusion

Public lands in the American West can help lead the nation's transition to a cleaner, cheaper electricity system. Our analysis shows that under reasonably foreseeable federal government development scenarios for renewable energy development, more than 34 gigawatts of solar, wind, and geothermal energy could be built on public lands in the Four Corners states plus California and Nevada over the next 20 years. This would provide economic opportunities—more than 209,000 direct jobs and \$137 billion in investment in the renewable energy sector. With supportive policies there is great potential to build additional wind, solar, and geothermal electricity projects on public lands in the West.

This region has the opportunity to become a leader in the development of homegrown American energy not subject to volatile fossil-fuel prices, creating jobs that cannot be outsourced and developing technologies for export to other countries. But in order to realize this likelihood and also help the region achieve its even greater potential for renewable energy, a number of additional policies should be put in place. These include a national clean energy standard, a clean resources standard for public lands and waters, energy zones, and electric transmission policy reforms to update our aging system.

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## Endnotes

- 1 Bureau of Labor Statistics, Employment in Green Goods and Services – 2010 (Department of Labor, 2012), p. 16, table 4, available at <http://www.bls.gov/news.release/pdf/ggqcew.pdf>.
- 2 Colorado College State of the Rockies Project, “Conservation in the West Poll: 2012 Western States Survey” (2012), available at [http://www2.coloradocollege.edu/stateoftherockies/Conservation\\_West\\_Survey/CWSOverallData.pdf](http://www2.coloradocollege.edu/stateoftherockies/Conservation_West_Survey/CWSOverallData.pdf).
- 3 Bureau of Land Management, Public Land Statistics (Department of the Interior, 2012), p. 7, table 1-3, available at [http://www.blm.gov/public\\_land\\_statistics/pls11/pls2011.pdf](http://www.blm.gov/public_land_statistics/pls11/pls2011.pdf).
- 4 National Renewable Energy Laboratory, Western Region Renewable Energy Markets: Implications for the Bureau of Land Management (Department of Energy, 2012), p. 37, available at <http://www.nrel.gov/docs/fy12osti/53540.pdf>.
- 5 34 gigawatts \* 1,000 megawatts/gigawatt \* 1,000 kilowatts/megawatt \* 8,760 hours/year \* 30 percent capacity factor/11,400 kilowatt-hours/year
- 6 “State & County QuickFacts,” available at <http://quickfacts.census.gov/qfd/index.html> (last accessed July 2012).
- 7 Bureau of Land Management, Final Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States (Department of the Interior, 2008), p. 2-35 and 2-41, available at [http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS\\_\\_REALTY\\_\\_AND\\_RESOURCE\\_PROTECTION\\_/energy/geothermal\\_eis/final\\_programmatic\\_Par.95063.File.dat/Geothermal\\_PEIS\\_final.pdf](http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/geothermal_eis/final_programmatic_Par.95063.File.dat/Geothermal_PEIS_final.pdf).
- 8 Max Wei, Shana Patadia, and Daniel M. Kammen, “Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US?,” Energy Policy 38 (2010): 919–931, available at [http://rael.berkeley.edu/sites/default/files/WeiPatadiaKammen\\_CleanEnergy-Jobs\\_EPolicy2010.pdf](http://rael.berkeley.edu/sites/default/files/WeiPatadiaKammen_CleanEnergy-Jobs_EPolicy2010.pdf).
- 9 Calculated by averaging solar photovoltaic (7.26 jobs) and solar thermal (5.93 jobs).
- 10 Nelson D. Schwartz, “Banks Look to Burnish Their Images by Backing Green Technology Firms,” The New York Times, June 10, 2012, available at <http://www.nytimes.com/2012/06/11/business/banks-look-to-burnish-their-images-by-backing-green-technology-firms.html>.
- 11 Energy Information Administration, Renewable Fuels Module (Department of Energy, 2011), p. 168, table 13.1, available at <http://www.eia.gov/forecasts/aeo/assumptions/pdf/renewable.pdf>.
- 12 Calculated by averaging solar photovoltaic (\$4,697 per kilowatt) and solar thermal electric (\$4,636 per kilowatt).
- 13 Jessica Goad, Christy Goldfuss, and Tom Kenworthy, “Using Public Lands for the Public Good” (Washington: Center for American Progress, 2012), available at [http://www.americanprogress.org/issues/2012/06/pdf/public\\_land.pdf](http://www.americanprogress.org/issues/2012/06/pdf/public_land.pdf).
- 14 Richard W. Caperton and others, “Helping America Win the Clean Energy Race” (Washington: Center for American Progress, 2011), available at [http://www.americanprogress.org/issues/2011/02/pdf/ces\\_brief.pdf](http://www.americanprogress.org/issues/2011/02/pdf/ces_brief.pdf).
- 15 Goad, Goldfuss, and Kenworthy, “Using Public Lands for the Public Good.”
- 16 Ibid.
- 17 “Federal Land and Policy Management Act 1976-2011,” available at <http://www.blm.gov/flpma/> (last accessed July 2012).
- 18 Bureau of Land Management, Supplement to Draft Solar Energy Programmatic Environmental Impact Statement (PEIS) (Department of the Interior, 2011), p. 8, available at [http://solareis.anl.gov/documents/docs/Supplement\\_Overview\\_Presentation.pdf](http://solareis.anl.gov/documents/docs/Supplement_Overview_Presentation.pdf).
- 19 U.S. Department of the Interior, “Obama Administration Releases Roadmap for Solar Energy Development on Public Lands,” Press release, July 24, 2012, available at [http://solareis.anl.gov/documents/docs/PressRelease\\_Final\\_Solar\\_PEIS.pdf](http://solareis.anl.gov/documents/docs/PressRelease_Final_Solar_PEIS.pdf).
- 20 Richard W. Caperton, “Transmitting the Clean Energy Future” (Washington: Center for American Progress, 2010), available at [http://www.americanprogress.org/issues/2010/01/transmission\\_courts.html](http://www.americanprogress.org/issues/2010/01/transmission_courts.html).
- 21 Richard W. Caperton, “FERC Helps Line Up Clean Energy Projects with New Rule” (Washington: Center for American Progress, 2011), available at [http://www.americanprogress.org/issues/2011/07/ferc\\_order\\_1000.html](http://www.americanprogress.org/issues/2011/07/ferc_order_1000.html).