2017 U.S. CLEAN TECH LEADERSHIP INDEX

State & Metro / May 2017

Embargoed until 8 AM Eastern, May 16
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CLEAN EDGE

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INDEX DESCRIPTION

What is the U.S. Clean Tech Leadership Index?

This **U.S. CLEAN TECH LEADERSHIP INDEX** report contains findings from the 2017 editions of Clean Edge's State and Metro Indexes, which track activity in the U.S. based on a diverse set of underlying industry indicators at state and metro levels. Indicator performances are grouped into separate categories (for index weighting purposes) and ultimately used to calculate regional leadership scores. The **STATE INDEX** offers scores for all 50 states, derived from more than 80 state-based indicators. The **METRO INDEX** uses 30 metro-based indicators to calculate scores for the 50 largest U.S. metropolitan statistical areas. Organizational structures of both indexes are shown at the right, and more information can be found later in the report (State Index methodology on page 28; Metro Index methodology on page 46).

The objective of the Leadership Index is to serve as a tool for regional comparative research, a source for aggregated industry data, and a jumping-off point for deep, data-driven analysis of the U.S. clean-tech market. This is the eighth edition of the State Index, the sixth annual Metro Index, and the fifth year that topline Index rankings and scores have been released as a public report.

Full Data Subscription Packages Available

Private subscription options, which provide access to all of the underlying datasets, are available for economic development agencies, policymakers, NGOs, investors, corporations, and other stakeholders. **For more information please see page 53.**

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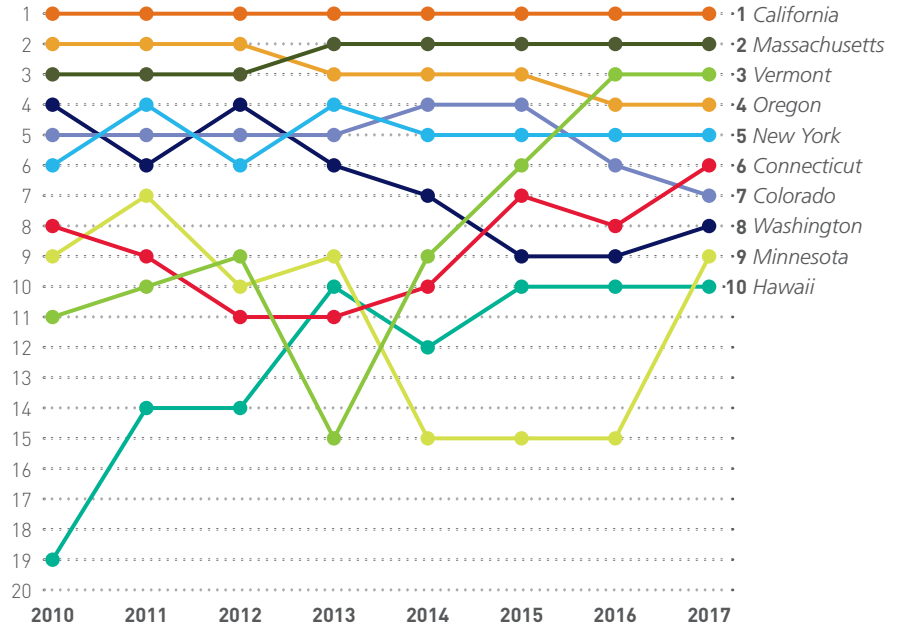
THE U.S. CLEAN TECH MARKET

The U.S. Clean Tech Leadership Index, now in its eighth year, marks another banner year for the national clean-energy economy. Combined, wind and solar power equaled nearly 17 GW of new additions in 2016, representing 61% of all new electricity generating capacity installed in the U.S. for the second year in a row. This dramatic transition away from fossil fuels (particularly coal) for new power sources is having a significant impact on state-level generation mix. Seventeen states now receive 10% or more of their electricity from non-hydro utility-scale renewables (wind, solar, and/or geothermal), up from 14 states in last year's Index and up more than five-fold since 2010 (when just three states reached the 10% threshold). Three states (Iowa, South Dakota, and Kansas) now generate 30% or more of their electrons from utility-scale wind, solar, and/or geothermal (all wind energy in those leading states) and another three states exceed 20% (Oklahoma, California, and North Dakota). And the trend isn't limited to the U.S. Renewables made up 55% of all new electric generation capacity additions globally in 2016, the most ever recorded, according to Bloomberg New Energy Finance.

What's driving this massive shift to renewable energy? Declining costs are the primary driver fueling renewables' rise. Lazard's most recent *Levelized Cost of Energy Analysis* report (December, 2016) finds that the levelized cost of new U.S. utility-scale onshore wind and solar now beats new coal, nuclear, and, in most cases, even combined-cycle natural gas.

Another factor impacting the shift to renewables is supportive policies and regulations. In 2016, five states upped their renewable portfolio standard (RPS) targets to 25% or more; a sixth (Michigan) extended its RPS to 15%; and a seventh (Ohio) re-instituted its RPS after having frozen it two years earlier. Five states (California, Hawaii, New York, Oregon, and Vermont) now have targets of 50% or greater. Cities are flexing their clean-energy muscles as well. Five cities tracked in our index (Portland, Salt Lake City, San Diego, San Francisco, and San Jose) are now aiming for 100% community-wide renewable electricity; Atlanta joined this elite group in May (too late to be included in this year's index scoring). Further, 18 cities have

2017 TOP 10 STATES (INCLUDING HISTORICAL RANKINGS)



Source: U.S. Clean Tech Leadership Index, Clean Edge, Inc.

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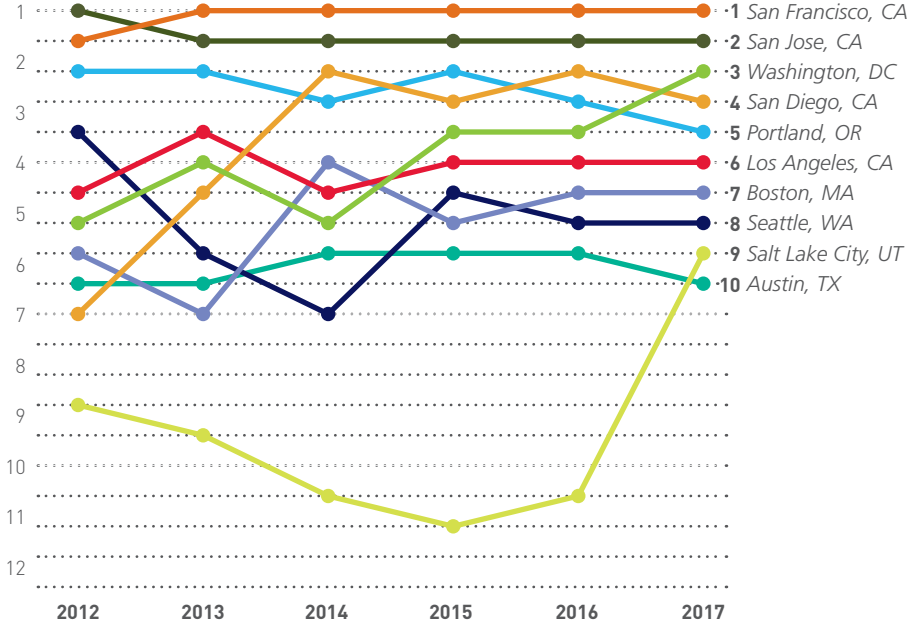
building energy use benchmarking requirements (50% more than last year); all but seven cities tracked in our index report environmental data to the CDP; and 36 have an electricity use/greenhouse gas (GHG) reduction goal.

As we reported earlier this year in the *Corporate Clean Energy Procurement Index*, it's not just governments, but also corporate buyers, that are playing a significant role in the growth of renewables. The commercial and industrial market is now one of the largest procurers of renewables, with more than 7.5 GW of contracted wind and solar power. Commercial customers are intending to procure an additional 60 GW by 2025, according to the Renewable Energy Buyers Alliance (REBA).

Another key factor: many aging coal power plants are simply no longer economically viable. Contrary to President Trump's call to reinvigorate the coal industry and "end the war on coal," such admonitions are more pipe dream than reality. Across the nation, coal plants are in the process of being shut down and replaced by natural gas and renewable energy sources for purely economic reasons. A recent survey by Reuters of 32 utilities with operations in the 26 states that sued to block Obama's Clean Power Plan found that the majority had no plans to change their shift away from coal. "Of the 32 utilities contacted by Reuters," the news agency reported, "20 said Trump's order would have no impact on their investment plans; five said they were reviewing the implications of the order; six gave no response… and just one said it would prolong the life of some of its older coal-fired power units."

While the early Trump administration has aimed at dismantling Obama-era climate action policies and forwarding a pro fossil-fuel, climate-change-denial narrative, a growing number of red and blue states and cities, along with leading corporates and utilities, are forging a divergent path. And despite much political rhetoric to the contrary, even at the national level there's still a chance for clean-energy momentum and leadership of innovation. Trump's roster of business advisors includes a who's-who of clean-energy business leaders and investors including Tesla CEO and founder Elon Musk, Blackstone Group CEO Stephen Schwarzman, GE CEO Jeff Immelt, and GM CEO Mary Barra.

2017 TOP 10 METRO AREAS (INCLUDING HISTORICAL RANKINGS)



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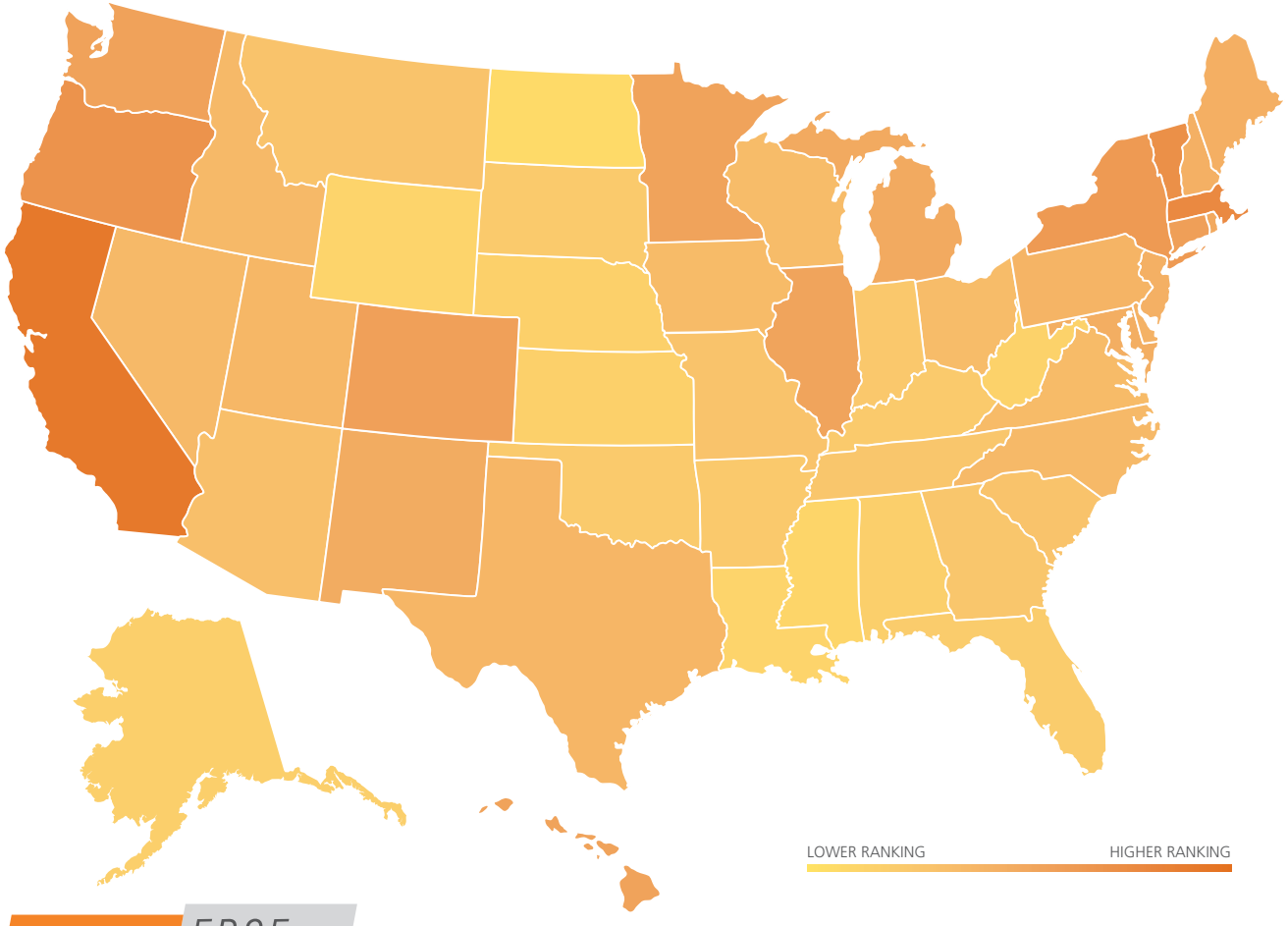
STATE INDEX

2017 U.S. Clean Tech Leadership Index

Full State Index Datasets Available

Clean Edge offers subscription access to the full State and Metro Index datasets. These include data for all 50 states on clean-energy generation, energy storage installations, green building deployment, energy efficiency expenditures, VC investments, clean-energy patents, and much more. **For more information on subscriptions, please see page 53.**

STATE INDEX



RANK	+/-	STATE	LEADERSHIP SCORE
1	0	California	92.0
2	0	Massachusetts	77.8
3	0	Vermont	72.2
4	0	Oregon	69.6
5	0	New York	63.6
6	2	Connecticut	58.7
7	-1	Colorado	58.4
8	1	Washington	57.4
9	6	Minnesota	55.9
10	0	Hawaii	55.5
11	-4	Illinois	55.3
12	0	Rhode Island	51.3
13	1	Michigan	50.1
14	-1	New Mexico	48.1
15	-4	Maryland	46.9
16	2	Maine	45.5
17	0	New Jersey	44.7
18	-2	New Hampshire	44.6
19	0	Delaware	43.3
20	0	Pennsylvania	42.2
21	1	Texas	40.2
22	8	Utah	38.9
23	3	Nevada	36.9
24	8	Idaho	36.6
25	-4	North Carolina	36.5
26	-3	Iowa	36.1
27	-3	Virginia	35.9
28	-3	Ohio	35.0
29	0	Wisconsin	34.5
30	-2	Arizona	32.8
31	0	Montana	29.0
32	2	South Carolina	28.6
33	6	Missouri	28.6
34	-7	Georgia	25.6
35	5	Tennessee	25.5
36	-3	Indiana	24.6
37	1	Arkansas	23.5
38	-3	Kentucky	22.2
39	-2	Oklahoma	21.8
40	-4	South Dakota	21.7
41	0	Florida	20.7
42	2	Alabama	18.1
43	4	Alaska	17.6
44	1	Nebraska	17.0
45	-3	Kansas	16.9
46	4	West Virginia	14.5
47	-4	Louisiana	14.1
48	-2	Wyoming	13.6
49	0	Mississippi	12.1
50	-2	North Dakota	8.0

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2017 STATE INDEX RESULTS

California and Massachusetts once again top the rankings of the Clean Tech Leadership Index in 2017. California has finished first in the Index in all eight years of its existence. This year, the Golden State increases its overall score by 2.24 points, and ups its lead over Massachusetts by just under half a point. Massachusetts garners its fifth consecutive second-place finish, while taking the Capital category crown for the second straight year over California. The rest of the top five states also remain unchanged from last year's Index, with Vermont, Oregon, and New York once again finishing third through fifth. The top four states all finish in the top 10 in each of the three Index categories.

The states occupying spots six through 10 find themselves bunched together, separated by a mere 3.22 points. Connecticut makes a two-spot leap into sixth, while Colorado drops one place to seventh, Washington moves up one to eighth, and Hawaii maintains its #10 ranking. This year's Index does see one big mover into the top 10, though: Minnesota. The Land of 10,000 Lakes makes a six-spot leap to #9, the fourth-largest increase in the Index, and Minnesota's second-best performance ever, behind 2011's #7 standing. Just missing out on the top 10 is Illinois, which drops four spots to #11 overall.

The Top 10 States

CALIFORNIA continues to dominate the Index, coming in first in the Technology and Policy categories, second in Capital, and no lower than second in any of the seven Index subcategories. The undisputed king of solar energy among the states, California received more than 27,000 gigawatt hours (GWh) of utility-scale and distributed solar power alone in 2016. That's more than five times the amount generated in Arizona, the state with the second-most solar production, and enough to power more than four million California homes for a year. The nation's most populous state has more than 1.2 million registered electric and hybrid vehicles, and garnered more than $9.5 billion in clean-tech venture capital in the last three years.

MASSACHUSETTS maintains its second-place ranking for the fifth year in a row. The Bay State continues to excel in the Capital category, leading in both the overall category and Financial Capital subcategory. Other strong showings include #2 rankings in the Policy category and the Incentives and Green Buildings subcategories. Energy efficiency is a particular strength: Massachusetts finished first in the American Council for an Energy-Efficient Economy's (ACEEE) most recent state efficiency scorecard, and has the second-most kilowatt hours (kWh) saved per person through utility efficiency programs.

VERMONT shows that its huge leap in last year's Index was no fluke, coming in third in for the second consecutive year. The state with a 75% RPS mandate by 2032 already uses renewables for nearly 100% of its in-state electricity generation when hydro and biomass are included. Little wonder, then, that Vermont also has the fewest carbon emissions from electricity generation in the nation, fueling its first-place finish in the Clean Electricity subcategory. The Green Mountain State lives up to its name by having the highest percentage of clean-energy jobs (more than 4% of total employment) in the nation, as well.

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OREGON holds steady at the #4 spot for the second consecutive year, finishing no lower than 10th in any category or subcategory. Transportation is one strength, as Oregon has the third-most registered hybrids per million people, the fourth-most plug-in and battery electric vehicles per million, and the third-most EV charging stations per million. It ranks fifth in clean-energy jobs, ahead of Massachusetts and California as a percent of total employment. It is also one of just two states with a low-carbon fuel standard, and has a renewable fuel standard to boot.

NEW YORK rounds out the top five with its fourth consecutive fifth-place finish, almost five points ahead of #6 Connecticut. Policy fuels the Empire State's success. As it continues to explore the future of the electric industry through its Reforming the Energy Vision (REV) initiative, New York also increased its RPS goal to 50%, among the strongest in the nation, and it gets credit for nearly all the measures tracked in the Incentives subcategory. The addition of carbon emissions to this year's Index fuels New York's eight-spot leap in the Transportation subcategory, likely a consequence of New York City's embrace of public transit.

CONNECTICUT moves up two places this year to #6. The state adds nearly nine points to its Technology category score, resulting in a two-spot jump in the category, largely due to its low carbon emissions. The Nutmeg State has an efficient economy, as well: it has the sixth-lowest kWh consumption per capita, the fourth-highest GDP per kWh, and ties for fifth in the most recent ACEEE scorecard. Connecticut also moves up one place to fourth in Policy, with a particularly strong showing (#3, up five places) in the Regulations & Mandates subcategory.

COLORADO drops a spot to #7 this year, though its overall score remains virtually unchanged from last year. Green buildings are a strength, as Colorado is in the top three in four out of five LEED and Energy Star indicators in that category. Its best performance, though, is in the Capital category, where it moves up one place to fourth. Colorado places no lower than eighth in each of the four VC indicators. The Centennial State is also one of only eight states to have a Department of Energy lab, a clean-tech incubator, and a top-ranked green Master's program.

WASHINGTON makes a move up to eighth after two years in the #9 spot. It continues to have one of the cleanest electricity generation systems in the country, coming in third in in-state utility-scale renewable energy generation (with more than 77% with hydro and biomass). Washington also excels in electric vehicle deployment, placing in the top five in per-million hybrid, plug-in, and battery electric vehicles, as well as EV charging stations. Other strengths include LEED building deployment (top six in both indicators) and VC (top seven in all four measures).

MINNESOTA owns this year's most notable overall increase, adding more than nine points to its score. That translates into a six-spot ranking jump to #9. The Transportation subcategory is an emerging strength, as steady progress in most indicators results in an 11.6-point increase this year. Minnesota also had a strong VC year in 2016, as the state brought in more than $57 million in clean-energy venture dollars last year alone. Additionally, the University of Minnesota has become home to a top-ranked green Master's program, and the state gets credit for a clean tech incubator (the Twin Cities' Clean Energy Accelerator) for the first time.

HAWAII rounds out the top ten for the third year in a row. The state with the nation's only 100% RPS goal (by 2045) is easily the top performer in distributed solar generation, at 7.59% of total utility-scale electricity generation. The Aloha State is also a hotbed for electric vehicle deployment per million residents, coming in second in both EVs and EV charging stations, and fifth in hybrids and plug-in hybrids. It is also a strong Energy Star building market, placing fourth in Energy Star square footage per capita, and seventh in the number of Energy Star homes per thousand people.

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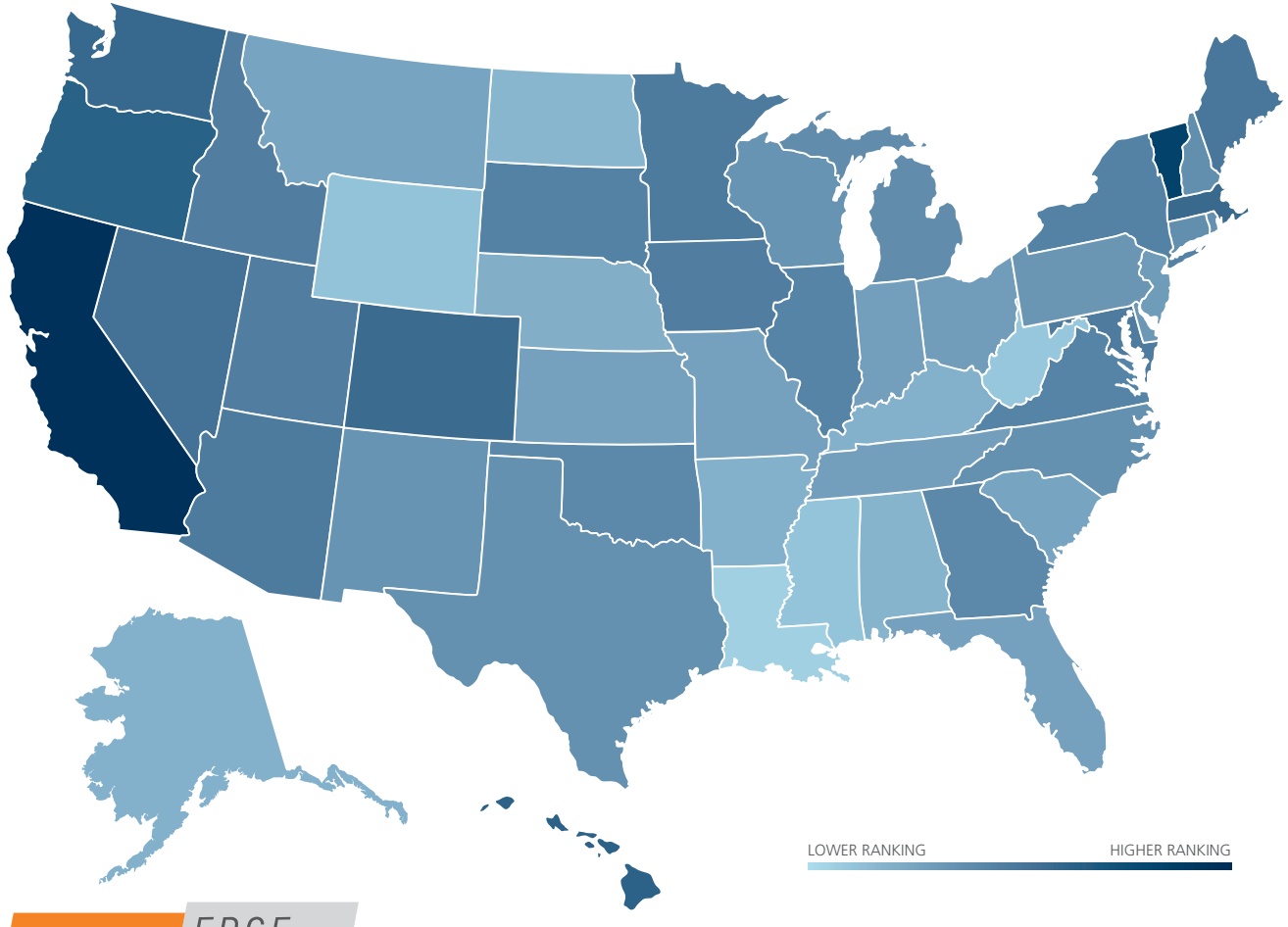
TECHNOLOGY



RANK	STATE	LEADERSHIP SCORE
1	California	96.3
2	Vermont	83.6
3	Oregon	62.7
4	Hawaii	61.5
5	Washington	58.6
6	Massachusetts	58.2
7	Colorado	56.5
8	Nevada	52.8
9	Maine	49.9
10	Arizona	48.3
11	Minnesota	47.6
12	Maryland	47.0
13	Utah	46.1
14	Idaho	46.0
15	Iowa	45.5
16	South Dakota	44.2
17	New York	43.8
18	Illinois	42.6
19	Virginia	42.5
20	Georgia	40.1
21	Oklahoma	39.8
22	Michigan	37.9
23	Connecticut	36.9
24	New Hampshire	36.7
25	North Carolina	36.4
26	Texas	36.0
27	Rhode Island	35.8
28	New Mexico	34.4
29	Wisconsin	34.2
30	Kansas	34.0
31	Pennsylvania	33.0
32	Delaware	32.2
33	New Jersey	29.9
34	Ohio	28.6
35	Indiana	28.1
36	Tennessee	27.6
37	Missouri	27.2
38	Florida	27.0
39	Nebraska	26.7
40	South Carolina	26.1
41	Montana	26.0
42	Kentucky	20.0
43	Alaska	19.9
44	Arkansas	19.8
45	Alabama	18.0
46	North Dakota	17.3
47	Wyoming	12.4
48	Mississippi	11.0
49	West Virginia	10.4
50	Louisiana	6.3

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TECHNOLOGY OVERVIEW

The Technology category tracks the progress of states' deployment across three subcategories:

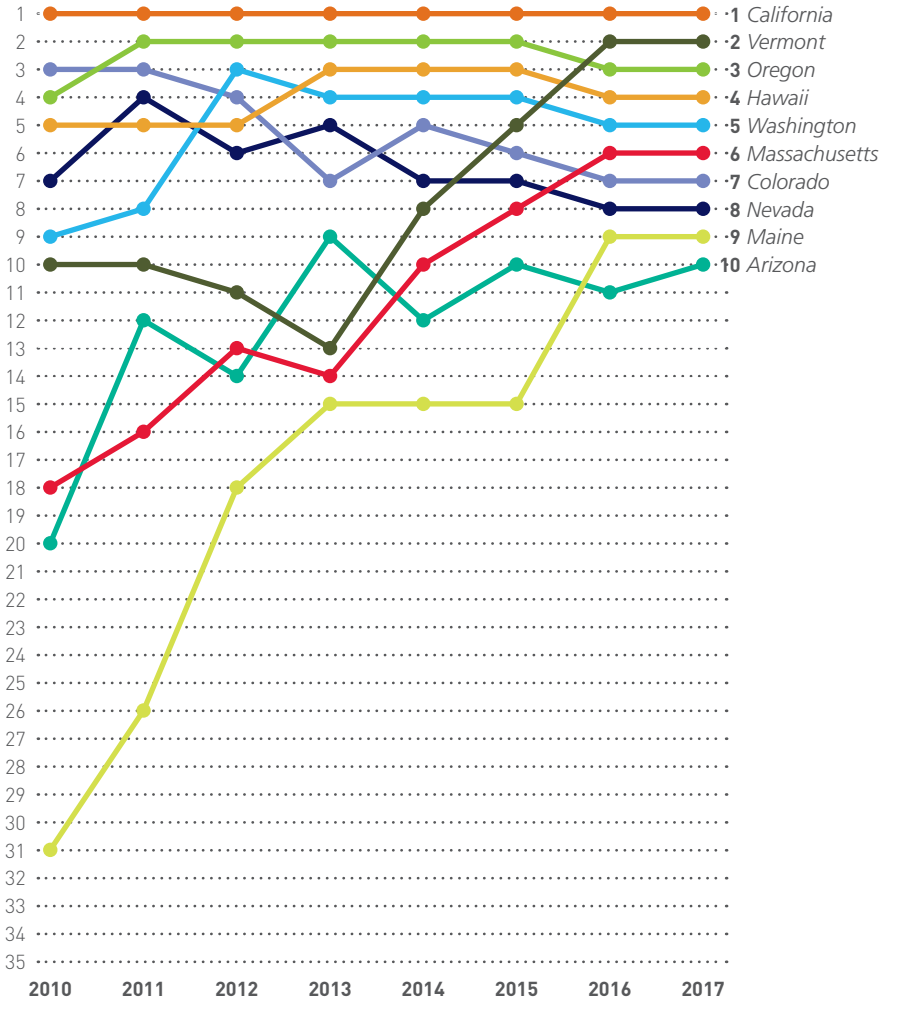
- Clean Electricity (renewable energy generation and energy storage)
- Clean Transportation (use of electric vehicles, hybrids, plug-in hybrids, natural gas vehicles, and charging/fueling infrastructure)
- Energy Intelligence & Green Buildings (green building projects, smart grid deployment, grid modernization, and efficient energy use)

The three subcategories are weighted equally.

There is one major change to the Technology category this year: We have added indicators in each subcategory measuring carbon dioxide emissions from the electricity generation, transportation, and built environment sectors, measured on a per-capita basis.

California remains the Technology category's juggernaut, topping the rankings for the eighth consecutive year. The Golden State maintains a nearly 13-point lead over #2 Vermont, finishing first in both the Transportation and Green Buildings subcategories. After Vermont (the top Clean Electricity subcategory state), it is a big drop (an additional 21-point spread) to #3 Oregon and the rest of the top 10. The top 10 states return unchanged from last year, except for Arizona, which rejoins the top 10 at #10 after a one-year absence, bumping Minnesota down a spot.

2017 TOP 10 TECHNOLOGY (INCLUDING HISTORICAL RANKINGS)



Source: U.S. Clean Tech Leadership Index, Clean Edge, Inc.

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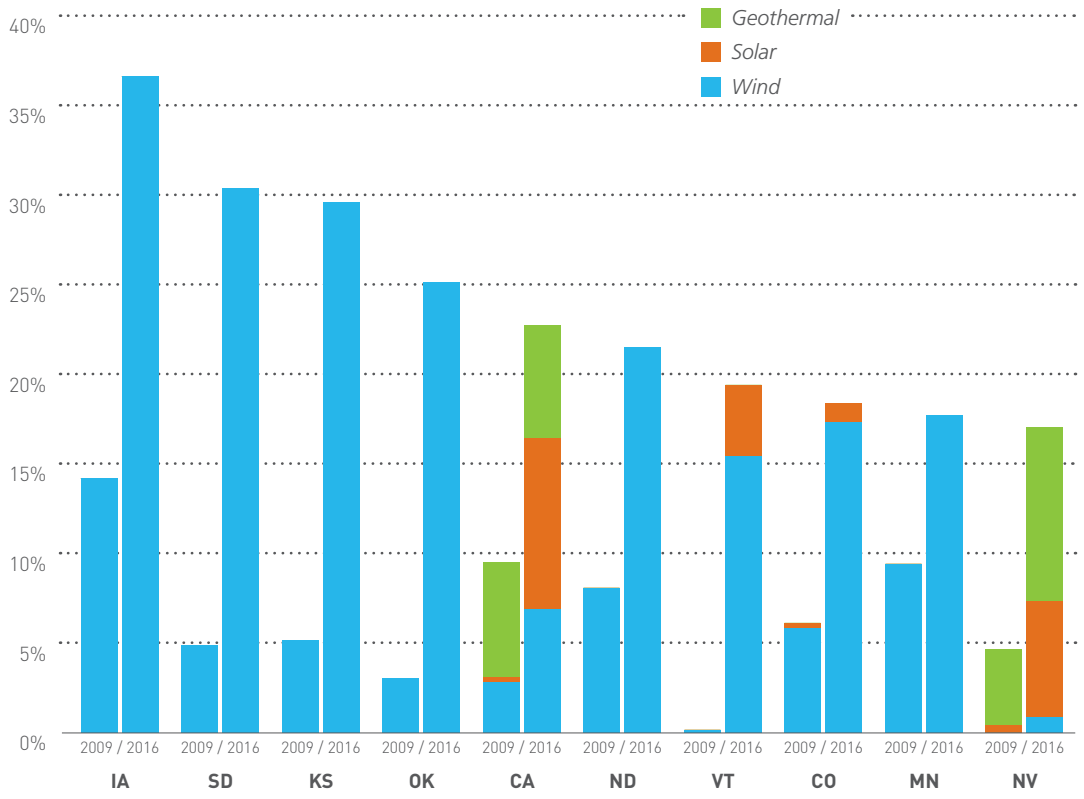
The historical trends shown by the top 10 states in the graph on page 12 highlight how the clean electricity leaders have diversified over the years. Arizona, Maine, and Massachusetts started from the middle of the pack and have steadily evolved into category leaders over the last eight years. Despite its reputation as one of the sunniest states in the country, Arizona holds the lowest Clean Electricity ranking among the Technology leaders; instead, its strengths lie in Transportation (#9) and Green Buildings (#7). That shows that there are several paths to leadership in the category.

Clean Electricity

Vermont repeats as champion in the Clean Electricity subcategory this year, finishing almost 11 points ahead of #2 California. While the state may be small (with only about 1,900 GWh of total electricity generated in 2016), it is nonetheless impressive that 99.84% of that comes from renewable sources. The closure of the Vermont Yankee nuclear plant at the end of 2014 vaulted Vermont into the top spot, but it stays there primarily through its hydro and biomass resources, which together make up nearly 80% of in-state generation.

The story going forward, though, is one of solar and wind. This year's results see South Dakota and Kansas joining Iowa in receiving 30% or more of their in-state electricity generation from wind power. Two additional states (Okla-

2016 TOP 10 CLEAN ELECTRICITY (WIND/SOLAR/GEOTHERMAL) STATES, % OF CLEAN ELECTRICITY, 2009 AND 2016



Source: EIA with Clean Edge Analysis. Note: Represents percentage of total in-state generation. Solar includes only utility-scale solar.
Full dataset available to subscription clients.

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UTILITY-SCALE WIND ELECTRICITY GENERATION (2016)

STATE	RANK	% OF TOTAL GENERATION	THOUSAND MWH
IOWA	1	36.59%	20,049
SOUTH DAKOTA	2	30.35%	3,145
KANSAS	3	29.58%	14,113
OKLAHOMA	4	25.12%	19,526
NORTH DAKOTA	5	21.50%	8,080
MINNESOTA	6	17.68%	10,637
COLORADO	7	17.33%	9,425
VERMONT	8	15.41%	293
IDAHO	9	15.16%	2,427
MAINE	10	13.85%	1,614

Source: EIA data with Clean Edge analysis. Note: Represents percentage of total in-state generation. EIA electricity generation data is gathered from monthly surveys of power plants with peak capacity of at least 1 MW, meaning sub-1 MW solar installations do not count toward generation totals.

Full dataset available to subscription clients.

TOTAL SOLAR ELECTRICITY GENERATION (2016)

STATE	RANK	UTILITY-SCALE % OF TOTAL GENERATION	DISTRIBUTED GENERATION % OF TOTAL GENERATION	% OF TOTAL GENERATION	UTILITY-SCALE THOUSAND MWH	DISTRIBUTED GENERATION THOUSAND MWH
CALIFORNIA	1	9.56%	4.22%	13.78%	19,031	8,402
HAWAII	2	0.96%	7.59%	8.55%	92	729
VERMONT	3	4.00%	4.16%	8.15%	76	79
NEVADA	4	6.44%	0.94%	7.38%	2,546	372
MASSACHUSETTS	5	2.18%	3.83%	6.01%	707	1,242
ARIZONA	6	3.45%	1.52%	4.97%	3,753	1,655
NEW JERSEY	7	1.34%	2.20%	3.54%	1,038	1,708
NORTH CAROLINA	8	2.93%	0.12%	3.05%	3,854	161
NEW MEXICO	9	2.44%	0.52%	2.95%	804	171
UTAH	10	2.31%	0.40%	2.71%	874	150

Source: EIA data with Clean Edge analysis. Note: Represents percentage of total in-state generation. Includes utility-scale (defined as a 1 MW installation or greater) photovoltaic and concentrated solar electricity, as well as distributed solar generation.

Full dataset available to subscription clients.

homa and North Dakota) achieved at least 20% wind generation, and four more reached 15%. On the solar side, California continues to be the runaway leader, with more than 27,000 GWh coming from solar (both utility-scale and distributed), representing nearly 14% of total generation. Five additional states (Hawaii, Vermont, Nevada, Massachusetts, and Arizona) reached 5% solar generation from distributed and utility-scale solar projects; the six states exceeding 5% solar is an increase of two states from last year's Index. Hawaii leads in distributed solar, with 7.6% of its total generation coming from such small-scale solar PV arrays.

Add geothermal to the mix, and we see six states reach the 20% clean-electricity threshold, with only California reaching that milestone primarily through something other than wind. When hydro and biomass are factored in, six states exceed the 50% renewable generation mark, mostly through hydro and wind.

Perhaps unsurprisingly, of the 10 states with the lowest per-capita carbon dioxide emissions from the electricity sector, six (including #1 Vermont) are also among the top 10 states in renewable generation, including hydro and biomass. Most of the remaining low-carbon states – such as Massachusetts, Connecticut, and New Jersey – rely on natural gas instead of higher-carbon coal.

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CARBON DIOXIDE EMISSIONS PER CAPITA (2014)

STATE	RANK	PER CAPITA CARBON EMISSIONS (METRIC TONS)	TOTAL CARBON EMISSIONS (MILLION METRIC TONS)	ELECTRICITY GENERATION (MILLION METRIC TONS)	TRANS-PORTATION (MILLION METRIC TONS)	BUILT ENVIRON-MENT (MILLION METRIC TONS)
NEW YORK	1	**8.61**	169.71	30.52	72.68	66.51
CALIFORNIA	2	**9.25**	357.98	46.28	200.71	110.99
VERMONT	3	**9.35**	5.86	0.01	3.28	2.58
MASSACHUSETTS	4	**9.46**	63.85	10.79	28.80	24.25
OREGON	5	**9.56**	37.95	7.92	20.91	9.12
CONNECTICUT	6	**9.76**	35.05	6.70	15.11	13.24
RHODE ISLAND	7	**10.07**	10.62	2.49	4.12	4.01
IDAHO	8	**10.18**	16.62	0.99	9.28	6.36
MARYLAND	9	**10.30**	61.46	19.03	27.81	14.61
WASHINGTON	10	**10.40**	73.37	11.66	40.65	21.06

Source: EIA and Census Bureau with Clean Edge analysis.
Full dataset available to subscription clients.

ELECTRIC VEHICLES (REGISTERED VEHICLES, 2016)

STATE	RANK	EVS PER 1M PEOPLE	TOTAL EVS
CALIFORNIA	1	**3,544.43**	139,119
HAWAII	2	**2,860.23**	4,086
WASHINGTON	3	**2,082.74**	15,179
OREGON	4	**1,790.41**	7,329
GEORGIA	5	**1,785.87**	18,413
ARIZONA	6	**983.54**	6,817
COLORADO	7	**890.89**	4,936
UTAH	8	**756.09**	2,307
NEVADA	9	**716.65**	2,107
VERMONT	10	**619.60**	387

Source: IHS Markit and Census Bureau data with Clean Edge analysis. IHS Markit data is a snapshot of every vehicle in operation as of the end of 2016. NOTE: This does not include plug-in hybrids, which are tracked as a separate indicator.
Full dataset available to subscription clients.

Clean Transportation

Nine of the top 10 states in the transportation subcategory remain the same as in last year's Index, though not in the same order. The only newcomer is #10 Minnesota, which supplants Georgia (#13). The latter eliminated its lucrative EV incentive in mid-2015, and may be starting to pay the price. California remains #1 for the seventh straight year: The state's electric vehicle market dwarfs all others, and even when normalized for population is 24% higher than second-place Hawaii's. Utah's #2 ranking is its best performance of the Index. It gets there by being a clear leader in natural gas vehicles, but also has a growing EV sector. Vermont, Oregon, and Washington rank third through fifth.

Five states rank in the top 10 of all three EV leaderboards (electrics, plug-ins, and hybrids) in normalized terms: California, Hawaii, Oregon, Vermont, and Washington. This same group constitutes the top five in EV charging stations, as well. Biofuel and natural gas fueling stations tend to be prevalent where those natural resources are abundant. Minnesota, for instance, is among many Midwest states atop the biofuel station rankings, while Oklahoma continues to lead the nation in natural gas stations per million. New York City's embrace of public transit helps push the state to #1 in lowest transportation emissions per capita.

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LEED BUILDING DEPLOYMENT (2016)

STATE	RANK	LEED CERTIFIED PROJECTS PER 1M PEOPLE	TOTAL LEED CERTIFIED PROJECTS	PLATINUM PROJECTS	GOLD PROJECTS	SILVER PROJECTS
VERMONT	1	160.10	100	8	37	30
COLORADO	2	159.37	883	67	376	260
MARYLAND	3	150.59	906	35	391	312
NEW MEXICO	4	142.72	297	8	126	118
WASHINGTON	5	138.86	1,012	57	418	366
MASSACHUSETTS	6	136.09	927	62	433	259
VIRGINIA	7	136.00	1,144	37	389	464
OREGON	8	128.25	525	65	268	128
CALIFORNIA	9	116.69	4,580	415	1865	1419
HAWAII	10	116.20	166	13	71	57

Source: USGBC and U.S. Census Bureau data with Clean Edge analysis. USGBC data is gathered from the LEED project registration database and includes all projects certified through the end of 2016. This does not include LEED for Homes projects.

Full dataset available to subscription clients.

ELECTRIC PRODUCTIVITY (DOLLARS PER KWH, 2015)

STATE	RANK	ELECTRIC PRODUCTIVITY	STATE GDP ($ MILLIONS)	RETAIL ELECTRICITY SALES (GWH)
NEW YORK	1	$9.70	$1,433,531	147,858
CALIFORNIA	2	$9.58	$2,481,348	258,983
MASSACHUSETTS	3	$9.03	$484,943	53,712
CONNECTICUT	4	$8.58	$252,930	29,481
ALASKA	5	$8.55	$52,747	6,166
HAWAII	6	$8.46	$80,376	9,504
NEW JERSEY	7	$7.57	$567,738	75,034
RHODE ISLAND	8	$7.31	$56,052	7,667
NEW HAMPSHIRE	9	$6.72	$73,867	10,998
DELAWARE	10	$6.02	$68,724	11,414

Source: EIA and US BEA with Clean Edge analysis.

Full dataset available to subscription clients.

Energy Intelligence and Green Buildings

The top 10 states in this subcategory also return completely intact from last year's Index. The only shift sees Arizona move up two slots to #7, while Oregon takes its place at #9. California leads in the subcategory for the sixth consecutive year; among other successes, it has the lowest electricity consumption per capita, and ties Massachusetts (#2 in the subcategory) for the highest ACEEE State Energy Efficiency Scorecard result. Vermont, Maryland, and Colorado round out the top five.

The numbers of LEED and Energy Star buildings, as well as the square footage of each, constitute roughly 30% of the subcategory. Colorado has long been a leader in efficient buildings, as it ranks third or higher in normalized terms in all four indicators. California and Virginia also rate as top efficient building markets; both rank in the top 10 in the same four indicators. The hot, sunny states of Nevada, Arizona, and Texas rate the highest on the Energy Star homes per thousand residents measure, perhaps due to high demand as people migrate to the West and South.

This year, Maine tops the list of states with the highest penetration of smart meters, at nearly 91%. In all, 16 states have at least 50% smart meter penetration. In one of its few strong performances in the Technology category, Florida edges Hawaii and Arizona for the lowest carbon emissions from the built environment.

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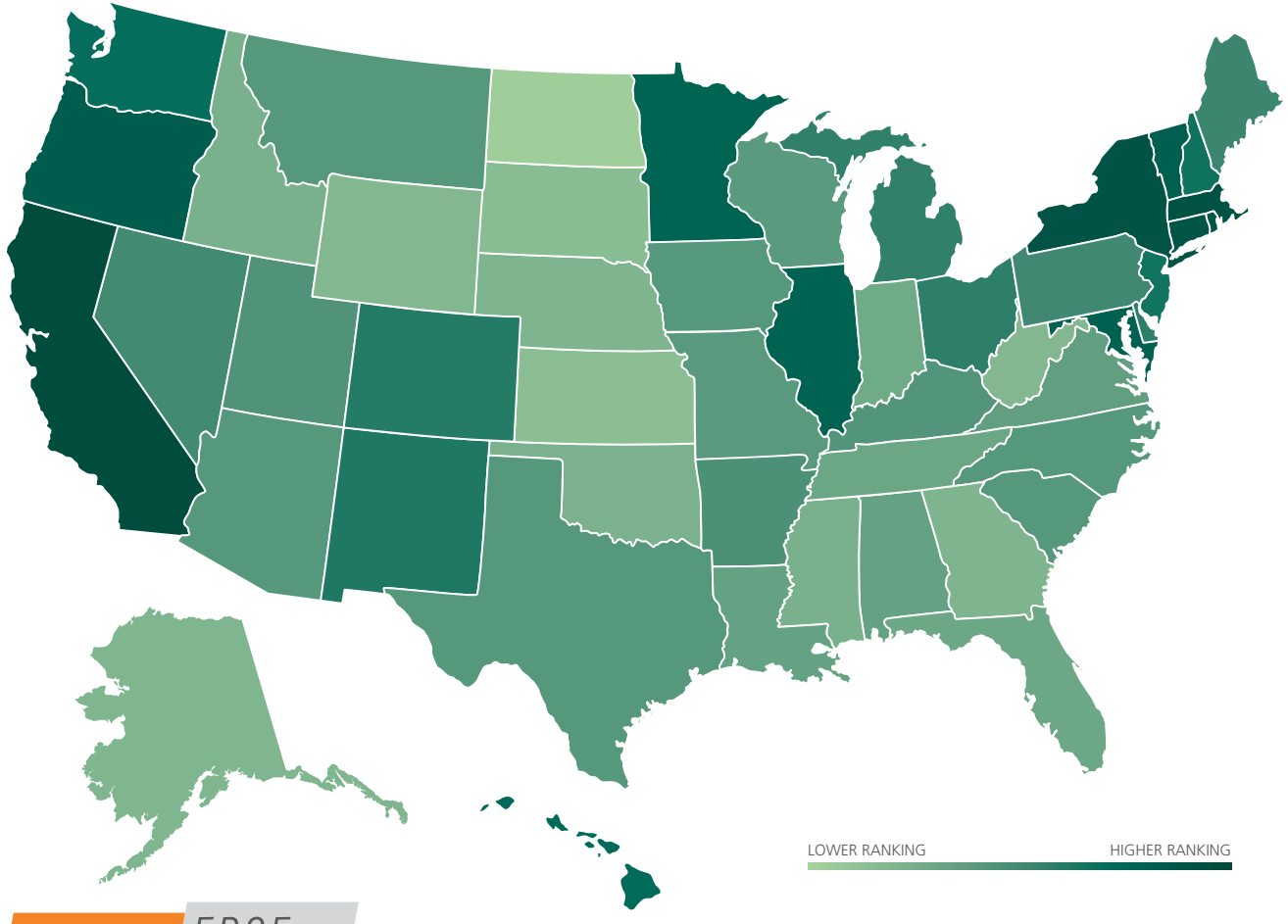
POLICY



RANK	STATE	LEADERSHIP SCORE
1	California	97.1
2	Massachusetts	91.7
3	New York	90.6
4	Connecticut	89.8
5	Rhode Island	88.7
6	Oregon	83.6
7	Vermont	80.6
8	Maryland	80.3
9	Illinois	79.1
10	Minnesota	77.8
11	Hawaii	72.1
12	Washington	70.7
13	New Hampshire	67.1
14	New Jersey	66.1
15	New Mexico	63.1
16	Colorado	61.0
17	Delaware	58.4
18	Ohio	57.9
19	Michigan	57.2
20	Maine	53.3
21	Pennsylvania	51.0
22	Nevada	50.4
23	Arkansas	45.6
24	Utah	43.7
25	Kentucky	42.6
26	North Carolina	41.2
27	Arizona	41.1
28	Iowa	41.0
29	Montana	40.9
30	Texas	40.6
31	South Carolina	40.6
32	Missouri	40.1
33	Wisconsin	38.6
34	Virginia	35.8
35	Louisiana	33.7
36	Alabama	33.6
37	Tennessee	30.6
38	Florida	30.0
39	Indiana	27.8
40	Mississippi	23.8
41	Idaho	23.7
42	Oklahoma	22.6
43	Nebraska	20.7
44	Georgia	20.7
45	Alaska	19.7
46	West Virginia	18.9
47	Wyoming	18.7
48	South Dakota	15.7
49	Kansas	13.9
50	North Dakota	0.0

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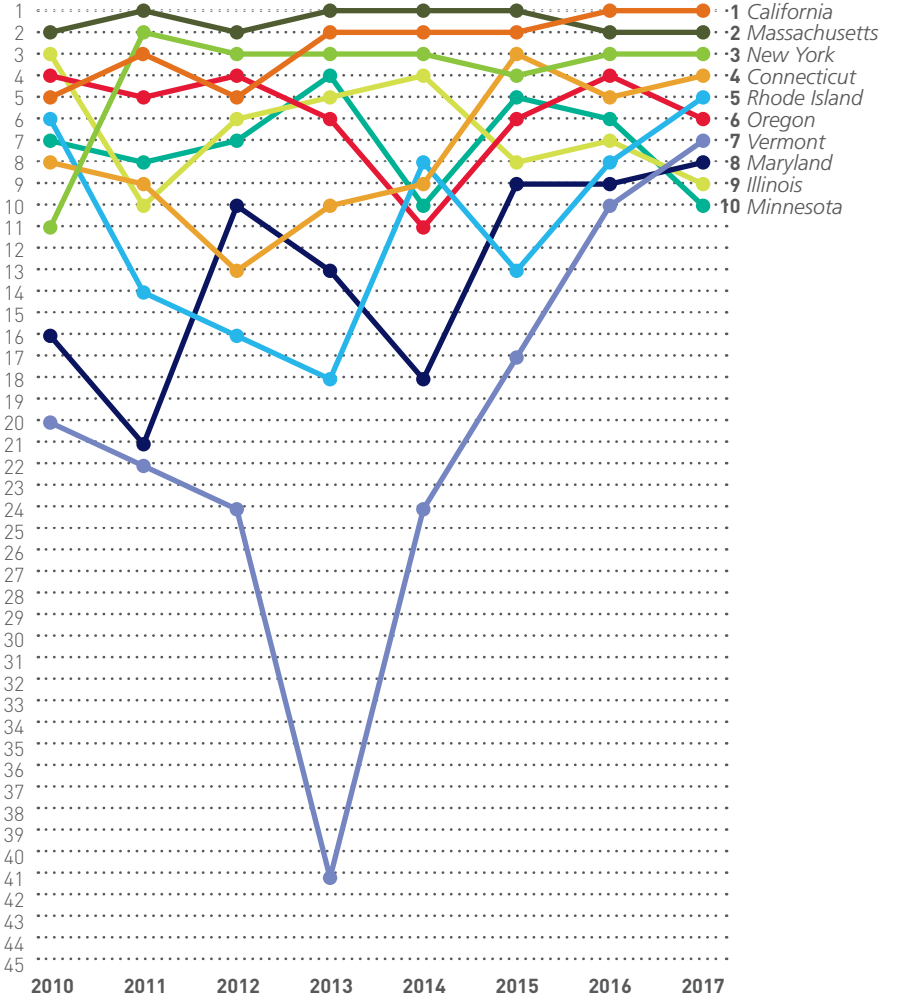
POLICY OVERVIEW

The Policy category of the State Index, as in past years, is calculated on the number and strength of the clean-tech policies passed by each state. It includes two subcategories: Regulations and Mandates, the proverbial "sticks," which includes such requirements as RPS and net metering and interconnection standards; and Incentives, the proverbial "carrots," which rewards states for incentivizing renewable electricity, efficiency, and advanced vehicle deployment.

For this year's Index, we did not add any new indicators, though we did make some slight adjustments to our scoring methodology and structure. Starting in 2017, instead of receiving full credit, states with expired RPS or RPS goals that are expressed in MW that have already been achieved, only receive half credit (in this case, Iowa, Montana, Texas, and Wisconsin). In addition, to better reflect real-world market conditions, a state now only receives credit if at least half of residential customers in the state have access to incentives (grants, bonds, loans, and/or rebates).

For the second year in a row, California captures the clean-tech policy crown with a #1 ranking in Regulations and Mandates and a #2 showing in Incentives (both up one spot over the prior year). This year's top 10 policy states remain the same as last year, but with shifts in order. Massachusetts and New York retain the second and third spots respectively, while Connecticut (#4) moves up one position and Rhode Island (#5) moves up three. Oregon (-2), Vermont (+3), Maryland (+1), Illinois (-2), and Minnesota (-4) round out the top 10.

2017 TOP 10 POLICY (INCLUDING HISTORICAL RANKINGS)



Source: U.S. Clean Tech Leadership Index, Clean Edge, Inc.

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RPS mandates continue to gain ground as an aggressive policy mechanism. Following in the footsteps of California – which upped its RPS goal to 50% by 2030 in our last Index – is New York. In 2016, the Empire State formalized its RPS of 50% by 2030, joining California and three other states (Oregon, Vermont, and Hawaii) which receive credit for having RPS goals of 50% or greater. Hawaii (#11 in the category) continues to have the most aggressive goal, mandating 100% renewable electricity by 2045. In total, five states upped their renewable portfolio standard targets to 25% or more in 2016; a sixth (Michigan) extended its RPS to 15%; and a seventh (Ohio) re-instituted its RPS after having frozen it two years earlier.

Massachusetts has been the Index's most consistent Policy leader over the past eight years – placing in the top two spots since we began tracking states in 2010. California is the other historical policy leader, placing in the top five since the Index's inception (the only other state to have achieved such consistently high performance). Connecticut, Illinois, New York, Oregon, and Minnesota have been Policy leaders in the Index for some time, moving up and down but generally placing in or near the top 10. Maryland, Rhode Island, and Vermont have shown the most improvement over time among this year's crop of top 10 Policy leaders. As in past years, there is considerable overlap between states which lead in the Regulations and Mandates and the Incentives subcategories. All but Illinois rank in the top 10 in both subcategories.

Other policies and incentives tracked among leading states include greenhouse gas reduction targets; membership in active cap-and-trade markets; interconnection and net metering policies; property-assessed clean energy (PACE) financing; and community renewables and community choice aggregation.

Policy levers tracked in this Index show that the "clean energy = economic development" storyline is not just a good sound bite for politicians at groundbreakings and ribbon cuttings, but is backed up by real-world statistics. With the addition of a clean-energy jobs indicator in this year's Index, the connection is clear. Top 10 Policy states California, Massachusetts, Oregon, Rhode Island, and Vermont all rank in the top 10 of clean-energy jobs as a percent of total employment. And as many of America's largest and most recognizable corporate brands look to acquire ever more renewables, states with supportive policies are reaping the financial rewards. Ohio's Republican Governor John Kasich, who in late 2016 vetoed a bill that would have continued to freeze the RPS and curtail clean energy development in the Buckeye State, issued a statement at the time saying that the bill would have resulted in "self-inflicted damage to both our state's near- and long-term economic competitiveness."

As federal support for clean energy wanes and national-level climate and environmental policies are overturned, states and cities will play an outsized role in continuing the expansion of clean energy, transportation, and energy efficiency in the U.S. California Governor Jerry Brown has made it clear that any national rollback of climate and clean energy-related policies will be met with resounding regional force. "Erasing climate change may take place in Donald Trump's mind," Brown emphasizes, "but nowhere else." And as former New York Mayor Michael Bloomberg and former Sierra Club executive director Carl Pope highlight in their new book *Climate of Hope*, it is corporations, cities, and other regional stakeholders that are now in the driver's seat.

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POLICY: REGULATIONS & MANDATES

POLICY CHECKLIST (1-25)		CA	MA	NY	CT	RI	OR	VT	MD	IL	MN	HI	WA	NH	NJ	NM	CO	DE	OH	MI	ME	PA	NV	AR	UT	KY
Qualifying States	POLICY CATEGORY RANK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
27	Renewable Portfolio Standard	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
15	Strong RPS: At least 25% by 2025	●		●	●	●	●	●	●	●	●	●		●			●	●			●		●			
5	Strong RPS: At least 50%	●		●			●	●				●														
24	Smart RPS: No Clean Coal or Coal By-Products	●	●	●	●	●	●	●	●	●		●	●	●	●	●		●	●		●	●	●			
26	Smart RPS: No Nuclear	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
16	Smart RPS: Solar/DG Provision		●				●	●	●	●	●			●	●	●	●	●	●			●	●			
24	Energy Efficiency Resource Standard	●	●	●	●	●		●	●	●	●	●	●			●	●		●	●	●	●	●	●		
8	State Renewable Fuel Standard						●				●		●			●						●				
34	Climate Action Plan	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●
20	GHG Reduction Target	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●					
10	Membership in Active Cap-and-Trade Market	●	●	●	●	●		●	●					●				●			●					
2	Low Carbon Fuel Standard	●					●																			
34	State Fleet High Efficiency Vehicle Requirement	●	●		●	●	●		●	●	●	●	●		●	●	●	●	●		●		●	●	●	●
10	Zero-Emissions Vehicle (ZEV) Requirement	●	●	●	●	●	●	●	●						●						●					
13	Mandated Green Power Purchasing Option				●		●	●			●		●		●	●	●	●			●					
n/a	Interconnection Law/Policy	4	4	4	3	3	4	3	3	4	2	4	3	3	3	4	3	3	4	2	3	3	3	0	4	1
n/a	Net Metering Law/Policy	4	4	4	4	4	4	3	4	4	3	0	3	4	4	3	4	4	4	3	3	4	0	4	4	3
n/a	Commercial Building Energy Policy	4	4	4	3	3	3	4	4	4	3	4	4	2	4	2	0	3	3	2	0	2	3	2	4	3
n/a	Residential Building Energy Policy	4	4	4	3	3	2	4	4	4	3	4	4	2	4	2	0	3	2	4	0	2	3	2	1	2

Sources include ACEEE, C2ES, DSIRE, EQ Research, IREC/Vote Solar, and the U.S. DOE and NREL. Commercial and residential building energy policies are scored based on their relation to ASHRAE and IECC standards. Scores are broken into five tiers, with 0 indicating the weakest or no codes and 4 indicating the strongest codes. Interconnection and net metering policies are scored based on their relation to IREC and Vote Solar's "Freeing the Grid" grades. Scores are broken into five tiers, with 0 indicating a grade of "F" or "N/A" and 4 indicating a grade of "A". Note: Data sources are updated only periodically. Data was compiled by Clean Edge as of March 2017. Clean Edge makes no guarantee about the accuracy of data provided by third party sources.

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POLICY: REGULATIONS & MANDATES

POLICY CHECKLIST (26-50)	NC	AZ	IA	MT	TX	SC	MO	WI	VA	LA	AL	TN	FL	IN	MS	ID	OK	NE	GA	AK	WV	WY	SD	KS	ND
POLICY CATEGORY RANK	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
Renewable Portfolio Standard	●	●	◐	◐	◐		●	◐																	
Strong RPS: At least 25% by 2025																									
Strong RPS: At least 50%																									
Smart RPS: No Clean Coal or Coal By-Products	●	●	◐	◐	◐		●	◐																	
Smart RPS: No Nuclear	●	●	◐	◐	◐		●	◐																	
Smart RPS: Solar/DG Provision	●	●					●																		
Energy Efficiency Resource Standard	●	●	●		●			●																	
State Renewable Fuel Standard				●			●			●															
Climate Action Plan	●	●	●	●		●	●	●	●				●							●					
GHG Reduction Target		●											●												
Membership in Active Cap-and-Trade Market																									
Low Carbon Fuel Standard																									
State Fleet High Efficiency Vehicle Requirement	●	●	●	●	●		●			●	●	●	●	●	●							●		●	
Zero-Emissions Vehicle (ZEV) Requirement																									
Mandated Green Power Purchasing Option			●	●					●																
Interconnection Law/Policy	4	0	3	2	1	4	0	1	4	0	0	0	1	3	3	0	0	0	0	0	3	0	2	0	0
Net Metering Law/Policy	2	0	3	2	0	3	3	1	2	2	0	0	3	3	0	2	0	3	0	2	4	1	0	2	1
Commercial Building Energy Policy	2	0	3	3	4	2	0	2	3	2	4	3	3	2	3	3	1	2	2	0	2	0	0	0	0
Residential Building Energy Policy	2	0	3	2	3	2	0	2	2	2	3	1	3	2	0	2	2	2	2	0	2	0	0	0	0

Sources include ACEEE, C2ES, DSIRE, EQ Research, IREC/Vote Solar, and the U.S. DOE and NREL. Commercial and residential building energy policies are scored based on their relation to ASHRAE and IECC standards. Scores are broken into five tiers, with 0 indicating the weakest or no codes and 4 indicating the strongest codes. Interconnection and net metering policies are scored based on their relation to IREC and Vote Solar's "Freeing the Grid" grades. Scores are broken into five tiers, with 0 indicating a grade of "F" or "N/A" and 4 indicating a grade of "A". Note: Data sources are updated only periodically. Data was compiled by Clean Edge as of March 2017. Clean Edge makes no guarantee about the accuracy of data provided by third party sources.

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POLICY: INCENTIVES

POLICY CHECKLIST (1-25)		CA	MA	NY	CT	RI	OR	VT	MD	IL	MN	HI	WA	NH	NJ	NM	CO	DE	OH	MI	ME	PA	NV	AR	UT	KY
Qualifying States	POLICY CATEGORY RANK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
14	Grants - Renewable Energy		●	●		●	●		●	●	●		●	●						●		●				●
20	Grants - Energy Efficiency	●	●	●	●	●			●	●			●		●			●	●	●		●				●
35	Loans - Renewable Energy	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●		●	●	●		●
39	Loans - Energy Efficiency	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●
18	Rebates - Renewable Energy	●	●	●	●		●	●	●		●	●		●	●			●	●				●			
47	Rebates - Energy Efficiency	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
5	Bonds - Renewable Energy									●		●				●									●	
6	Bonds - Energy Efficiency									●		●				●								●	●	
25	Clean-Tech Vehicle Purchasing Incentive	●	●	●	●	●	●		●	●	●		●		●		●	●				●			●	
29	Utility Revenue Decoupling - Electricity	●	●	●	●	●	●	●	●		●	●	●	●					●		●		●	●		●
29	Utility Revenue Decoupling - Natural Gas	●	●	●	●	●	●	●	●	●	●		●	●			●			●			●	●	●	●
27	Utility Performance Incentives - Electricity	●	●	●	●	●		●			●	●		●		●	●		●	●				●		●
17	Utility Performance Incentives - Natural Gas	●	●	●	●	●		●			●			●			●		●	●				●		●
15	Utility On-Bill Financing	●	●	●	●	●	●	●		●		●		●	●					●						
5	Green Bank	●		●	●	●						●														
33	PACE Legislation	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●		●	●	●		●	●	●	●
34	Third Party Ownership	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	
18	Community Renewables	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●			●	●				
7	Community Choice Aggregation	●	●	●		●				●					●				●							

Sources include ACEEE, C2ES, DSIRE, EQ Research, IREC/Vote Solar, and the U.S. DOE and NREL. Commercial and residential building energy policies are scored based on their relation to ASHRAE and IECC standards. Scores are broken into five tiers, with 0 indicating the weakest or no codes and 4 indicating the strongest codes. Interconnection and net metering policies are scored based on their relation to IREC and Vote Solar's "Freeing the Grid" grades. Scores are broken into five tiers, with 0 indicating a grade of "F" or "N/A" and 4 indicating a grade of "A". Note: Data sources are updated only periodically. Data was compiled by Clean Edge as of March 2017. Clean Edge makes no guarantee about the accuracy of data provided by third party sources.

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POLICY: INCENTIVES

POLICY CHECKLIST (26-50)	NC	AZ	IA	MT	TX	SC	MO	WI	VA	LA	AL	TN	FL	IN	MS	ID	OK	NE	GA	AK	WV	WY	SD	KS	ND
POLICY CATEGORY RANK	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Grants - Renewable Energy								●												●					
Grants - Energy Efficiency				●								●		●					●	●		●			
Loans - Renewable Energy			●	●	●	●	●	●	●	●	●	●				●		●		●					
Loans - Energy Efficiency			●	●	●	●	●	●	●	●	●	●			●	●		●		●		●			
Rebates - Renewable Energy		●		●	●			●																	
Rebates - Energy Efficiency	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
Bonds - Renewable Energy																●									
Bonds - Energy Efficiency																●									
Clean-Tech Vehicle Purchasing Incentive		●			●	●				●		●	●				●	●			●			●	
Utility Revenue Decoupling - Electricity	●	●				●	●			●	●			●	●	●	●						●	●	
Utility Revenue Decoupling - Natural Gas	●	●							●		●	●		●	●		●		●			●	●		
Utility Performance Incentives - Electricity	●	●			●	●	●	●		●	●			●			●		●				●		
Utility Performance Incentives - Natural Gas								●			●						●						●		
Utility On-Bill Financing						●						●			●										
Green Bank																									
PACE Legislation	●				●		●	●	●		●		●				●	●	●			●			
Third Party Ownership		●	●		●	●	●		●	●		●							●		●			●	
Community Renewables						●																			
Community Choice Aggregation																									

Sources include ACEEE, C2ES, DSIRE, EQ Research, IREC/Vote Solar, and the U.S. DOE and NREL. Commercial and residential building energy policies are scored based on their relation to ASHRAE and IECC standards. Scores are broken into five tiers, with 0 indicating the weakest or no codes and 4 indicating the strongest codes. Interconnection and net metering policies are scored based on their relation to IREC and Vote Solar's "Freeing the Grid" grades. Scores are broken into five tiers, with 0 indicating a grade of "F" or "N/A" and 4 indicating a grade of "A". Note: Data sources are updated only periodically. Data was compiled by Clean Edge as of March 2017. Clean Edge makes no guarantee about the accuracy of data provided by third party sources.

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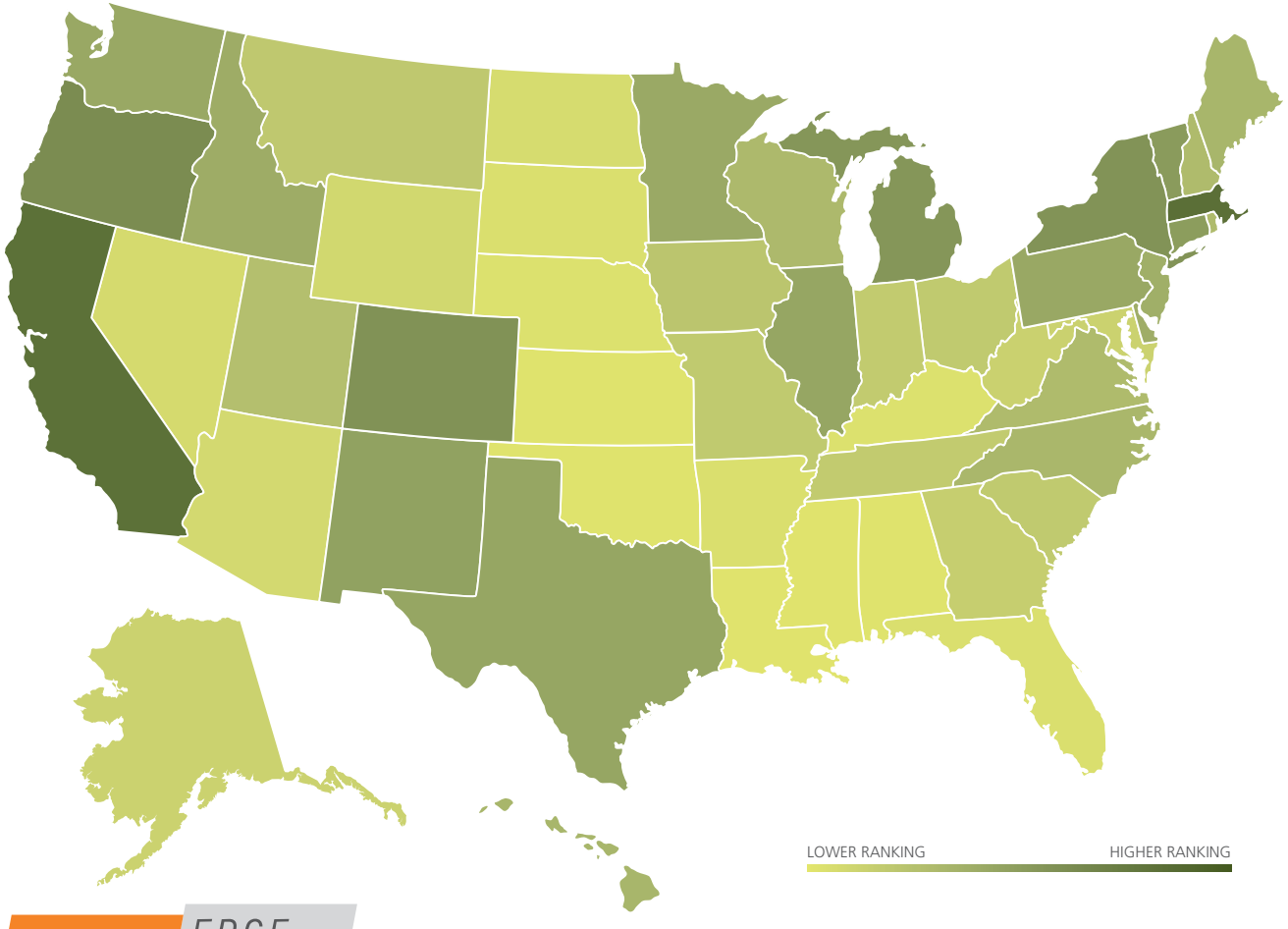
CAPITAL



RANK	STATE	LEADERSHIP SCORE
1	Massachusetts	83.4
2	California	82.5
3	Oregon	62.4
4	Colorado	57.7
5	New York	56.5
6	Michigan	55.2
7	Vermont	52.4
8	Connecticut	49.6
9	New Mexico	46.9
10	Illinois	44.2
11	Texas	43.9
12	Washington	42.7
13	Pennsylvania	42.5
14	Minnesota	42.3
15	Idaho	40.3
16	Delaware	39.2
17	New Jersey	38.1
18	Maine	33.4
19	Hawaii	32.9
20	North Carolina	32.0
21	Wisconsin	30.7
22	New Hampshire	30.1
23	Virginia	29.6
24	Rhode Island	29.5
25	Utah	26.9
26	Iowa	21.9
27	Montana	20.0
28	South Carolina	19.2
29	Ohio	18.7
30	Missouri	18.5
31	Tennessee	18.3
32	Indiana	17.8
33	Georgia	15.9
34	West Virginia	14.3
35	Maryland	13.4
36	Alaska	13.1
37	Wyoming	9.6
38	Arizona	9.0
39	Nevada	7.6
40	North Dakota	6.6
41	Florida	5.2
42	South Dakota	5.0
43	Arkansas	5.0
44	Kentucky	3.9
45	Nebraska	3.7
46	Oklahoma	2.9
47	Kansas	2.8
48	Alabama	2.7
49	Louisiana	2.4
50	Mississippi	1.6

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CAPITAL OVERVIEW

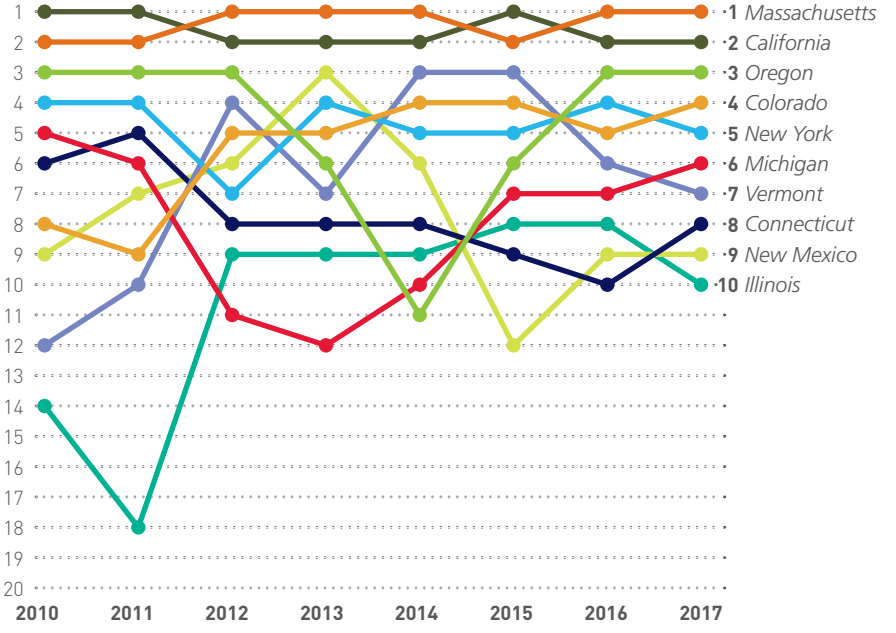
The Capital category consists of two subcategories: Financial Capital, and Human and Intellectual Capital. The Financial Capital subcategory measures VC investment in clean-tech companies, along with utility energy efficiency investments; the Human and Intellectual Capital subcategory evaluates states on their rate of clean-tech patent acquisition, whether they have top-notch energy research facilities and business accelerators, and (new in the 2017 Index) clean-energy jobs.

Much like the Policy category, the Capital category sees the same 10 states at the top of the rankings as last year, although in a different order. As can be seen in the chart on this page, Massachusetts, California, and Oregon repeat their top-three performances from last year. Colorado, New York, Michigan, Vermont, Connecticut, New Mexico, and Illinois round out the top 10. Massachusetts and California have finished in the top two in Capital in all eight years of the Index. They've done the same in the Financial Capital subcategory, primarily by their massive venture capital advantage over the rest of the country.

Massachusetts is once again first in Financial Capital by a wide margin, while Maine and Hawaii are notable newcomers to the subcategory leaderboard. Michigan repeats as the Human and Intellectual Capital champion, though the subcategory has seen a major shakeup with Texas, Pennsylvania, and Idaho making big jumps to elite status.

Regular readers of this report know how dominant California and Massachusetts are in venture capital. Massachusetts leads the nation in all four VC indicators in normalized terms, but finishes a very distant second to the Golden State in total

2017 TOP 10 CAPITAL (INCLUDING HISTORICAL RANKINGS)



Source: U.S. Clean Tech Leadership Index, Clean Edge, Inc.

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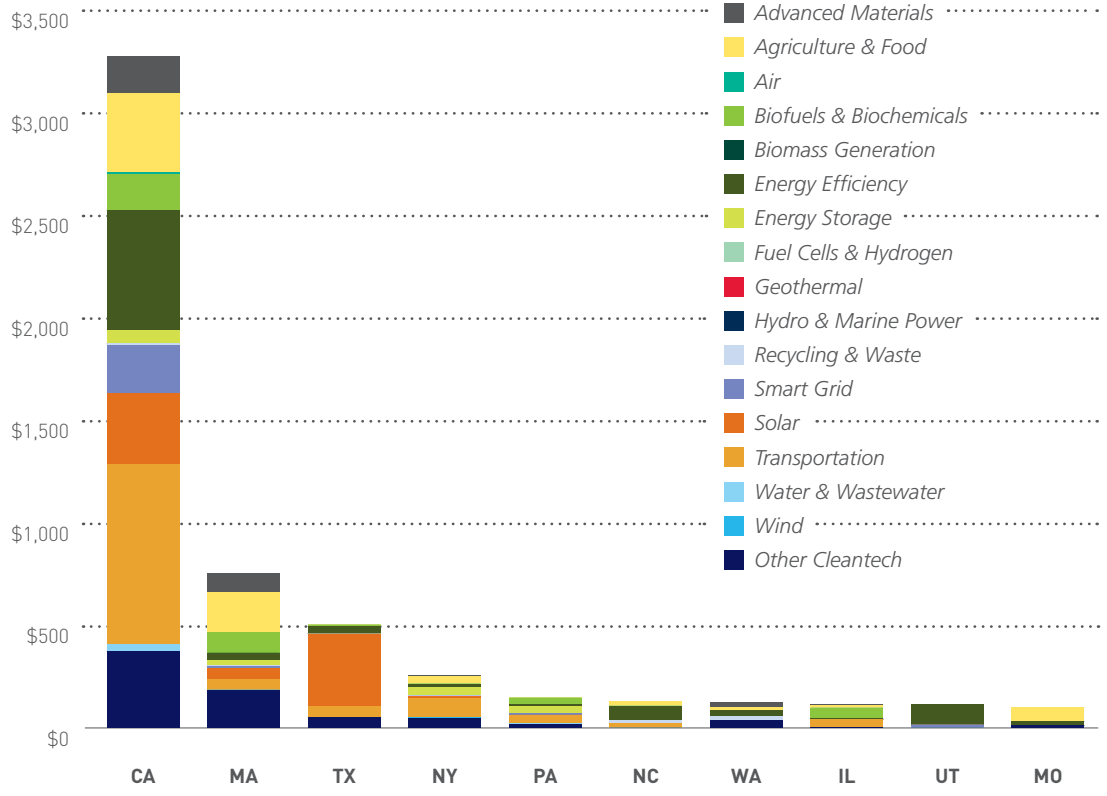
market size. But other strong markets deserve some attention as well. Colorado has been a top-10 VC player in all four normalized indicators for the entire eight-year history of the Index. Washington can make nearly the same claim. This year, Montana is also in the top 10 in all four VC indicators: Big Sky Country saw a sizable increase in VC funding in 2016, most notably for Columbia Falls-based flow battery maker ViZn Energy Systems.

The utility energy efficiency spending numbers reveal some interesting patterns. Of the 10 states that spend the most money per person on efficiency programs, six are also leaders in the Technology category's efficiency savings metric. Seven of the 10 leaders (including six Regional Greenhouse Gas Initiative members and California) participate in cap and trade markets. Six of the efficiency spending leaders are also leaders in LEED buildings per million, although interestingly, only three top efficiency spending states also appear atop the built environment CO2 emissions leaderboard. Finally, seven states lead both the efficiency spending and electricity generation CO2 emissions lists, though the reliance on natural gas in the New England area likely plays a leading role in that association.

The clean-energy jobs indicator, measured as a percentage of a state's total workforce, is a new addition to this year's Index. The categories of jobs covered in this metric include those in solar, wind, and hydro generation; ethanol and

2016 CLEAN-ENERGY VENTURE CAPITAL - TOP 10 STATES BY TOTAL INVESTMENT($US MILLIONS)



Source: Cleantech Group data with Clean Edge analysis.
Full dataset available to subscription clients.

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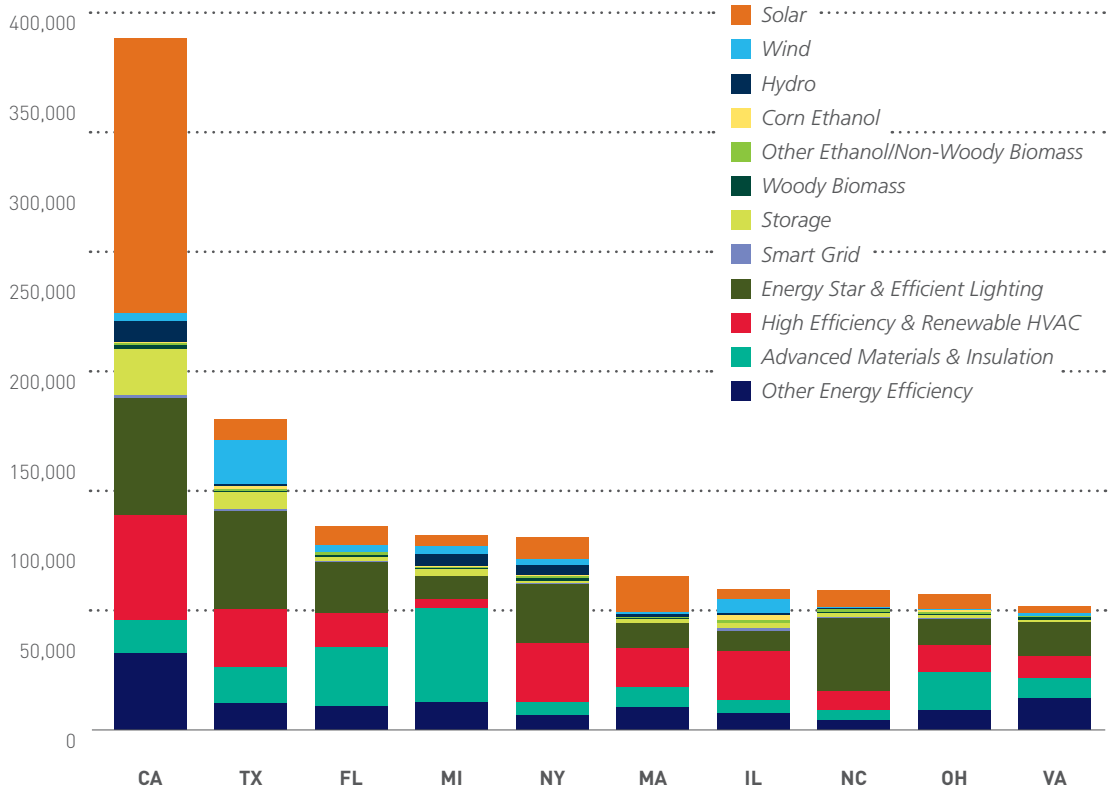
biomass fuels; storage and smart grid; and energy efficiency jobs. Vermont leads in this indicator by a wide margin; its 4.13% of clean-energy jobs outpaces #2 Rhode Island by more than a full percentage point. Four of the top 10 states in the overall Index rank in the top 10 of clean-energy jobs as percent of total state employment. In addition to Vermont, this list includes Oregon (#5 in the indicator), Massachusetts (#6), and California (#8). When viewed in terms of total number of clean-energy jobs (not normalized), eight of the 10 most populous states in the country rank in the top 10. Only Pennsylvania (the sixth-most populous state) and Georgia (eighth-most populous) are not in the top 10 states with the most clean-energy jobs, though they still fall in the top 15 (#13 and #15, respectively).

The final three indicators in the subcategory give credit to states that have Department of Energy research labs, clean-tech incubators, or top-ranked "green" Master's programs. This year, eight states get credit for all three. Idaho, Pennsylvania, and Texas join that group, helping to fuel their rise to the top of the Human and Intellectual Capital subcategory rankings. Nine states have two of these three facilities, while 15 have one.

2016 CLEAN-ENERGY JOBS – TOP 10 STATES BY TOTAL NUMBER OF JOBS



Source: US DOE and US BLS with Clean Edge analysis. NOTE: Data is from the end of Q1 2016.

Full dataset available to subscription clients.

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STATE INDEX METHODOLOGY

How is the State Index constructed?

The structure of the State Index includes four distinct layers. The top layer, the State Index itself, is a set of 50 state scores which evaluates each state based on involvement and leadership in clean technology. Results of the top layer are derived from performance in three equally weighted categories – technology, policy, and capital – that each play an important role in a state's positioning in the clean-tech industry. Each of these categories is composed of two or three subcategories, which themselves include a set of individual indicators. Some minor methodology changes were made in this edition of the State Index, but generally the structure remains the same as in previous years.

How is the State Index calculated?

The overall State Index measures each state on a 100-point scale and is the result of many calculations made at the indicator, subcategory, and category levels.

First, **INDICATOR SCORES** are calculated on a scale of 0 to 100. The best-performing state in an individual indicator receives a score of 100; the worst-performing state gets a 0. All other states receive scores based on where they fall between the best and worst-performing states.

To put states on an even playing field, all quantitative indicators are adjusted for state size using metrics such as state population, state GDP, electricity generation capacity, etc. By reporting in terms of per capita or percent of state totals, smaller states are not punished for having relatively smaller economies.

Several indicators, like those related to policy, are qualitative rather than quantitative. In this case, qualifying states receive indicator scores of 100 and non-qualifying states get 0.

SUBCATEGORY SCORES range from 0 to 100 and are calculated in the same fashion as individual indicators, with a score of 100 given to the state with the best average indicator score in each subcategory, and the state with the lowest average indicator score receiving a 0. All other states receive scores between 0 and 100 based on performance relative to the best and worst-performing states.

CATEGORY SCORES are calculated from a simple averaging of underlying subcategory scores; and the ultimate **STATE CLEAN ENERGY INDEX SCORES** are calculated from averaging the three equally weighted category scores

Data Sources

Along with an extensive level of clean-energy data mining from sources in the public domain, Clean Edge has also teamed up with private data providers to offer the highest level of industry intelligence. Private data partners include Cleantech Group, EQ Research LLC, Heslin Rothenberg Farley & Mesiti P.C., IHS Markit, and the North Carolina Clean Technology Center.

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The following is a list of indicators used to calculate the State Index. Indicators are grouped by subcategory and are shaded according to which category they are included in.

TECHNOLOGY

CLEAN ELECTRICITY

- Utility-Scale Clean Electricity Generation, GWh % of Total (2016)
- Utility-Scale Clean Electricity Generation incl. Hydro & Biomass, GWh % of Total (2016)
- Utility-Scale Wind Electricity Generation, % of Total (2016)
- Utility-Scale Solar Electricity Generation, % of Total (2016)
- Utility-Scale Geothermal Electricity Generation, % of Total (2016)
- Utility-Scale Hydro Electricity Generation, % of Total (2016)
- Utility-Scale Biomass Electricity Generation, MWh % of Total (2016)
- Distributed Solar PV Generation, % of Total (2016)
- Installed Energy Storage Capacity, MW % of Total (2016)
- Electricity Generation CO2 Emissions, Per Capita Metric Tons (2014)

CLEAN TRANSPORTATION

- Hybrid Electric Vehicles Per 1M People (2016)
- Electric Vehicles Per 1M People (2016)
- Plug-In Hybrid Electric Vehicles Per 1M People (2016)
- Natural Gas Vehicles Per 1M People (2016)
- Electric Vehicle Charging Stations Per 1M People (2016)
- E85 & B20 Fueling Stations Per 1M People (2016)
- CNG Fueling Stations Per 1M People (2016)
- Transportation Sector CO2 Emissions, Per Capita Metric Tons (2014)

ENERGY INTELLIGENCE & GREEN BUILDING

- Electricity Consumption Per Capita, Annual kWh (2016)
- Electric Productivity, State GDP Dollars Per kWh Consumed (2015)
- LEED-Certified Projects Per 1M People (2016)
- LEED-Certified Square Feet Per Capita (2016)

ENERGY INTELLIGENCE & GREEN BUILDING

- Energy Star Buildings & Plants Per 1M People (2016)
- Energy Star Buildings & Plants Square Feet Per Capita (2016)
- Energy Star Homes Per 1K People (2016)
- Smart Meter Market Penetration, % of Total Meters (2015)
- Energy Efficiency Incremental Yearly Savings Per Capita, kWh (2015)
- Demand Response Peak Demand Shaved Per Capita, W (2015)
- ACEEE 2016 State Energy Efficiency Scorecard Performance
- Gridwise Alliance 2016 Grid Modernization Index Performance
- Building Sector CO2 Emissions, Per Capita Metric Tons (2014)

POLICY

REGULATIONS & MANDATES

- Renewable Portfolio Standard
- Strong RPS: At Least 25% by 2025
- Strong RPS: At Least 50%
- Smart RPS: No Clean Coal/Coal Gasification/Coal Mine Methane
- Smart RPS: No Nuclear
- Smart RPS: Solar/DG Provision
- Energy Efficiency Resource Standard
- State Renewable Fuel Standard
- Climate Action Plan
- GHG Reduction Target
- Membership in Active Cap-and-Trade Market
- Low Carbon Fuel Standard
- State Fleet High Efficiency Vehicle Requirement
- Zero-Emissions Vehicle (ZEV) Requirement
- Mandated Green Power Purchasing Option
- Interconnection Law/Policy
- Net Metering Law/Policy
- Commercial Building Energy Policy
- Residential Building Energy Policy

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POLICY (CONT.)

INCENTIVES

- Grants - Renewable Energy
- Grants - Energy Efficiency
- Loans - Renewable Energy
- Loans - Energy Efficiency
- Rebates - Renewable Energy
- Rebates - Energy Efficiency
- Bonds - Renewable Energy
- Bonds - Energy Efficiency
- Clean-Tech Vehicle Purchasing Incentive
- Utility Revenue Decoupling - Electricity
- Utility Revenue Decoupling - Natural Gas
- Utility Performance Incentives - Electricity
- Utility Performance Incentives - Natural Gas
- Utility On-Bill Financing
- Green Bank
- PACE Legislation
- Third Party Ownership
- Community Renewables
- Community Choice Aggregation

CAPITAL

FINANCIAL CAPITAL

- Venture Capital Investment, $ Per Capita (2014-2016)
- Venture Capital Investment, Deals Per 1M People (2014-2016)
- Venture Capital Investment, $ Per Capita (2016)
- Venture Capital Investment, Deals Per 1M People (2016)
- Utility Energy Efficiency Program Spending, $ Per Capita (2015)
- State Clean Energy Fund or Public Benefit Fund

HUMAN & INTELLECTUAL CAPITAL

- Clean Energy Patents, Patents Per 1M People (2015)
- Clean Energy Patents, Patents Per 1M People (2002-2015)
- Clean Tech Jobs, % of Total Employment (Q1 2016)
- Presence of DOE Lab
- Presence of Clean Energy Incubator and/or Accelerator
- Presence of Top-Ranked Green Master's Program

ACCESS FULL DATASETS

more than 100 indicators and 19,000 unique data points

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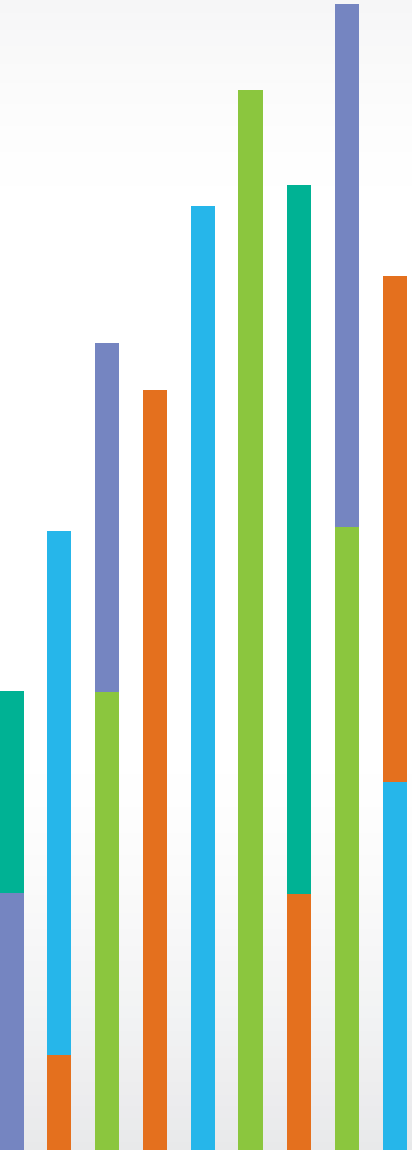


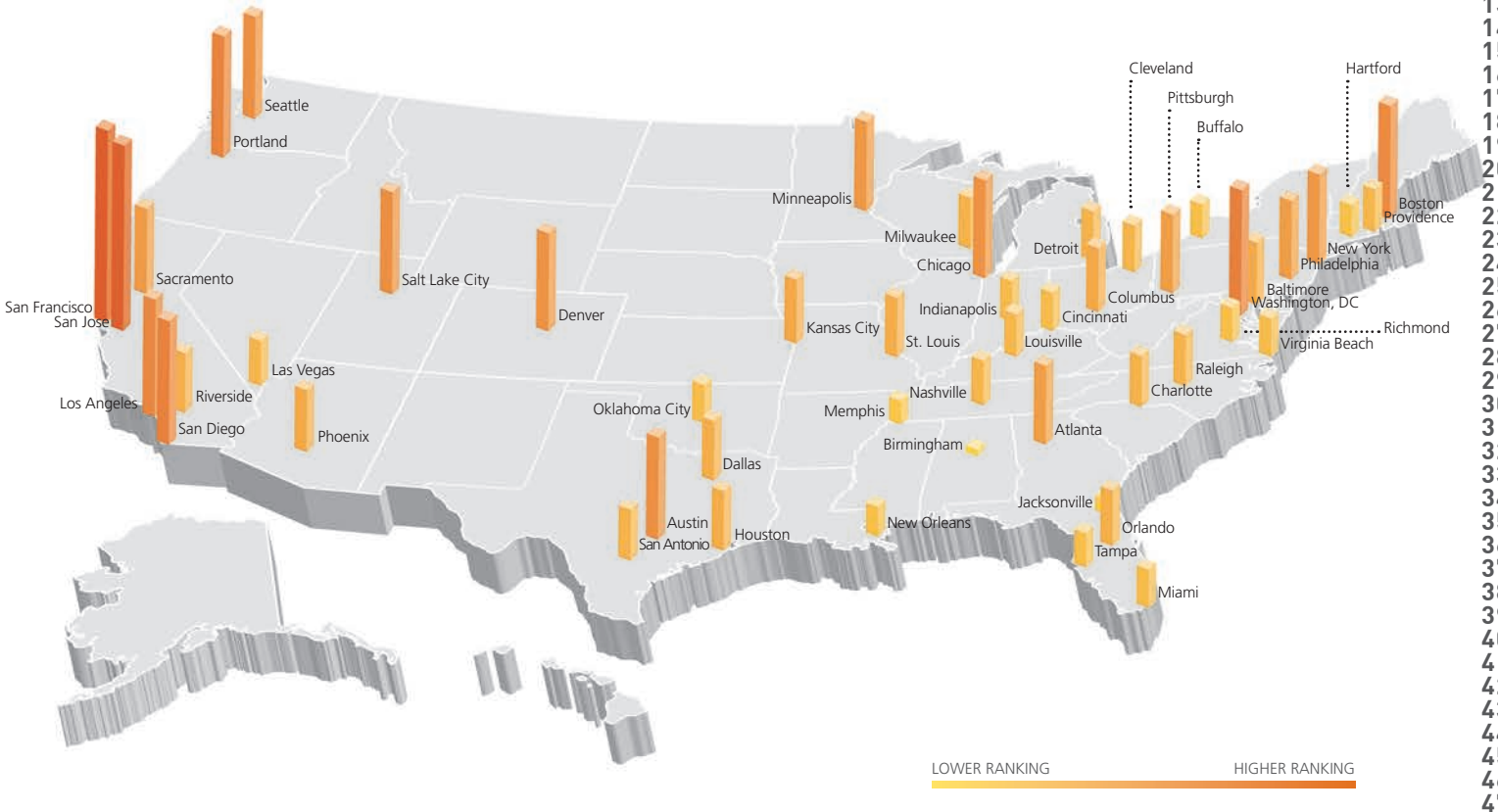
METRO INDEX

2017 U.S. Clean Tech Leadership Index

Full Metro Index Datasets Available

Clean Edge offers subscription access to the full State and Metro Index datasets. These include data for the top 50 Metro Area regions on green building deployment, electric and hybrid vehicles, large facility carbon emissions, VC investments, clean-energy patents, and much more. **For more information on subscriptions, please see page 53.**

METRO INDEX



RANK	+/-	METRO AREA	LEADERSHIP SCORE
1	0	San Francisco, CA	90.3
2	0	San Jose, CA	86.5
3	2	Washington, DC	59.0
4	-1	San Diego, CA	58.2
5	-1	Portland, OR	56.6
6	0	Los Angeles, CA	55.0
7	0	Boston, MA	52.8
8	0	Seattle, WA	47.5
9	8	Salt Lake City, UT	47.5
10	-1	Austin, TX	47.4
11	-1	Chicago, IL	46.3
12	0	Denver, CO	44.8
13	1	Minneapolis, MN	41.8
14	-1	New York, NY	40.6
15	-4	Sacramento, CA	39.5
16	3	Philadelphia, PA	36.9
17	1	Pittsburgh, PA	36.2
18	-2	Atlanta, GA	35.9
19	1	Kansas City, MO	30.3
20	7	Columbus, OH	30.2
21	1	Baltimore, MD	29.3
22	2	Phoenix, AZ	28.8
23	0	Houston, TX	28.4
24	-3	Dallas, TX	28.2
25	-10	Riverside, CA	27.7
26	13	St. Louis, MO	27.4
27	14	Orlando, FL	26.1
28	-3	San Antonio, TX	23.9
29	1	Milwaukee, WI	23.8
30	2	Raleigh, NC	23.6
31	-2	Charlotte, NC	23.5
32	-6	Detroit, MI	22.8
33	1	Cleveland, OH	21.6
34	1	Las Vegas, NV	20.8
35	-7	Nashville, TN	20.8
36	0	Providence, RI	20.5
37	8	Louisville, KY	19.6
38	-5	Indianapolis, IN	18.6
39	3	Virginia Beach, VA	18.4
40	-2	Cincinnati, OH	18.4
41	-10	Oklahoma City, OK	18.3
42	-2	Miami, FL	17.7
43	1	Buffalo, NY	16.0
44	2	Tampa, FL	15.7
45	-2	Richmond, VA	15.5
46	-9	Hartford, CT	15.2
47	2	New Orleans, LA	13.5
48	0	Memphis, TN	10.5
49	-2	Jacksonville, FL	7.0
50	0	Birmingham, AL	3.3

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2017 METRO INDEX RESULTS

Nine of the top 10 metro areas in the 2017 Clean Tech Leadership Index are returnees from last year. As has been the case for the previous five years, San Francisco and San Jose are far and away the Index leaders, with San Francisco lengthening its lead over its southern neighbor by just over a point. The metros ranked third through sixth find themselves tightly clustered, with a mere four points between them. This year, Washington, DC, makes a two-spot jump up to third, but remains 27 points behind San Jose. San Diego (#4) and Portland (#5) each slide one spot, while Los Angeles holds steady at #6.

Boston once again snags the seventh spot, and is followed by three metros that are virtually tied in overall score. A scant 0.08 points separates #8 Seattle and #10 Austin; Seattle repeats its placement from last year, while Austin moves down one spot. The real story, however, is Salt Lake City, which crashes the party at #9. New commitments to greening its electricity supply (chiefly a commitment to 100% renewable electricity by 2032) launch Utah's capital into the top 10; its 15.7-point score improvement is easily the strongest in the Index this year.

The Top 10 Metro Areas

1 **SAN FRANCISCO** remains the Index leader for the fifth consecutive year, lengthening its lead over San Jose to almost four points. There are no weak spots in the City by the Bay's performance: It finishes first in Transportation; second in Green Buildings and Clean-Tech Investment, Innovation, and Workforce; and fourth in Climate & Carbon Management. San Francisco remains a leader in a wide variety of metrics, such as LEED and Energy Star buildings, venture capital, transit ridership, and EVs.

2 **SAN JOSE** finishes second once again, though its score dips about a point from last year's Index. The center of Silicon Valley is the clear leader in the Clean-Tech Investment category, finishes a close second in the Climate category, and trails only San Francisco in Transportation. San Jose is the nation's top metro in terms of VC investment per capita; its $1,212 in investment per person outpaces San Francisco by more than $100. San Jose is also a solar energy leader, ranking second in the Index in installed solar capacity per capita in the metro's principal city (trailing only San Diego).

3 **WASHINGTON, DC** adds nearly seven points to its overall score this year (the second-largest score increase among the top 10 metros), resulting in a two-spot jump up the national rankings. The nation's capital is far and away the best Green Building metro in the country, taking the crown in all four LEED and Energy Star indicators while also receiving credit for all the qualitative factors in the category. Washington is also a top public transit area, ranking fourth in per-capita yearly transit trips.

4 **SAN DIEGO** slips one spot this year to #4, though it still adds 2.5 points to its overall score. It moves into the top spot in the Climate category by a slim margin over San Jose, by virtue of its category-leading solar numbers, low large facility

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carbon emissions, and increased commitment to measuring, reporting, and reducing greenhouse gas emissions. As with several of its California brethren, San Diego is also a top-five performer in EV deployment and venture capital.

5 **PORTLAND** takes a slight step back to fifth this year, after having finished third or fourth every year of the Index. One particular strength is the Climate & Carbon Management category, where its April 2017 announcement that all community-wide energy would be sourced from renewables by 2050 (with 100% renewables for electricity by 2035) fuels a 9.8-point score increase. Transportation is another strength: the City of Roses places in the top nine in all three EV indicators, is fourth in EV stations per million, and ranks ninth in transit ridership.

6 **LOS ANGELES** holds steady at #6 this year, with a solid three-point increase to its overall score. Its biggest improvement is in Green Buildings, where Los Angeles leaps 11 spots and adds 21 points to its category score. This move is fueled by the city's addition of a building energy use benchmarking policy, as well as improvement in the two LEED building indicators. The City of Angels continues its top-five performance in all four normalized advanced vehicle deployment indicators, and its raw totals of EV and CNG stations are both tops in the nation.

7 **BOSTON** also maintains its strong position, coming in seventh for the second consecutive year. The strength of the Boston area has always been the Innovation, Investment, & Workforce category, where it has placed third in five of the six years of the Index. It trails only California's Bay Area in VC dollars per capita and deals per million people. This spirit of innovation is likely fueled by the area's collection of top-ranked Master's programs and business incubators. Green Buildings has emerged as a second strength: Boston has steadily climbed the rankings in this category, repeating its third-place performance from last year.

8 **SEATTLE** manages to hold off Salt Lake City for the eighth spot while losing a little more than a point off its overall score from last year. The area's two biggest strengths are Green Buildings and Transportation, ranking seventh in both categories. The Emerald City remains a top-five performer in LEED-certified building performance. Additionally, the area's efforts to electrify its transportation infrastructure continues to bear fruit, as it ranks between fourth and eighth in per-thousand resident deployment of EVs, plug-ins, and hybrids. Seattle also places sixth in both VC dollars per capita and deals per million.

9 **SALT LAKE CITY** adds almost 16 points to its overall score from a year ago, the most in the Index. The result? An eight-spot ranking jump into the top 10 for the first time ever. Utah's biggest city made big news in July 2016, when it announced that it had set a goal of 100% renewable energy for the entire community by 2032. It also added a building energy use benchmarking policy, and saw impressive gains in plug-in electric hybrid deployment, in addition to already being the nation's top natural gas vehicle metro.

10 **AUSTIN** adds more than three points to its overall score in 2017, but still slips one slot to #10. Texas' capital rides strong performances in Climate & Carbon Management (#9), and Green Buildings and Clean-Tech Investment (#8 in both) to its leadership position. One area where Austin gains ground in this year's Index is Energy Star buildings: it climbs 10 spots to sixth in the number of Energy Star buildings per million residents, and jumps six spots to 15th in per-capita Energy Star square footage.

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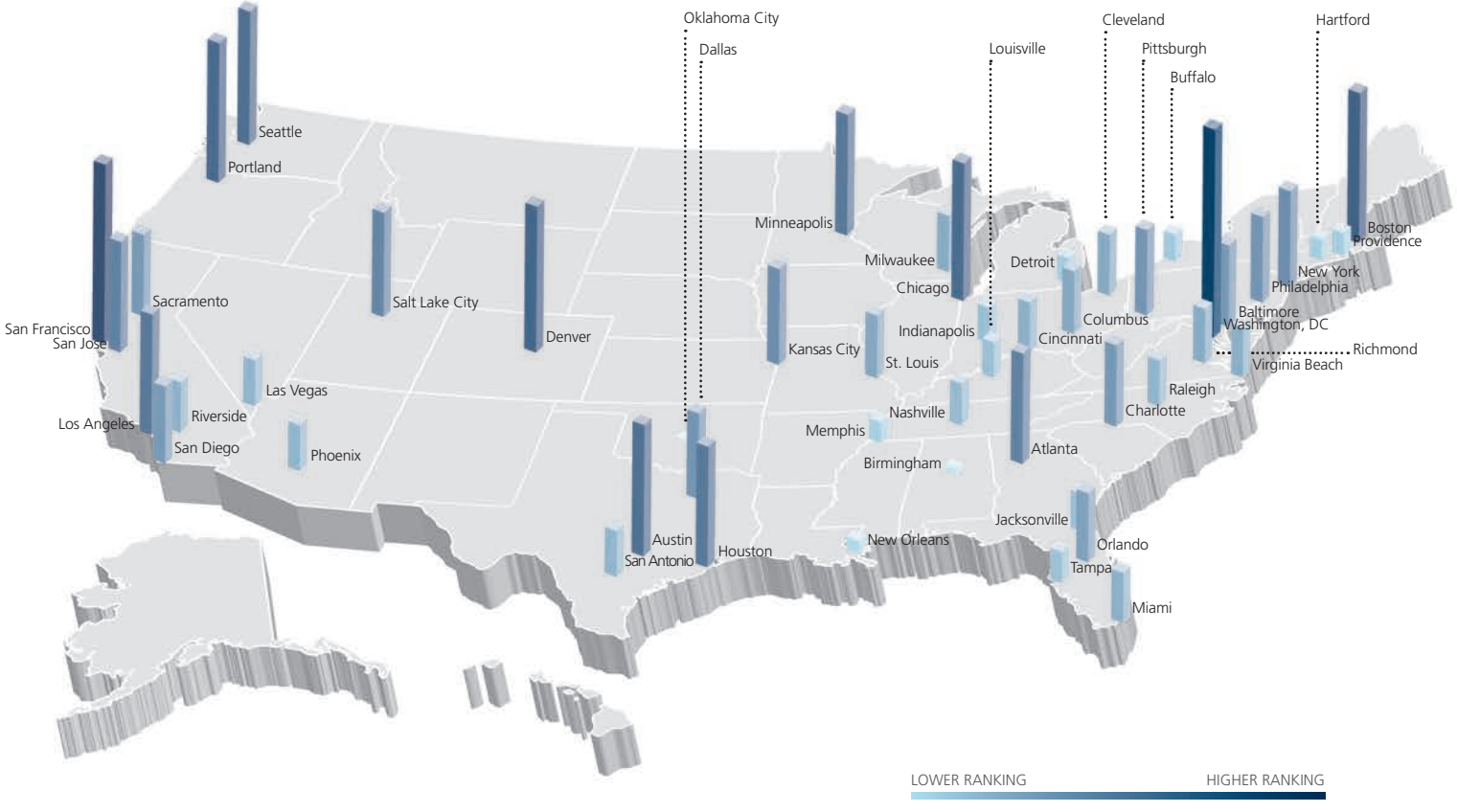
GREEN BUILDINGS



RANK	METRO AREA	LEADERSHIP SCORE
1	Washington, DC	100.0
2	San Francisco, CA	85.9
3	Boston, MA	72.6
4	Denver, CO	69.6
5	Portland, OR	66.9
6	Chicago, IL	65.5
7	Seattle, WA	64.1
8	Austin, TX	62.9
9	Minneapolis, MN	58.4
10	Los Angeles, CA	57.5
11	San Jose, CA	53.1
12	Atlanta, GA	52.5
13	Salt Lake City, UT	49.6
14	New York, NY	46.9
15	Kansas City, MO	45.5
16	Philadelphia, PA	41.9
17	Dallas, TX	40.8
18	Pittsburgh, PA	40.6
19	Baltimore, MD	38.9
20	Sacramento, CA	37.7
21	Charlotte, NC	37.5
22	San Diego, CA	37.3
23	Houston, TX	35.8
24	Orlando, FL	33.2
25	St. Louis, MO	31.0
26	Columbus, OH	29.9
27	Cleveland, OH	28.4
28	Milwaukee, WI	26.8
29	Richmond, VA	25.2
30	Cincinnati, OH	24.6
31	Virginia Beach, VA	24.2
32	Miami, FL	23.9
33	Riverside, CA	23.7
34	Raleigh, NC	22.6
35	San Antonio, TX	22.4
36	Phoenix, AZ	22.3
37	Las Vegas, NV	21.7
38	Nashville, TN	20.5
39	Jacksonville, FL	18.1
40	Indianapolis, IN	17.3
41	Louisville, KY	17.2
42	Tampa, FL	15.0
43	Buffalo, NY	12.5
44	Detroit, MI	11.4
45	Providence, RI	10.8
46	Hartford, CT	10.8
47	Memphis, TN	9.8
48	New Orleans, LA	5.5
49	Birmingham, AL	2.5
50	Oklahoma City, OK	0.0

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GREEN BUILDINGS OVERVIEW

The Metro Green Buildings category tracks four key indicators that measure LEED- and Energy Star-certified building deployment (covering both total buildings and square footage). It also includes the ACEEE's biannual City Energy Efficiency Scorecard score (for which new data was unavailable for this year's Index). Finally, there are two qualitative indicators crediting metros if their principal city has passed two specific ordinances: requiring buildings to achieve LEED certification or meet specified energy savings goals; and requiring buildings to measure and disclose their electricity usage each year.

Washington, DC, continues to be the category champion, placing first every year since the Metro Index was first released in 2012. It has a nearly 14-point advantage over second-place San Francisco, about the same score difference as last year. San Francisco has also been remarkably consistent, finishing second for the sixth straight year. Boston repeats at #3, and Denver makes a five-spot leap to #4. The #5 through #9 metros – Portland, Chicago, Seattle, Austin, and Minneapolis – have switched positions some, but all repeat as top-10 metros. Los Angeles climbs 11 places to 10th, adding more than 21 points to its category score (the second-highest increase in the category).

The nation's capital has dominated in both LEED and Energy Star buildings for six years. Over that time, Washington, DC, has ranked no lower than fourth in any of the four LEED and Energy Star indicators. Further, its current lead over the second-ranked metro in each metric is sizable, so there is no real reason to think that it will relinquish the pole position any time soon. The LEED leaderboards (for both number of buildings and their square footage) include the same metros as they did last year, with only minor shifts among them. For Energy Star, on the other hand, two metros stand out for their improvements. Austin rises 10 spots to sixth in buildings per million, while Kansas City jumps up 12 on the same metric. The two metros both find themselves in the middle of the pack in terms of total Energy Star-certified buildings, so small advancements overall have led to big rankings improvements.

The differences between the LEED and Energy Star leaders are notable. Only half of the Energy Star-certified buildings leaders show up in the LEED-certified buildings top 10. On the other hand, six of the Energy Star square footage per capita top 10,

LEED CERTIFIED PROJECTS (2016)

METRO AREA	RANK	PROJECTS PER 1M PEOPLE	TOTAL PROJECTS
WASHINGTON, DC	1	**293.05**	1,797
SAN FRANCISCO, CA	2	**229.10**	1,072
SAN JOSE, CA	3	**218.82**	433
SEATTLE, WA	4	**183.74**	698
SAN DIEGO, CA	5	**168.79**	560
DENVER, CO	6	**168.59**	481
PORTLAND, OR	7	**167.43**	406
BOSTON, MA	8	**162.90**	781
BALTIMORE, MD	9	**157.21**	440
SALT LAKE CITY, UT	10	**132.36**	157

Source: USGBC data with Clean Edge analysis. USGBC data is gathered from the LEED project registration database and includes all projects certified through the end of 2016. This does not include LEED for Homes projects.

Full dataset available to subscription clients.

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ENERGY STAR BUILDINGS AND PLANTS (2016)

METRO AREA	RANK	PROJECTS PER 1M PEOPLE	TOTAL PROJECTS
WASHINGTON, DC	1	223.26	1,369
CHARLOTTE, NC	2	193.18	478
DENVER, CO	3	191.37	546
SAN FRANCISCO, CA	4	183.15	857
SACRAMENTO, CA	5	178.54	410
AUSTIN, TX	6	163.88	337
SAN DIEGO, CA	7	160.05	531
SAN JOSE, CA	8	156.66	310
LOUISVILLE, KY	9	154.27	198
KANSAS CITY, MO	10	153.48	323

Source: Energy Star with Clean Edge analysis. Energy Star Buildings and Plants includes all projects that have qualified for Energy Star accreditation through the end of 2016. This does not include Energy Star certification for new homes.

Full dataset available to subscription clients.

BUILDING ENERGY USE DISCLOSURE REQUIREMENT

METRO AREA	YEAR ENACTED
AUSTIN, TX	2008
WASHINGTON, DC	2008
NEW YORK, NY	2009
SAN FRANCISCO, CA	2011
PHILADELPHIA, PA	2012
SEATTLE, WA	2012
BOSTON, MA	2013
CHICAGO, IL	2013
MINNEAPOLIS, MN	2013
ATLANTA, GA	2015
KANSAS CITY, MO	2015
PORTLAND, OR	2015
SALT LAKE CITY, UT	2015
DENVER, CO	2016
LOS ANGELES, CA	2016
ORLANDO, FL	2016
PITTSBURGH, PA	2016
ST. LOUIS, MO	2017

Source: Institute for Market Transformation. NOTE: This table lists all of the primary cities in the Metro Index that have enacted a benchmarking and disclosure ordinance.

Full dataset available to subscription clients.

as well as numbers #11-13, are also in the top 10 in LEED square footage. Clearly there is more symmetry between the square footage leaders than there is between the leaders in total numbers of certified buildings.

Turning to the category's qualitative metrics, nearly three quarters (37) of the nation's 50 largest U.S. metro areas now have a requirement that public buildings (or buildings using public funds) meet above-minimum building code standards, while 11 metros have a similar requirement for private buildings. That's three more metros with public sector requirements, and one more with a private sector requirement, than last year. The bulk of these ordinances require LEED certification, often at the Silver level. Even if it only covers public buildings, cities that pass a green building ordinance set a strong example for their residents and businesses to follow.

Cities can send another powerful (and direct) signal by requiring buildings to benchmark and report their electricity usage each year. This is a practice that seems to be gaining in popularity. Last year, 12 cities in the Index had such a requirement. That number has risen by 50% this year, with six new additions to the list: Denver, Los Angeles, Orlando, Pittsburgh, Salt Lake City, and St. Louis. These additions make for a diverse group of cities: It includes many of the coastal cities, but also several in the South and the Midwest. Adding this requirement also fuels Denver's and Los Angeles' rise to the top of the category rankings.

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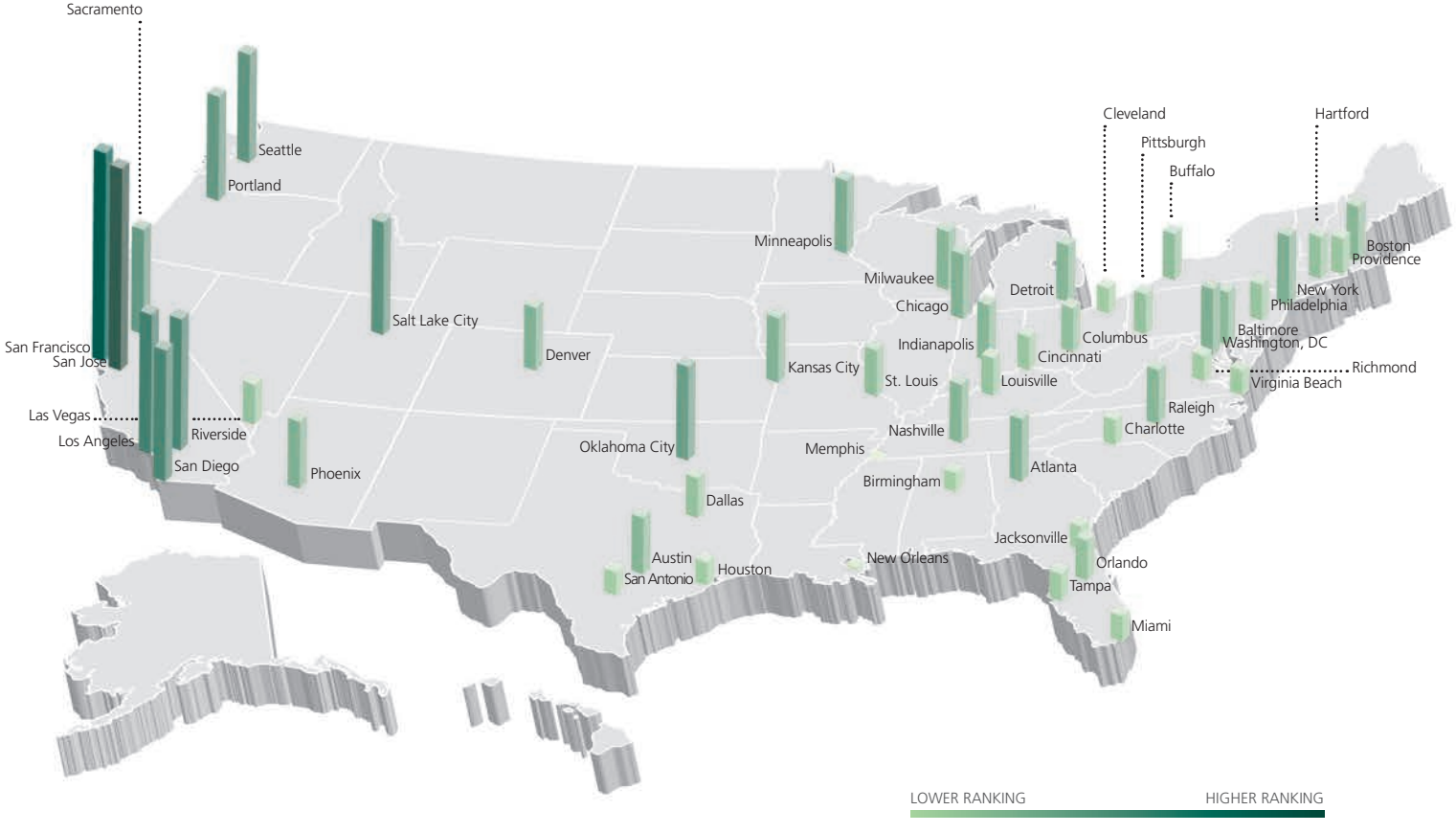
ADVANCED TRANSPORTATION



RANK	METRO AREA	LEADERSHIP SCORE
1	San Francisco, CA	100.0
2	San Jose, CA	96.7
3	Los Angeles, CA	67.5
4	San Diego, CA	63.0
5	Riverside, CA	62.1
6	Salt Lake City, UT	54.2
7	Seattle, WA	52.9
8	Sacramento, CA	49.9
9	Portland, OR	48.9
10	Oklahoma City, OK	44.4
11	Minneapolis, MN	35.9
12	Washington, DC	33.4
13	New York, NY	32.6
14	Phoenix, AZ	32.2
15	Chicago, IL	31.4
16	Kansas City, MO	31.1
17	Atlanta, GA	30.3
18	Denver, CO	30.0
19	Milwaukee, WI	28.2
20	Nashville, TN	27.7
21	Detroit, MI	27.2
22	Indianapolis, IN	27.1
23	Austin, TX	27.1
24	Boston, MA	26.3
25	Raleigh, NC	25.6
26	Baltimore, MD	25.0
27	Buffalo, NY	22.3
28	St. Louis, MO	21.5
29	Hartford, CT	21.2
30	Columbus, OH	20.7
31	Las Vegas, NV	19.7
32	Dallas, TX	19.3
33	Pittsburgh, PA	19.0
34	Orlando, FL	18.8
35	Louisville, KY	18.4
36	Providence, RI	17.2
37	Cincinnati, OH	17.0
38	Philadelphia, PA	16.3
39	Richmond, VA	13.1
40	Tampa, FL	12.8
41	Virginia Beach, VA	12.2
42	Miami, FL	11.8
43	Charlotte, NC	11.6
44	Cleveland, OH	11.5
45	Houston, TX	11.1
46	San Antonio, TX	11.0
47	Jacksonville, FL	9.3
48	Birmingham, AL	8.9
49	New Orleans, LA	1.2
50	Memphis, TN	0.0

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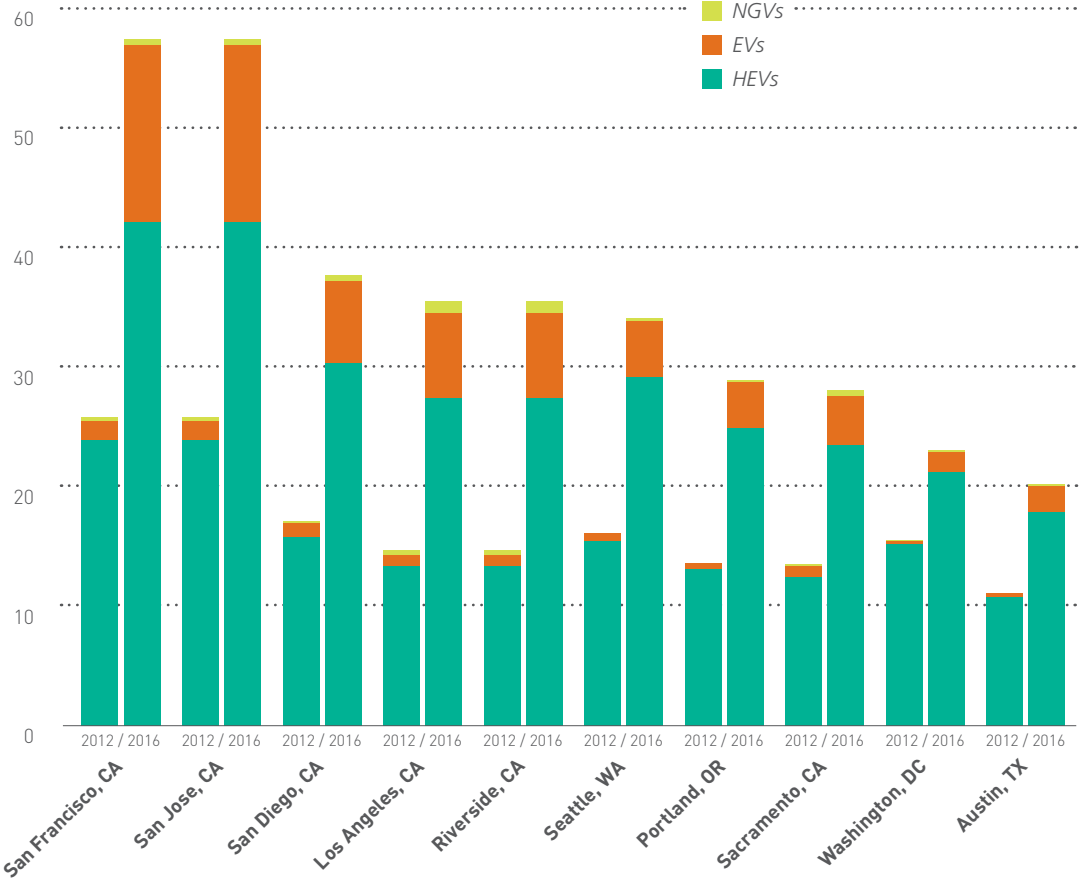
ADVANCED TRANSPORTATION OVERVIEW

The Advanced Transportation category consists of eight indicators that benchmark U.S. metro areas in the transportation sector. Advanced Transportation indicators cover four types of advanced vehicles (hybrids, EVs, plug-ins, and natural gas vehicles), their related charging or fueling infrastructure, and public transportation ridership. California's six metro areas once again dominate the category – occupying the top five places, plus Sacramento at #8 – with two other Pacific Coast metros, Portland and Seattle, placing in the top 10. These eight metro regions all place in top 10 for hybrid, EV, and plug-in vehicle registrations, and six of them place in the top 10 for EV charging stations per million people.

San Francisco and San Jose capture the top two spots as they did last year; Los Angeles and San Diego trade spots for third and fourth place respectively, while Riverside returns for a fifth-place finish. Salt Lake City places #6 once again, mainly based on its strength in natural gas vehicles, CNG fueling stations, and a respectable showing (#11) in public transit ridership. Seattle and Portland both return at eighth and ninth place respectively. Oklahoma City, which trails in

2016 TOP 10 CLEAN VEHICLE (HYBRID/ELECTRIC/NATURAL GAS) METRO AREAS, VEHICLES PER THOUSAND PEOPLE, 2012 AND 2016



Source: IHS Markit and TVB with Clean Edge analysis. IHS Markit data is a snapshot of every vehicle in operation as of the end of 2016. NOTE: This indicator is based on Designated Market Area (DMA) data instead of MSA data. San Francisco and San Jose are considered one DMA, as are Los Angeles and Riverside. Plug-in hybrids are included in electric vehicles.

Full dataset available to subscription clients.

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ELECTRIC VEHICLES IN USE (2016)

METRO AREA	RANK	EVS PER 1K PEOPLE	TOTAL EVS
SAN FRANCISCO, CA	1	**8.83**	57,404
SAN JOSE, CA	1	**8.83**	57,404
SAN DIEGO, CA	3	**4.01**	11,427
LOS ANGELES, CA	4	**3.25**	53,250
RIVERSIDE, CA	4	**3.25**	53,250
SEATTLE, WA	6	**3.22**	13,833
ATLANTA, GA	7	**2.84**	17,696
PORTLAND, OR	8	**2.42**	6,821
SACRAMENTO, CA	9	**2.21**	8,326
AUSTIN, TX	10	**1.32**	2,463

Source: IHS Markit data with Clean Edge analysis. Does not include plug-in hybrids. IHS Markit data is a snapshot of every vehicle in operation as of the end of 2016.This indicator is based on Designated Market Area (DMA) data instead of MSA data. San Francisco and San Jose are considered one DMA, as are Los Angeles and Riverside.

Full dataset available to subscription clients.

ELECTRIC VEHICLE CHARGING STATIONS (2016)

METRO AREA	RANK	EV CHARGING STATIONS PER 1M PEOPLE	TOTAL EV CHARGING STATIONS
SAN JOSE, CA	1	**204.16**	404
SAN FRANCISCO, CA	2	**155.16**	726
KANSAS CITY, MO	3	**150.15**	316
PORTLAND, OR	4	**134.44**	326
SEATTLE, WA	5	**126.62**	481
SAN DIEGO, CA	6	**116.65**	387
SACRAMENTO, CA	7	**115.83**	266
AUSTIN, TX	8	**107.96**	222
BALTIMORE, MD	9	**99.68**	279
HARTFORD, CT	10	**98.60**	119

Source: US DOE Alternative Fuels & Advanced Vehicles Data Center with Clean Edge analysis. As of the end of 2016.

Full dataset available to subscription clients.

many of the indicators in this category (including 49th in public transit ridership and dead last in EV charging stations), still makes it into the top 10 based on its strength in both natural gas vehicles per thousand (#2) and CNG fueling stations per million (#1).

As many cities work to transition to a low-carbon economy, two increasingly important indicators in this category are zero-emission EVs and the concomitant EV charging infrastructure. The same five California metros that lead in the category also lead in EV registrations per thousand people, followed by Seattle, Atlanta, Portland, Sacramento and Austin (up from #11 last year).

The EV charging station indicator is correlated to some extent with EV registrations, with six metros sharing the top 10 in both metrics. Similarly, seven of the cities which lead in the plug-in hybrid vehicles indicator rank in the top 10 for EV charging stations per million people. But as regions expand their EV charging infrastructure with an "if you build it, they will come" mindset, there are several outliers. Kansas City, for example, continues to climb to #3 in the EV charging station indicator, although it places just 31st and 32nd in EV and plug-in vehicle registrations respectively (normalized). Cities such as Baltimore and Hartford (ninth and 10th in EV stations) rank #25 and #32 in EV registrations and #10 and #16 in plug-in vehicle registrations respectively.

The public transit ridership measures yearly transit trips per capita, with cities with large commuting populations rising to the top. Once again, New York (with 212 trips per capita), tops the list as a public transit powerhouse. #2 San Francisco clocks in with 101 trips per capita, less than half of #1 New York's showing. Boston, Washington, DC, and Chicago, all with significant public transit options, place third through fifth with yearly transit trips per capita of 88, 78, and 66 respectively. Rounding out the top 10 this year are Philadelphia, Seattle, Los Angeles, Portland, and Baltimore.

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CLIMATE & CARBON MANAGEMENT

RANK	METRO AREA	LEADERSHIP SCORE
1	San Diego, CA	100.0
2	San Jose, CA	96.1
3	Portland, OR	86.6
4	San Francisco, CA	86.0
5	Salt Lake City, UT	72.1
6	Los Angeles, CA	71.8
7	Washington, DC	69.4
8	Boston, MA	68.9
9	Austin, TX	68.1
10	Columbus, OH	67.7
11	Philadelphia, PA	65.9
12	Pittsburgh, PA	59.1
13	Phoenix, AZ	57.9
14	Sacramento, CA	56.8
15	Chicago, IL	56.0
16	Denver, CO	53.1
17	San Antonio, TX	52.7
18	Seattle, WA	52.6
19	Providence, RI	51.6
20	New York, NY	51.3
21	Baltimore, MD	50.8
22	Dallas, TX	50.2
23	Houston, TX	50.1
24	Atlanta, GA	49.3
25	Orlando, FL	49.0
26	Minneapolis, MN	48.9
27	St. Louis, MO	45.5
28	New Orleans, LA	43.9
29	Louisville, KY	42.3
30	Cleveland, OH	41.5
31	Las Vegas, NV	41.3
32	Charlotte, NC	34.6
33	Nashville, TN	34.2
34	Miami, FL	34.0
35	Tampa, FL	33.5
36	Memphis, TN	32.3
37	Kansas City, MO	31.3
38	Milwaukee, WI	30.5
39	Cincinnati, OH	30.3
40	Indianapolis, IN	27.9
41	Oklahoma City, OK	27.9
42	Riverside, CA	24.6
43	Richmond, VA	22.1
44	Raleigh, NC	21.5
45	Buffalo, NY	19.3
46	Virginia Beach, VA	18.0
47	Detroit, MI	15.1
48	Hartford, CT	3.2
49	Birmingham, AL	1.9
50	Jacksonville, FL	0.0

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CLIMATE & CARBON MANAGEMENT OVERVIEW

The Climate & Carbon Management category has undergone significant changes this year. The most notable of these is the elimination of the two electricity mix indicators, which used state-level generation data as a proxy for city electricity mix. Enough cities procure electricity through power purchase agreements (PPAs) and other means that this methodology was no longer reflective of the true situation. Last year's "climate leadership and reporting" indicator has been split into two indicators, and the "commitment to reducing greenhouse gases/electricity use" indicator has gone from being a three-part measure to a two-part one. Metrics on solar power, large facility emissions, and climate/carbon reduction goals remain the same. The name change from Clean Electricity & Carbon Management to Climate & Carbon Management reflects this new focus.

Leadership in this category has shifted significantly. Last year, four California metros – San Jose, San Francisco, San Diego, and Los Angeles – swept the top spots. All four remain in the top 10 this year, though San Diego now edges last year's champ San Jose for the #1 spot. Portland (#5), Boston (#8), and Austin (#9) are the other holdovers from the top grouping. Joining them are newcomers Salt Lake City (#5), Washington, DC (#7), and Columbus (#10). Salt Lake City had the largest score increase in the category, based largely on its July 2016 commitment to achieve 100% renewable energy for the community by 2032.

There are two quantitative indicators in the category. One is per-capita carbon emissions from large facilities. The leaders in this indicator have stayed fairly consistent since last year. #1 Raleigh has now had the fewest emissions on both a normalized and overall level for all six years of the Index. The other indicator leaders have also performed consistently, as have metros at the low end of the spectrum, like Birmingham (last in the indicator for five out of six years). This may have to do with large emitters not opening or closing often, and emission totals that don't fluctuate sig-

CARBON EMISSIONS FROM LARGE FACILITIES (2015)

Least Emissions

METRO AREA	RANK	METRIC TONS CO2E* PER CAPITA	METRIC TONS CO2E*
RALEIGH, NC	1	0.24	303,094
COLUMBUS, OH	2	0.67	1,355,697
SEATTLE, WA	3	0.74	2,743,160
VIRGINIA BEACH, VA	4	1.08	1,865,267
SAN DIEGO, CA	5	1.38	4,547,024
SACRAMENTO, CA	6	1.49	3,376,630
PORTLAND, OR	7	1.77	4,210,715
SAN JOSE, CA	8	1.86	3,669,481
NEW YORK, NY	9	2.12	42,631,805
LOS ANGELES, CA	10	2.21	29,319,329
RICHMOND, VA	41	11.94	15,174,785
KANSAS CITY, MO	42	12.58	26,215,394
CINCINNATI, OH	43	13.25	28,561,714
OKLAHOMA CITY, OK	44	15.52	21,059,875
ST. LOUIS, MO	45	18.32	51,443,341
PITTSBURGH, PA	46	19.33	45,460,334
LOUISVILLE, KY	47	19.79	25,286,106
HOUSTON, TX	48	20.98	139,489,838
NEW ORLEANS, LA	49	31.78	40,102,459
BIRMINGHAM, AL	50	36.06	41,278,504

Most Emissions

*Source: EPA and US Census Bureau with Clean Edge analysis. *CO2e = carbon dioxide equivalent*

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nificantly. Emissions from the lowest performing metros come primarily from power generation, with Houston's oil and gas-centric economy being a notable exception.

The other quantitative metric measures the amount of installed solar capacity per capita in each metro's principal city. This year, San Diego overtakes Indianapolis (which falls to third) for the top spot, with 217 watts of installed solar per person. That is a nearly 70-watt increase over last year's Index, and leads second-place San Jose by almost 50 watts. This year, five cities check in with 100 watts or more of solar per person, and seven have at least 100 MW installed total; both numbers are two more than in the 2016 Index. Four of the top 10 cities in this indicator are in generally solar policy-friendly California, but others are in states (like Arizona, Nevada, and Indiana) where solar has come under occasional policy and regulatory attack.

The five qualitative indicators in the category measure a metro's commitment to combating climate change, which will likely become increasingly important with lagging federal leadership on climate action. Nearly all (43) of the principal cities in the Index submitted a 2016 report to climate reporting organization CDP, an increase of 12 over last year's Index. Three-quarters (38) of principal cities are members of C40, the Compact of Mayors, or the Mayors' National Climate Action Agenda; 10 belong to two of those groups, while another 12 are members of all three. Thirty-six cities now have a specific goal for reducing community GHGs or electricity use, with 32 of those goals enshrined in city code.

But the most aggressive and influential target a city can set is to achieve 100% community-wide renewable electricity. The 2016 Index counted three cities with such a commitment. This year, that number is up to five. Salt Lake City joined San Diego, San Francisco, and San Jose in July 2016, setting a goal of reaching 100% renewable electricity by 2032. Then, in April 2017, Portland joined the club, pledging 100% renewable electricity by 2035 and 100% renewable energy by 2050. And these are just the largest U.S. cities covered by this Index; the Sierra Club's Ready for 100 campaign and others count numerous smaller communities across the country with 100% renewable commitments of their own.

SELECT POLICIES ADOPTED, 2017 TOP 20 CLIMATE & CARBON MANAGEMENT METRO AREAS

METRO AREA	RANK	TOP LOCAL GOVERNMENT RE PURCHASER (Q4 2016)	COMMUNITY GHG/ ELECTRICITY REDUCTION GOAL	100% RE GOAL
SAN DIEGO, CA	1	●	●	●
SAN JOSE, CA	2	●	●	●
PORTLAND, OR	3	●	●	●
SAN FRANCISCO, CA	4	●	●	●
SALT LAKE CITY, UT	5		●	●
LOS ANGELES, CA	6	●	●	
WASHINGTON, DC	7	●	●	
BOSTON, MA	8	●	●	
AUSTIN, TX	9	●	●	
COLUMBUS, OH	10	●	●	
PHILADELPHIA, PA	11	●	●	
PITTSBURGH, PA	12	●	●	
PHOENIX, AZ	13		●	
SACRAMENTO, CA	14		●	
CHICAGO, IL	15	●	◐	
DENVER, CO	16		●	
SAN ANTONIO, TX	17		●	
SEATTLE, WA	18		●	
PROVIDENCE, RI	19		●	
NEW YORK, NY	20		●	

Source: EPA, ACEEE, the Renewables 100% Policy Institute, and Clean Edge research. Note: Cities get full credit for a GHG/electricity use reduction goal if a goal has been set and officially adopted through ordinance, resolution, or executive order; if the goal has not been officially adopted, the city receives half credit.

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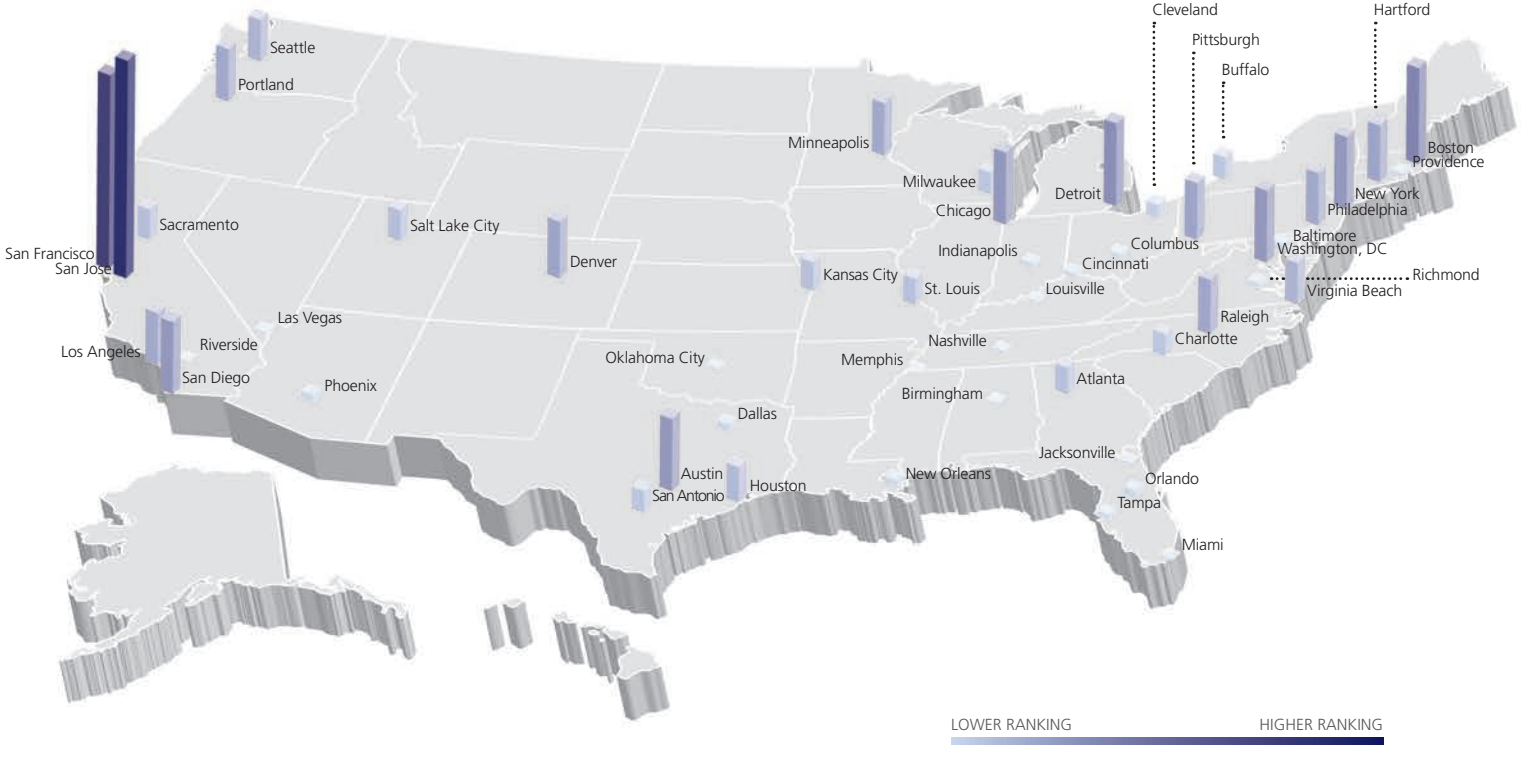
CLEAN-TECH INVESTMENT, INNOVATION & WORKFORCE



RANK	METRO AREA	LEADERSHIP SCORE
1	San Jose, CA	100.0
2	San Francisco, CA	89.2
3	Boston, MA	43.6
4	Detroit, MI	37.7
5	Washington, DC	33.3
6	San Diego, CA	32.7
7	Chicago, IL	32.4
8	Austin, TX	31.5
9	New York, NY	31.5
10	Denver, CO	26.5
11	Pittsburgh, PA	26.2
12	Hartford, CT	25.7
13	Raleigh, NC	24.7
14	Minneapolis, MN	24.1
15	Portland, OR	24.0
16	Philadelphia, PA	23.6
17	Los Angeles, CA	23.4
18	Seattle, WA	20.3
19	Virginia Beach, VA	19.1
20	Houston, TX	16.7
21	Salt Lake City, UT	13.9
22	Sacramento, CA	13.8
23	Kansas City, MO	13.4
24	Atlanta, GA	11.7
25	St. Louis, MO	11.7
26	Charlotte, NC	10.5
27	Milwaukee, WI	9.9
28	Buffalo, NY	9.8
29	San Antonio, TX	9.7
30	Cleveland, OH	5.1
31	New Orleans, LA	3.3
32	Orlando, FL	3.3
33	Phoenix, AZ	2.8
34	Baltimore, MD	2.6
35	Dallas, TX	2.6
36	Providence, RI	2.4
37	Columbus, OH	2.3
38	Indianapolis, IN	2.0
39	Tampa, FL	1.6
40	Cincinnati, OH	1.5
41	Richmond, VA	1.5
42	Miami, FL	1.2
43	Oklahoma City, OK	0.8
44	Nashville, TN	0.7
45	Jacksonville, FL	0.7
46	Las Vegas, NV	0.6
47	Louisville, KY	0.5
48	Riverside, CA	0.4
49	Birmingham, AL	0.0
50	Memphis, TN	0.0

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CLEAN-TECH INVESTMENT, INNOVATION, & WORKFORCE OVERVIEW

The Clean-Tech Investment, Innovation, and Workforce category measures a metro area's financial, human, and intellectual capital. It tracks indicators such as venture capital investments, patent activity, and the presence of clean-energy labs, incubators, and Master's programs.

Three regions known for their tech innovation prowess continue to lead the category. Silicon Valley dominates, with San Jose and San Francisco scoring 100 and 89.2 respectively, followed distantly by Boston with a score of 43.6. These three metro regions take the top three spots in both overall venture capital and on a per-capita basis. Their more than $9 billion VC haul equals more than the remaining 47 metro regions combined. All three also score in the top five for clean-tech patent registrations (per one million people) and receive credit for the presence of clean-tech incubators and/or accelerators and top-ranked green Master's programs.

Fourth-place Detroit, with a score of 37.7, achieves its strong showing by being home to a quarter of all metro-area patents. The presence of Detroit's auto manufacturers, with their fuel cell, EV, and other auto-related patents, helps lift Detroit to its strong finish. Fifth-place Washington, DC, with a score of 33.3, is buoyed by being one of only four metro regions with a DOE lab, the presence of a clean-tech incubator/accelerator and a top-ranked green Master's program.

While there is movement in this category outside of the top 10 (even slight changes in VC dollars and total venture deals can have a significant impact outside of San Francisco, San Jose, and Boston), the top 10 remain relatively constant. There are no changes from the 2016 Index among the top four spots. Washington, DC and San Diego swap places for fifth and sixth place. #7 Chicago moves up two spots, #8 Austin remains constant, and #9 New York is up one. Denver joins the top 10 after placing 11th last year. The only metro to drop out of the top 10 is Los Angeles, down to #17. However, the category score difference between #10 Denver and #17 Los Angeles is a spread of only about three points.

CLEAN TECH VENTURE CAPITAL (2014 - 2016)

METRO AREA	RANK	DOLLARS PER CAPITA	TOTAL DOLLARS (MILLIONS)	TOTAL DEALS
SAN JOSE, CA	1	**$1,212.16**	$2,398.64	148
SAN FRANCISCO, CA	2	**$1,090.43**	$5,102.28	380
BOSTON, MA	3	**$352.63**	$1,690.69	184
SAN DIEGO, CA	4	**$234.81**	$779.05	59
HOUSTON, TX	5	**$176.40**	$1,194.68	28
SEATTLE, WA	6	**$126.70**	$481.32	67
AUSTIN, TX	7	**$116.84**	$240.26	52
PITTSBURGH, PA	8	**$93.47**	$218.93	35
RALEIGH, NC	9	**$70.75**	$92.18	13
KANSAS CITY, MO	10	**$65.80**	$138.47	12

Source: Cleantech Group and U.S. Census Bureau data with Clean Edge analysis.

Full dataset available to subscription clients.

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METRO INDEX METHODOLOGY

How is the Metro Index constructed?

The Metro Index consists of three layers. The top layer, the Metro Index itself, is a set of 50 metro area scores which evaluates each MSA based on involvement and leadership in clean tech. Results of the top layer are derived from performance in four equally weighted categories – green buildings; advanced transportation; climate & carbon management; and clean-tech investment, innovation, & workforce – with each category composed of a set of individual indicators.

How is the Metro Index calculated?

The overall Metro Index evaluates the 50 largest metro areas on a 100-point scale, deriving each score from category and individual indicator performance. The score calculation process works as follows:

INDICATOR SCORES are given on a scale of 0 to 100. The best-performing metro area in an individual indicator receives a score of 100; the worst-performing metro area gets a 0. All other metro areas receive scores based on where they fall between the best and worst-performing regions. To put each metro area on an even playing field, all quantitative indicators are adjusted for region size. By reporting in terms of per capita or percent of metro totals, smaller regions are not punished for having relatively smaller economies.

Several indicators, like the presence of a top-ranked green Master's program, are qualitative rather than quantitative. In this case, qualifying states receive indicator scores of 100 and non-qualifying states get 0.

CATEGORY SCORES are calculated in a similar fashion as individual indicators. Based on metro areas' average indicator scores within each corresponding category, category scores of 100 are given to the metro area with the best average indicator score; the metro area with the lowest average indicator score in a category receives a 0.

Finally, the **METRO CLEAN TECH INDEX SCORE** is calculated by averaging the four equally-weighted category scores.

Data Sources

Along with an extensive level of data mining from clean-energy sources in the public domain, Clean Edge has also teamed up with private data providers to offer U.S. Metro Index subscribers the highest level of industry intelligence. Private data partners include Cleantech Group, EQ Research LLC, Heslin Rothenberg Farley & Mesiti P.C., IHS Markit, and the North Carolina Clean Technology Center.

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The following is a list of all indicators used to calculate the Metro Index. Indicators are grouped by category.

GREEN BUILDINGS

GREEN BUILDINGS
LEED Certified Projects Per 1M People (2016)
LEED Certified Square Feet Per Capita (2016)
Energy Star Buildings & Plants Per 1M People (2016)
Energy Star Buildings & Plants Square Feet Per Capita (2016)
ACEEE 2015 City Energy Efficiency Scorecard Performance
Above-Code Green Building Requirement for Public Buildings
Above-Code Green Building Requirement for Private Buildings
Building Energy Use Benchmarking Policy

ADVANCED TRANSPORTATION

ADVANCED TRANSPORTATION
Electric Vehicles Per 1K People (2016)
Hybrid Electric Vehicles Per 1K People (2016)
Plug-In Hybrid Electric Vehicles Per 1K People (2016)
Natural Gas Vehicles Per 1K People (2016)
Electric Vehicle Charging Stations Per 1M People (2016)
CNG Fueling Stations Per 1M People (2016)
E85 & B20 Fueling Stations Per 1M People (2016)
Public Transit: Yearly Unlinked Passenger Trips Per Capita (2015)

CLIMATE & CARBON MANAGEMENT

CLIMATE & CARBON MANAGEMENT
Presence of Top Local Government Green Power Purchaser
GHG Emissions from Large Facilities Per Capita, CO2e MT (2015)
Installed Solar Capacity, W Per Capita in Principal City in Metro Area (2016)
Reporting to Climate Disclosure Project (CDP)
Member of C40, Compact of Mayors, or Mayor's National Climate Action Agenda
City-Wide GHG or Energy Use Reduction Goal
GHG/Electricity Use Reduction Goal Codified in City Code
Goal to Achieve 100% Renewable Electricity

CLEAN-TECH INVESTMENT, INNOVATION, & WORKFORCE

CLEAN-TECH INVESTMENT, INNOVATION, & WORKFORCE
Venture Capital Investment, $ Per Capita (2014-2016)
Venture Capital Investment, Deals Per 1M People (2014-2016)
Clean Energy Patents Per 1M people (2002-2015)
Presence of DOE Lab
Presence of Clean Energy Incubator and/or Accelerator
Presence of Top-Ranked Green Master's Program

ACCESS FULL DATASETS

more than 100 indicators and 19,000 unique data points

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OTHER INDEX DATA SOURCES

ALTERNATIVE FUELS DATA CENTER (AFDC)

AMERICAN COUNCIL FOR AN ENERGY–EFFICIENT ECONOMY (ACEEE)

BLOOMBERG NEW ENERGY FINANCE

THE BUSINESS COUNCIL FOR SUSTAINABLE ENERGY

BUILDING CODES ASSISTANCE PROJECT

C40

CDP

THE CENTER FOR CLIMATE AND ENERGY SERVICES

THE COALITION FOR GREEN CAPITAL

THE COMPACT OF MAYORS

ENERGY STAR

ENVIRONMENT AMERICA

GRIDWISE ALLIANCE

THE INCUBATENERGY NETWORK

INSTITUTE FOR MARKET TRANSFORMATION (IMT)

INTERSTATE RENEWABLE ENERGY COUNCIL, INC.

LEAN ENERGY US

THE MAYOR'S NATIONAL CLIMATE ACTION AGENDA

NATIONAL TRANSIT DATABASE

NET IMPACT

THE PRINCETON REVIEW

THE RENEWABLES 100% POLICY INSTITUTE

TVB

U.S. BUREAU OF ECONOMIC ANALYSIS (BEA)

U.S. BUREAU OF LABOR STATISTICS

U.S. CENSUS BUREAU

U.S. DEPARTMENT OF ENERGY (DOE)

U.S. ENERGY INFORMATION ADMINISTRATION (EIA)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

U.S. GREEN BUILDING COUNCIL (USGBC)

U.S. NEWS & WORLD REPORT

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ABOUT CLEAN EDGE

Clean Edge, Inc., founded in 2000, offers a suite of indexes, surveys, and advisory services devoted to the clean-energy economy. With offices in Portland, Oregon and the San Francisco Bay Area, Clean Edge serves corporate, government, NGO, utility, and financial clients working to transition to a clean-energy, low-carbon future. Products and services include multiple clean-tech stock indexes in partnership with NASDAQ, the *U.S. Clean Tech Leadership Index* (tracking state and metro activity), the *Grid Modernization Index* in partnership with GridWise Alliance, and an annual survey of consumer clean energy actions, attitudes, and perceptions. The firm produces webinars and events that regularly convene hundreds of industry innovators and stakeholders. www.cleanedge.com.

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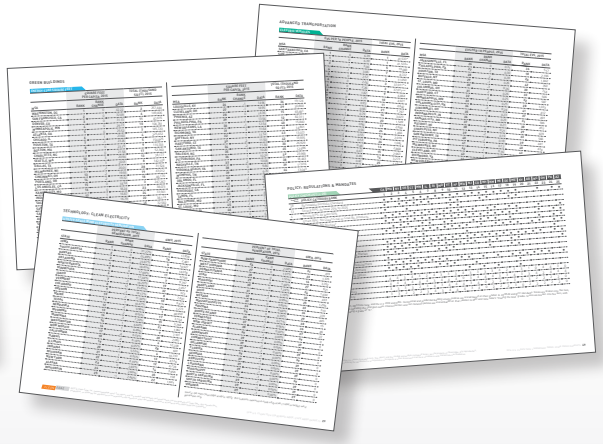

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