



# 2016

## U.S. CLEAN TECH LEADERSHIP INDEX

State & Metro / May 2016

*CLEAN* *EDGE*



# INDEX PARTNERS

## LEAD PARTNER

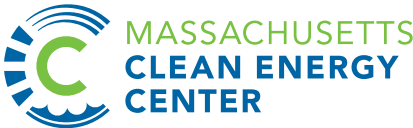


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A leader in reducing its own greenhouse gas emissions and operating sustainably, in 2016 Wells Fargo has announced plans to be 100% powered by renewable energy by 2017 and has been recognized by the U.S. Environmental Protection Agency's Center for Corporate Climate Leadership, the CDP, and the U.S. Green Building Council. Since 2012, Wells Fargo has provided more than \$52 billion in environmental finance, supporting sustainable buildings, renewable energy and other environmentally beneficial projects nationwide. Projects owned in whole or in part by Wells Fargo generated 10 percent of wind and solar PV energy produced in the U.S. in 2015. Last year, the Wells Fargo Foundation provided \$12.3 million in grants to support environmental causes and will provide additional environmental grant funds of \$65 million from 2016 through 2020. For more information, please visit: [wellsfargo.com/about/csr](http://wellsfargo.com/about/csr) and the Wells Fargo Environmental Forum.

## SUPPORTING PARTNERS



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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 2016 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 70 state-based indicators. The **METRO INDEX** uses more than 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 26; 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 seventh edition of the State Index, the fifth annual Metro Index, and the fourth 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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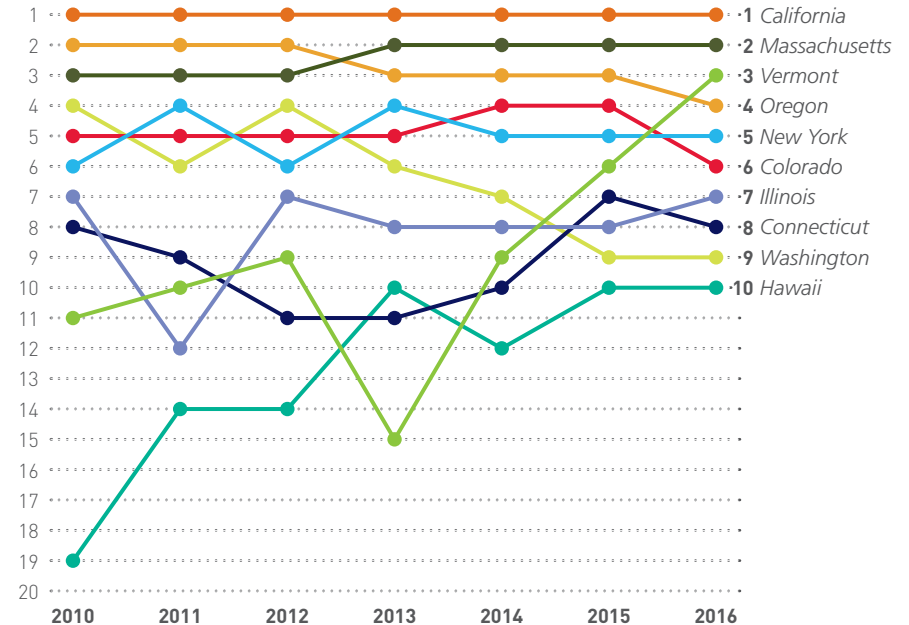
# THE U.S. CLEAN TECH MARKET

The seventh annual edition of the U.S. Clean Tech Leadership Index comes at a time of notable acceleration in the nation's transition to a clean-energy economy. In 2015, utility-scale wind and solar power accounted for a record 62% of all new electric generation capacity added in the U.S., up from 47% the prior year, according to Federal Energy Regulatory Commission (FERC) data. The nation added 8.2 GW of new wind capacity and 2.6 new GW of utility-scale solar in 2015, giving renewables more than 10 GW of new capacity additions for the year, compared to 6 GW of new natural-gas fired power additions (34% of total new capacity). The U.S. followed a global trend which saw wind power as the largest contributor of new generation capacity worldwide, with 63 GW added in 2015. By contrast, when FERC issued its first annual energy infrastructure update at the end of 2010, renewables accounted for less than 14% of new U.S. capacity additions.

At the same time, the U.S. continued its dramatic transition away from coal and nuclear, adding just one 3 MW unit of new coal power in 2015. On one single day in April 2016, three Midwestern utilities retired a combined 2,000 MW of coal-fired generation capacity. It's been 20 years since a new nuclear plant has been brought online in the U.S., and the few nuclear facilities currently under construction (such as the second Watts Bar reactor in Tennessee, scheduled to open in May) continue to experience cost overruns and delays.

Against the backdrop of the December 2015 Paris climate agreement (officially signed by the U.S. along with 174 other nations in April 2016) and the extension of

## 2016 TOP 10 STATES (INCLUDING HISTORICAL RANKINGS)



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

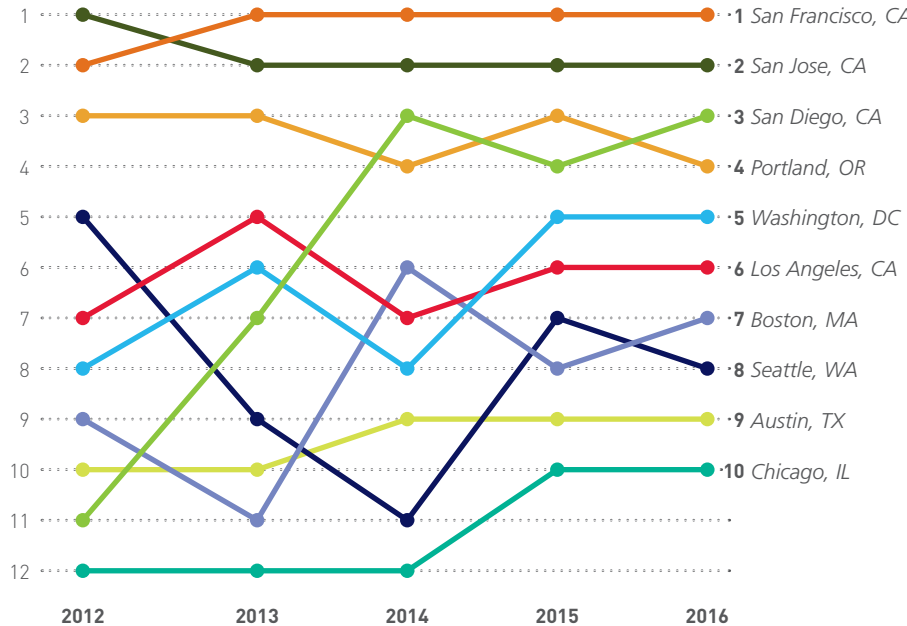
federal wind and solar tax credits at the end of 2015, leading U.S. states and metro areas have continued to expand their clean-tech activities. In 2015, Iowa became the first state to generate more than 30% of its total in-state electricity from non-hydro utility scale renewables (wind, solar, and geothermal). A total of four states now get 20% or more of their electricity from utility-scale renewables, and 14 states are now at 10% or more. These include the nation's two most populous states, California (with 20%) and Texas (10%); on one day in March 2016, Texas's ERCOT grid reported that a record 48.3% of its generation came from the state's wind farms. By contrast,

six years earlier in 2009, the first year tracked in the inaugural Leadership Index, only three states eclipsed the 10% milestone. When hydro and biomass are included, six states received more than two-thirds of their in-state generation from clean sources.

Vermont, which leapt three places to #3 in the overall State Index, is a small but telling example of the nation's slow but steady energy transition away from coal and nuclear power. After Entergy shuttered the 635 MW, 42-year-old Vermont Yankee nuclear generation plant in late 2014, the state more than doubled its utility-scale solar generation in 2015 and added more wind power as well; it now ranks in the top 10 states in both wind and solar as a percentage of total generation. And in 2015, it established the nation's second-highest RPS target, 75% by 2032. (Note: most RPSs including Vermont's refer to the energy mix of the state's investor-owned utilities, including electrons purchased from out of state, rather than the total in-state generation tracked in our Index.)

In 2015, Hawaii (#10 in this year's Index) became the first state to join the burgeoning ranks of global governments and corporations establishing a goal to be 100% powered by renewable energy; Hawaii's target year is 2045. Even more impactful, in terms of sheer scale, is the 50% by 2030 RPS mandated in late 2015 by California, the world's eighth-largest economy and the #1 state in the Index for seven straight years. During the year, California also became the first state to surpass one million registrations of hybrids and electric vehicles.

### 2016 TOP 10 METRO AREAS (INCLUDING HISTORICAL RANKINGS)



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

## ACCESS FULL DATASETS

more than 100 indicators and 17,000 unique data points

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# STATE INDEX

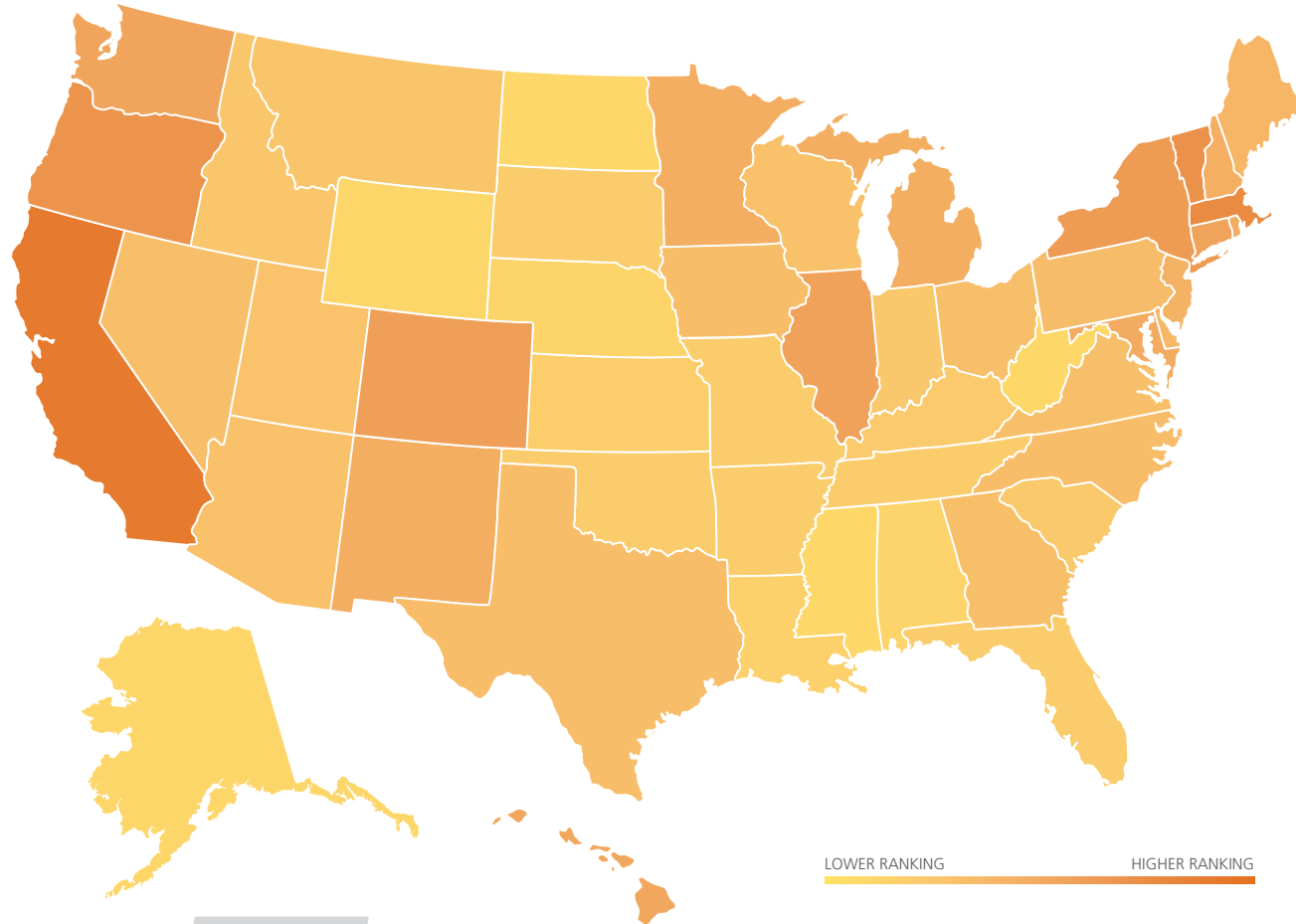
2016 U.S. Clean Tech Leadership Index

## 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



LOWER RANKING  HIGHER RANKING

RANK	+/-	STATE	LEADERSHIP SCORE
1	0	California	89.7
2	0	Massachusetts	76.0
3	3	Vermont	70.6
4	-1	Oregon	69.5
5	0	New York	62.5
6	-2	Colorado	58.6
7	1	Illinois	57.1
8	-1	Connecticut	56.0
9	0	Washington	55.2
10	0	Hawaii	53.2
11	5	Maryland	48.5
12	5	Rhode Island	48.3
13	-2	New Mexico	47.4
14	-1	Michigan	47.0
15	0	Minnesota	46.8
16	-4	New Hampshire	46.0
17	-3	New Jersey	44.0
18	4	Maine	39.7
19	-1	Delaware	39.1
20	1	Pennsylvania	34.5
21	2	North Carolina	34.4
22	-2	Texas	33.9
23	1	Iowa	33.5
24	5	Virginia	32.9
25	1	Ohio	32.6
26	-7	Nevada	32.1
27	1	Georgia	31.6
28	-3	Arizona	31.3
29	1	Wisconsin	30.9
30	-3	Utah	30.0
31	0	Montana	27.0
32	3	Idaho	25.7
33	-1	Indiana	24.9
34	3	South Carolina	24.4
35	6	Kentucky	21.9
36	3	South Dakota	21.1
37	1	Oklahoma	21.0
38	4	Arkansas	20.3
39	-6	Missouri	20.2
40	-6	Tennessee	20.2
41	2	Florida	19.7
42	-6	Kansas	19.2
43	-3	Louisiana	16.7
44	1	Alabama	13.9
45	5	Nebraska	12.6
46	-2	Wyoming	11.3
47	1	Alaska	10.8
48	-1	North Dakota	9.7
49	0	Mississippi	9.2
50	-4	West Virginia	9.0



# 2016 STATE INDEX RESULTS

California leads all states by a wide margin for the seventh consecutive year, although its victory margin over #2 Massachusetts fell slightly to 13.7 points from 15.2 in last year's Index. The Golden State also retains its seven-year hold on the #1 ranking in the Technology category, while swapping places with Massachusetts in the other two categories. California captured the best score in the Policy category for the first time, while ceding the top spot in Capital to its cross-country rival; the two states have occupied the top two places in Capital in every edition of the Index back to 2010.

Vermont is the big story of the top 10, adding nearly eight points from last year for a score of 70.6 and a three-place jump to #3, an unprecedented surge at that level of the rankings. (Most leading states' scores are slightly lower than last year's, reflecting small changes in the Index indicators rather than any significant retreats on clean-tech deployment, policy, or investments.) Vermont knocks Oregon down one spot to fourth, while New York holds onto to the #5 ranking for the third straight year. The rest of the top 10 is closely bunched; just 5.4 points separate the sixth- and 10th-place states. Colorado drops two places to sixth, while #7 Illinois and #8 Connecticut swap places from last year. Washington State (after three straight years of declining rankings) and Hawaii hold steady at ninth and 10th, respectively. Just missing the top 10 are Maryland and Rhode Island, which each improve by five places to 11th and 12th respectively.

## The Top 10 States



**CALIFORNIA** completed another banner year as the nation's perennial clean-tech leader in 2015, capping it when Governor Jerry Brown signed the state's new RPS mandate of 50% by 2030 (up from 33% by 2020) in December. The solar power capital of the U.S. in both industry presence and deployment, California generated more than 15,000 utility-scale GWh and more than 5,000 distributed GWh of power from the sun during the year, both the most in the nation by far. It also became the first state with more than one million hybrids and electric cars on the road. California also captured the #1 spot in the Policy category for the first time.



**MASSACHUSETTS** ranks second for the fourth consecutive year. Despite a slight drop in its score from 78.8 to 76, it narrowed the gap behind California from 15.2 points to 13.7. Although Massachusetts ceded the #1 rank in Policy (to California) for the first time since 2012, the state more than made up for it with a #1 ranking in Capital (which it held from 2012 to 2014) and a two-place rise to sixth in Technology, its highest ever. The Bay State notably ranks #1 in the energy storage capacity indicator, equivalent to more than 13% of its total generation capacity.




**VERMONT** vaulted three places for the second straight year, achieving the #3 spot after ranking 15th only three years ago. The Green Mountain State improved its overall score by 7.7 points to 70.6. Vermont actually fell three places in Capital, but its improvements in the other two categories are eye-opening,


and show the impact that aggressive clean-tech policies and deployment can have, particularly in a small state. In Policy (spearheaded by its 75% by 2032 RPS), Vermont soared seven places to the top 10 (at #10) for the first time; it was in the bottom 10 (41st) just three years ago. Its 19-place leap in Regulations & Mandates is the nation's best by far. And the state jumped three places to the #2 rank in Technology, displacing mighty California as #1 in the Clean Electricity subcategory.


 **4** After posting the best score increase of any top 10 state in last year's Index, **OREGON** slipped a bit from 72 points to 69.5, but remains a solid leader just 1.1 point behind Vermont and well ahead of fifth-place New York's 62.5. The Beaver State had been third for the past three years, and #2 in the three Index editions before that. Oregon is a strong all-around performer, finishing third in Technology, fourth in Policy (up two places from last year, and its best showing since 2011), and third in Capital (up three spots, its best rank since 2012).


 **5** Another steady performer is **NEW YORK**, placing fifth for the third consecutive year after ranking fourth or sixth in the first four years of the Index. The home of the closely watched Reforming the Energy Vision (REV) utility market initiative, New York gained one place in both Policy (to third, the same spot it held from 2012 to 2014) and Capital (to #4, after placing fifth for the past two years). New York's 19th place in Technology is more typical of other Eastern states; with the exception of Vermont, Massachusetts, and Maine, all of the top 16 Technology states are west of the Mississippi River.

 **6** **COLORADO** drops two places to sixth, losing 8.5 points from last year's score to 58.6; it has been fourth or fifth in the six preceding years of the Index. The biggest factor was a four-place drop to #14 in Policy, due to a five-place decline in the Regulations & Mandates subcategory and two-place drop in Incentives. The Rocky Mountain State fell one place each in Technology (to seventh) and

Capital (to #5); it has been a top five performer in Capital since 2012.

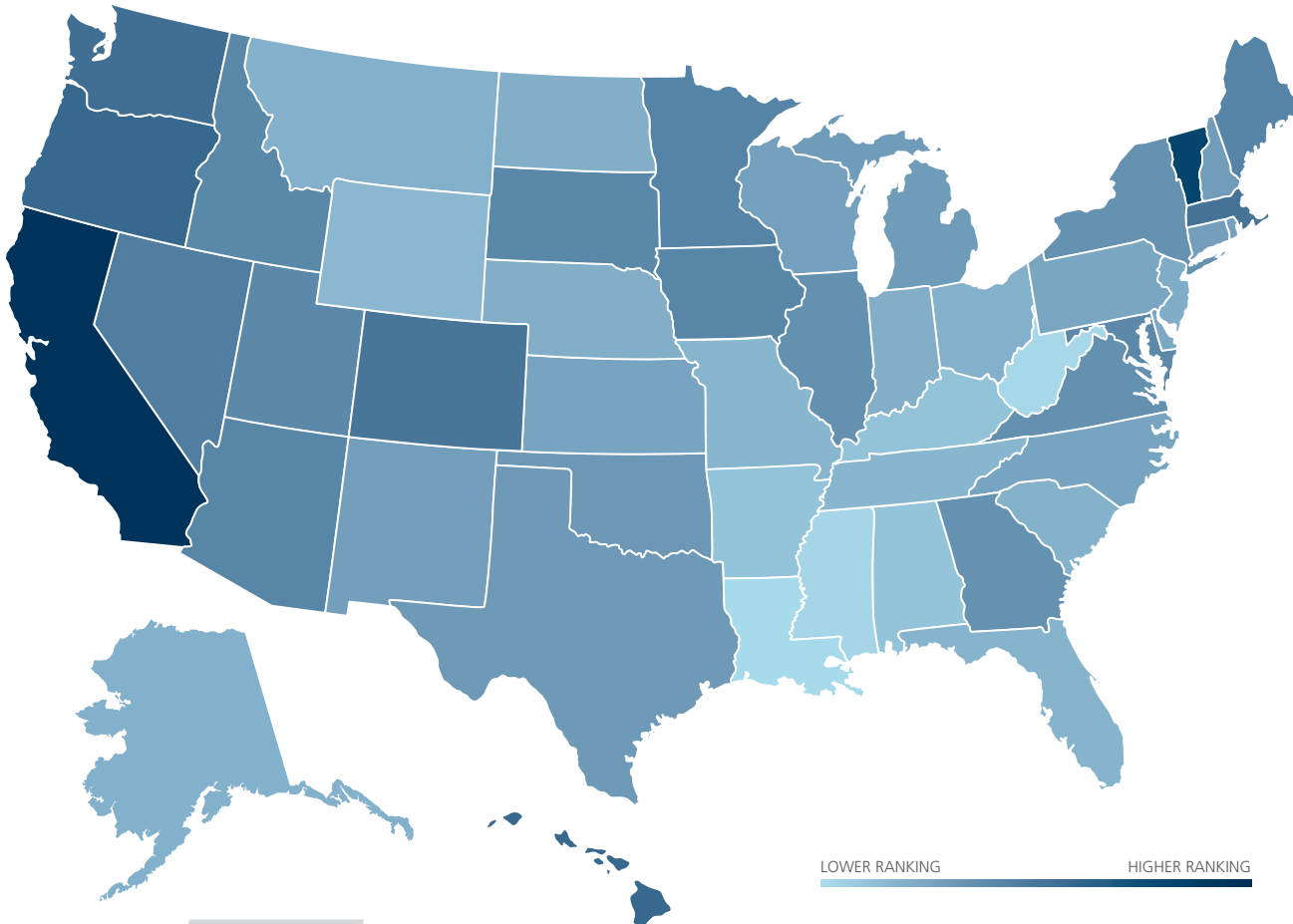
 **7** **ILLINOIS** moves up one place to seventh with a score of 57.1, equaling its highest ranking previously reached in 2010 and 2012. Its overall score is down 2.5 points from last year. The Land of Lincoln improved in the Technology category by four places, to 17th, with particular strength in green buildings and grid modernization. A top 10 state in Policy in all seven years of the Index, Illinois gained one spot in that category to seventh, while repeating last year's #8 ranking in Capital.

 **8** After its best-ever seventh place last year, **CONNECTICUT** slips one place to eighth with 56 points. The home of the nation's first statewide green bank, Connecticut fell two places in Policy but remains a national leader at #5, still its second-best showing in that category. The Constitution State dropped one place to 10th in Capital (where it's been a top 10 performer in all seven years of the Index) and gained one spot in Technology to 25th.

 **9** **WASHINGTON**, after dropping from #4 to #9 between 2012 and 2015, holds steady in ninth place with a score of 55.2. A top 10 Technology member in all seven years of the Index with its hydropower and wind resources plus advanced transportation leadership, Washington is fifth in the category this year, down one place. But the Evergreen State moves up three places to 12th in both Policy and Capital.

 **10** **HAWAII** also repeats its ranking from last year, placing 10th for the third time in four years after a steady rise from 19th in the first Index in 2010. Technology is the name of the game in the Aloha State, where its leadership in solar, storage, and hybrids/EVs has placed it in the top five in the category every year; it's fourth in 2016 after three years at #3.

# TECHNOLOGY



RANK	STATE	LEADERSHIP SCORE
1	California	94.4
2	Vermont	81.7
3	Oregon	59.4
4	Hawaii	58.8
5	Washington	55.4
6	Massachusetts	52.1
7	Colorado	50.6
8	Nevada	46.4
9	Maine	43.0
10	Minnesota	42.6
11	Arizona	42.4
12	Iowa	41.5
13	South Dakota	41.4
14	Idaho	40.8
15	Maryland	39.8
16	Utah	39.5
17	Illinois	36.1
18	Virginia	35.5
19	New York	35.0
20	Georgia	34.7
21	Oklahoma	32.1
22	Texas	30.5
23	Michigan	30.0
24	New Hampshire	28.6
25	Connecticut	28.1
26	New Mexico	27.9
27	Rhode Island	27.2
28	Wisconsin	27.2
29	Kansas	26.0
30	North Carolina	26.0
31	Pennsylvania	25.0
32	Delaware	24.3
33	New Jersey	22.4
34	Indiana	21.4
35	North Dakota	20.8
36	Nebraska	20.7
37	Ohio	20.3
38	Alaska	19.6
39	Montana	19.6
40	South Carolina	18.8
41	Florida	17.7
42	Missouri	17.2
43	Tennessee	16.6
44	Wyoming	16.0
45	Kentucky	11.7
46	Alabama	10.6
47	Arkansas	10.4
48	Mississippi	3.5
49	West Virginia	2.9
50	Louisiana	1.9

# TECHNOLOGY OVERVIEW

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

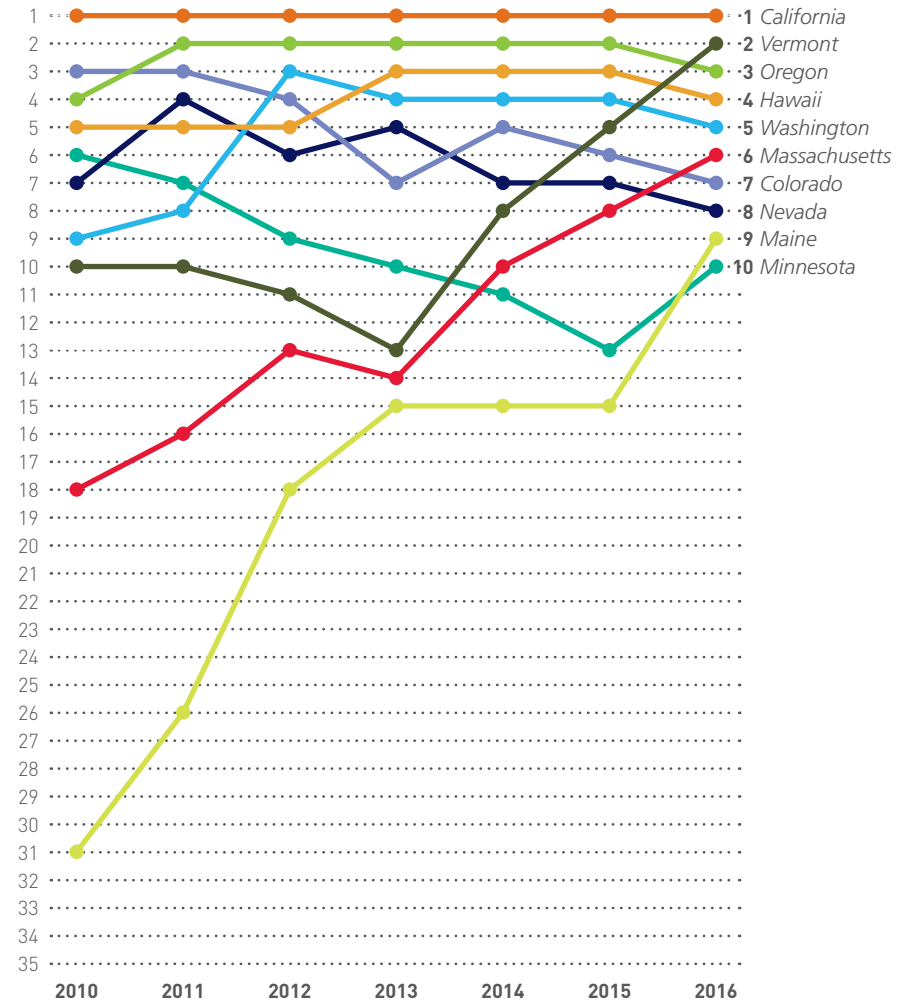
- Clean Electricity (renewable energy generation, energy storage, fuel cell deployment)
- Clean Transportation (use of electric vehicles, hybrids, plug-in hybrids, biofuels, natural gas vehicles, charging/fueling infrastructure)
- Energy Intelligence & Green Building (green building projects, smart grid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

The three subcategories are weighted equally.

For the seventh straight year, California leads the Technology category in 2016 by a substantial margin. But for the first time in five years, the Golden State has ceded the #1 spot in one of the three Technology subcategories, as Vermont surged 12 places to rank first in Clean Electricity (see details below). Vermont (with notable advances in all three subcategories) places second in Technology with a score of 81.7, trailing California's 94.4; last year, California led the field by more than 30 points. After the top two, five other states among the overall top 10 – Oregon (which had held the #2 spot in the category since 2011), Hawaii, Washington, Massachusetts, and Colorado – make the top 10 in Technology, as they did in 2015.

The historical trajectories of the top 10 Technology states over the Index's seven years (see table on this page) show two New England states – Massachusetts and Maine – moving from also-rans to national leaders alongside Vermont and the

2016 TOP 10 TECHNOLOGY (INCLUDING HISTORICAL RANKINGS)



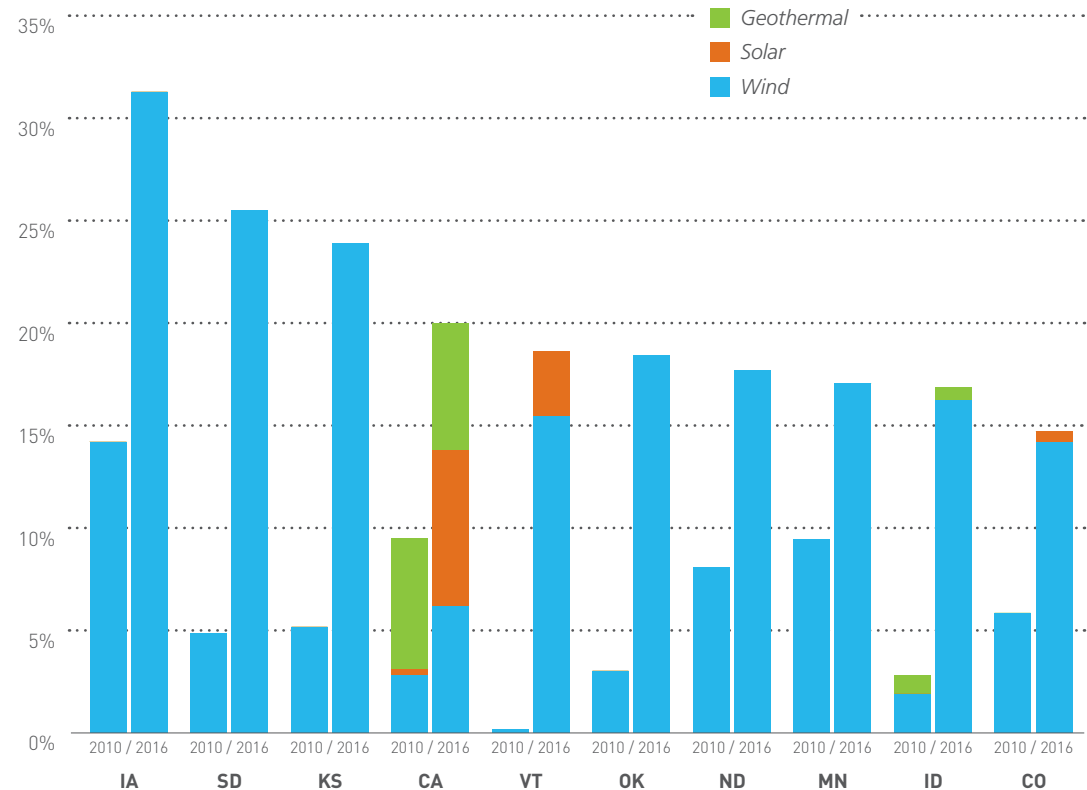
Source: U.S. Clean Tech Leadership Index, Clean Edge, Inc.

traditional resource-rich clean-energy deployment champions from the West and Midwest. Massachusetts, #18 in 2010, has improved its ranking every year but one and claims its highest-ever place of sixth in 2016. The Bay State jumped four places in utility-scale generation, and ranks in the top 10 in utility-scale solar, distributed solar, energy storage (#1), hybrid and plug-in hybrid vehicles, and EV charging stations. Maine, the national leader in biomass generation, joins the top 10 for the first time this year at #9 after three years at 15th; back in 2010, the state was a lowly 31st. Nevada (26th in the overall Index), Maine (18th) and Minnesota (15th) are the three Technology top 10 states ranking lowest overall in the Leadership Index.

### Clean Electricity

Although helped by the “law of small numbers” – Vermont’s population is 49th in the nation, about 1/60th that of California’s – its rise to the top is nonetheless remarkable. With its Vermont Yankee nuclear plant shuttered in late 2014, the tiny state has significantly increased both renewables and efficiency. Vermont jumped 11 places in the utility-scale clean electricity generation indicator (solar, wind, and geothermal as a percentage of total generation) from 16th to fifth, with 18.6%. Add in the state’s notable hydro and biomass generation, and the state was virtually 100% clean energy-powered in 2015, at 99.8%. And this snowy winter

2016 TOP 10 CLEAN ELECTRICITY GENERATION STATES  
(WIND, SOLAR, GEOTHERMAL), % OF TOTAL ELECTRICITY, 2010 AND 2016



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



## UTILITY-SCALE WIND ELECTRICITY GENERATION (2015)

STATE	RANK	% OF TOTAL GENERATION	THOUSAND MWH
IOWA	1	31.27%	17,878
SOUTH DAKOTA	2	25.49%	2,481
KANSAS	3	23.87%	10,927
OKLAHOMA	4	18.43%	14,018
NORTH DAKOTA	5	17.69%	6,530
MINNESOTA	6	17.04%	9,797
IDAHO	7	16.20%	2,457
VERMONT	8	15.45%	323
COLORADO	9	14.17%	7,441
OREGON	10	11.34%	6,675

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.**

paradise in northern New England is #3 in the nation in its share of electrons from both utility-scale solar (behind California and Nevada) and distributed PV (behind Hawaii and California).

The distributed solar PV indicator is new to the Index this year, reflecting its growing (and often controversial) significance in the leading solar states. Five states generated more than 600 GWh from distributed solar systems in 2015, led by California's 5,139. Hawaii's share of total generation from distributed solar exceeded 6% – considerably more than its utility-scale share of just .81%. California is the runaway leader in utility-scale solar, garnering 7.6% of its power (more than 15,000 GWh) from solar



## TOTAL SOLAR ELECTRICITY GENERATION (2015)

STATE	RANK	UTILITY-SCALE % OF TOTAL GENERATION	DISTRIBUTED GENERATION % OF TOTAL GENERATION	% OF TOTAL GENERATION	UTILITY-SCALE THOUSAND MWH	DISTRIBUTED THOUSAND MWH
CALIFORNIA	1	7.58%	2.60%	10.18%	15,007	5,139
HAWAII	2	0.81%	6.11%	6.92%	80	607
VERMONT	3	3.16%	2.58%	5.74%	66	54
NEVADA	4	4.36%	0.41%	4.77%	1,694	160
MASSACHUSETTS	5	2.14%	2.08%	4.22%	690	673
ARIZONA	6	3.10%	1.01%	4.11%	3,516	1,140
NEW JERSEY	7	1.10%	1.52%	2.62%	824	1,145
NEW MEXICO	8	1.97%	0.42%	2.39%	646	138
DELAWARE	9	0.80%	0.83%	1.63%	62	64
NORTH CAROLINA	10	1.42%	0.07%	1.49%	1,834	90

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.**

farms in 2015. Nevada, whose regulators ended the state's net metering policies for distributed solar in late 2015, was second in utility-scale solar at 4.4%.

Wind power remains the biggest contributor of clean electrons in most states with significant percentages of in-state clean electricity generation. A dozen states generated at least 10% of their power from wind in 2015 (with Texas's 9.98% rounded up); perennial leader Iowa tops the field once again, this time exceeding the historic 30% threshold at 31.3%. South Dakota and Kansas surpassed 20%. Vermont impresses here too, ranking #8 in the indicator (a 12-place jump from the previous year) at 15.5%; it's the only Eastern state in the top 10.



## HYBRID ELECTRIC VEHICLES (REGISTERED VEHICLES, 2015)

STATE	RANK	HEVS PER 1M PEOPLE	TOTAL HEVS
CALIFORNIA	1	22,940.15	897,988
WASHINGTON	2	18,840.50	135,093
OREGON	3	18,574.69	74,837
VERMONT	4	17,168.18	10,748
HAWAII	5	14,776.44	21,154
VIRGINIA	6	14,569.02	122,132
NEW HAMPSHIRE	7	13,882.38	18,472
MASSACHUSETTS	8	13,826.64	93,944
MARYLAND	9	13,434.00	80,690
COLORADO	10	12,729.23	69,458

Source: IHS Automotive and Census Bureau data with Clean Edge analysis. IHS Automotive data is a snapshot of every vehicle in operation as of the end of 2015.

**Full dataset available to subscription clients.**

When hydro and biomass are included along with wind, solar, and geothermal, nearly half the states (22) exceeded 10% of their generation from clean sources in 2015. In addition to Vermont, five states exceeded 66%: Washington, South Dakota, Idaho, Oregon, and Maine. Three states – Massachusetts, Virginia, and South Carolina – surpassed 10% in installed energy storage capacity as a percentage of total capacity.

## Clean Transportation

For the past four indexes, the top five rankings in the Clean Transportation subcategory remained virtually unchanged. California, Utah, and Hawaii held the first three spots, with Oregon and Washington essentially trading off #4 and #5.



## ELECTRIC VEHICLES (REGISTERED VEHICLES, 2015)

STATE	RANK	EVS PER 1M PEOPLE	TOTAL EVS
CALIFORNIA	1	2,619.17	102,527
HAWAII	2	2,271.58	3,252
GEORGIA	3	1,937.57	19,792
WASHINGTON	4	1,689.32	12,113
OREGON	5	1,292.64	5,208
ARIZONA	6	770.79	5,263
COLORADO	7	603.13	3,291
VERMONT	8	503.16	315
UTAH	9	486.66	1,458
NEVADA	10	469.07	1,356

Source: IHS Automotive and Census Bureau data with Clean Edge analysis. IHS Automotive data is a snapshot of every vehicle in operation as of the end of 2015. NOTE: This does not include plug-in hybrids, which are tracked as a separate indicator.

**Full dataset available to subscription clients.**

But as in Clean Electricity, Vermont shakes things up in this year's Index, vaulting four places to #3 and pushing Hawaii and the two Pacific Northwest neighbors down one notch each. Vermont leads the nation in EV charging stations, is second in plug-in hybrids, fourth in hybrids, and eighth in EVs (all indicators per million people). California continues to set the clean-vehicle pace for the U.S., as it has for all seven years of the Index, leading in hybrids, plug-in hybrids, and EVs per million people. In 2015, those three types of clean vehicles exceeded one million for the first time, and California also has nearly 25,000 registered natural gas vehicles.

Utah's #2 rank in the subcategory stems from its leadership in natural gas vehicles and compressed natural gas fueling stations. Utah has more than 1,265 NGVs per million

people. Five states (California, Hawaii, Georgia, Washington, and Oregon) now have more than 1,000 EVs per million people; 17 states exceed 10,000 hybrids per million.

## Energy Intelligence and Green Building

The top five states in this subcategory remain the same as in last year's Index, but only #1 California and #3 Vermont kept the same positions. Massachusetts jumped two places to second, Maryland moved up one spot to fourth, and Colorado fell three places to fifth. The biggest mover in the top 10 was Minnesota, rising five places to 10th, aided by an eight-place jump in the grid modernization indicator (as measured by its ranking in the latest edition of GridWise Alliance's Grid Modernization Index, produced in partnership with Clean Edge).

In green building metrics, Vermont supplanted Colorado as the leader in LEED-certified projects per million people; Maryland and New Mexico each moved up two places to third and fourth, respectively. In LEED square feet per million people, Illinois took over the top spot from Nevada. Colorado remained #1 in Energy Star buildings, in both the projects and square feet indicators.

Nevada overtook Maine as the leader in smart meter market penetration, exceeding 95% of all meters in the Silver State (at the end of 2014, the most recent year with available data). But the most notable result in this indicator may be Alabama's; ranked just 44th in the overall Index, the state vaulted 26 places to seventh, reaching 72.2% market penetration. Overall, 16 states exceeded 50% smart meter market penetration.



## LEED BUILDING DEPLOYMENT (2015)

STATE	RANK	PROJECTS PER 1M PEOPLE	CERTIFIED PROJECTS	PLATINUM PROJECTS	GOLD PROJECTS	SILVER PROJECTS
VERMONT	1	145.36	91	7	33	29
COLORADO	2	145.15	792	58	345	239
MARYLAND	3	133.36	801	30	354	272
NEW MEXICO	4	127.09	265	8	109	110
WASHINGTON	5	126.91	910	52	379	327
OREGON	6	119.88	483	60	246	118
VIRGINIA	7	118.22	991	35	347	388
MASSACHUSETTS	8	116.86	794	53	369	213
HAWAII	9	104.08	149	13	68	46
CALIFORNIA	10	100.78	3,945	357	1,618	1,239

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 2015. This does not include LEED for Homes projects.

Full dataset available to subscription clients.



## SMART METER MARKET PENETRATION (2014)

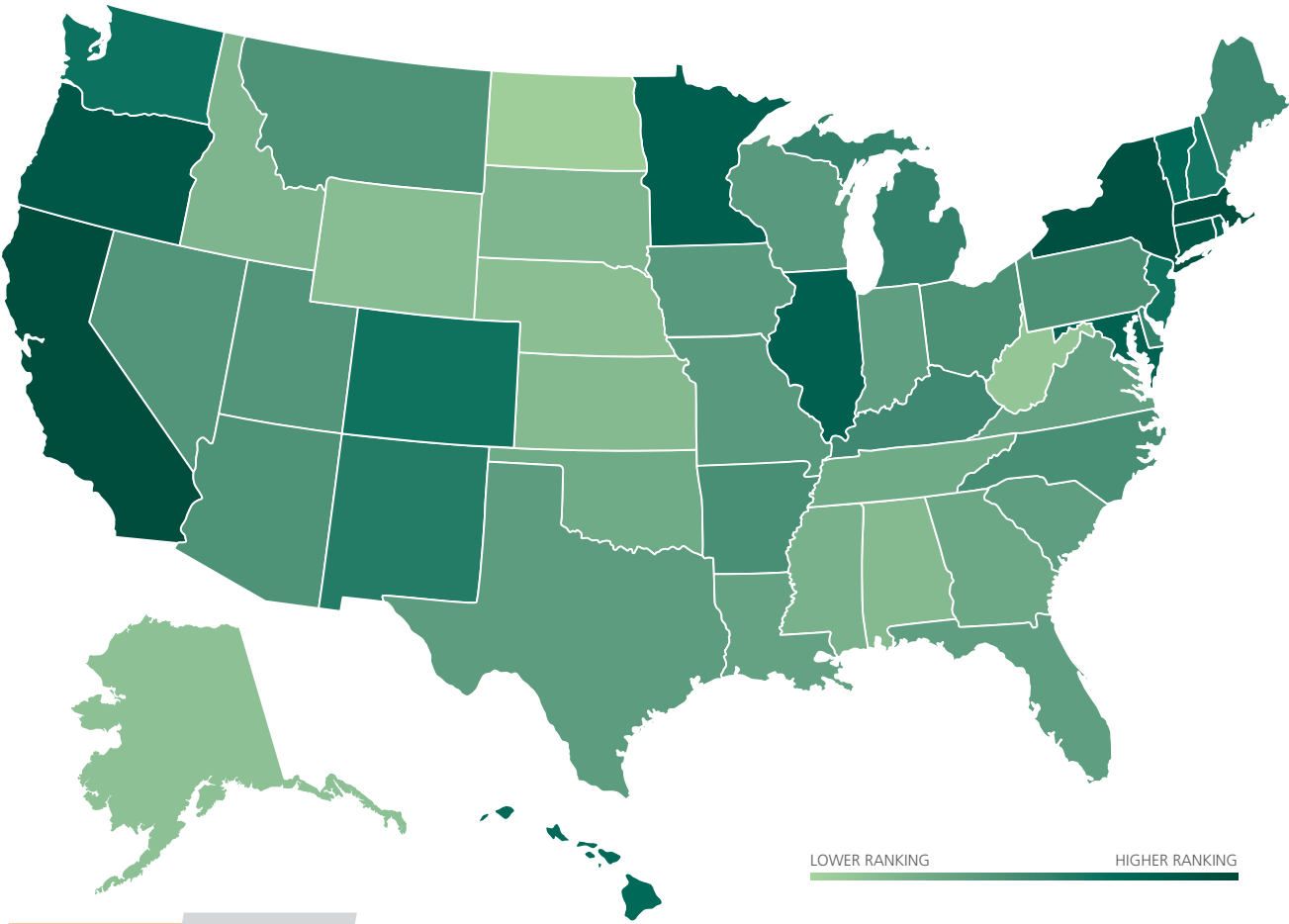
STATE	RANK	% OF SMART METERS	TOTAL SMART METERS
NEVADA	1	95.52%	1,213,192
MAINE	2	91.73%	741,819
GEORGIA	3	87.00%	3,936,081
VERMONT	4	83.91%	296,824
CALIFORNIA	5	82.03%	12,394,671
ARIZONA	6	74.42%	2,220,125
ALABAMA	7	72.20%	1,766,148
IDAHO	8	71.16%	576,309
TEXAS	9	69.85%	8,157,050
DELAWARE	10	69.68%	307,168

Source: EIA data with Clean Edge analysis.

Full dataset available to subscription clients.



# POLICY



LOWER RANKING  HIGHER RANKING

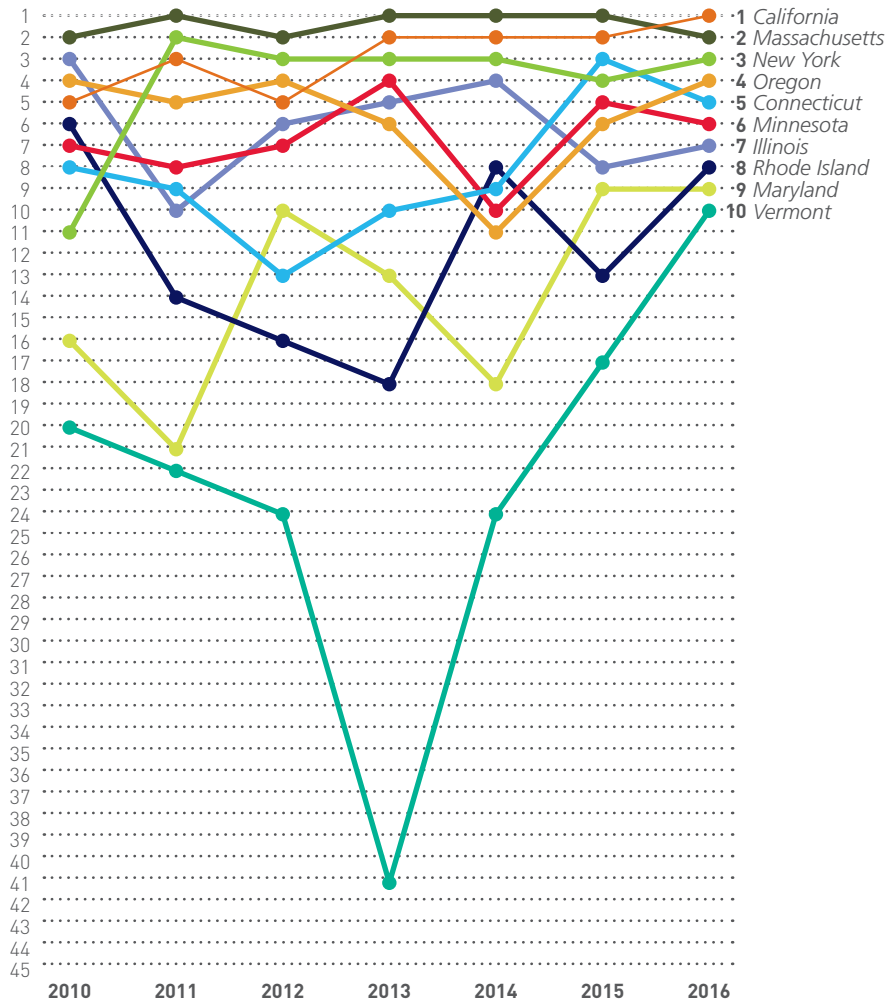
RANK	STATE	LEADERSHIP SCORE	
1	California	95.8	
2	Massachusetts	94.1	
3	New York	93.4	
4	Oregon	88.5	
5	Connecticut	87.1	
6	Minnesota	81.5	
7	Illinois	80.5	
8	Rhode Island	80.1	
9	Maryland	79.8	
10	Vermont	74.5	
11	Hawaii	73.5	
12	Washington	67.5	
13	New Jersey	67.3	
14	Colorado	66.9	
15	New Hampshire	64.5	
16	New Mexico	59.9	
17	Michigan	56.1	
18	Delaware	55.7	
19	Maine	51.5	
20	Kentucky	51.3	
21	Arkansas	46.7	
22	North Carolina	46.7	
23	Ohio	46.4	
24	Pennsylvania	46.3	
25	Arizona	44.6	
26	Montana	44.6	
27	Utah	42.9	
28	Nevada	42.8	
29	Iowa	40.0	
30	Wisconsin	39.7	
31	Missouri	39.4	
32	Texas	38.0	
33	South Carolina	37.3	
34	Florida	37.3	
35	Indiana	36.6	
36	Virginia	34.1	
37	Louisiana	33.8	
38	Georgia	30.0	
39	Tennessee	28.3	
40	Oklahoma	28.0	
41	Mississippi	23.7	
42	Idaho	20.6	
43	South Dakota	20.3	
44	Alabama	17.1	
45	Kansas	16.7	
46	Wyoming	15.7	
47	Nebraska	13.9	
48	Alaska	12.9	
49	West Virginia	10.4	
50	North Dakota	3.8	

# POLICY OVERVIEW

The Policy category of the State Index 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 renewable portfolio standards (RPS) and net metering and interconnection standards; and Incentives, the proverbial “carrots,” which rewards states for incentivizing renewable electricity, efficiency, and advanced vehicle deployment. The Policy category has undergone a few slight modifications this year. The RPS indicator has been strengthened to provide additional credit for states that set the most aggressive standards; and a state’s adoption of community choice aggregation (CCA) – wherein communities combine their electricity demand to purchase cheaper (primarily renewable) generation – has been added to the Incentives subcategory.

California is the new king of clean-tech policy, after having finishing second to Massachusetts for three consecutive years. While not finishing at the top of either subcategory, California’s #2 ranking in Regulations and Mandates and third-place finish in Incentives still give it the edge. One of the policies that put the Golden State over the top is its October 2015 mandate, signed by Governor Jerry Brown, to up its RPS goal to 50% by 2030. That puts it in elite company: only three other states – Oregon (#4 in the category), Vermont (#10), and Hawaii (#11, missing out on the top 10 by a single point) – receive credit for having a RPS goal of 50% or greater. All four have strengthened their targets since mid-2015. Hawaii went the furthest, mandating 100% renewable electricity by 2045. In New York (#3),

2016 TOP 10 POLICY (INCLUDING HISTORICAL RANKINGS)



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

Governor Andrew Cuomo has directed state regulators to craft a plan for a 50% RPS by 2030, but it is not yet official policy. Cuomo's directive follows on the progress made by the REV initiative, which he announced in 2014 and which aims to completely overhaul the electric utility industry in the state.

The remainder of the top 10 consists of Massachusetts (down one to second), New York, Connecticut (#5), Minnesota (#6), Illinois (#7), Rhode Island (#8), and Maryland (#9). Oregon moves up one spot into the pole position in the Regulations and Mandates subcategory, while Massachusetts and New York tie for the top spot in Incentives.

As can be seen on the chart on page 18, many of these states – California, Massachusetts, New York, and Oregon among them – have been Policy leaders in the Index for some time. Others – like Rhode Island, Maryland, and Vermont – are relative newcomers to the leaderboard. Vermont's rise has been particularly meteoric. It was 41st as recently as the 2013 Index, but leaps up to 10th in 2016. Vermont's policy *piece de resistance* is its 75%-by-2032 RPS, which went into effect in July 2015.

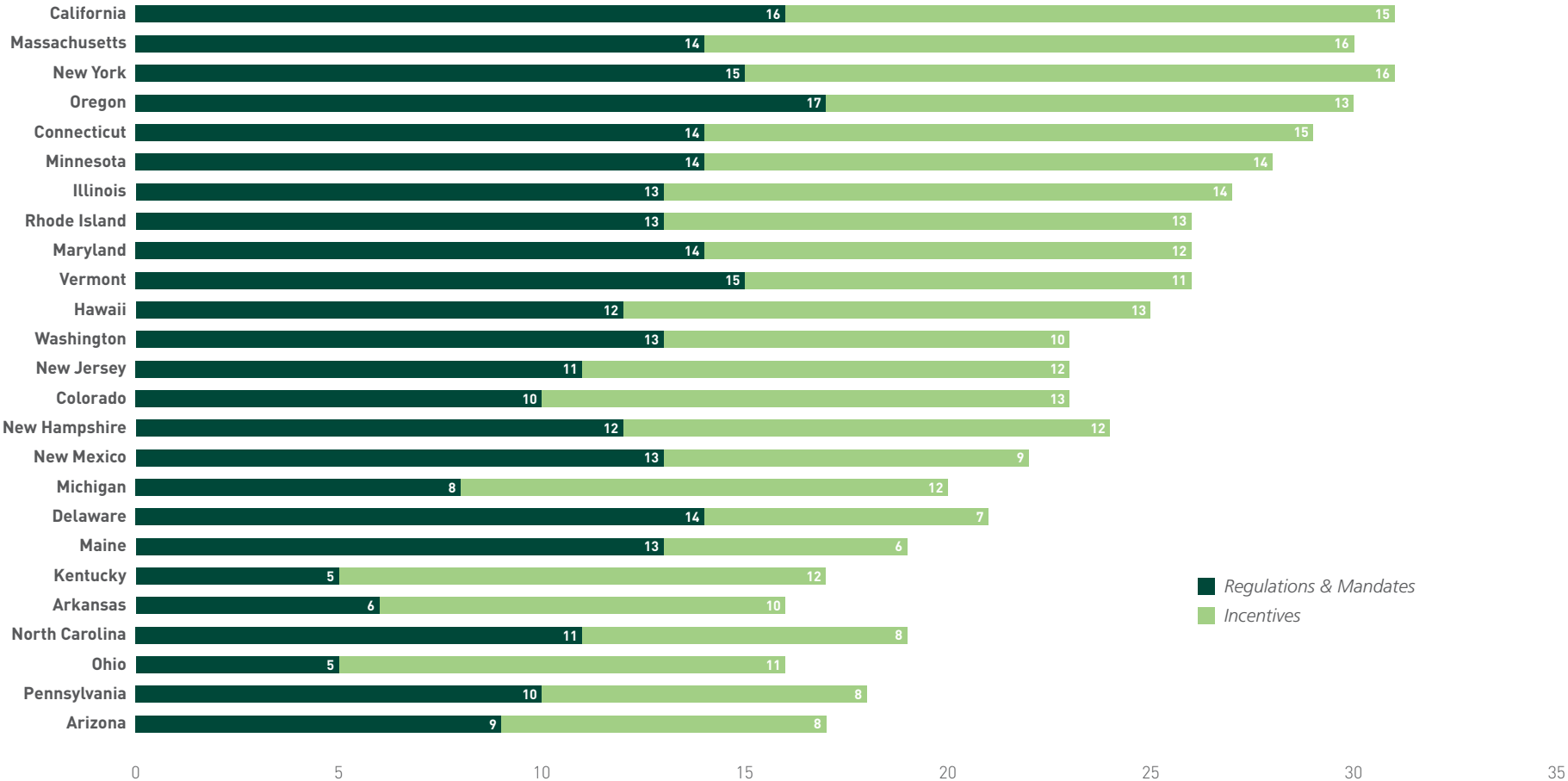
There is plenty of overlap between the category and subcategory leaders. Eight of the category's top 10 appear at least once in the subcategory top rankings, while six states rank in the top 10 in both subcategories. Geographically, the coasts dominate the category, with Colorado, Illinois, and Minnesota being the only lead-

ers that aren't located on the East or West Coasts. Minnesota, like New York, is in the midst of an effort - dubbed the e21 Initiative - to shift away from a large, one-size-fits-every customer utility business model to a performance-based system that offers consumers more options.

The top-ranking states share several common policies. The top Regulations and Mandates states all have RPS and greenhouse gas (GHG) reduction targets, and eight of the top 10 are members of active cap-and-trade markets (California's internal market and the Regional Greenhouse Gas Initiative [RGGI] in the Northeast). They also score well on interconnection and net metering policies. The leading Incentives states, meanwhile, all encourage distributed renewables through property-assessed clean energy (PACE) financing and the permission of third-party renewable ownership. Eight of the top 10 allow community renewables, and five (out of just seven nationwide) allow CCA.

But states that don't currently perform as well in the Policy category are starting to get the message. South Carolina vaults 10 spots in Incentives to 18th, and four places in the overall category to 33rd, just by improving its net metering policy and reaching an agreement in May 2015 with Duke Energy to construct more than 50 MW of community solar. And Arkansas moves up nine places to 21st in Policy, the biggest improvement by any state, largely by also improving its net metering laws and creating new energy-efficiency bonds.

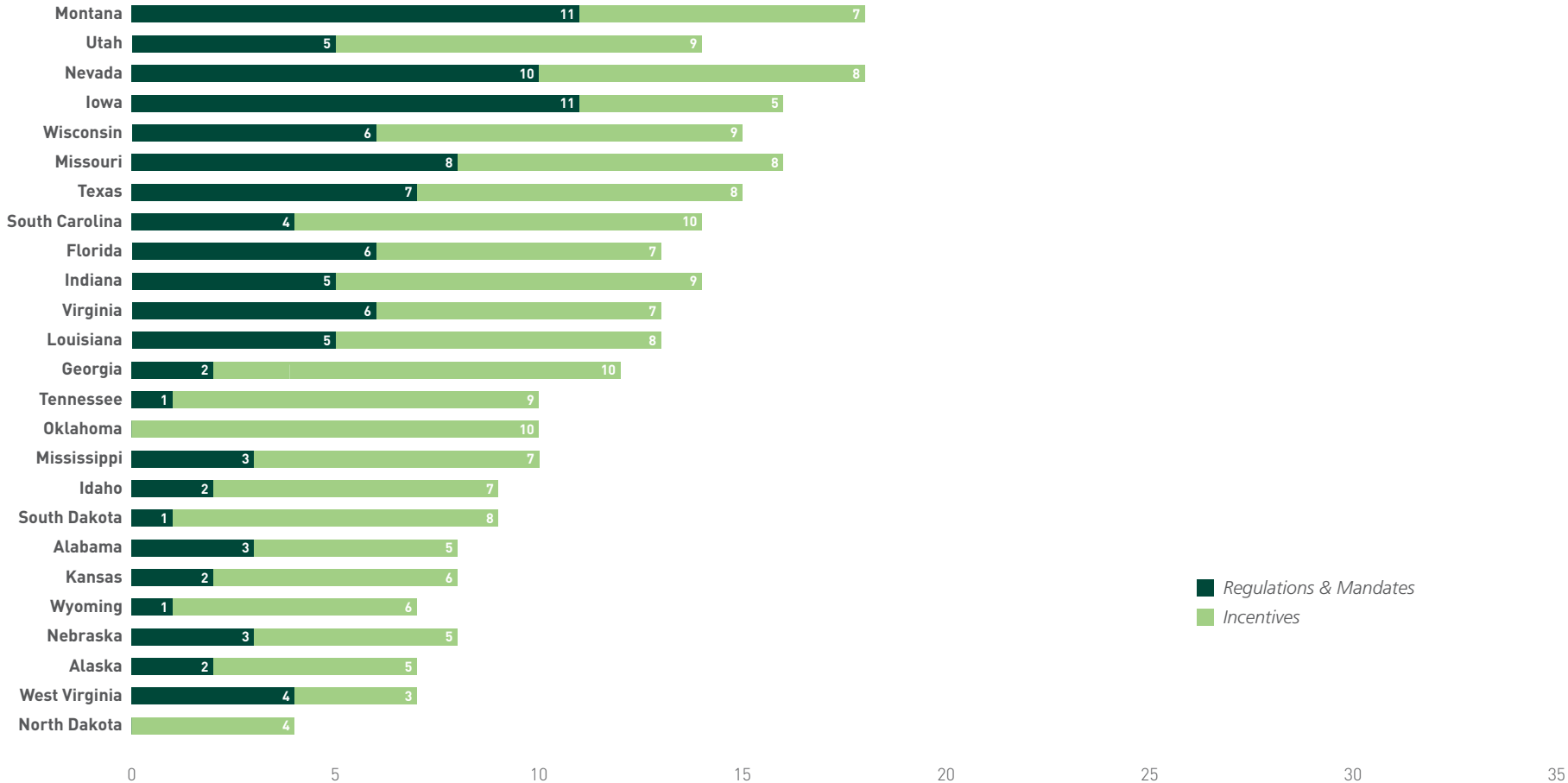
# NUMBER OF CLEAN TECH POLICIES ENACTED BY STATE (TOP 25)



Regulations & Mandates  
Incentives

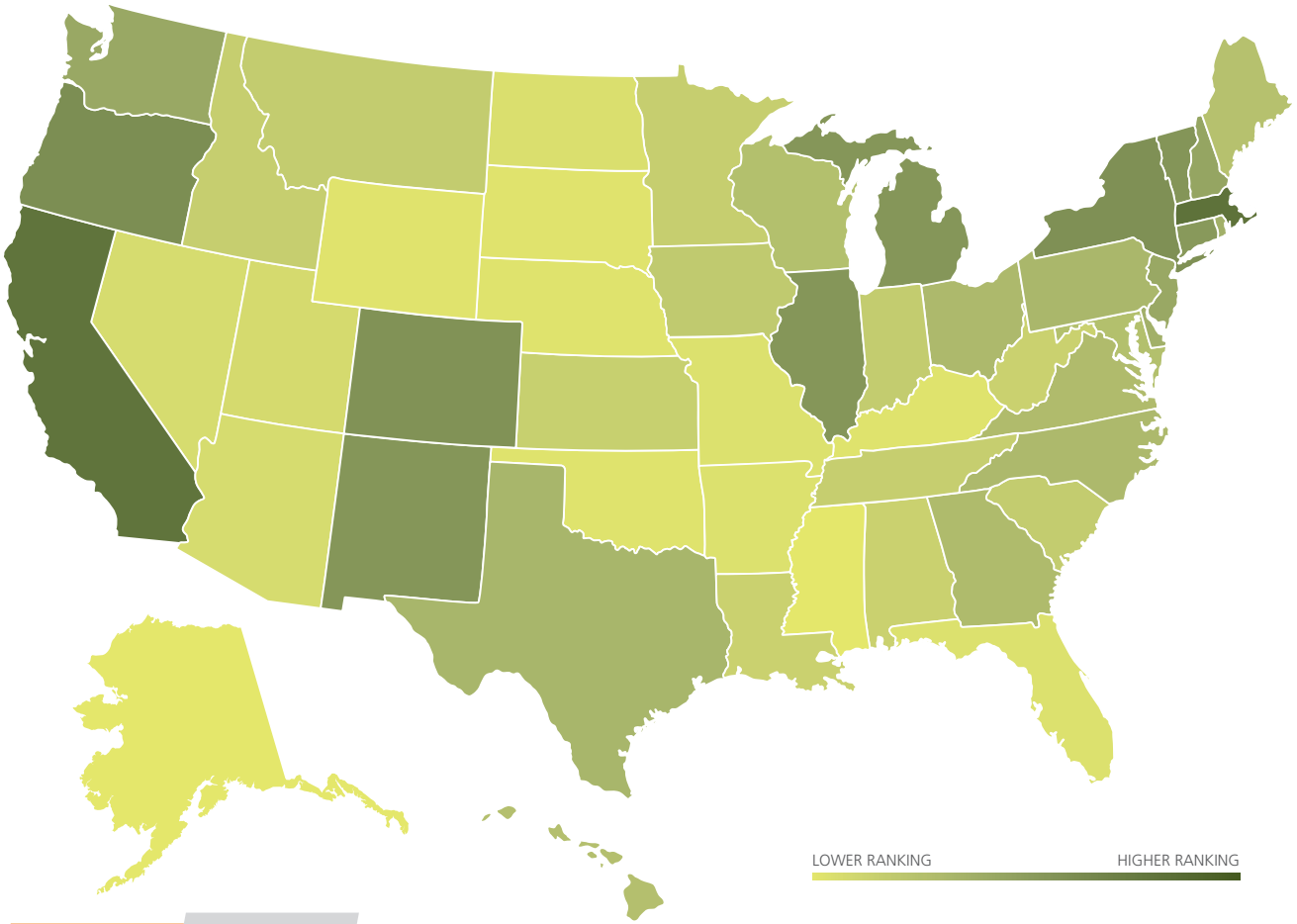
Note: The above table and rankings are based on the "Regulations & Mandates" and "Incentives" subcategories of the U.S. Clean Tech Leadership Index, such as renewable portfolio standards (RPS), utility on-bill financing, net metering, third-party renewable ownership, and building codes. Sources include ACEEE, the Building Codes Assistance Project, C2ES, the Coalition for Green Capital, DSIRE, EQ Research, IREC, LEAN Energy US, Vote Solar, and the U.S. DOE and EPA. For Interconnection Law/Policy, Net Metering Law/Policy, Commercial Building Energy Policy, and Residential Building Energy Policy, credit is given to states scoring "2" or higher on 0-4 scale. Subscribers to Clean Edge's Leadership Index have access to the full dataset and policy checklist.

# NUMBER OF CLEAN TECH POLICIES ENACTED BY STATE (BOTTOM 25)



Note: The above table and rankings are based on the “Regulations & Mandates” and “Incentives” subcategories of the U.S. Clean Tech Leadership Index, such as renewable portfolio standards (RPS), utility on-bill financing, net metering, third-party renewable ownership, and building codes. Sources include ACEEE, the Building Codes Assistance Project, C2ES, the Coalition for Green Capital, DSIRE, EQ Research, IREC, LEAN Energy US, Vote Solar, and the U.S. DOE and EPA. For Interconnection Law/Policy, Net Metering Law/Policy, Commercial Building Energy Policy, and Residential Building Energy Policy, credit is given to states scoring “2” or higher on 0-4 scale. Subscribers to Clean Edge’s Leadership Index have access to the full dataset and policy checklist.

# CAPITAL



RANK	STATE	LEADERSHIP SCORE
1	Massachusetts	81.7
2	California	79.0
3	Oregon	60.6
4	New York	59.2
5	Colorado	58.4
6	Vermont	55.6
7	Michigan	54.9
8	Illinois	54.8
9	New Mexico	54.5
10	Connecticut	52.8
11	New Hampshire	44.7
12	Washington	42.5
13	New Jersey	42.3
14	Rhode Island	37.4
15	Delaware	37.3
16	Texas	33.1
17	Pennsylvania	32.2
18	Ohio	31.1
19	North Carolina	30.6
20	Georgia	30.1
21	Virginia	29.2
22	Hawaii	27.3
23	Maryland	26.0
24	Wisconsin	25.7
25	Maine	24.5
26	Iowa	19.1
27	South Carolina	17.1
28	Montana	16.8
29	Indiana	16.6
30	Minnesota	16.2
31	Tennessee	15.7
32	Idaho	15.7
33	Kansas	14.8
34	Louisiana	14.2
35	Alabama	14.0
36	West Virginia	13.6
37	Utah	7.8
38	Nevada	7.1
39	Arizona	6.9
40	North Dakota	4.6
41	Missouri	4.2
42	Florida	4.1
43	Arkansas	3.6
44	Nebraska	3.2
45	Oklahoma	2.8
46	Kentucky	2.7
47	Wyoming	2.4
48	South Dakota	1.7
49	Mississippi	0.4
50	Alaska	0.0

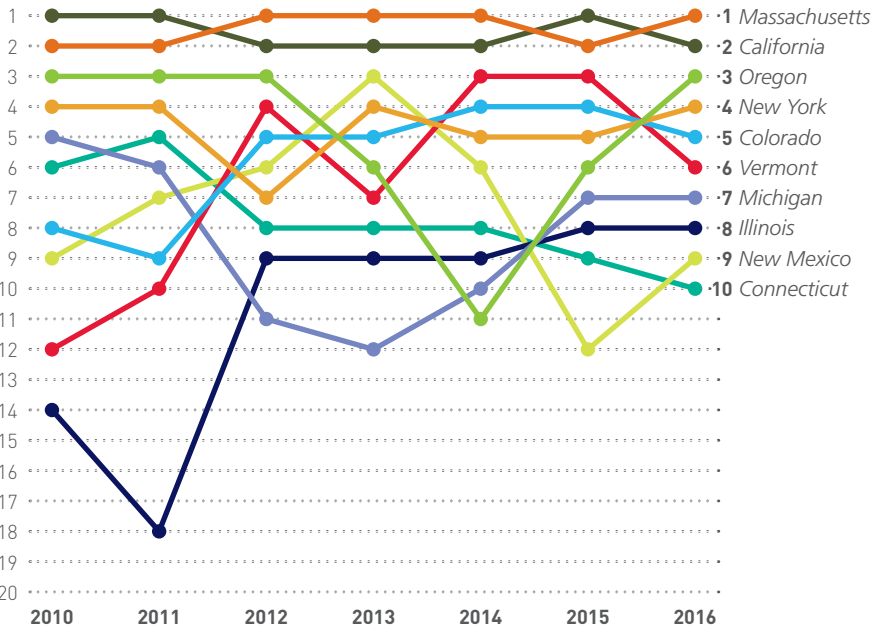
# CAPITAL OVERVIEW

The Capital category might be the most stable of the three State Index categories. As can be seen in the graph on the right, five of this year's top 10 states have been in the top 10 in all seven years of the Index, and Massachusetts and California have been the top two Capital states in all seven years. They switch places in 2016, with Massachusetts reclaiming the top spot it lost in 2015. While both states excel in all facets of the category, it's the venture capital (VC) indicators where Massachusetts separates itself. From 2013 to 2015, it received \$262 per capita in VC investment, easily besting California. That indicator helps make Massachusetts tops in the Financial Capital subcategory, as well. Colorado, New York, and Connecticut are the other three top 10 stalwarts.

The Financial Capital subcategory measures VC investment in clean-tech companies and energy utility investments, while the Human and Intellectual Capital subcategory evaluates states on their rate of clean-tech patent acquisition, and whether they have top-notch energy research labs and clean-tech incubator facilities. The only modification to the category from the 2015 Index involves tracking utility energy efficiency program spending rather than program budgets, as we had in the past.

After Massachusetts and California, the remainder of the Capital category top 10 consists of Oregon, New York, Colorado, Vermont, Michigan, Illinois, New Mexico and Connecticut. The Human and Intellectual Capital subcategory has the exact same top 10 as the overall category, though in a different order. Michigan leads

2016 TOP 10 CAPITAL (INCLUDING HISTORICAL RANKINGS)



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



## CLEAN ENERGY VENTURE CAPITAL INVESTMENT (DOLLARS PER CAPITA, 2015)

STATE	RANK	DOLLARS INVESTED PERCAPITA	TOTAL DOLLARS (\$, MILLIONS)	TOTAL DEALS
MASSACHUSETTS	1	<b>\$119.59</b>	\$812.6	64
CALIFORNIA	2	<b>\$73.94</b>	\$2,894.3	191
WASHINGTON	3	<b>\$23.80</b>	\$170.6	24
TEXAS	4	<b>\$15.55</b>	\$427.1	22
COLORADO	5	<b>\$14.86</b>	\$81.1	23
MARYLAND	6	<b>\$14.00</b>	\$84.1	9
NEW MEXICO	7	<b>\$12.32</b>	\$25.7	8
NEW JERSEY	8	<b>\$10.85</b>	\$97.2	3
GEORGIA	9	<b>\$10.31</b>	\$105.3	8
VIRGINIA	10	<b>\$8.65</b>	\$72.5	9

Source: Cleantech Group and U.S. Census Bureau data with Clean Edge analysis. Cleantech Group investment data used includes venture and growth financing rounds in the following sectors: Advanced Materials, Agriculture & Food, Air, Biofuels & Biomaterials, Biomass Generation, Energy Efficiency, Energy Storage, Fuel Cells & Hydrogen, Geothermal, Hydro & Marine Power, Recycling & Waste, Smart Grid, Solar, Transportation, Water & Wastewater, Wind, and Other Cleantech.

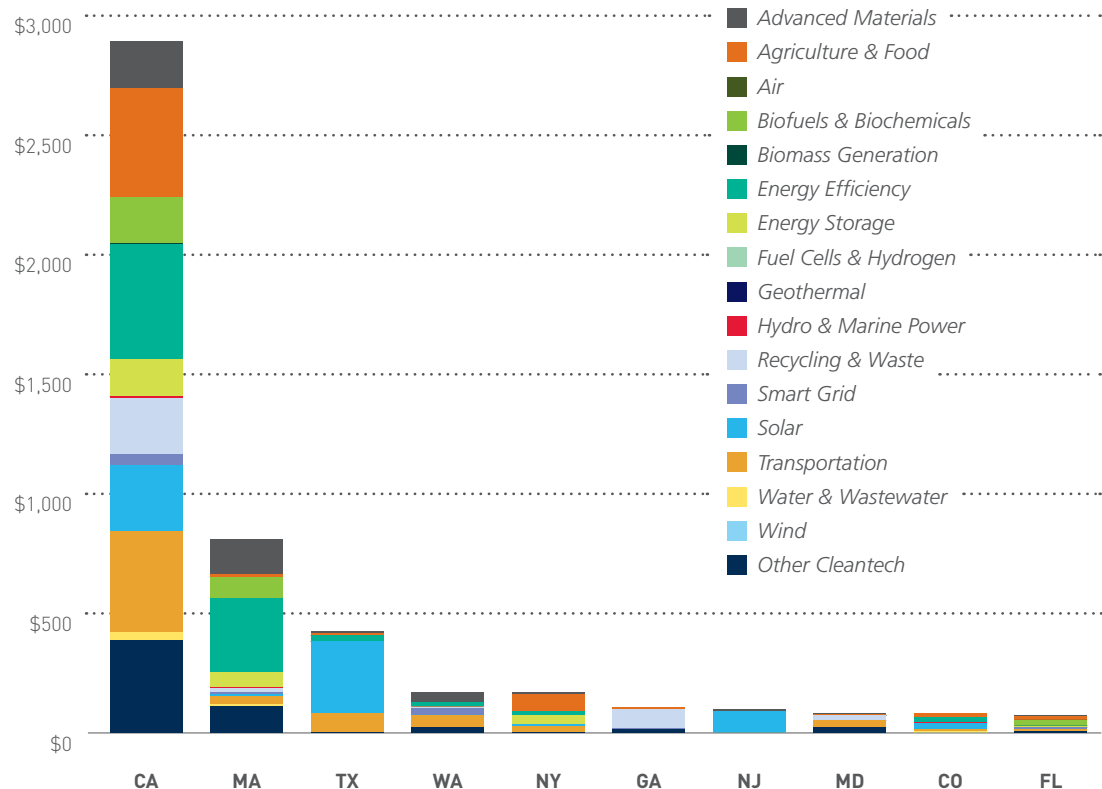
**Full dataset available to subscription clients.**

the subcategory on the strength of its patent activity and its network of incubators and research institutions. Rhode Island, Montana, and New Hampshire all show up on the Financial subcategory leaderboard, but are not among the category-level leaders.

2015 saw a total of nearly \$5.4 billion in clean-tech VC investment in the U.S., down about 3% from 2014. Total



## 2015 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.**



deals, meanwhile, were down more than 12% in 2015, leading to an increase in the average deal size to almost \$10.5 million. The top 10 VC states (particularly Massachusetts and California) continued to rake in the dollars, receiving 91% of all VC dollars in 2015 (for comparison, the 2014 top 10 VC states received 89% of VC dollars). Energy efficiency received the most VC money in 2015, accounting for 16.4% of all clean-tech VC dollars. The year's biggest VC deals in the top two states were both efficiency-related: \$175 million to Simplivity in Westborough, Mass., and \$150 million to View in Milpitas, Calif. Transportation, solar, and agriculture and food were the next-most popular categories, each bringing in between 12 and 15% of the total VC dollars.

The patent numbers echo some of the same patterns as VC investment. Solar, fuel cell, hybrid electric vehicle, and wind power technologies received the vast majority of clean-tech patents in 2015, underlining the attention being paid to modernizing our electricity and transportation systems. As with VC, states seem to specialize in certain patent categories. Michigan, home of the Motor City, unsurprisingly leads in hybrid and fuel cell patents, while sunny California receives nearly one-third of the nation's solar patents. Tiny Delaware (home of DuPont) once again led the pack in patents per million people in 2015, despite getting only 26 total patents.

New England dominates in utility energy efficiency spending, placing four of its six states (including #1 Rhode Island) among the five states spending the most money per capita on efficiency. In fact, all of the RGGI states except Delaware slot into the top half of this indicator. That's no surprise, since an April 2015 RGGI program report noted that, through 2013, 62% of all RGGI investments went towards energy efficiency.



### CLEAN ENERGY PATENTS GRANTED (2015)

STATE	RANK	PATENTS PER 1 MILLION PEOPLE	TOTAL PATENTS
DELAWARE	1	27.5	26
MICHIGAN	2	26.7	265
NEW MEXICO	3	16.8	35
CALIFORNIA	4	9.2	359
COLORADO	5	7.9	43
CONNECTICUT	6	6.4	23
MASSACHUSETTS	7	6.3	43
NEW YORK	8	6.3	124
NEW HAMPSHIRE	9	6.0	8
VERMONT	10	4.8	3

Source: Data from Heslin Rothenberg Farley & Mesiti P.C. and U.S. Census Bureau with Clean Edge analysis.  
Full dataset available to subscription clients.

The final three Capital indicators judge states on whether they have a Department of Energy research facility, a clean-tech incubator facility, and a university with a top “green” Master’s program. Five states, all of which slot into the top eight in the category, are home to all three. Meanwhile, fourteen states have two out of the three, and an additional fourteen have one. Many of the incubators and top Master’s programs are located along the coasts and the Upper Midwest, with relatively few in the South and the middle of the country.

# 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., and IHS Automotive.

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 (2015)
Utility-Scale Clean Electricity Generation incl. Hydro & Biomass, GWh % of Total (2015)
Utility-Scale Wind Electricity Generation, % of Total (2015)
Utility-Scale Solar Electricity Generation, % of Total (2015)
Utility-Scale Geothermal Electricity Generation, % of Total (2015)
Utility-Scale Hydro Electricity Generation, % of Total (2015)
Utility-Scale Biomass Electricity Generation, MWh % of Total (2015)
Distributed Solar PV Generation, % of Total (2015)
Installed Energy Storage Capacity, MW % of Total (2015)

### CLEAN TRANSPORTATION

Hybrid Electric Vehicles Per 1M People (2015)
Electric Vehicles Per 1M People (2015)
Plug-In Hybrid Electric Vehicles Per 1M People (2015)
Natural Gas Vehicles Per 1M People (2015)
Electric Vehicle Charging Stations Per 1M People (2015)
E85 & B20 Fueling Stations Per 1M People (2015)
CNG Fueling Stations Per 1M People (2015)

### ENERGY INTELLIGENCE & GREEN BUILDING

Electricity Consumption Per Capita, Annual kWh (2015)
Electric Productivity, State GDP Dollars Per kWh Consumed (2014)
LEED-Certified Projects Per 1M People (2015)
LEED-Certified Square Feet Per Capita (2015)

### ENERGY INTELLIGENCE & GREEN BUILDING (CONT)

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

## 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

# 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 (2013-2015)
Venture Capital Investment, Deals Per 1M People (2013-2015)
Venture Capital Investment, \$ Per Capita (2015)
Venture Capital Investment, Deals Per 1M People (2015)
Utility Energy Efficiency Program Spending, \$ Per Capita (2014)
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)
Presence of DOE Lab
Presence of Clean Energy Incubator and/or Accelerator
Presence of Top-Ranked Green Master's Program



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# METRO INDEX

2016 U.S. Clean Tech Leadership Index

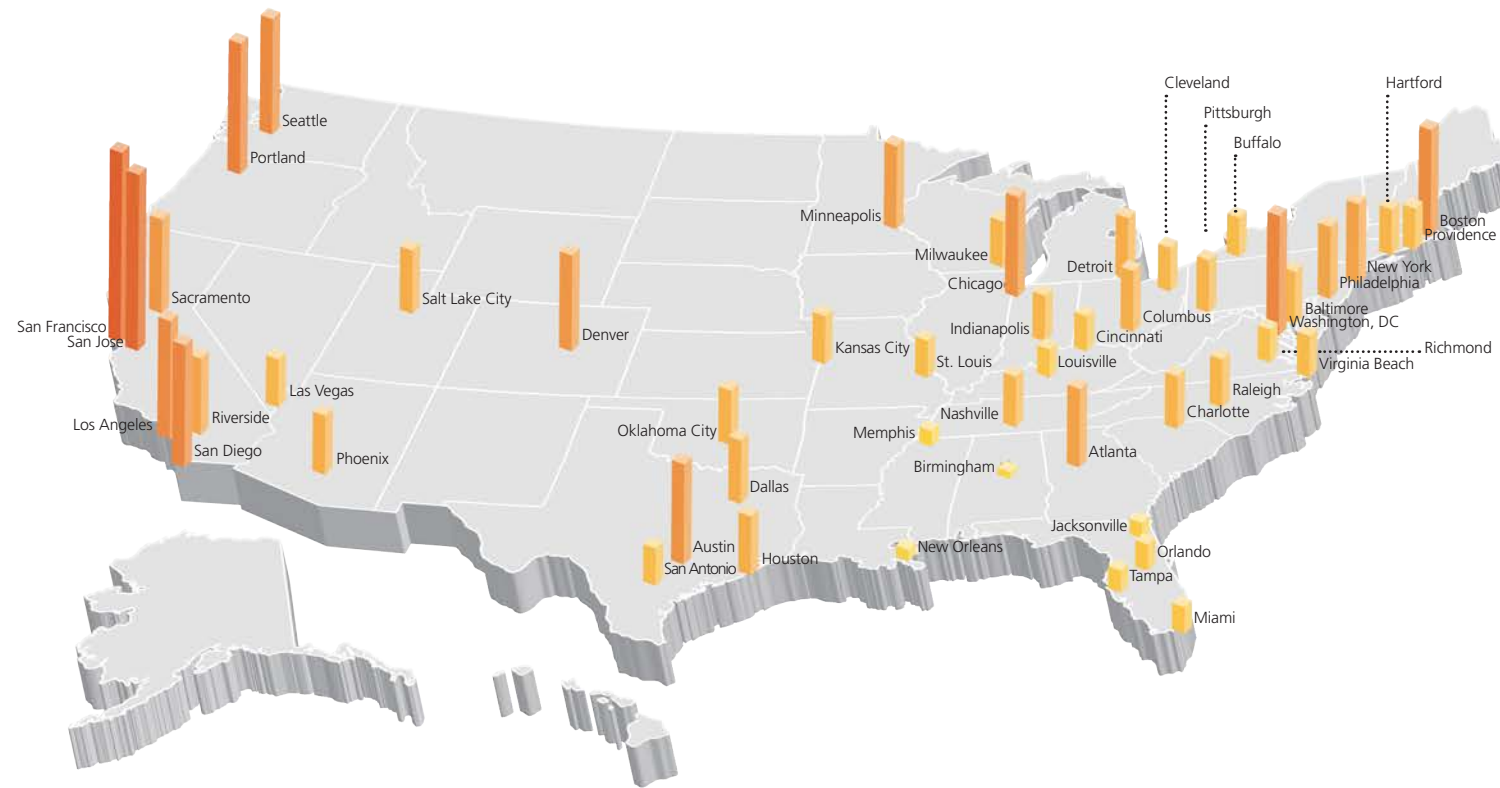
## Full Metro Index Datasets Available

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



LOWER RANKING  HIGHER RANKING

RANK	+/-	METRO AREA	LEADERSHIP SCORE
1	0	San Francisco, CA	90.0
2	0	San Jose, CA	87.5
3	1	San Diego, CA	55.8
4	-1	Portland, OR	52.4
5	0	Washington, DC	52.3
6	0	Los Angeles, CA	52.2
7	1	Boston, MA	48.8
8	-1	Seattle, WA	48.7
9	0	Austin, TX	44.1
10	0	Chicago, IL	42.9
11	1	Sacramento, CA	42.5
12	-1	Denver, CO	40.7
13	1	New York, NY	37.7
14	-1	Minneapolis, MN	36.7
15	1	Riverside, CA	33.7
16	-1	Atlanta, GA	33.5
17	1	Salt Lake City, UT	31.8
18	7	Pittsburgh, PA	28.5
19	-2	Philadelphia, PA	28.5
20	9	Kansas City, MO	28.1
21	-2	Dallas, TX	27.7
22	4	Baltimore, MD	27.1
23	-1	Houston, TX	25.7
24	-1	Phoenix, AZ	23.7
25	15	San Antonio, TX	23.1
26	-6	Detroit, MI	22.6
27	-6	Columbus, OH	22.6
28	0	Nashville, TN	21.3
29	-2	Charlotte, NC	20.7
30	3	Milwaukee, WI	19.9
31	-7	Oklahoma City, OK	19.7
32	-2	Raleigh, NC	19.7
33	1	Indianapolis, IN	19.7
34	1	Cleveland, OH	19.4
35	-4	Las Vegas, NV	18.2
36	0	Providence, RI	17.9
37	-5	Hartford, CT	15.8
38	3	Cincinnati, OH	15.7
39	0	St. Louis, MO	15.7
40	4	Miami, FL	14.7
41	4	Orlando, FL	14.1
42	-5	Virginia Beach, VA	13.5
43	-1	Richmond, VA	12.8
44	-6	Buffalo, NY	12.4
45	-2	Louisville, KY	12.1
46	0	Tampa, FL	10.6
47	0	Jacksonville, FL	7.4
48	0	Memphis, TN	5.6
49	0	New Orleans, LA	4.5
50	0	Birmingham, AL	2.7

# 2016 METRO INDEX RESULTS

Consistency is a theme among the metro areas leading the rankings of the 2016 Metro Clean Tech Leadership Index. The San Francisco Bay Area's dominance continues into its fifth year: San Francisco and San Jose have finished in the top two for each year the Index has been run, with San Francisco leading the pack for the last four years. However, San Francisco's lead has narrowed considerably, going from nearly 15 points in the 2014 Index to just 2.5 points in 2016. That being said, the two neighboring metros remain head and shoulders above the rest of the field, with #3 San Diego finishing more than 30 points behind San Jose.

The top 10 metros return intact this year from the 2015 Index, while their order has changed only slightly. San Diego snags the third spot from fourth-place Portland, with Washington, DC (#5), and Los Angeles (#6) following, but the difference between #4 Portland and #6 Los Angeles is only .15 points. Boston (#7) and Seattle (#8) change places, though they are virtually tied with only .03 points between them. Austin and Chicago round out the top 10, as they did last year.

## The Top 10 Metro Areas

**1 SAN FRANCISCO, CA** – Not only has the City by the Bay finished first or second in every year of the Index, but it places either first or second in all four categories in 2016. San Francisco saw a significant increase of 13 points in the Investment, Innovation, and Workforce category. It overtook San Jose in the notable indicator of venture capital deals per million people, showing the growing preponderance

of clean-tech companies north of Silicon Valley itself. It is also home to top-notch research universities like UC-Berkeley and DOE laboratories like Lawrence Berkeley National Lab, as well as a thriving incubator scene.

**2 SAN JOSE, CA** – San Francisco's neighbor to the south also shows consistency, finishing first or second in three out of four categories (the exception being Green Buildings, where it ranks 10th). The home of Silicon Valley checks in with more than \$1,100 per capita in clean-tech venture capital money, which is tops in the Index by a whopping \$300 per capita. San Jose also excels in clean electricity, having the third-most installed solar per person and the seventh-lowest carbon emissions from large facilities.

**3 SAN DIEGO, CA** – Rounding out California's sweep of the top three slots is San Diego. Strong deployment of advanced vehicles and their charging/fueling infrastructure drives the area's success, but San Diego's crown jewel may be its passage of a new Climate Action Plan in December 2015. That plan includes a pledge to receive 100% of city-wide electricity (across the community for both public and private use) from renewable sources by 2035. It is the largest city in the nation to make such a pledge, and puts San Diego in elite company, with just San Francisco and San Jose having set similar targets.

**4 PORTLAND, OR** – Although Portland's score declined by more than seven points this year (largely due to slight changes in indicator and scoring methodol-

ogy)), it lost only one ranking spot as a result. The Rose City is a clean-electricity leader, with strong commitments to report and reduce carbon emissions, as well as an abundance of wind and especially hydro electricity on its grid. It also performs well in the Advanced Transportation category (placing ninth) and in the Green Buildings category, finishing sixth with strong LEED deployment numbers and a building energy use disclosure policy enacted in 2015.

**5 WASHINGTON, DC** – The nation’s capital rounds out the top five clean-tech metros, as it did in 2015. Washington continues to dominate the Index in the Green Buildings category, finishing 14 points ahead of #2 San Francisco. It leads in every LEED and Energy Star indicator, overtaking Charlotte for the top score in the Energy Star buildings per million residents indicator. The District also jumps six spots to sixth in Investment, Innovation, and Workforce, powered by its research and incubator network and strong venture capital numbers.

**6 LOS ANGELES, CA** – The fourth top 10 entry from California, Los Angeles excels in the Advanced Transportation category. L.A. may be known for its traffic, but at least many of those vehicles run on clean fuels: the City of Angels ranks in the top six in all four advanced vehicle indicators, as well as coming in ninth in public transit ridership. As with the other California metros, Los Angeles benefits from plenty of renewable energy, and has commitments to report and reduce its greenhouse gas emissions.

**7 BOSTON, MA** – Boston’s score declines slightly from last year, but it still edges Seattle for the #7 spot. The Green Buildings category, where Boston adds nearly 11 points to its category score from last year to place 3rd, is a particular strength. “The Hub” received the highest score in the American Council for an Energy-Efficient Economy’s (ACEEE) 2015 “City Energy Efficiency Scorecard”; it also has a building

energy use disclosure requirement, and a requirement that large commercial and multi-family buildings meet LEED certification.

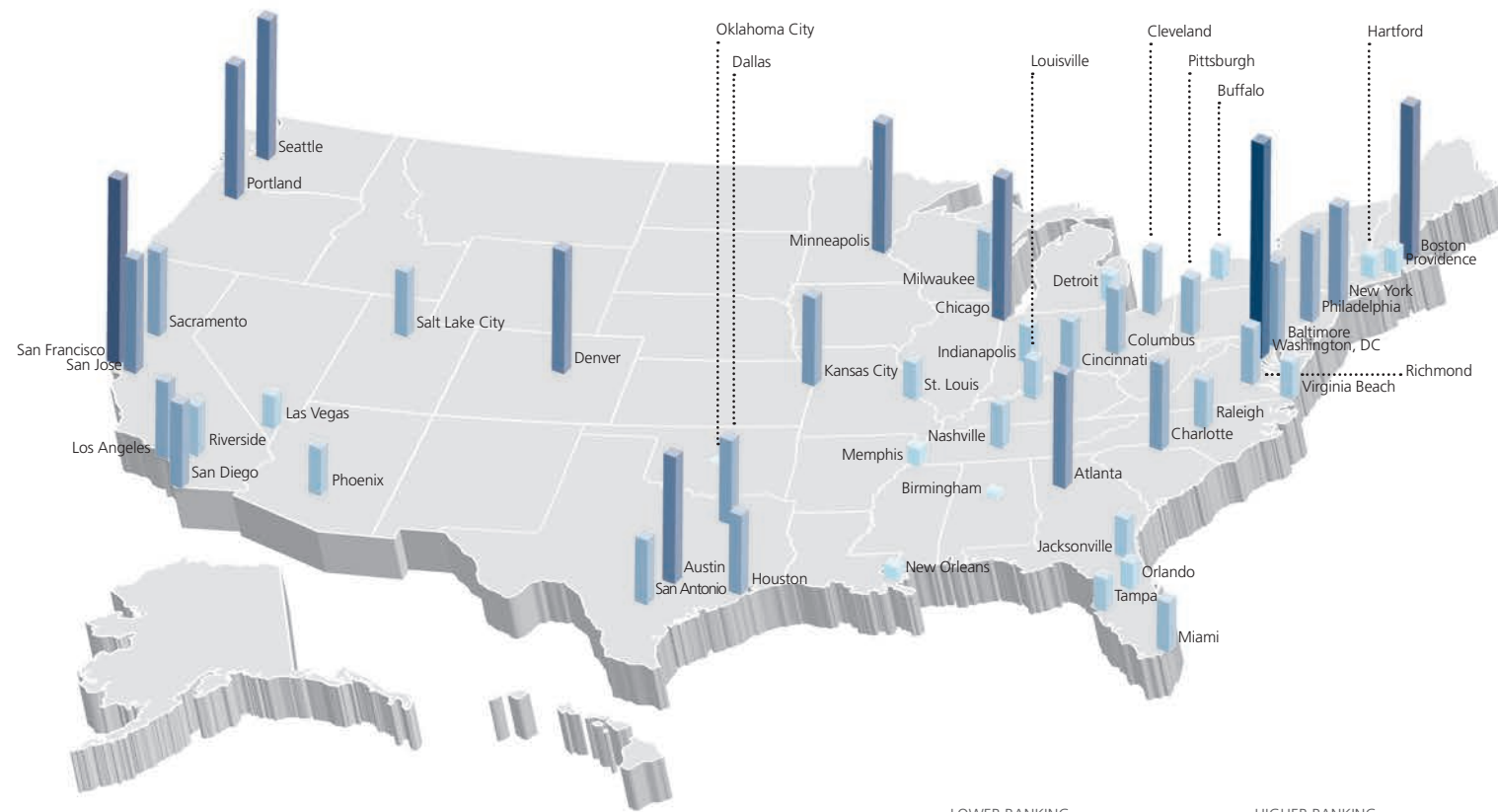
**8 SEATTLE, WA** – Seattle once again lives up to its reputation as one of the nation’s greenest cities. Its electric vehicle initiatives have paid off, as it ranks in the top eight in EVs, hybrids, and plug-in hybrids. The Emerald City is also electrifying its public transportation system, which ranks eighth among Index metros in ridership per capita. And much of the electricity that powers those buses and trolleys is renewable: easy access to hydropower makes Seattle’s electricity mix the cleanest among all metros in the U.S.

**9 AUSTIN, TX** – Austin is a paradigm of consistency: it ranks ninth in the Index for the third consecutive year, fueled by eighth-place finishes in three out of four Index categories. Austin boasts the ninth-highest score in the ACEEE scorecard, and also requires many private buildings to attain certification through municipal utility Austin Energy’s city-specific green building program. The Texas state capital also ranks fifth in venture capital dollars per capita, and fourth in deals per capita, signifying its historically strong local VC sector.

**10 CHICAGO, IL** – The Windy City holds off Sacramento to round out the Metro Index’s top 10 rankings. The Green Buildings category is a particular strength. What Chicago lacks in total numbers of green buildings it makes up for in size, ranking fourth in LEED-certified square footage per capita, and sixth in Energy Star-certified square footage per capita. The city also requires most large buildings receiving public assistance to have green roofs. Additionally, the Chicago metro area is home to the Argonne and Fermi national laboratories, as well as clean-tech incubators and top university research programs.



# GREEN BUILDINGS



LOWER RANKING  HIGHER RANKING

RANK	METRO AREA	LEADERSHIP SCORE
1	Washington, DC	100.0
2	San Francisco, CA	85.9
3	Boston, MA	72.1
4	Chicago, IL	65.9
5	Seattle, WA	65.2
6	Portland, OR	62.1
7	Minneapolis, MN	60.1
8	Austin, TX	59.3
9	Denver, CO	57.1
10	San Jose, CA	53.1
11	Atlanta, GA	53.0
12	New York, NY	46.1
13	Kansas City, MO	42.4
14	Philadelphia, PA	41.4
15	Charlotte, NC	40.1
16	Sacramento, CA	39.5
17	Dallas, TX	39.1
18	Baltimore, MD	38.7
19	San Diego, CA	38.6
20	Houston, TX	36.7
21	Los Angeles, CA	36.2
22	San Antonio, TX	30.4
23	Columbus, OH	29.6
24	Salt Lake City, UT	29.5
25	Cleveland, OH	29.1
26	Milwaukee, WI	27.2
27	Pittsburgh, PA	26.3
28	Richmond, VA	25.9
29	Cincinnati, OH	24.4
30	Miami, FL	23.3
31	Riverside, CA	23.0
32	Raleigh, NC	22.2
33	Phoenix, AZ	22.1
34	Nashville, TN	20.2
35	Louisville, KY	18.1
36	Jacksonville, FL	17.9
37	Indianapolis, IN	16.9
38	St. Louis, MO	16.7
39	Virginia Beach, VA	16.5
40	Tampa, FL	15.4
41	Las Vegas, NV	15.1
42	Buffalo, NY	12.7
43	Orlando, FL	11.7
44	Detroit, MI	11.5
45	Providence, RI	10.7
46	Hartford, CT	10.1
47	Memphis, TN	8.1
48	New Orleans, LA	5.6
49	Birmingham, AL	1.9
50	Oklahoma City, OK	0.0

# GREEN BUILDINGS OVERVIEW

The Green Buildings category evaluates metros on their achievements in creating a more efficient building stock. Washington, DC, remains the dominant metro in the category, leading second-place San Francisco by 14 points. Third-place Boston is nearly as far behind San Francisco as the latter is behind DC. Then the rankings tighten, with #4 Chicago (the top 10's biggest mover, up five) just edging out Seattle (#5). Portland, Minneapolis (the 14th-ranked metro in the overall Index, lowest in the Green Buildings top 10), Austin, Denver, and San Jose round out the top 10. San Jose is the only newcomer to the top 10, adding more than 11.5 points to its category score due to steady progress in LEED and Energy Star certification, and a strong showing in the category's new indicators.

The category is comprised of four indicators that measure green building deployment, two each for LEED- and Energy Star-certified buildings. The category has evolved over the last two years. In 2015, Clean Edge added a building energy use disclosure policy indicator, and this year sees the debut of two additional measures. The first ranks the metros based on their performance in ACEEE's City Energy Efficiency Scorecard, a biannual benchmark that grades metros on their policies and accomplishments in the realm of energy efficiency. The second new indicator rewards metros for enacting ordinances that require certain buildings to meet specific requirements, such as achieving LEED certification or meeting energy savings goals. Metros get full, half, or no credit based on the applicability of these ordinances.

Washington, DC leads the nation in all four LEED and Energy Star measures: two indicators measuring buildings per million people, and two ranking metros on



## LEED CERTIFIED PROJECTS (2015)

METRO AREA	RANK	PROJECTS PER 1M PEOPLE	TOTAL PROJECTS
WASHINGTON, DC	1	251.6	1,534
SAN JOSE, CA	2	197.3	390
SAN FRANCISCO, CA	3	192.9	898
SEATTLE, WA	4	166.6	622
PORTLAND, OR	5	157.0	375
DENVER, CO	6	150.3	423
SAN DIEGO, CA	7	147.9	488
BOSTON, MA	8	139.9	668
BALTIMORE, MD	9	139.1	389
SALT LAKE CITY, UT	10	118.8	139

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 2015. This does not include LEED for Homes projects.

Full dataset available to subscription clients.

certified square footage per person. To accomplish this sweep, the nation's capital had to wrest the top spot in the Energy Star buildings per million people indicator away from Charlotte, which it did by adding 200 Energy Star-certified buildings in 2015. In fact, Washington added the most LEED and Energy Star buildings overall, certifying just over 400 buildings (almost 100 more than second-place Los Angeles), totaling nearly 59 million square feet of space. The nation's capital, home to strong building standards at both the federal and municipal level, became the first metro to surpass 1,500 LEED-certified buildings in 2015.



## ENERGY STAR BUILDINGS AND PLANTS (2015)

METRO AREA	RANK	PROJECTS PER 1M PEOPLE	TOTAL PROJECTS
WASHINGTON, DC	1	202.5	1,235
CHARLOTTE, NC	2	190.8	463
DENVER, CO	3	186.2	524
SACRAMENTO, CA	4	175.0	398
SAN FRANCISCO, CA	5	173.1	806
SAN DIEGO, CA	6	155.5	513
LOUISVILLE, KY	7	149.4	191
SALT LAKE CITY, UT	8	148.7	174
MINNEAPOLIS, MN	9	145.8	514
SAN JOSE, CA	10	142.1	281

Source: Energy Star and U.S. Census Bureau data with Clean Edge analysis. Energy Star Buildings and Plants includes all projects that have qualified for Energy Star accreditation through the end of 2015. This does not include Energy Star certification for new homes.

**Full dataset available to subscription clients.**

While there is overlap between leadership in LEED and leadership in Energy Star, the Energy Star leaderboard is a bit more diverse. Louisville ranks seventh in Energy Star buildings per million, but is in the bottom 10 in the same measure for LEED buildings. One reason for the discrepancy is likely the Louisville-Jefferson County Metro Government's Energy Star partner agreement, which began in October 2007 and commits it to Energy Star's more energy-specific requirements for its government buildings. Charlotte and Minneapolis are two other metros that lead in Energy Star deployment, but don't perform as well in LEED deployment.

Beyond LEED and Energy Star buildings, the Green Buildings category includes three additional indicators. Passage of a building energy use disclosure ordinance was added to the Index in 2015. A dozen metros got credit last year, and they're



## 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
PORTLAND, OR	2015
KANSAS CITY, MO	2015

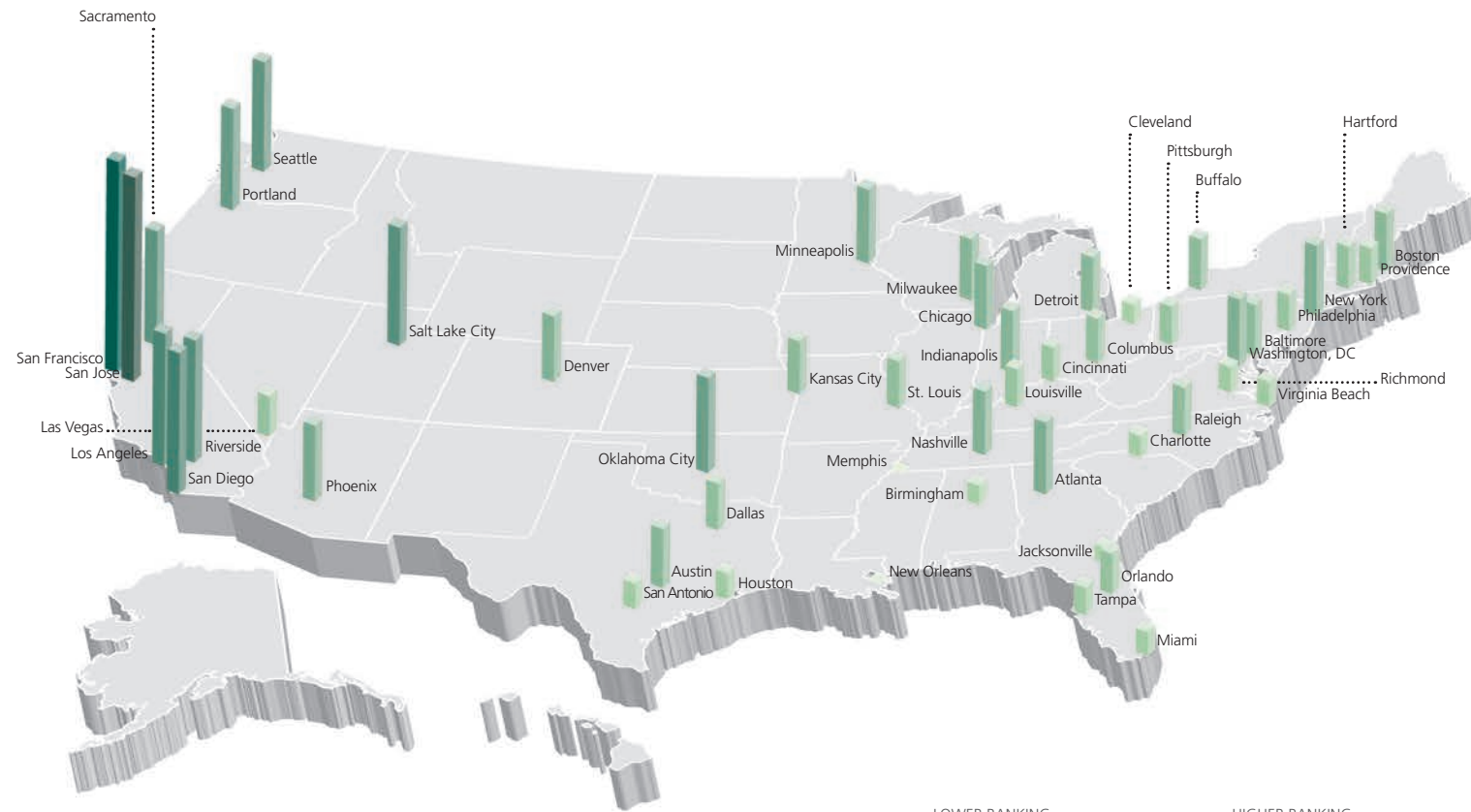
Source: Institute for Market Transformation. This table lists all of the primary cities in the Metro Index that have enacted a benchmarking and disclosure ordinance. Berkeley, CA (part of the San Francisco MSA) and Cambridge, MA (part of the Boston MSA) also have building energy use disclosure requirements.

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joined this year by Kansas City, whose 2015 ordinance covers 47% of energy used by buildings in the city. This helped fuel the metro's 10-place jump up the Green Buildings rankings to 13th, the fourth-best improvement in the category.

Among the two new indicators added this year, Boston takes the City Energy Efficiency Scorecard cake, with a top score of 82 out of 100. Nine of the top 10 ACEEE performers make the top 10 in the Green Buildings category; New York, 12th in the category, is the party crasher, ranking #2 on the scorecard with a score of 78. Meanwhile, 10 metros (include six of the category top 10) receive full credit on building ordinances, meaning that public buildings and at least some private buildings are subject to the requirement. Further, 23 metros get half credit, as their ordinances apply only to public buildings or those using public funds.

# ADVANCED TRANSPORTATION



LOWER RANKING HIGHER RANKING

RANK METRO AREA LEADERSHIP SCORE

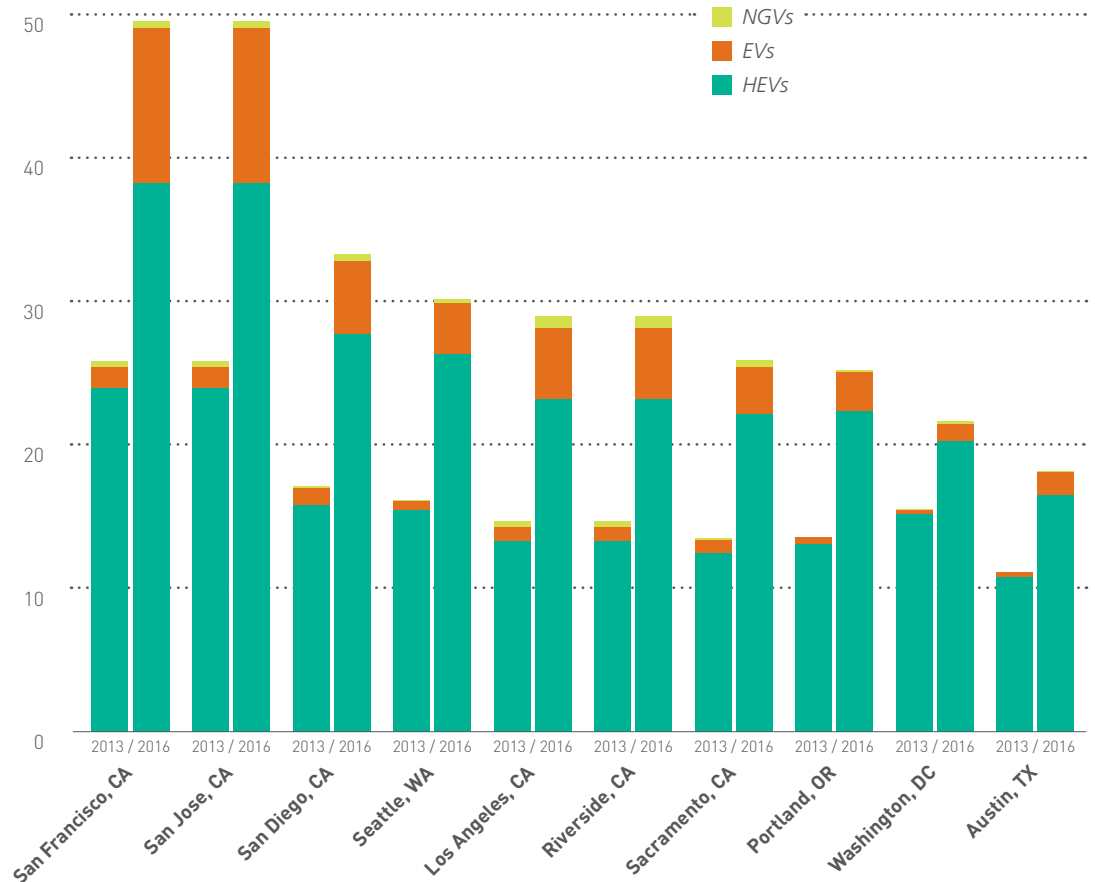
1	San Francisco, CA	100.0	
2	San Jose, CA	97.0	
3	San Diego, CA	66.8	
4	Los Angeles, CA	62.8	
5	Riverside, CA	58.3	
6	Salt Lake City, UT	55.7	
7	Sacramento, CA	54.2	
8	Seattle, WA	52.4	
9	Portland, OR	47.8	
10	Oklahoma City, OK	44.5	
11	Phoenix, AZ	35.9	
12	Minneapolis, MN	35.2	
13	Atlanta, GA	33.6	
14	New York, NY	32.7	
15	Washington, DC	32.3	
16	Denver, CO	30.5	
17	Nashville, TN	29.8	
18	Chicago, IL	29.5	
19	Milwaukee, WI	28.7	
20	Indianapolis, IN	28.6	
21	Austin, TX	27.6	
22	Boston, MA	26.9	
23	Detroit, MI	25.9	
24	Kansas City, MO	25.2	
25	Baltimore, MD	23.9	
26	Buffalo, NY	23.8	
27	Raleigh, NC	23.2	
28	St. Louis, MO	21.5	
29	Columbus, OH	21.2	
30	Hartford, CT	20.0	
31	Dallas, TX	19.4	
32	Orlando, FL	18.5	
33	Las Vegas, NV	18.5	
34	Louisville, KY	18.0	
35	Pittsburgh, PA	17.5	
36	Providence, RI	16.7	
37	Philadelphia, PA	16.5	
38	Cincinnati, OH	16.1	
39	Tampa, FL	13.1	
40	Richmond, VA	12.4	
41	Virginia Beach, VA	12.3	
42	San Antonio, TX	12.0	
43	Houston, TX	11.6	
44	Miami, FL	11.1	
45	Charlotte, NC	10.3	
46	Cleveland, OH	9.2	
47	Birmingham, AL	8.9	
48	Jacksonville, FL	7.0	
49	Memphis, TN	0.4	
50	New Orleans, LA	0.0	

# ADVANCED TRANSPORTATION OVERVIEW

The Advanced Transportation category consists of eight indicators to benchmark U.S. metro areas in the transportation sector. Advanced Transportation indicators cover four types of advanced vehicles, their related charging or fueling infrastructure, and public transportation ridership.

California metro areas once again dominate leadership in this category – occupying the top five places and six of the top seven – with other western metros rounding out the top 10. San Francisco and San Jose capture the top two spots as they did last year; San Diego jumps two places to third, making the top three Transportation metros the same as in the overall Index. Los Angeles and Riverside each move down a notch to fourth and fifth. Salt Lake City climbs two places to #6, while Sacramento places seventh for the third straight year. Seattle drops two places to eighth; Portland and Oklahoma City return in ninth and 10th, respectively. Atlanta is the highest-ranked metro east of the Mississippi, jumping four places to #13.

**2016 TOP 10 ADVANCED VEHICLE METRO AREAS (HYBRID, ELECTRIC, NATURAL GAS VEHICLES), VEHICLES PER THOUSAND PEOPLE, 2013 AND 2016**



Source: IHS Automotive and TVB with Clean Edge analysis. 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.**



## HYBRID ELECTRIC VEHICLES IN USE (2015)

METRO AREA	RANK	HEVS PER 1K PEOPLE	TOTAL HEVS
SAN FRANCISCO, CA	1	38.21	248,502
SAN JOSE, CA	1	38.21	248,502
SAN DIEGO, CA	3	27.74	79,072
SEATTLE, WA	4	26.30	112,930
LOS ANGELES, CA	5	23.20	379,740
RIVERSIDE, CA	5	23.20	379,740
PORTLAND, OR	7	22.37	63,037
SACRAMENTO, CA	8	22.14	83,315
WASHINGTON, DC	9	20.28	128,067
AUSTIN, TX	10	16.49	30,806

Source: IHS Automotive and U.S. Census Bureau data with Clean Edge analysis. IHS Automotive data is a snapshot of every vehicle in operation as of the end of 2015. 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.**

Readers should note that the vehicle registration data has one methodological anomaly. This data (affecting four of the eight indicators) is reported by Designated Market Area (DMA), instead of the Metropolitan Statistical Area (MSA) designations used in the other parts of the Metro Index. Practically speaking, this affects only San Francisco/San Jose and Los Angeles/Riverside, which are respectively combined into one geographic market; they are separate and distinct MSAs throughout the rest of the Index.

Registration numbers for the advanced vehicles (per thousand people) indicators reflect the geographical makeup of the overall category rankings. The six California



## ELECTRIC VEHICLES IN USE (2015)

METRO AREA	RANK	EVS PER 1K PEOPLE	TOTAL EVS
SAN FRANCISCO, CA	1	6.39	41,533
SAN JOSE, CA	1	6.39	41,533
ATLANTA, GA	3	3.06	19,083
SAN DIEGO, CA	4	3.06	8,722
SEATTLE, WA	5	2.57	11,050
LOS ANGELES, CA	6	2.26	37,011
RIVERSIDE, CA	6	2.26	37,011
SACRAMENTO, CA	8	1.82	6,864
PORTLAND, OR	9	1.75	4,921
PHOENIX, AZ	10	0.97	4,642

Source: IHS Automotive and U.S. Census Bureau data with Clean Edge analysis. Does not include plug-in hybrids. IHS Automotive data is a snapshot of every vehicle in operation as of the end of 2015. 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.

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metros each show up in the top 10 lists for electric vehicles (EVs), plug-in electric vehicles (PHEVs), and hybrid electric vehicles (HEVs), as do Seattle and Portland. No other metros can make this claim; in fact, only six other metros (Atlanta, Austin, Baltimore, Detroit, Phoenix, and Washington DC) appear even once in the top-10 rankings for any of these three vehicle types, with Atlanta's #4 in EVs being the highest placement. The San Francisco/San Jose DMA leads all three indicators by healthy margins. The California metros also all make the top 10 in natural gas vehicles (NGVs), but the rest of the leaderboard has a very different makeup from the other vehicle indicators. Salt Lake City and Oklahoma City place first and second in NGVs per million people, with St. Louis and Dallas also in the top 10.

The EV charging station indicator is more varied and more volatile, reflecting the results of specific metros making a concerted effort to expand their charging networks and the still nascent stage of EV infrastructure development. Kansas City jumps eight places to #7, for example, while Nashville falls four spots to ninth. At the top, San Jose and San Francisco move ahead of 2015 Index leader Portland. San Jose has 175 charging stations per million people, and five other metros, all on the West Coast, have more than 100. Joining the top 10 this year is Baltimore, edging out Los Angeles for #10.

The public transit ridership indicator is slightly revised this year, measuring yearly transit trips per capita rather than average weekday trips. The results are comparable to past years, with older cities such as New York (the leader by far with 223 trips per capita), Boston, Washington DC, Chicago, and Philadelphia in five of the top seven places. But California metros fare surprisingly well, with San Francisco #2, San Diego #5, and Los Angeles #9; the two southern California metros have made expanded mass transit a key part of their carbon emissions reduction goals. Seattle and Portland also make the top 10.



### ELECTRIC VEHICLE CHARGING STATIONS (2015)

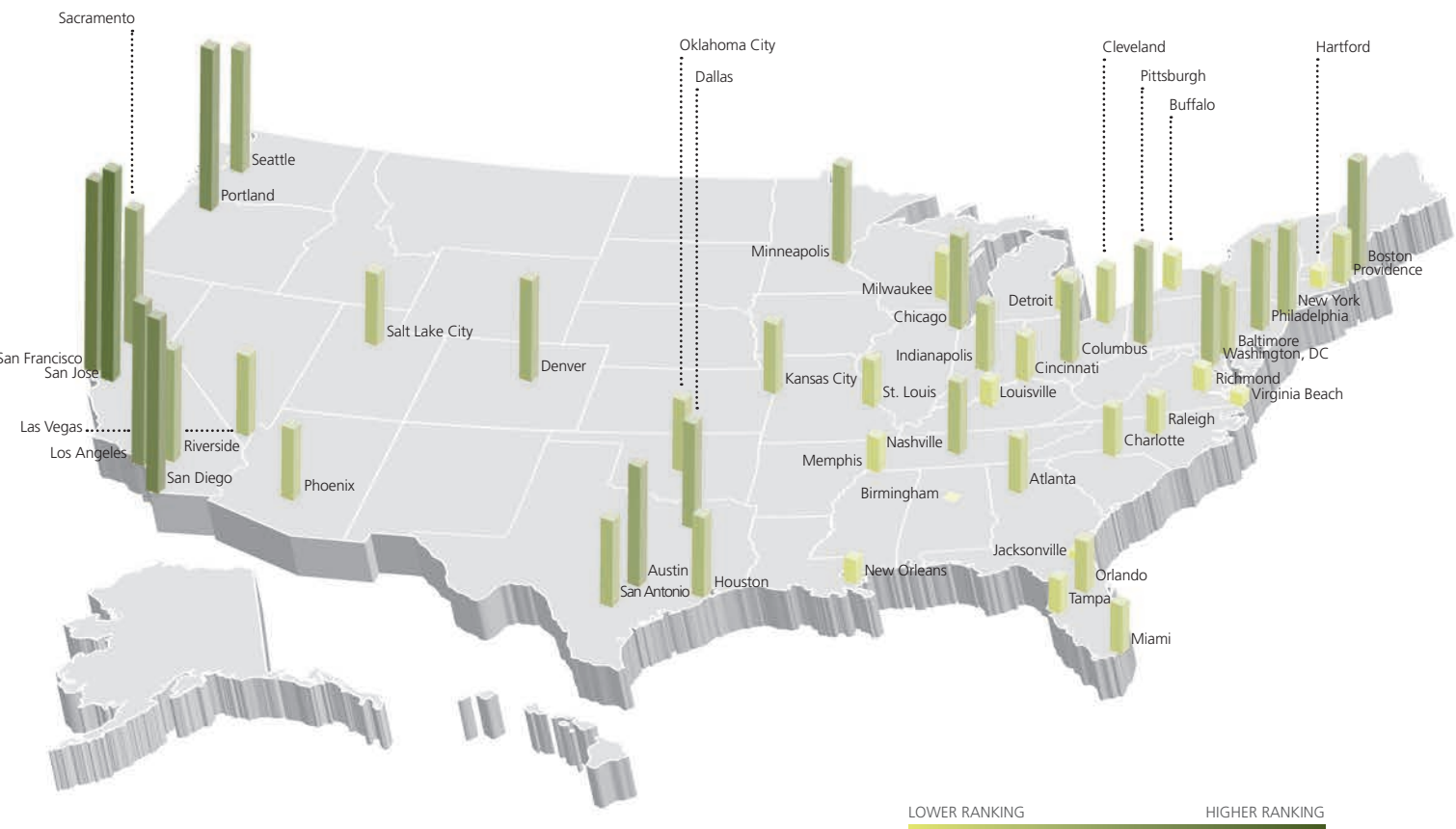
METRO AREA	RANK	EV CHARGING STATIONS PER 1M PEOPLE	TOTAL EV CHARGING STATIONS
SAN JOSE, CA	1	175.0	346
SAN FRANCISCO, CA	2	135.5	631
PORTLAND, OR	3	132.7	317
SEATTLE, WA	4	116.0	433
SACRAMENTO, CA	5	109.5	249
SAN DIEGO, CA	6	104.0	343
KANSAS CITY, MO	7	96.8	202
AUSTIN, TX	8	91.5	183
NASHVILLE, TN	9	89.6	164
BALTIMORE, MD	10	85.4	239

Source: Clean Edge analysis of data gathered from the U.S. DOE Alternative Fuels & Advanced Vehicles Data Center and the U.S. Census Bureau. As of the end of 2015.

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# CLEAN ELECTRICITY & CARBON MANAGEMENT



RANK	METRO AREA	LEADERSHIP SCORE
1	San Jose, CA	100.0
2	San Francisco, CA	90.6
3	San Diego, CA	83.0
4	Los Angeles, CA	77.3
5	Portland, OR	76.7
6	Sacramento, CA	63.5
7	Seattle, WA	58.0
8	Austin, TX	57.3
9	Riverside, CA	53.1
10	Boston, MA	52.3
11	Dallas, TX	49.9
12	Denver, CO	47.7
13	Pittsburgh, PA	45.9
14	Minneapolis, MN	45.7
15	Chicago, IL	44.4
16	Washington, DC	43.8
17	Philadelphia, PA	42.0
18	New York, NY	41.0
19	San Antonio, TX	40.8
20	Houston, TX	38.3
21	Las Vegas, NV	38.2
22	Columbus, OH	37.5
23	Oklahoma City, OK	34.2
24	Salt Lake City, UT	34.0
25	Phoenix, AZ	33.7
26	Nashville, TN	33.7
27	Baltimore, MD	33.4
28	Kansas City, MO	32.6
29	Indianapolis, IN	31.6
30	Atlanta, GA	25.8
31	Cleveland, OH	25.6
32	Orlando, FL	23.7
33	Miami, FL	23.1
34	Charlotte, NC	22.8
35	Providence, RI	22.5
36	St. Louis, MO	22.4
37	Cincinnati, OH	20.9
38	Raleigh, NC	18.1
39	Detroit, MI	15.5
40	Milwaukee, WI	13.8
41	Memphis, TN	13.7
42	Tampa, FL	12.9
43	Buffalo, NY	12.9
44	Louisville, KY	12.1
45	New Orleans, LA	11.0
46	Richmond, VA	11.0
47	Hartford, CT	7.9
48	Virginia Beach, VA	6.4
49	Jacksonville, FL	4.1
50	Birmingham, AL	0.0



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# CLEAN ELECTRICITY & CARBON MANAGEMENT OVERVIEW

The Clean Electricity and Carbon Management category ranks metros based on the extent to which they use renewable electricity and have, or are committed to having, low carbon emissions. The West Coast has almost completely taken over leadership in this category, with all six California cities and the two Pacific Northwest metros appearing in the top 10. San Jose (up four spots to #1), San Francisco, San Diego, and Los Angeles give the Golden State a top-four sweep, with 2015 category leader Portland, Sacramento, and Seattle filling the 5-7 slots and Riverside coming in ninth. Austin (#8) and Boston (#10) are the only top 10 metros not located on the West Coast. Sacramento and Riverside are the only two newcomers to the top of the rankings this year, moving up from #14 and #18, respectively.

This category consists of a mixture of qualitative and quantitative measures. The quantitative indicators include two that use state-level electricity generation data as a proxy for local clean electricity; one that measures carbon emissions from large industrial and power-producing facilities; and a new indicator measuring installed solar power in each metro's principal city. The qualitative measures have increased this year, with new indicators giving credit for reporting and reducing carbon emissions, and for setting high renewable electricity goals.

The regional electricity mix indicator leaders are virtually unchanged from 2015. Metros in leading solar states such as California and Nevada mix with wind-dominant places like Oklahoma City, Minneapolis, and Denver to set the pace in



## REGIONAL ELECTRICITY MIX (2015)

METRO AREA	RANK	PERCENT OF TOTAL GENERATION FROM SOLAR, WIND, GEOTHERMAL, HYDRO, & BIOMASS
SEATTLE, WA	1	75.8%
PORTLAND, OR	2	69.9%
SAN JOSE, CA	3	30.5%
SAN FRANCISCO, CA	3	30.5%
SACRAMENTO, CA	3	30.5%
RIVERSIDE, CA	3	30.5%
SAN DIEGO, CA	3	30.5%
LOS ANGELES, CA	3	30.5%
BUFFALO, NY	9	24.1%
OKLAHOMA CITY, OK	10	22.2%
MINNEAPOLIS, MN	11	20.6%
LAS VEGAS, NV	12	19.9%
DENVER, CO	13	17.8%
NEW YORK, NY	14	16.0%
NASHVILLE, TN	15	14.5%


Source: EIA and U.S. Census with Clean Edge analysis. This indicator uses state-level, utility-scale, in-state electricity generation data reported to the EIA as a proxy for the electricity fuel mix of each MSA. For MSAs that cross state boundaries, this indicator is calculated based on the percentage of each state's residents that reside in the MSA. Full dataset available to subscription clients.

the indicator that includes only wind, solar, and geothermal. The equation changes when adding hydro and biomass: Seattle and Portland vault to the top of the charts, followed by the California metros.

The large facility carbon emissions leaders also remain fairly stable. Raleigh, with its government, technology, and education-based economy, continues to have the lowest emissions, as it has in all five years of the Metro Index. At the other end of the spectrum, Birmingham has the dubious distinction of being the metro with the most per-capita emissions. Emissions from it and #49 New Orleans each exceed 30 tons of CO2 per person.

This year's additions to the Index are designed to recognize metros that are taking extra steps to reduce their emissions. Solar power is one way to accomplish this, and one new Index measure, based on Environment America's 2015 "Shining Cities" report, measures the amount of solar installed within each metro area's largest city. (The 2016 "Shining Cities" report was released too late to be included in the Index.) While many of the best solar metros are located in sunny places like California, Arizona, Utah, and Texas, the top solar metro (in installed watts per capita) in the Index is Indianapolis (Honolulu, Environment America's #1 city in watts per capita, is not included in the Index). "The Crossroads of America" boasts what's been called the largest airport solar farm in the world, as well as a large solar array at the iconic Indianapolis Motor Speedway.

Commitments to measure, report, and reduce carbon emissions are significant signs of clean electricity leadership. Several indicators have been added to the Index in the last two years to reward metros for such commitments. In all, 31 metros (including seven of the top 10) report their carbon emissions through CDP or carbonn, while 40 (including nine of the top 10) are members of one or more organizations that help cities keep their climate commitments. A new addition to the Index this year judges metros on whether they have a specific electricity use or GHG emission reduction goal; whether such a goal is codified as a city ordinance; and whether the goal is included in the city's general plan. Ten metros check all three boxes (including seven of the top 10), while 10 get credit for the first two.



### CARBON EMISSIONS FROM LARGE FACILITIES (2014)

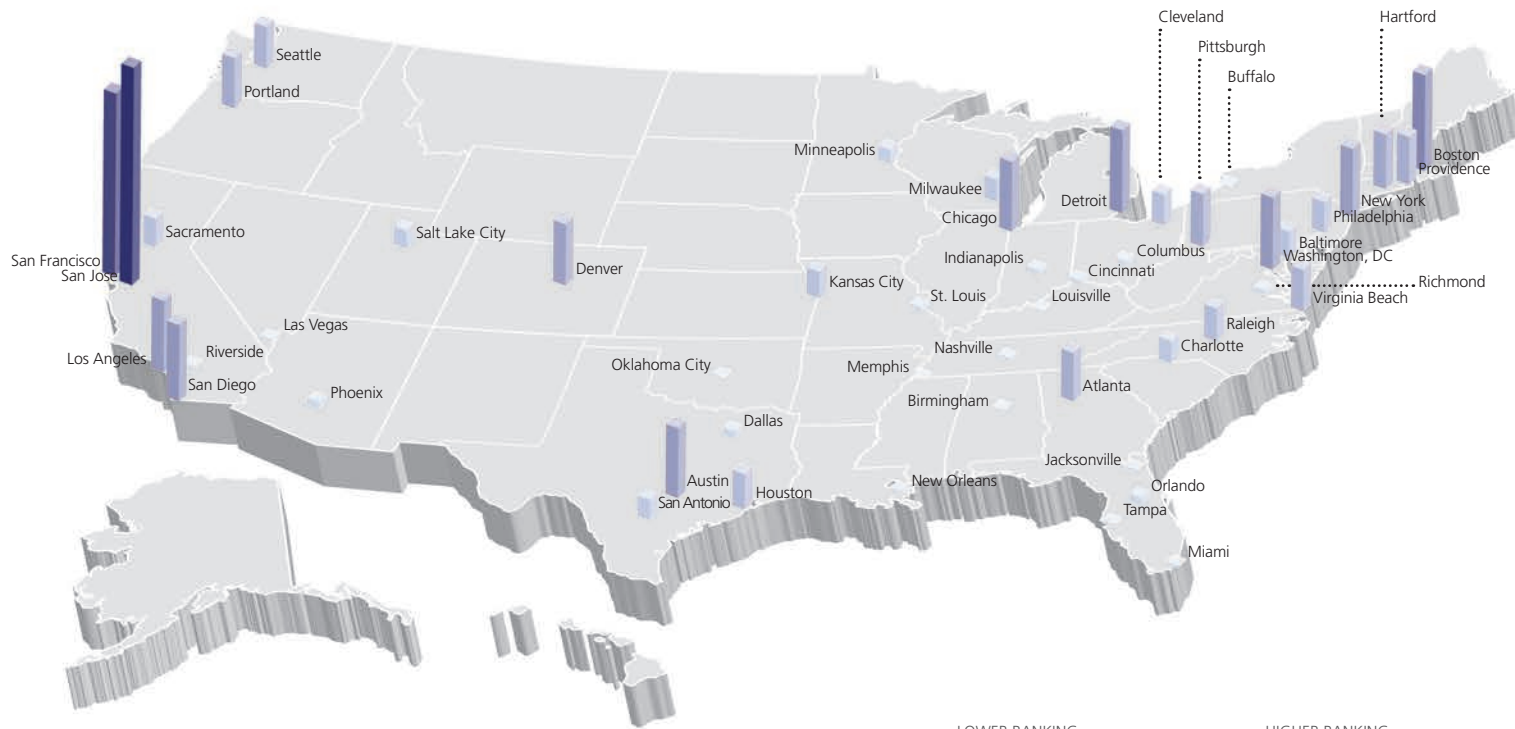
METRO AREA	RANK (LOW TO HIGH)	METRIC TONS CO2E PER CAPITA	METRIC TONS CO2E*
RALEIGH, NC	1	0.28	343,705
COLUMBUS, OH	2	0.58	1,164,188
SEATTLE, WA	3	0.70	2,553,193
SAN DIEGO, CA	4	1.36	4,437,794
SACRAMENTO, CA	5	1.42	3,179,177
PORTLAND, OR	6	1.51	3,544,938
SAN JOSE, CA	7	1.70	3,317,086
VIRGINIA BEACH, VA	8	2.06	3,540,249
NEW YORK, NY	9	2.09	41,994,441
BOSTON, MA	10	2.09	9,891,281
SAN ANTONIO, TX	41	13.20	30,734,879
KANSAS CITY, MO	42	13.30	27,542,395
OKLAHOMA CITY, OK	43	14.58	19,496,064
CINCINNATI, OH	44	15.19	32,645,670
PITTSBURGH, PA	45	20.07	47,279,181
HOUSTON, TX	46	20.74	134,600,331
LOUISVILLE, KY	47	21.24	26,963,573
ST. LOUIS, MO	48	22.13	62,087,385
NEW ORLEANS, LA	49	30.23	37,845,718
BIRMINGHAM, AL	50	39.30	44,946,928

Source: EPA and U.S. Census Bureau with Clean Edge analysis. \*CO2e = carbon dioxide equivalent  
 Full dataset available to subscription clients.

Finally, this year, we have added an indicator to reward metros for setting the most aggressive goal: a pledge to obtain 100% of their community-wide electricity from renewable sources. Only the top three metros in the category receive credit here: San Jose, San Francisco, and most recently San Diego, whose new climate action plan specifying this goal was completed in December 2015.

# CLEAN-TECH INVESTMENT, INNOVATION & WORKFORCE

RANK	METRO AREA	LEADERSHIP SCORE
1	San Jose, CA	100.0
2	San Francisco, CA	83.7
3	Boston, MA	43.8
4	Detroit, MI	37.5
5	San Diego, CA	34.8
6	Washington, DC	33.3
7	Los Angeles, CA	32.7
8	Austin, TX	32.1
9	Chicago, IL	31.8
10	New York, NY	31.0
11	Denver, CO	27.5
12	Hartford, CT	25.4
13	Pittsburgh, PA	24.1
14	Portland, OR	22.9
15	Atlanta, GA	21.7
16	Providence, RI	21.7
17	Seattle, WA	19.3
18	Virginia Beach, VA	18.7
19	Houston, TX	16.2
20	Raleigh, NC	15.4
21	Philadelphia, PA	13.9
22	Cleveland, OH	13.7
23	Sacramento, CA	13.3
24	Baltimore, MD	12.3
25	Kansas City, MO	12.3
26	Charlotte, NC	9.6
27	Milwaukee, WI	9.6
28	San Antonio, TX	9.3
29	Salt Lake City, UT	7.8
30	Minneapolis, MN	5.9
31	Phoenix, AZ	2.9
32	Dallas, TX	2.6
33	Orlando, FL	2.5
34	St. Louis, MO	2.0
35	Columbus, OH	2.0
36	Richmond, VA	1.9
37	Indianapolis, IN	1.5
38	Cincinnati, OH	1.5
39	Nashville, TN	1.4
40	New Orleans, LA	1.3
41	Miami, FL	1.2
42	Tampa, FL	1.0
43	Las Vegas, NV	1.0
44	Jacksonville, FL	0.8
45	Riverside, CA	0.5
46	Buffalo, NY	0.3
47	Oklahoma City, OK	0.3
48	Birmingham, AL	0.1
49	Memphis, TN	0.0
50	Louisville, KY	0.0



LOWER RANKING HIGHER RANKING

# 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 in clean tech, clean-energy patent activity, and the presence of U.S. Department of Energy labs, clean-energy incubators, and top-rated green Master's programs.

The Bay Area dominates this category like no other. San Jose repeats last year's #1 ranking and score of 100, but San Francisco adds 13 points to creep closer with a score of 83.7. That grew its already commanding lead over #3 Boston from 30 points to almost 40. Although Massachusetts edged out California in the State Index Capital category this year, no other U.S. metros can best the Bay Area's thriving clean-tech ecosystem of research, venture capital, and job and wealth creation.

San Jose ranks first or second in all three of the category's quantitative indicators measuring VC and patent activity; San Francisco nabs a first, second, and fourth. Both are home to a top green master's program and a clean-energy incubator or accelerator, and San Francisco boasts a DOE lab in Lawrence Berkeley National Laboratory, former workplace of President Obama's first Secretary of Energy Dr. Steven Chu.

Less than 13 points separate the metros ranked #3 through #10 in this category, but there were some notable changes from 2015. Boston and Detroit repeat in third and fourth place, but Washington DC jumps six spots to #6 and Los Angeles four

places to #7; both metros increased their 2015 scores by more than nine points. San Diego moved up one place to fifth. Completing the top 10 are Austin, Chicago, and New York – the Big Apple's only top 10 category showing in the Index.

The VC dollars per capita indicator is measured over a three-year period, to lessen the potential "spike" effect of particularly large deals in any given year. The top six metros in this indicator remain the same as last year: San Jose (tallying more



## CLEAN TECH VENTURE CAPITAL (2013 - 2015)

METRO AREA	RANK	DOLLARS PER CAPITA	TOTAL DOLLARS (MILLIONS)	TOTAL DEALS
SAN JOSE, CA	1	\$1,106.15	\$2,186.67	144
SAN FRANCISCO, CA	2	\$800.19	\$3,725.79	358
BOSTON, MA	3	\$301.65	\$1,440.20	189
SAN DIEGO, CA	4	\$250.88	\$827.78	70
AUSTIN, TX	5	\$159.41	\$318.96	46
HOUSTON, TX	6	\$138.85	\$924.30	33
SEATTLE, WA	7	\$108.24	\$404.11	58
DENVER, CO	8	\$76.87	\$216.35	37
WASHINGTON, DC	9	\$69.63	\$424.59	31
PITTSBURGH, PA	10	\$66.93	\$157.49	25


Source: Cleantech Group and U.S. Census Bureau data with Clean Edge analysis.  
Full dataset available to subscription clients.

than \$1,100 in VC investment for each of its nearly two million residents), San Francisco, Boston, San Diego, Austin, and Houston. They are followed by Seattle (up two places), Denver, Washington DC, and Pittsburgh, which continues to transform its Rust Belt heritage toward a more tech-focused, 21st century urban lifestyle and economy.

In VC deals per million people, San Francisco surpassed San Jose for the #1 spot, and its 358 total deals (2013-15) dwarfs #3 Boston's 189 and San Jose's 144. The rest of the top 10 is the same as in the VC dollars per capita metric (in slightly different order) with two exceptions: the VC deals leaders include Salt Lake City and Raleigh, with Washington DC and Houston further down the list.

San Jose (home to Stanford, San Jose State, and other key research institutions) displaces last year's leader Detroit in clean-energy patents per million people, measured over a 14-year period from 2002 to 2015. (The larger Detroit metro area leads by a wide margin in total patents, 2,077 to San Jose's 984.) Places three through eight remain the same as last year: Hartford, San Francisco, and Boston, followed by this year's two national political convention cities, Cleveland and Philadelphia, with Denver in eighth place. San Diego and Minneapolis swap places from last year at #9 and #10.

In the "commitment to innovation" indicators, Washington DC and Los Angeles join New York, Chicago, and San Francisco this year as the only metros housing all three key institutions: a DOE lab, clean-energy incubator/accelerator (as determined by the Incubatenetwork and Clean Edge research), and a top-ranked green master's program. Nine additional metros have two of the three; interestingly, only



CLEAN ENERGY PATENTS GRANTED (2002 - 2015)			
METRO AREA	RANK	PATENTS PER 1M PEOPLE	TOTAL PATENTS
SAN JOSE, CA	1	497.77	984
DETROIT, MI	2	482.79	2,077
HARTFORD, CT	3	266.65	323
SAN FRANCISCO, CA	4	151.63	706
BOSTON, MA	5	69.12	330
CLEVELAND, OH	6	61.63	127
PHILADELPHIA, PA	7	52.72	320
DENVER, CO	8	48.32	136
SAN DIEGO, CA	9	48.19	159
MINNEAPOLIS, MN	10	44.54	157

Source: Data from Heslin Rothenberg Farley & Mesiti P.C. and U.S. Census Bureau with Clean Edge analysis.  
Full dataset available to subscription clients.

four have just one. For three of those – Kansas City, Milwaukee, and Philadelphia – the single credit is an incubator; for Sacramento, it's a green master's program. All eight metros that are home to a DOE lab have at least one of the other two clean-tech innovation institutions.

# 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; clean electricity & 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 MBA 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., and IHS Automotive.

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

## ADVANCED TRANSPORTATION

### ADVANCED TRANSPORTATION

Electric Vehicles Per 1K People (2015)
Hybrid Electric Vehicles Per 1K People (2015)
Plug-In Hybrid Electric Vehicles Per 1K People (2015)
Natural Gas Vehicles Per 1K People (2015)
Electric Vehicle Charging Stations Per 1M People (2015)
CNG Fueling Stations Per 1M People (2015)
E85 & B20 Fueling Stations Per 1M People (2015)
Public Transit: Yearly Unlinked Passenger Trips Per Capita (2014)

## CLEAN ELECTRICITY & CARBON MANAGEMENT

### CLEAN ELECTRICITY & CARBON MANAGEMENT

Regional Electricity Mix, MWh % of Total (2015)
Regional Electricity Mix incl. Hydro & Biomass, MWh % of Total (2015)
Presence of Top Local Government Green Power Purchaser
GHG Emissions from Large Facilities Per Capita, CO2e MT (2014)
Installed Solar Capacity, W Per Capita in Principal City in Metro Area (2014)
Reporting to Climate Disclosure Project (CDP) or carbonn
Member of C40, Compact of Mayors, or STAR Community Rating System
City-Wide GHG or Energy Use Reduction Goal
GHG/Electricity Use Reduction Goal Codified in City Code
GHG/Electricity Use Reduction Goal Included in City General Plan
Goal to Achieve 100% Renewable Electricity

## CLEAN-TECH INVESTMENT, INNOVATION, & WORKFORCE

### CLEAN-TECH INVESTMENT, INNOVATION, & WORKFORCE

Venture Capital Investment, \$ Per Capita (2013-2015)
Venture Capital Investment, Deals Per 1M People (2013-2015)
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



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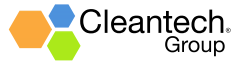
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## OTHER INDEX DATA SOURCES

AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY (ACEEE)

BUILDING CODES ASSISTANCE PROJECT

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TVB

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U.S. CENSUS BUREAU

U.S. DEPARTMENT OF ENERGY (DOE)

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

U.S. ENERGY INFORMATION ADMINISTRATION (EIA)

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Clean Edge, Inc., founded in 2000, is the world's first research and advisory firm devoted to the clean-tech sector. The firm delivers an unparalleled suite of clean-energy benchmarking services including stock indexes, utility and consumer surveys, and regional leadership (state and metro) tracking. These services provide Fortune 500 companies, clean-tech innovators, investors, NGOs, and governments with timely research, trending analysis, and actionable insights. Managing director Ron Pernick and senior editor Clint Wilder are co-authors of the widely acclaimed business books *The Clean Tech Revolution* (HarperCollins, 2007) and *Clean Tech Nation* (HarperCollins, 2012). To keep abreast of the latest clean-tech trends, or for more information on the company, visit [www.cleantechedge.com](http://www.cleantechedge.com).

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## LEAD AUTHORS

**ANDREW RECTOR**, Lead Analyst

**CLINT WILDER**, Senior Editor

**RON PERNICK**, Managing Director



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Contact Bryce Yonker: [yonker@cleantechedge.com](mailto:yonker@cleantechedge.com)



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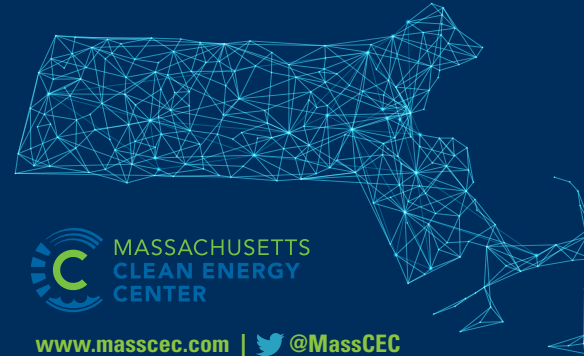
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