ENCORE LEARNING

Expand Your World

Encore Learning Presents

Save Money While Combating Climate Change: Sustainable Energy Solutions for Every Household

Presentation 1 of 3

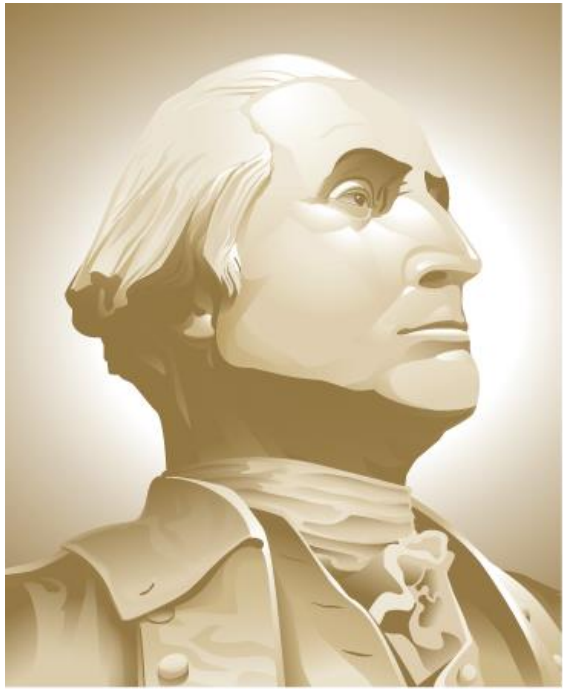
Presenter: Scott Sklar

June 1, 2020

The Stella Group, Ltd.

The Stella Group, Ltd.. is a strategic technology optimization and policy firm for clean distributed energy users and companies which include advanced batteries and controls, energy efficiency, fuel cells, geoexchange, heat engines, microhydropower (including tidal and wave), modular biomass, photovoltaics, small wind, and solar thermal (including CSP, daylighting, water heating, industrial preheat, building air-conditioning, and electric power generation). Scott Sklar serves on the national Boards of Directors of the non-profit Business Council for Sustainable Energy and The Solar Foundation. He teaches three unique interdisciplinary sustainable energy courses at The George Washington University (GWU) and serves as Energy Director of GWU's Environment & Energy Study Institute (EEMI). Scott Sklar was awarded the prestigious The Charles Greely Abbot Award by the American Solar Energy Society (ASES) and on April 26, 2014 was awarded the Green Patriot Award by George Mason University in Virginia. He was appointed to the US Department of Commerce (DOC) Renewable Energy & Energy Efficiency Advisory Committee (RE&EEAC), term ending 2020.

The Stella Group, Ltd. 703-522-3049 www.TheStellaGroupLtd.com solarsklar@aol.com

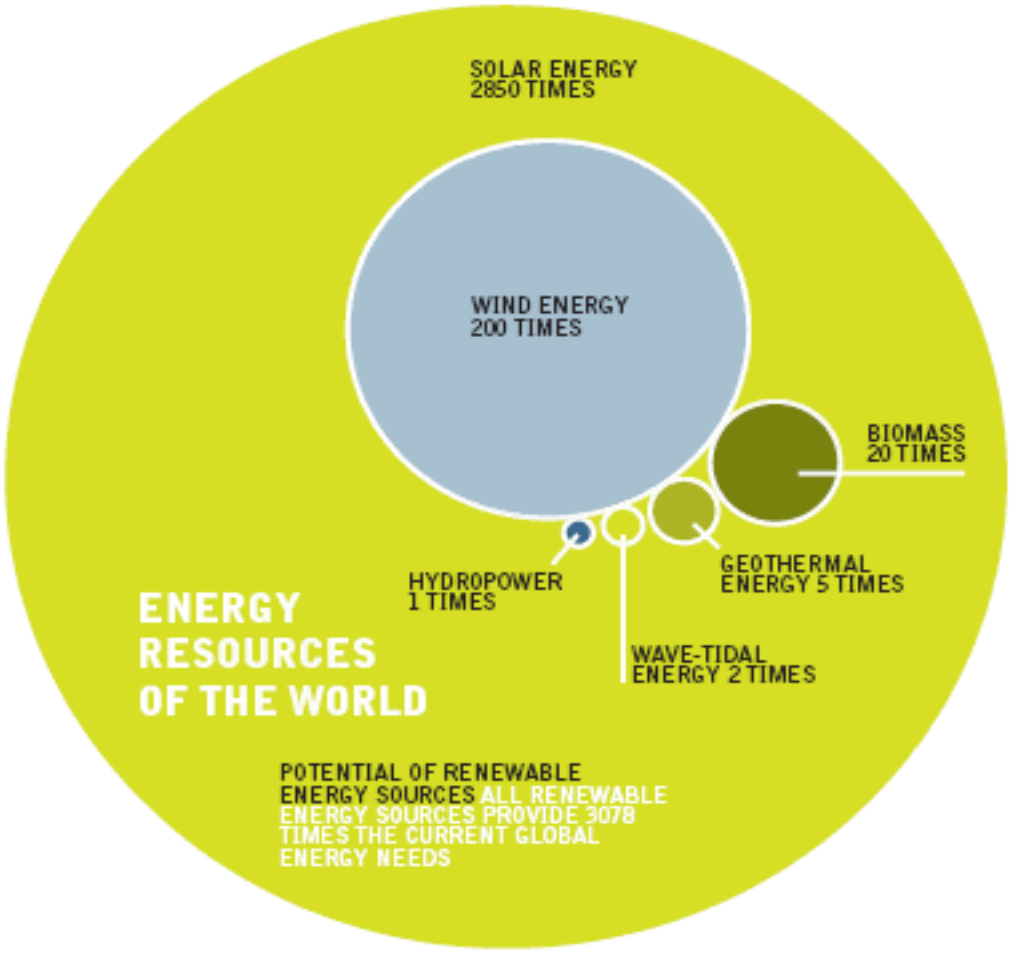


THE GEORGE WASHINGTON UNIVERSITY

WASHINGTON, DC

Adj Prof Scott Sklar
Energy Director
Environment & Energy Management Institute (EEMI)
and Acting Director, GWU Solar Institute
The George Washington University (GWU)
https://eemi.seas.gwu.edu/ sklar@gwu.edu
Personal email: solarsklar@aol.com Ph 703-522-3049

figure 30: **energy resources of the world**

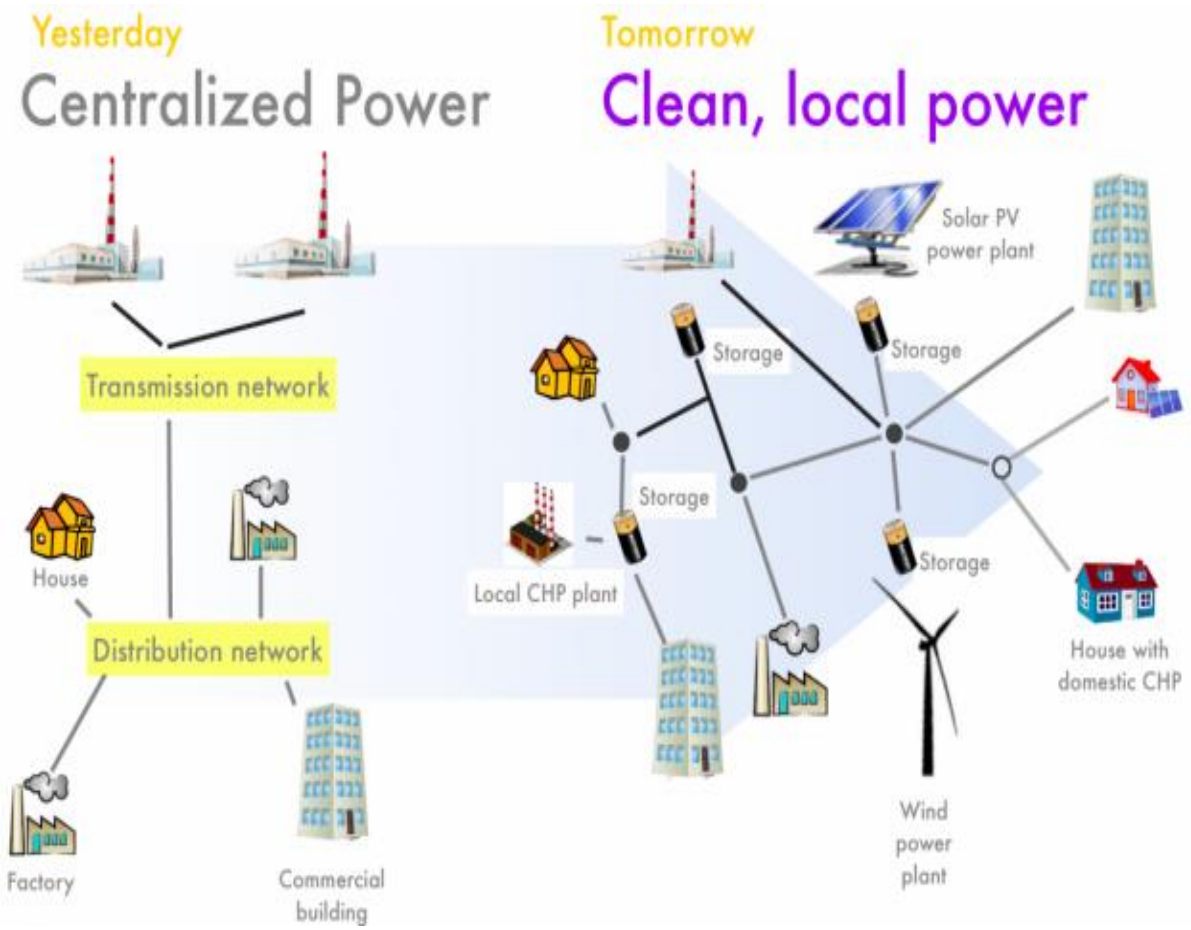


source WBGU

Institute DLR, Institute of Technical Thermodynamics, Department of Systems Analysis and Technology Assessment, Stuttgart, Germany Ecofys BV, P.O. Box 8408, NL-3503 RK Utrecht, Kanaalweg 16-G

The source of information in this Mind Map comes from http://www.mckinsey.com/insights/business_technology/disruptive_technologies

Reforming the Energy Vision



Earth Sizzles Through October as Another Month Ranks as the Warmest on Record:
Washington Post, by Andrew Freedman, November 5, 2019

https://www.washingtonpost.com/weather/2019/11/05/earth-sizzles-through-october-another-month-ranks-warmest-record

October was the warmest such month on record globally, narrowly edging out October 2015 for the top spot, according to a new analysis from the European Union's Copernicus Climate Change Service. Global average surface temperatures were 1.24 degrees above average when compared to the 1981-2010 average, and 0.02 degrees above the 2015 record. The month was a solid 0.2 degrees above the third-warmest October, which occurred in 2017.The findings are significant because it shows that 2019 is certain to be one of the warmest years on record, continuing a trend scientists attribute to increasing amounts of greenhouse gases in the atmosphere due to human activities.

What is the difference between weather and climate?

_____

Weather reflects short-term conditions of the atmosphere

While climate is the average daily weather for an extended period of time at a certain location

SOURCE: http://oceanservice.noaa.gov/facts/weather_climate.html

International academies: Joint statement "Climate change is real. There will always be uncertainty in understanding a system as complex as the world's climate. However there is now strong evidence that significant global warming is occurring. The evidence comes from direct measurements of rising surface air temperatures and subsurface ocean temperatures and from phenomena such as increases in average global sea levels, retreating glaciers, and changes to many physical and biological systems. Most of the warming in recent decades can be attributed to human activities (IPCC 2001)."
(2005, 11 international science academies)

Academia Brasiliera de Ciencias (Brazil) **Royal Society of Canada (Canada)**
Chinese Academy of Sciences (China) **Academie des Sciences (France)**
Deutsche Akademie der Naturforscher Leopoldina (Germany)
India National Science Academy (India) **Accademia die Lincei (Italy)**
Science Council of Japan (Japan) **Russian Academy of Sciences (Russia)**
Royal Society (United Kingdom) **National Academy of Sciences (USA)**

http://nationalacademies.org/onpi/06072005.pdf

National Academies Issue Statement Affirming Climate Science:
National Academies of Sciences, Engineering and Medicine, June 18, 2019

http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=06182019&_ga=2.265542415.103960959.1560981949-2132886821.1560981949

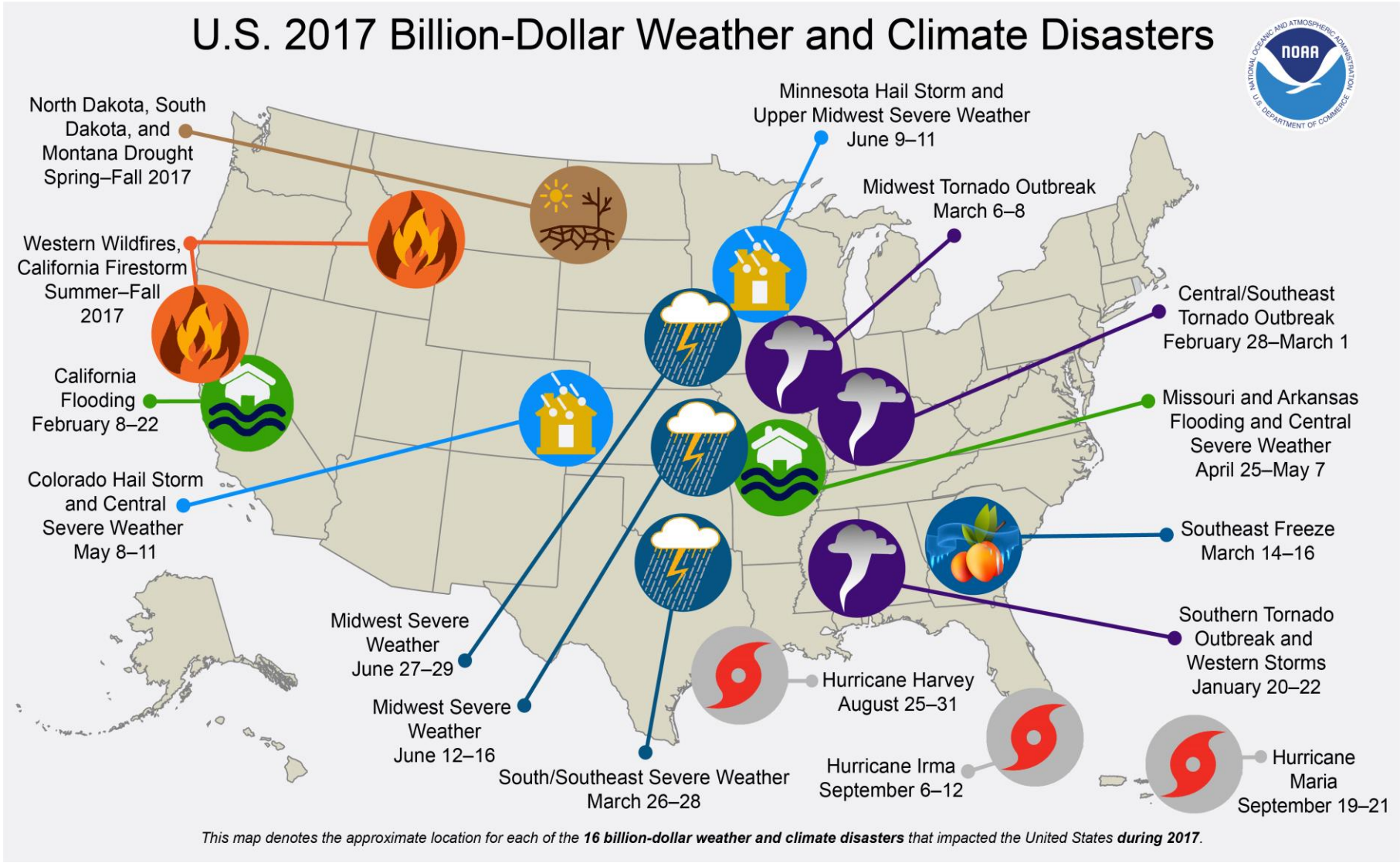
The presidents of the National Academies of Sciences, Engineering and Medicine have issued a statement making clear their support for the scientific evidence of climate change. They wrote: "Scientists have known for some time, from multiple lines of evidence, that humans are changing Earth's climate, primarily through greenhouse gas emissions. The evidence on the impacts of climate change is also clear and growing. The atmosphere and the Earth's oceans are warming, the magnitude and frequency of certain extreme events are increasing, and sea level is rising along our coasts. ... A solid foundation of scientific evidence on climate change exists. It should be recognized, built upon, and most importantly, acted upon for the benefit of society."

IEA's Energy Outlook Warns Global Carbon Emissions Unlikely to Peak Before 2040:

Financial Times, by Anjli Raval, November 13, 2019

https://insideclimatenews.org/news/13112019/iea-world-energy-outlook-emissions-climate-change-fossil-fuel-subsidies

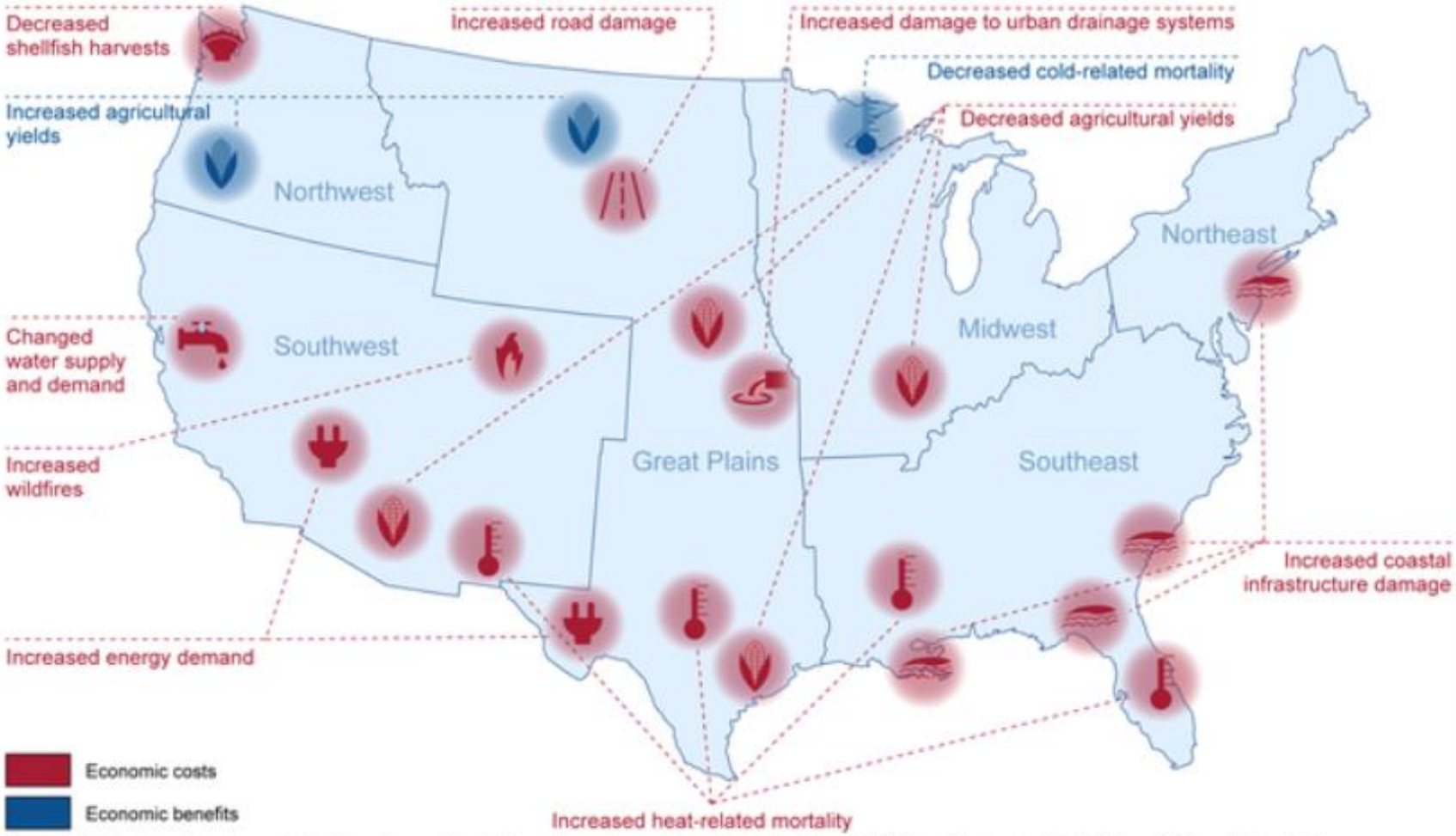
Carbon emissions are set to rise until 2040 even if governments meet their existing environmental targets, according to the International Energy Agency. IEA's annual "World Energy Outlook" report warns that the world's reliance on fossil fuels remains 'stubbornly high' when drastic changes are needed to slow climate change, the report says. The current set of government policies will not bring the world in line with the Paris climate agreement goals of limiting temperature rise to well below 2 degrees Celsius compared to pre-industrial times, or the more aggressive 1.5°C target. Carbon emissions, mostly caused by the burning of hydrocarbons, grew 44 percent between 2000 and 2018. IEA also noted that the global value of fossil fuel consumption subsidies in 2018 was nearly double the combined value of subsidies for renewable energy and electric vehicles as well as the revenue from global carbon pricing systems.



During 2017, the U.S. experienced a historic year of weather and climate disasters impacted by 16 separate billion-dollar disaster events tying 2011 for the record number of billion-dollar disasters for an entire calendar year. In fact, 2017 arguably has more events than 2011 given that our analysis traditionally counts all U.S. billion-dollar wildfires, as regional-scale, seasonal events, not as multiple isolated events.

https://www.ncdc.noaa.gov/billions/overview

Examples of Potential Economic Effects of Climate Change by 2100



Sources: GAO analysis of Environmental Protection Agency, *Climate Change Impacts in the United States: Benefits of Global Action* (Washington, D.C.: 2015), and Solomon Hsiang et al., "Estimating Economic Damage from Climate Change in the United States," *Science*, vol. 356 (2017); Map Resources (map). | GAO-17-720

ACEEE Report Says Efficiency Could Halve U.S. Energy Usage by 2050:
Energy Manager Today, by Alyssa Danigelis, September 19, 2019

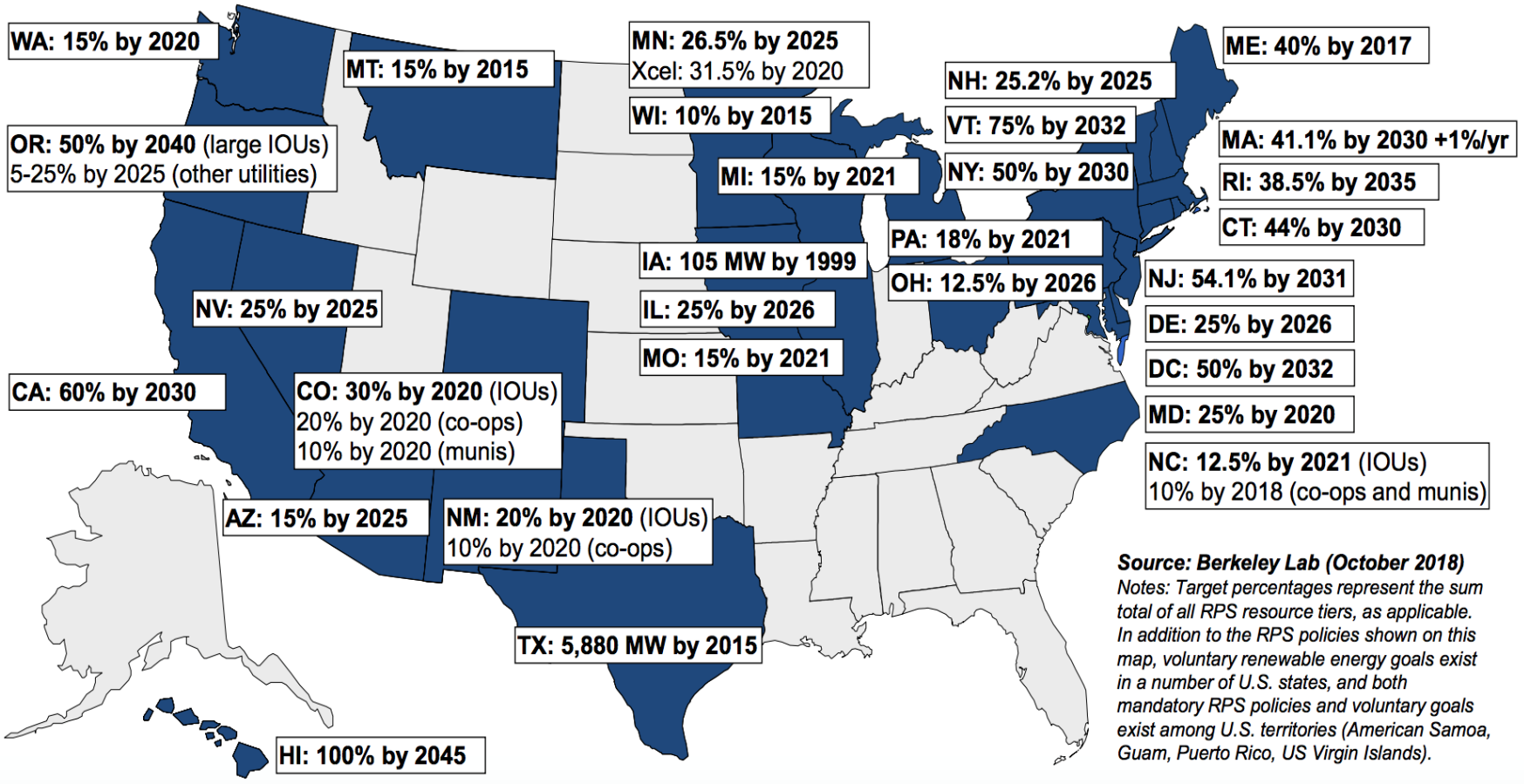
https://www.energymanagertoday.com/aceee-energy-efficiency-2050-0184387
and
https://aceee.org/press/2019/09/energy-efficiency-can-slash

A new report from the American Council for an Energy-Efficient Economy concludes that energy efficiency could cut US energy use and greenhouse gas emissions by 50% by 2050. The report, "Halfway There: Energy Efficiency Can Cut Energy Use and Greenhouse Gas Emissions in Half by 2050," builds on previous studies including ones from the International Energy Agency and the Natural Resources Defense Council. It identified 11 ambitious but cost-effective and technically possible measures that would avert emissions of nearly 2,500 million metric tons of heat-trapping carbon dioxide — equivalent to all emissions from cars, trucks, homes, and commercial buildings in 2050. For example, new homes and commercial buildings could cut their emissions by 70% with efficient design and use of cleaner electricity.

States Hold Fast to Clean Energy Growth Plans:
Pew Charitable Trusts, May 19, 2020

https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2020/05/19/clean-energy-has-taken-a-hit-will-it-rebound

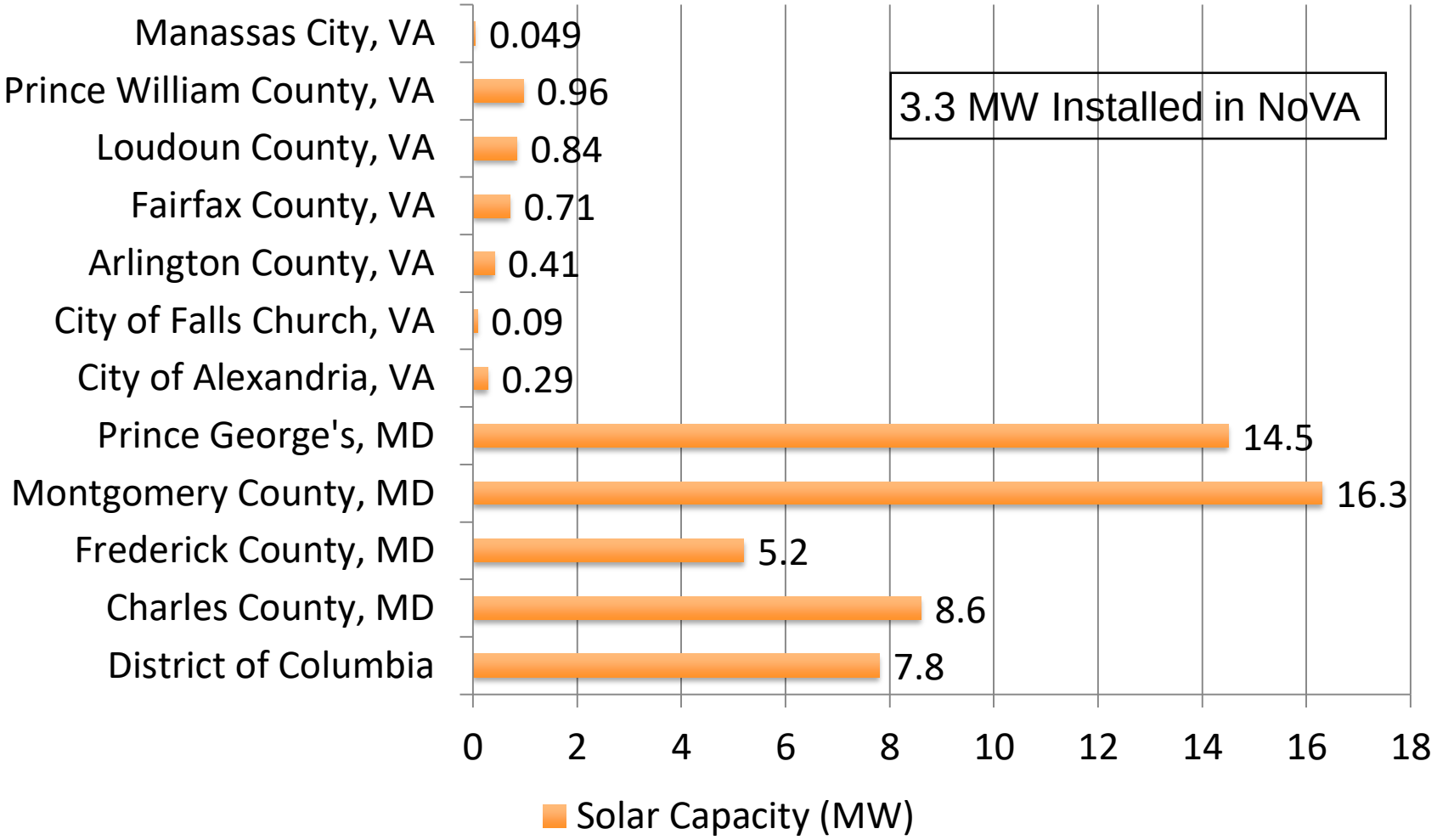
Members of the 100% Clean Energy Collaborative, which include 14 states and Washington, DC, say they remain committed to their 100% clean energy goals, despite the pandemic. That commitment is possibly a surprise, given the battering the clean energy industry has taken over the past two months. The pandemic has slashed state budgets, devastated the clean energy workforce and set back many projects. But leaders from California to New York to Washington say the disruption is just a speed bump. In the states that have set firm clean energy targets, utilities, investors and developers have been preparing to meet the demand created by state mandates, and that work isn't stopping. Moreover, many state officials think investments in clean energy could play a huge part in the country's economic recovery. They point to the 2009 stimulus package passed during the last recession, which provided $90 billion for the industry. That investment paved the way for the rapidly growing, increasingly affordable renewable energy being provided today



Source: Berkeley Lab (October 2018)

Notes: Target percentages represent the sum total of all RPS resource tiers, as applicable. In addition to the RPS policies shown on this map, voluntary renewable energy goals exist in a number of U.S. states, and both mandatory RPS policies and voluntary goals exist among U.S. territories (American Samoa, Guam, Puerto Rico, US Virgin Islands).

Solar PV Deployment in the National Capital Region



Northern Virginia Regional Commission

WAMU | DEC 18, 2018

D.C. Commits To All Renewable Energy by 2032

https://wamu.org/story/18/12/18/d-c-commits-to-all-renewable-energy-by-2032/

Washington, D.C. will be among the first cities in the nation to transition to 100 percent renewable energy, under a bill that passed a final vote today by the D.C. Council. The bill updates the District's renewable portfolio standard, which previously required 50 percent renewables by 2032.

The Clean Energy D.C. Act passed unanimously. It includes a variety of measures to cut carbon emissions and combat climate change: in addition to updating the renewable portfolio standard, it will toughen energy efficiency requirements for new and existing buildings, help fund efficiency upgrades and incentivize electric vehicle purchase. Taken together, these measures are expected to slash emissions by 42 percent by 2032.

Maryland General Assembly approves 50 percent renewable energy target for 2030

By SCOTT DANCE. THE BALTIMORE SUN |. APR 08, 2019 | 11:00 PM

Maryland lawmakers approved a dramatic investment in renewable energy in the final hours of the 2019 General Assembly session, passing a measure mandating that half the state's electricity supply come from renewable sources by 2030.(Kenneth K. Lam / The Baltimore Sun). Maryland lawmakers approved a dramatic investment in renewable energy in the final hours of the 2019 General Assembly session, passing a measure mandating that half the state's electricity supply come from renewable sources by 2030.
The proposal appeared doomed as recently as two weeks ago, languishing in the House of Delegates until **lawmakers revised it to preserve subsidies for the waste-to-energy industry**. Senators had voted earlier in the session to stop subsidizing trash incineration as green energy.

Supporters say the legislation will stem a downturn in solar industry jobs in the state, and could also boost wind farms and other alternative energy development. It requires utilities across the state to subsidize solar and wind farms, as well as trash incinerators, hydroelectric dams and paper mills powered with a substance known as black liquor. "This bill now makes Maryland a true national leader in the fight against climate change and in favor of clean energy," Mike Tidwell, director of the Chesapeake Climate Action Network, said in a statement.

SOURCE: https://www.baltimoresun.com/news/environment/bs-md-renewable-energy-passed-20190408-story.html

Virginia becomes the first state in the South to target 100% clean power
The state's Democratic majority is doing what Democratic majorities do.

by David Roberts@drvoxdavid@vox.com
Updated Apr 13, 2020, 2:56pm EDT
Virginia Gov. Ralph Northam **signed the Virginia Clean Economy Act into law**. The post below, originally published on March 12, describes what is in it and how it came about.

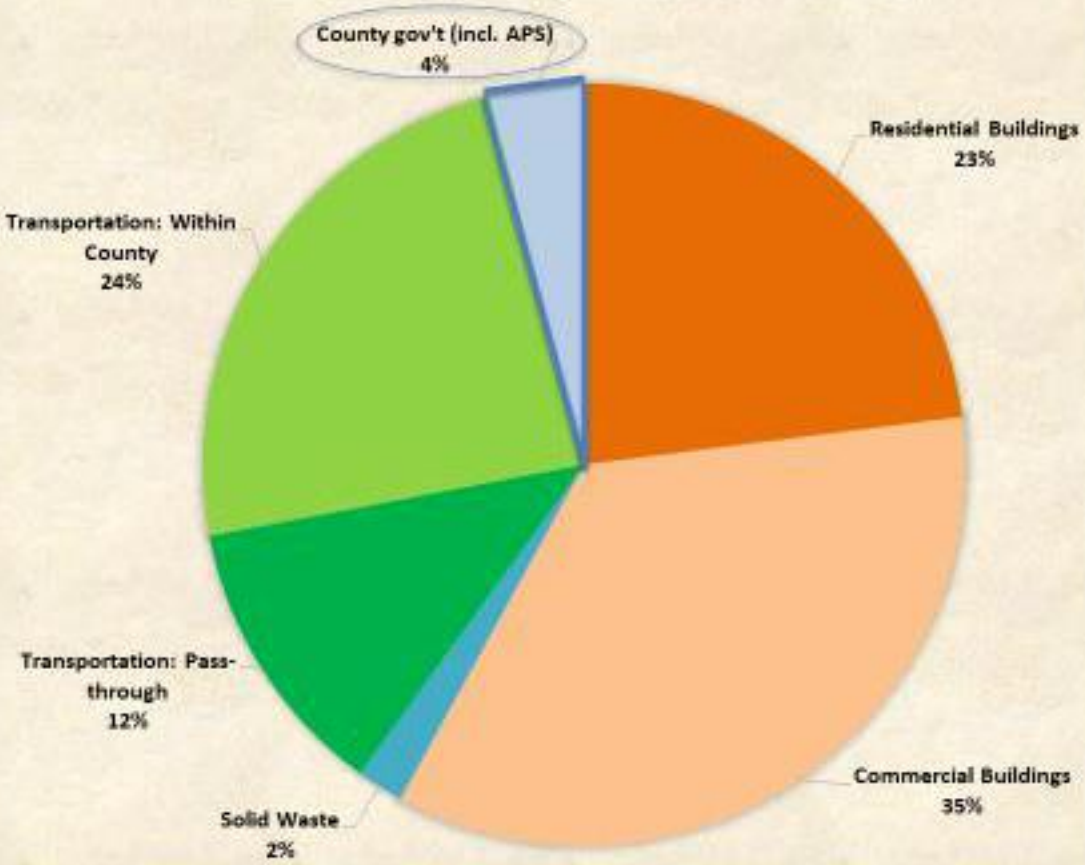
In September of 2019, Northam tried to do what Democrats generally do when elected: support clean energy. He issued **Executive Order 43**, which laid out a plan for the state to reach 100 percent carbon-free electricity by 2050 (in keeping with the **consensus goal of national Democrats**) and to join the Regional Greenhouse Gas Initiative (**RGGI**, a nine-state carbon trading network).

Sure enough, last week, the General Assembly passed the **Virginia Clean Economy Act** (VCEA), which puts Northam's vision into law. The House voted 51-45 and the Senate voted 22-17; in each chamber, the bill received precisely one Republican vote.

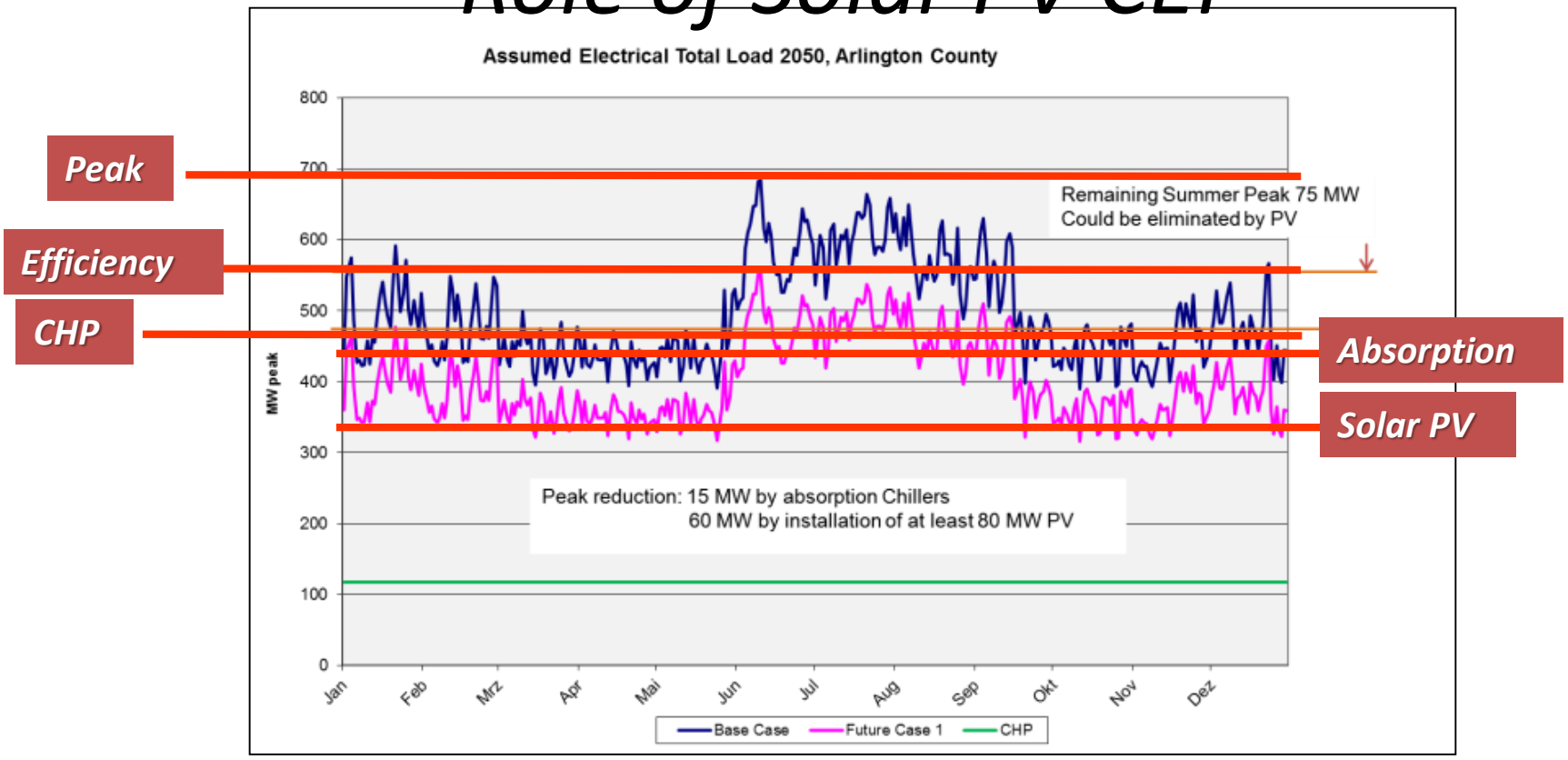
https://www.vox.com/energy-and-environment/2020/3/12/21172836/virginia-renewable-energy-100-percent-clean

Arlington's Emissions Profile

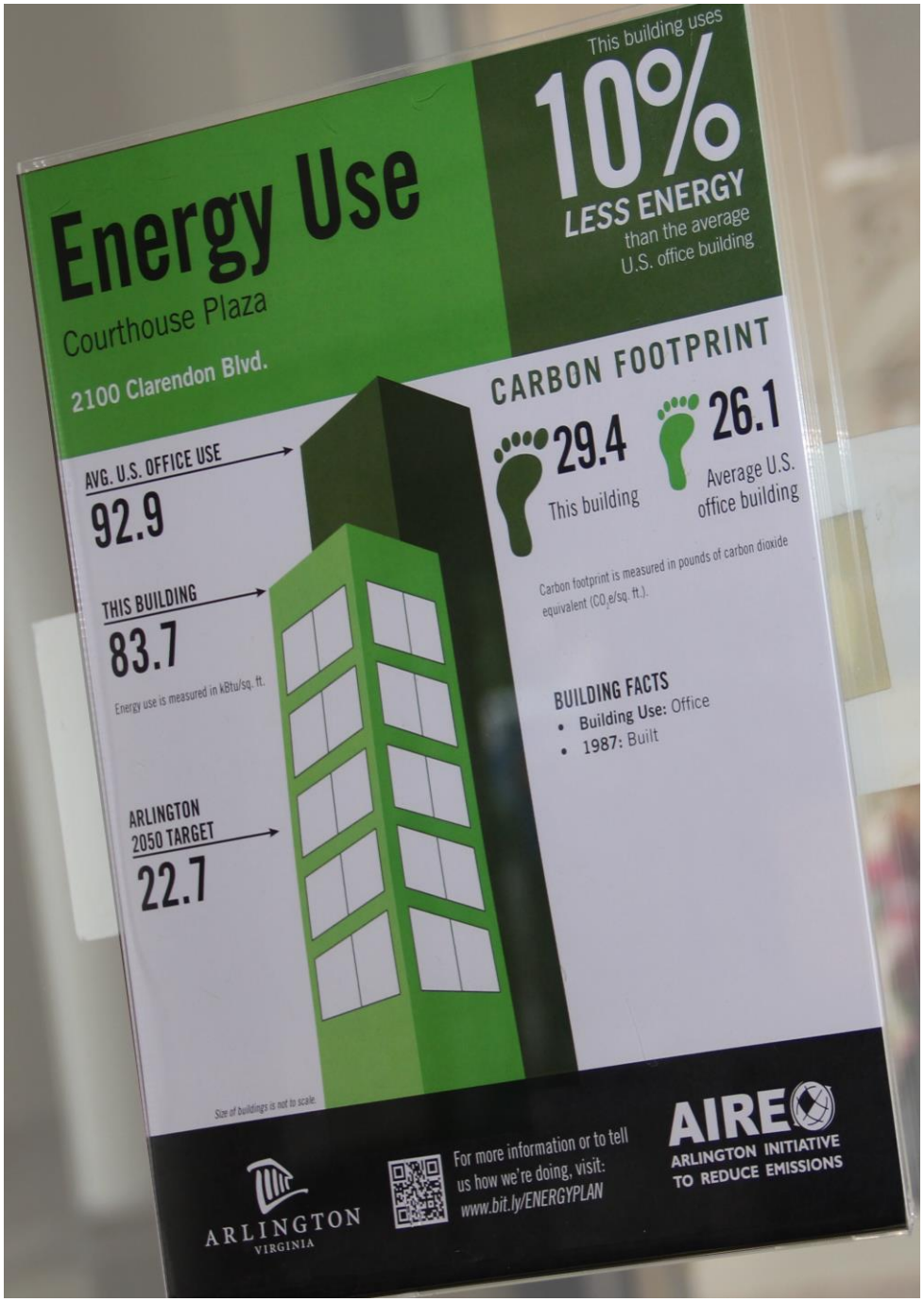
ARLINGTON GHG EMISSIONS BY SECTOR - 2016



Electricity Peak Reduction
Role of Solar PV CEP



- CEP eliminates summer electrical peak at County boundary
- Multiple contributing factors
  - Buildings' efficiency
  - 146 MW electricity CHP
  - 15 MW equivalent absorption cooling from CHP heat recovery
  - 160 MW (nominal) Solar PV
- Solar power roughly coincides with peak demand


Energy Use
Courthouse Plaza
2100 Clarendon Blvd.
This building uses
10%
LESS ENERGY
than the average
U.S. office building
AVG. U.S. OFFICE USE
92.9
THIS BUILDING
83.7
Energy use is measured in kBtu/sq. ft.
ARLINGTON
2050 TARGET
22.7
Size of buildings is not to scale.
CARBON FOOTPRINT
29.4
This building
26.1
Average U.S.
office building
Carbon footprint is measured in pounds of carbon dioxide
equivalent (CO_2e/sq. ft.).
BUILDING FACTS
Building Use: Office
1987: Built
ARLINGTON
VIRGINIA
For more information or to tell
us how we're doing, visit:
www.bit.ly/ENERGYPLAN
AIRE
ARLINGTON INITIATIVE
TO REDUCE EMISSIONS

Advanced Energy Hit Record $1.6 Trillion Worldwide in 2018; U.S. Revenue Grew Nearly 4 Times as Fast as GDP:
Advanced Energy Economy, by Monique Hanis, April 25, 2019

https://www.aee.net/articles/report-advanced-energy-hit-record-1.6t-worldwide-in-2018-u.s.-revenue-grew-nearly-4-times-as-fast-as-gdp

Total revenue for advanced energy worldwide was a record $1.6 trillion in 2018, making the industry equal to global tourism, bigger than pharmaceuticals, and twice the size of airlines worldwide according to the "Advanced Energy Now 2019 Market Report" produced by Navigant Research for AEE. The U.S. advanced energy market hit $238 billion after growing 11% in 2018 – nearly four times as fast as U.S. GDP. Advanced energy is now nearly equal in revenue to aerospace manufacturing, and twice the revenue of the biotech industry. Of the $25 billion overall increase in U.S. advanced energy revenue over 2017, the bulk came in three segments: Advanced Transportation ($7.9 billion), led by explosive growth in revenue from plug-in electric vehicles; Building Efficiency ($7.8 billion), a steady source of growth since 2011; and Advanced Fuel Production ($5.4 billion), marked by a rebound in ethanol and biodiesel revenue.

Renewables Bring 72% of New Global Power Capacity in 2019:
Renewables Now, April 6, 2020

https://renewablesnow.com/news/renewables-bring-72-of-new-global-power-capacity-in-2019-693872
and
https://solarindustrymag.com/renewable-energy-accounts-for-majority-of-new-capacity-in-2019
and
https://www.hydroreview.com/2020/04/06/nearly-three-quarters-of-global-generating-capacityy
added-in-2029-came-from-renewables

According to the International Renewable Energy Agency (IRENA), the world installed 176 GW of renewable power capacity in 2019, 90% of which came from solar and wind farms.

The share of renewables in net power generation capacity additions was 72% globally. The only regions in which that share was below 70% were Africa and the Middle East. There, renewables projects represented 52% and 26%, respectively, of net new capacity. Renewables accounted for 34.7% of installed global power capacity at the end of 2019, up from a share of 33.3% in 2018. The 2019 renewable capacity additions were slightly below the 2018 total of 179 GW. Last year, the total renewable power growth outpaced fossil fuel growth by a factor of 2.6. Asia, the Middle East and Africa recorded net growth in non-renewable capacity additions, while Europe and North America decommissioned more than they added.

Renewable Energy Continues to Be Cheaper Than Natural Gas and Coal:
Navigant Research, by Jesse Broehl, January 2, 2019

https://www.navigantresearch.com/news-and-views/renewable-energy-continues-to-be-cheaper-than-natural-gas-and-coal

Lazard's latest annual comparative assessment of levelized cost of energy (LCOE) shows that the cost of generating energy from utility-scale solar PV and onshore wind technologies continues to decline. The LCOE of utility-scale PV technologies is down approximately 13% from 2017 and the mean LCOE of onshore wind has declined close to 7%. More impressive are the long-term declines in cost of energy; over the last 9 years, unsubsidized wind has declined by 69% and unsubsidized utility-scale solar PV has declined by 88%. These figures are all in current dollars, so price differences between years would be even more impressive if adjusted for inflation. The latest unsubsidized cost figures show the levelized cost of onshore wind-generated energy is between $29/MWh and $56/MWh, whereas coal is between $60MWh and $143/MWh. The levelized cost of utility-scale solar is between $36/MWh and $46/MWh.

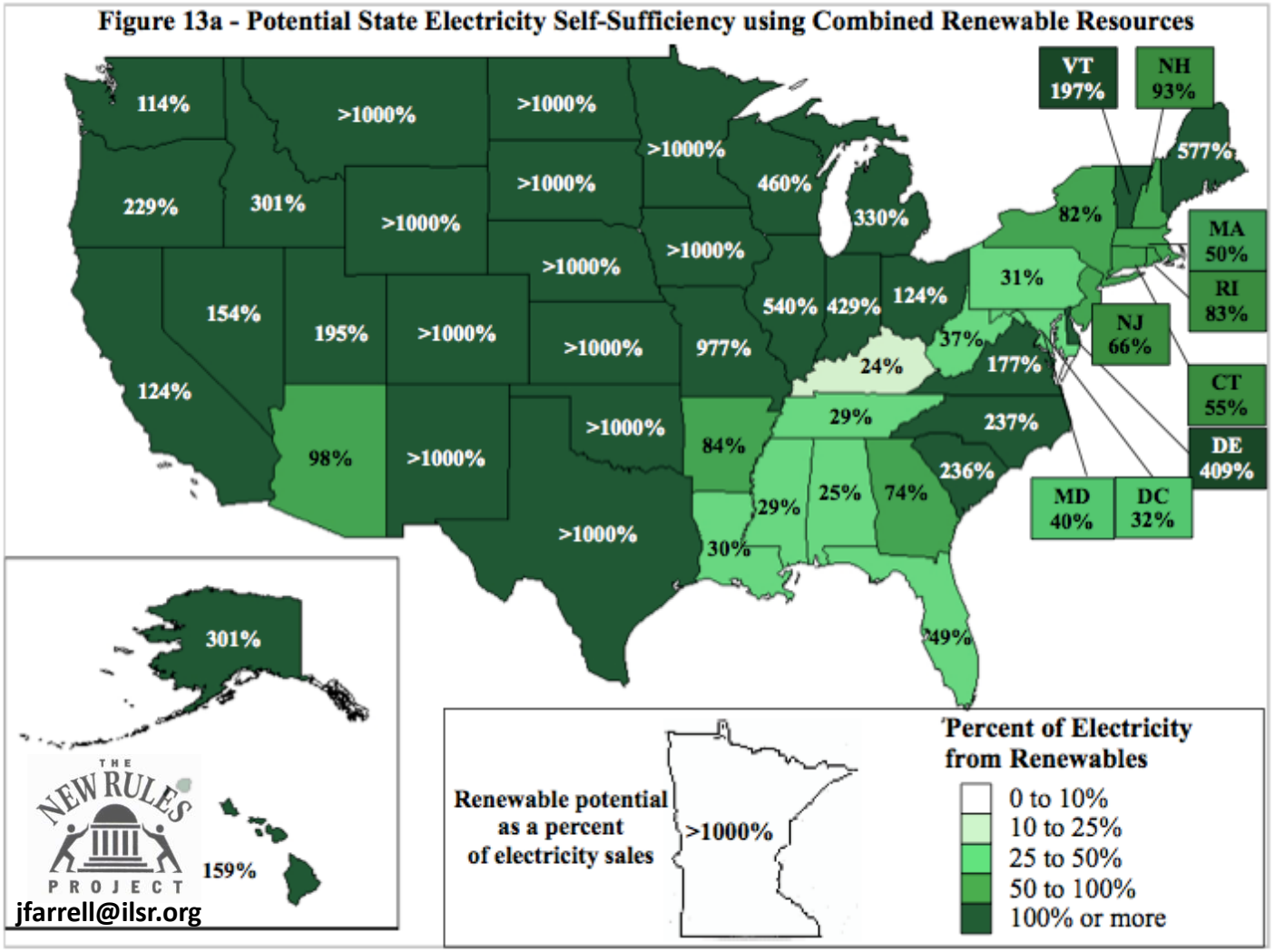
World Now Has 583.5 GW of Operational PV

PV-Magazine.com, by Emiliano Bellini, April 6, 2020

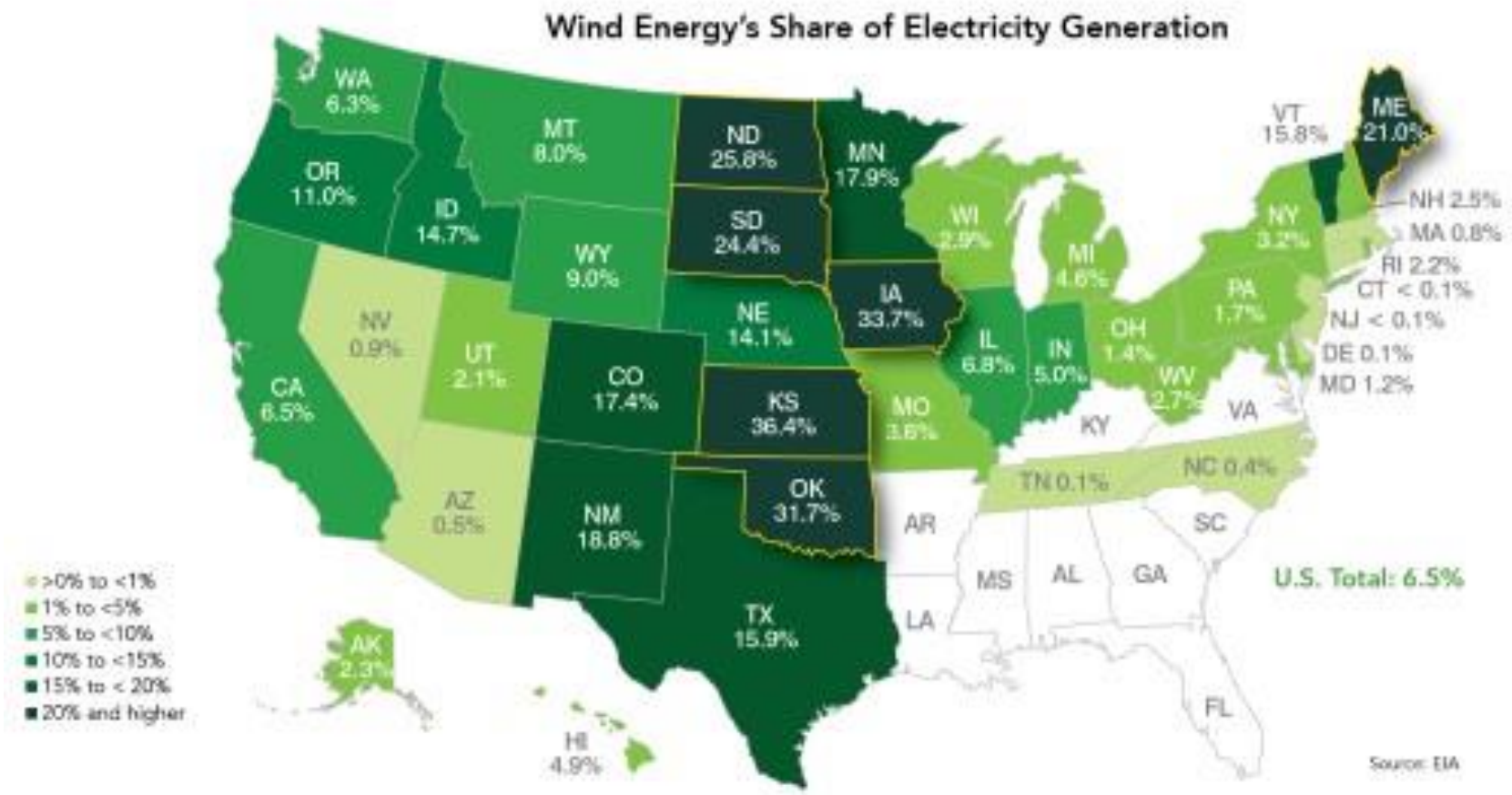
https://www.pv-magazine.com/2020/04/06/world-now-has-583-5-gw-of-operational-pv

Global grid-connected solar capacity reached 580.1 GW at the end of 2019, along with 3.4 GW of offgrid PV, according to the International Renewable Energy Agency. Solar installations, including PV and concentrated solar power (CSP), continue to lag slightly behind wind, with a cumulative installed capacity of 586.4 GW. CSP represented 6.27 GW of the total, while grid-connected PV accounted for 580.1 GW. Asia is the part of the world with the largest share of PV capacity, at 330.1 GW of cumulative installed capacity. In North America, total grid-connected PV capacity reached 68.2 GW at the end of December. About 60.5 GW was installed in the United States, followed by 4.8 GW in Mexico and 3.3 GW in Canada. Total installed renewables capacity globally hit a remarkable 2,563.8 GW, with hydropower remaining the dominant source at 1,310.9 GW, followed by wind at 622.7 GW.

32 States can be Self-Sufficient



jfarrell@ilsr.org



According to a new report from the American Wind Energy Association, the U.S. wind power industry emerged from 2018 stronger than ever, now able to power 30 million American homes after 8% capacity growth last year. The annual report reveals that U.S. wind power supports a record 114,000 American jobs, over 500 domestic factories, and more than $1 billion a year in revenue for states and communities that host wind farm.

Report: https://www.awea.org/2018-market-report_us-wind-power-grew-8-percent-in-2018

https://mail.aol.com/webmail-std/en-us/suite

FERC's latest monthly "Energy Infrastructure Update" report (with data through November 30, 2019) reveals renewable sources (i.e. biomass, geothermal, hydropower, solar, wind) accounted for 8,784 MW of new generating capacity through the end of November . [1] That is 8% more than that of natural gas (7,819 MW), nuclear (155 MW), oil (77 MW), and coal (62 MW) combined. Combined, renewables provided 52% of new generating capacity through the first eleven months of 2019 and seem poised to increase their share once the final December numbers are released.

Renewables have now also surpassed 22% (i.e., 22.03%) of the nation's total available installed generating capacity - further expanding their lead over coal capacity (20.92%). Among renewables, wind can boast the largest installed electrical generating capacity - 8.52% of the U.S. total, followed by hydropower (8.43%), solar (3.43%) [2], biomass (1.33%), and geothermal (0.32%).

Moreover, FERC foresees renewables dramatically expanding their lead over fossil fuels and nuclear power in terms of new capacity additions during the coming three years (i.e., December 2019 - November 2022). Net generating capacity additions (i.e., "proposed additions under construction" minus "proposed retirements") for renewable sources total 49,926 MW: wind - 28,856 MW, solar - 19,156 MW, hydropower - 1,463 MW, biomass - 238 MW, and geothermal - 213 MW.

By comparison, net additions for natural gas total 23,233 MW while the installed capacities for coal, nuclear, and oil are projected to drop by 14,067 MW, 3,751 MW, and 2,751 MW respectively. Thus, net new renewable energy capacity will be 18.7 times greater than that of fossil fuels and nuclear power combined (49,926 MW vs. 2,664 MW). FERC's projections are consistent with new projections released just this week (1/15/2020) by the U.S. Energy Information Administration (EIA). [3] The agency expects solar and wind to represent 76% (or almost 32 GW) of new capacity additions in 2020.

For Release: Wednesday - January 15, 2020 SUN DAY CAMPAIGN **sun-day-campaign@hotmail.com**

36 STUDIES ON GOING TO 100% RENEWABLES

“a subset of efficiency & renewables”

Clean Energy Reports

1. **GREENPEACE/DLR**

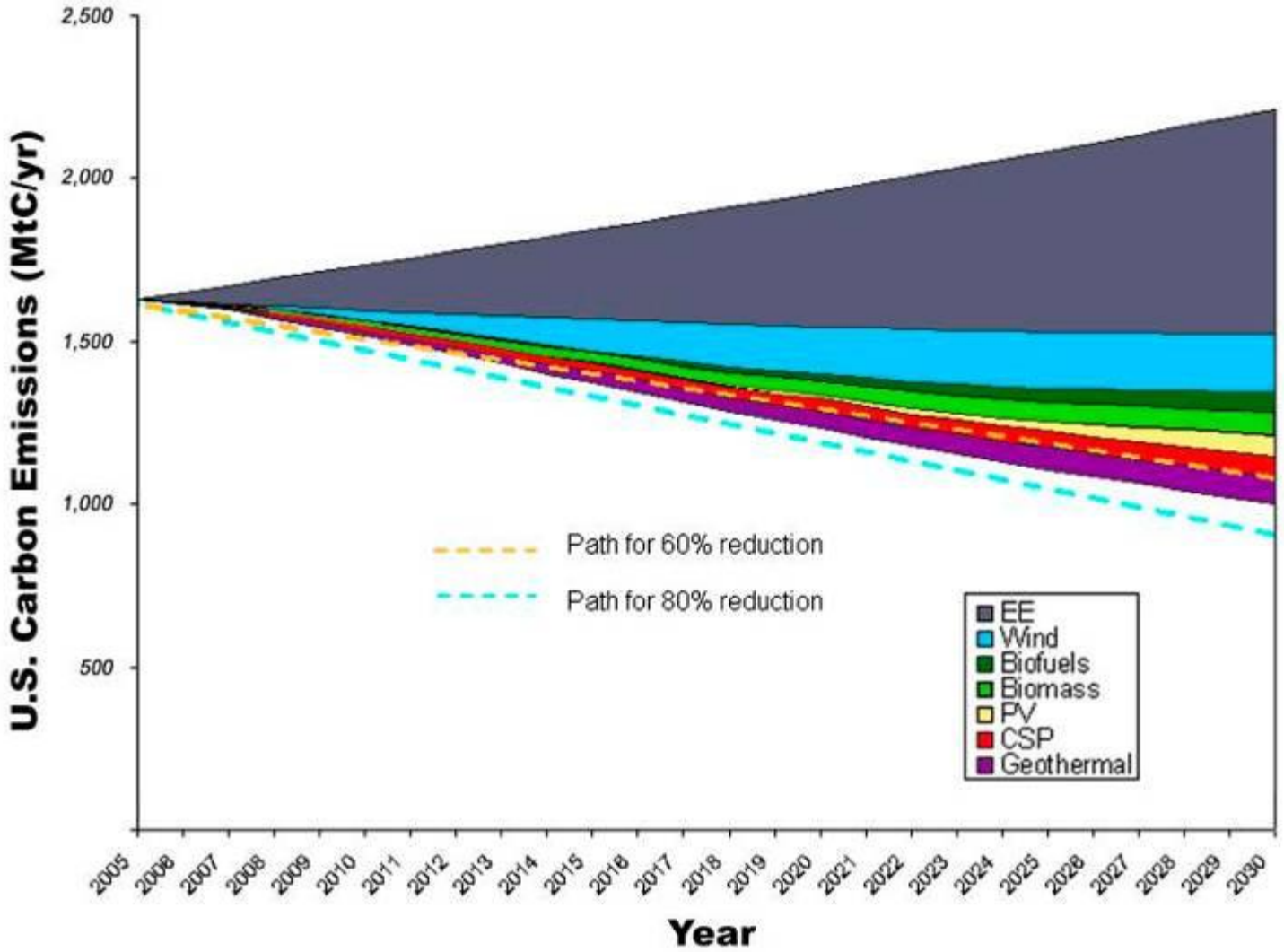
The world could eliminate fossil fuel use by 2090 by spending trillions of dollars on a renewable energy revolution, the European Renewable Energy Council (EREC) and environmental group Greenpeace said. The 210-page study is one of few reports -- even by lobby groups -- to look in detail at how energy use would have to be overhauled to meet the toughest scenarios for curbing greenhouse gases outlined by the U.N. a Climate Panel. "Renewable energy could provide all global energy needs by 2090," according to the study, entitled "Energy (R)evolution." EREC represents renewable energy industries and trade and research associations in Europe.

2. **ASES/NREL** U.S. Energy Experts Announce Way to Freeze Global Warming

On January 31, 2007 at a press conference in Washington, D.C., ASES unveiled a 200-page report, Tackling Climate Change in the U.S.: Potential Carbon Emissions Reductions from Energy Efficiency and Renewable Energy by 2030. The result of more than a year of study, the report illustrates how energy efficiency and renewable energy technologies can provide the emissions reductions required to address global warming. U.S. Carbon Emissions Displacement Potential from Energy Efficiency and Renewable Energy by 2030 - 57% Energy Efficiency, 43% Renewables

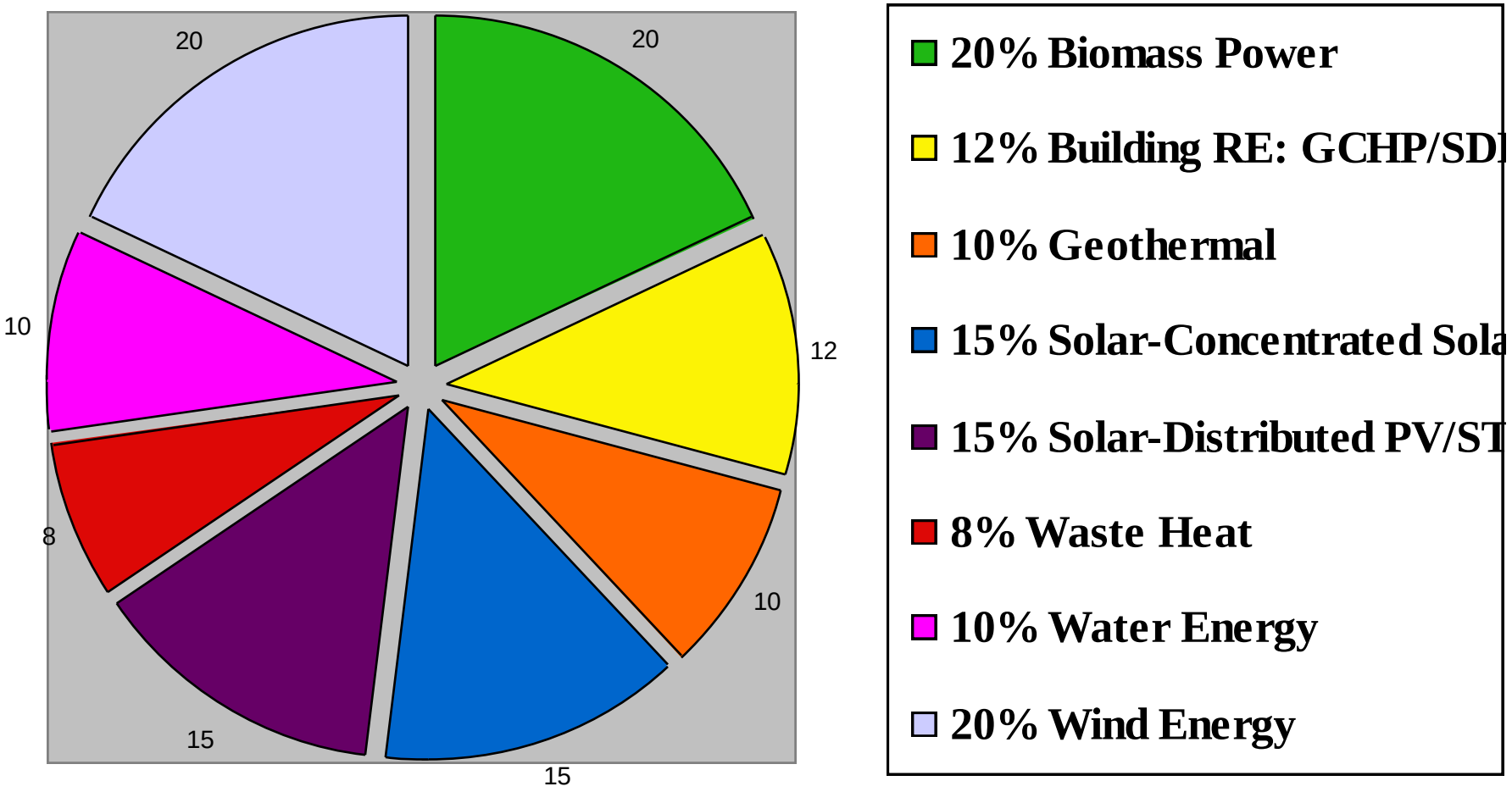
3. **GOOGLE** Google.org, the philanthropic arm of the search giant, has unveiled a plan to move the U.S. to a clean-energy future. The vision: In 2030, electricity will be generated not from coal or oil but from wind, solar, and geothermal power. Energy demand will be two-thirds what it is now, thanks to stringent energy-efficiency measures. Ninety percent of new vehicle sales will be plug-in hybrids. Carbon dioxide emissions will be down 48 percent. Getting there will cost $4.4 trillion, says the plan -- but will recoup $5.4 trillion in savings. The Clean Energy 2030 plan would require ambitious national policies, a huge boost to renewables, increased transmission capacity, a smart electricity grid, and much higher fuel-efficiency standards for vehicles.

U.S. Carbon Emissions Displacement Potential from Energy Efficiency and Renewable Energy by 2030



57% Energy Efficiency, 43% Renewables

Percentage of Clean Energy in 21st Century



Orlando City Commission Commits to 100% Renewable Energy by 2050:
Sierra Club, August 8, 2017

http://content.sierraclub.org/press-releases/2017/08/orlando-city-commission-commits-100-renewable-energy-2050http://content.sierraclub.org/press-releases/2017/08/orlando-city-commission-commits-100-renewable-energy-2050

The Orlando City Commission has unanimously approved a resolution establishing a goal to move Orlando to 100 percent clean and renewable energy by 2050. Orlando is now the largest city in Florida to make such a commitment and joins a growing movement of more than three dozen cities nationwide that have committed to a 100 percent clean energy future. Orlando represents the 40th city in the U.S. to commit to move to 100 percent clean and renewable energy. Other Florida cities that have committed to transition to 100 percent clean and renewable energy include St. Petersburg and Sarasota.

Colorado City to Become One of the First in U.S. to Run Completely on Renewable Energy:
The Hill, by JustinWise, May 29, 2019

https://thehill.com/policy/energy-environment/446065-colorado-city-to-become-one-of-the-first-in-the-country-run-on-100

Glenwood Springs, Colorado is set to become the latest U.S. city to run entirely on renewable energy. The move to 100 percent renewable energy comes after the city inked a deal with its wholesale power supplier. The Glenwood Springs City Council in April approved a resolution to buy all of Glenwood Springs Electric's electricity from wind power supplied by Municipal Energy Agency of Nebraska. Glenwood Springs will join six other cities that are already running on 100 percent renewable energy. The cities include Aspen, Colorado, Burlington, Vermont.; Georgetown, Texas; Greensburg, Kansas; Rock Port, Missouri; and Kodiak Island, Alaska.

RENEWABLE ENERGY

Germany Exceeds 50% Renewable Energy Use Milestone

Deutsche Welle

Apr. 03, 2020 02:48PM EST**RENEWABLE ENERGY**

In Germany's Hunsrück village of Schorbach, numerous photovoltaic systems are installed on house roofs, on Sept. 19, 2019. Thomas Frey / Picture Alliance via Getty Images

Germany's target for renewable energy sources to deliver 65% of its consumed electricity by 2030 seemed on track Wednesday, with 52% of electricity coming from renewables in 2020's first quarter. Renewable energy advocates, however, warned the trend is imperiled by slowdowns in building new wind and solar plants. The federal BDEW energy and water federation and Baden-Württemberg state's ZSW solar and hydro research center observed a 7% percent renewables jump from 44.4% in the same period last year, in comparison to fossil fuel consumption.

Wind, especially offshore wind turbines, solar panels and other sources generated 77 billion kilowatt-hours (kWh) compared to 67 kWh in the first quarter of 2019. Using the standard EU's electricity consumption measurement, Germany's total, also from conventional coal, gas and nuclear plants, amounted to 148 billion kWh. The 7% jump in renewables came despite conventional plant closures and pandemic impacts on industry, officials said, while also noting "special effects" such as record winds in February and plentiful sun in March that benefited turbines and voltaic panels.

SOURCE: https://www.ecowatch.com/germany-renewable-energy-2645629058.html


Good planets are hard to find.

THERE ARE NO “DUMB” QUESTIONS !!

Any questions ???

Need reports, contacts ???

Contact:

Scott Sklar
solarsklar@aol.com

ENCORE LEARNING

Expand Your World

Thank you!

www.EncoreLearning.net