Lattice Energy LLC

February 2016 was warmest February since 1880

Following the hottest January ever on record the trend toward higher global temperatures continues

Drastic curtailment of CO_2 emissions from man's power generation activities will eventually happen regardless because British Petroleum has estimated that fossil fuel resources will be totally exhausted in less than 150 years at present rates of energy consumption

Lewis Larsen

President and CEO

March 18, 2016

Contact: 1-312-861-0115 Chicago, Illinois USA

lewisglarsen@gmail.com

Like it or not global warming is presently upon us

Increases in global temperatures and ppm CO_2 concentration in our Earth's atmosphere recently set new all-time records going all the way back to 1880. Could these rates now be accelerating?

The relationship between higher temperatures and ppm CO_2 is well-established scientifically. As long as societal economic costs are reasonable, it would be beneficial to reduce CO_2 emissions associated with many different power generation activities. Green ultralow energy neutron reactions (LENRs) are the only new technology on foreseeable horizon that could enable the "energy miracle" of Bill Gates.

Credit: david_addimage (Stockphoto)

NOAA: February 2016 global temperatures broke records

Increased temperature anomalies were widespread across entire world

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

http://www.ncdc.noaa.gov/sotc/global/201602

Global Highlights

standard | metric

FEBRUARY 2016	ANOMALY	RANK
Land	+4.16°F	1st Warmest
Ocean	+1.46°F	1st Warmest
Land+Ocean	+2.18°F	1st Warmest

NOAA: February 2016 - global temperatures broke records

Average temperatures highest ever recorded since 1880 or in 136 years

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

http://www.ncdc.noaa.gov/sotc/global/201602

The globally averaged temperature over land and ocean surfaces for February 2016 was the highest for the month of February in the NOAA global temperature dataset record, which dates back to 1880. It was the highest departure from average among all 1,646 months in the record. The December–February temperature was also the highest for the season and highest departure from average for any three-month period on record.

NOAA: February 2016 - global temperatures broke records

Average temperatures highest ever recorded since 1880 or in 137 years

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http://www.ncdc.noaa.gov/sotc/global/201602

"The combined average temperature over global land and ocean surfaces for February 2016 was the highest for February in the 137-year period of record, at 1.21°C (2.18°F) above the 20th century average of 12.1°C (53.9°F). This not only was the highest for February in the 1880 - 2016 record - surpassing the previous record set in 2015 by 0.33°C / 0.59°F - but it surpassed the all-time monthly record set just two months ago in December 2015 by 0.09°C (0.16°F). Overall, the six highest monthly temperature departures in the record have all occurred in the past six months. February 2016 also marks the 10th consecutive month a monthly global temperature record has been broken."

"The average global temperature across land surfaces was 2.31°C (4.16°F) above the 20th century average of 3.2°C (37.8°F), the highest February temperature on record, surpassing the previous records set in 1998 and 2015 by 0.63°C (1.13°F) and surpassing the all-time single-month record set in March 2008 by 0.43°C (0.77°F)."

NOAA: February 2016 - global temperatures broke records

Notable record warmth occurred across many populous regions of world

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

"Most of Earth's land surfaces were warmer than average or much warmer than average, according to the Land & Ocean Temperature Percentiles map above, with record warmth notable across various areas of South America, much of southern Africa, southern and eastern Europe, around the Urals of Russia, and most of Southeast Asia stretching to northern Australia. Of significance, a vast region stretching from central Russia into eastern Europe, along with most of Alaska, observed February temperatures more than 5°C (9°F) above the 1981 - 2010 average, beyond the upper bounds of the Land & Ocean Temperature Departure from Average map shown above. A few pockets in Asia were cooler than average, including part of Far East Russia, with one area record cold in the upper Kamchatka Peninsula … In the United States, Alaska reported its warmest February in its 92-year period of record, at 6.9°C (12.4°F) higher than the 20th century average. The contiguous U.S. was seventh warmest in its 122-year period of record, at 3.18°C (5.72°F) above average, with the west and extreme northeast observing the highest departures from average."

NOAA graphic summarizes February 2016 temperature data

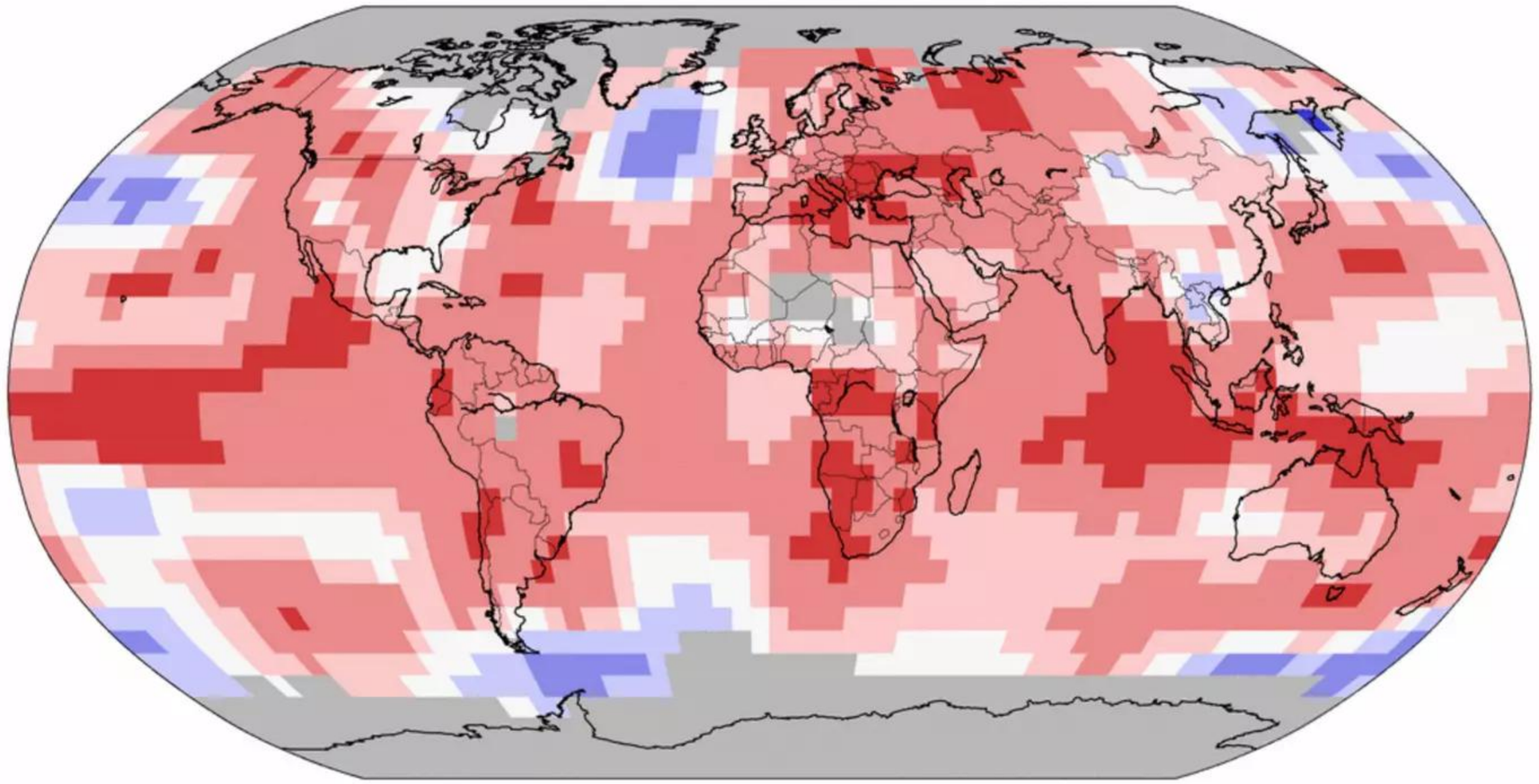
Regions on map marked with darkest shade of red are record warmest

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Land & Ocean Temperature Percentiles Feb 2016

NOAA's National Centers for Environmental Information

Data Source: GHCN–M version 3.3.0 & ERSST version 4.0.0

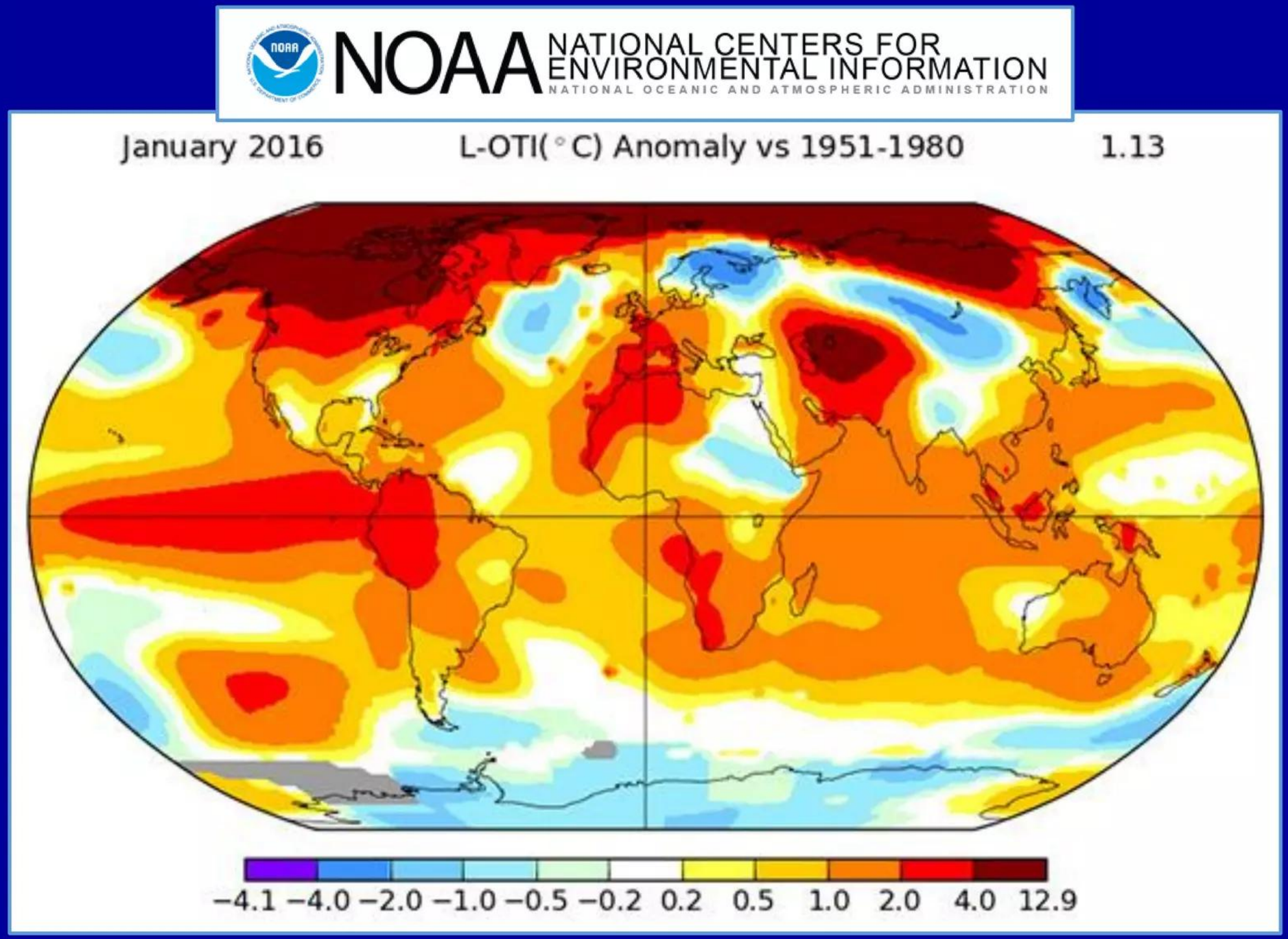


Record Coldest | Much Cooler than Average | Cooler than Average | Near Average | Warmer than Average | Much Warmer than Average | Record Warmest

Mon Mar 14 07:22:20 EDT 2016

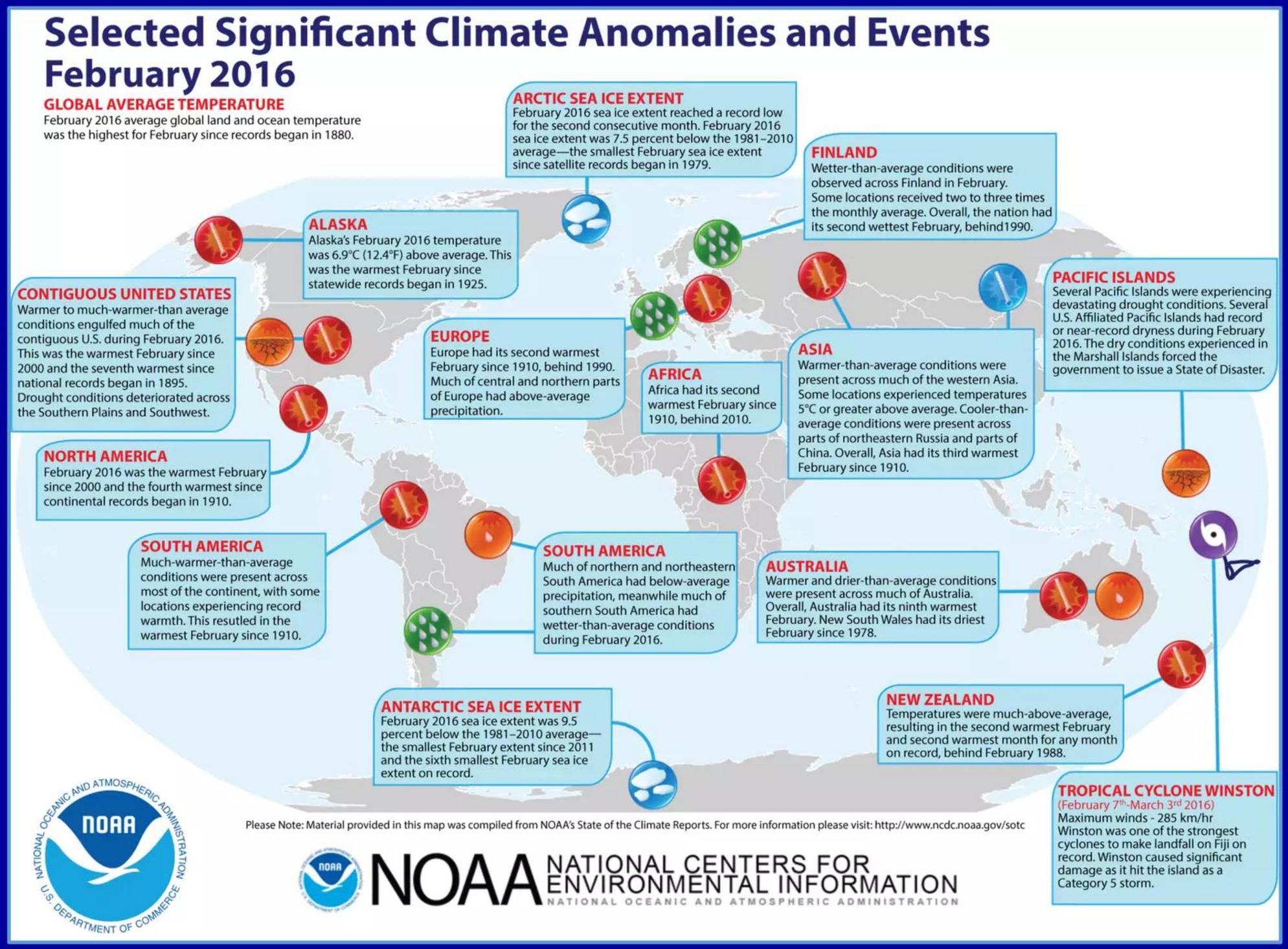
NOAA graphic summarizes January 2016 temperature data

Regions marked with darkest shade of reddish brown are largest anomaly



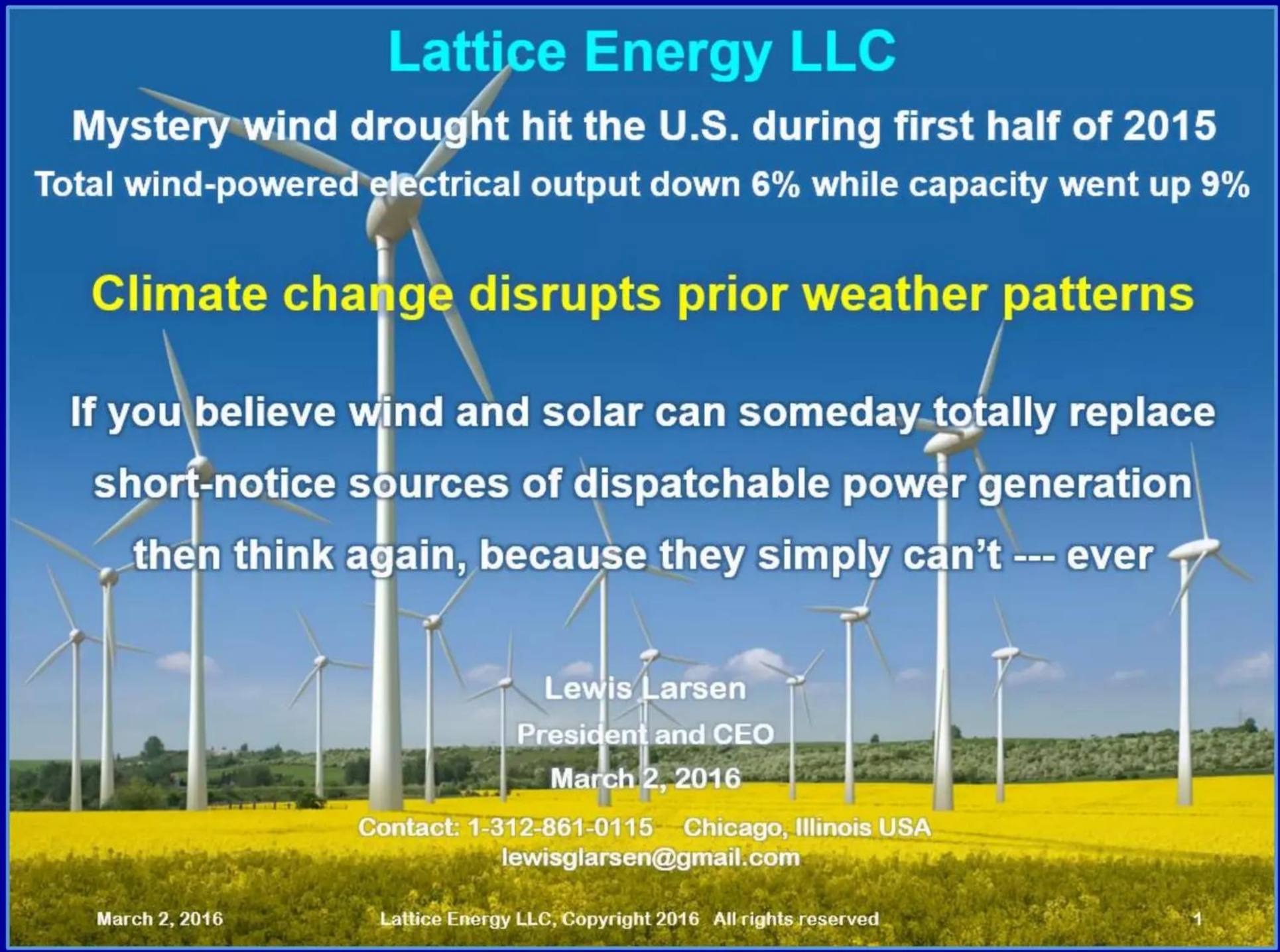
Go to NOAA URL to see February 2016 climate anomalies

https://www.ncdc.noaa.gov/sotc/service/global/extremes/201602.gif



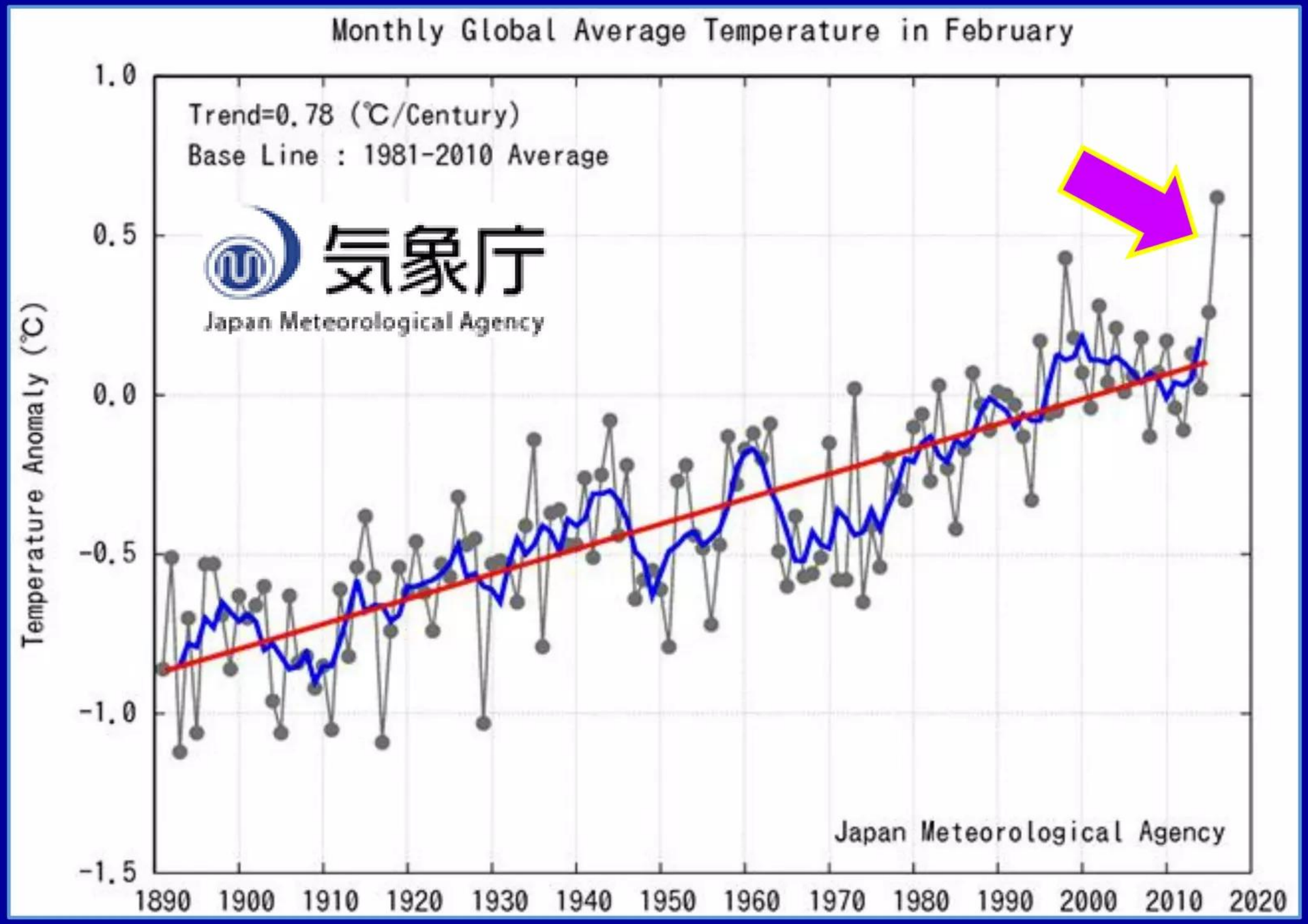
Will a U.S. wind drought continue? See PowerPoint below

http://www.slideshare.net/lewisglarsen/lattice-energy-llc-climate-change-can-reduce-wind-and-solar-power-output-also-need-dispatchable-generation-march-2-2016



Japan Meteorological Agency chart shows history of temps

February 2016 global temperature anomaly indicated with purple arrow



2014 was one of the warmest years recorded since 1880

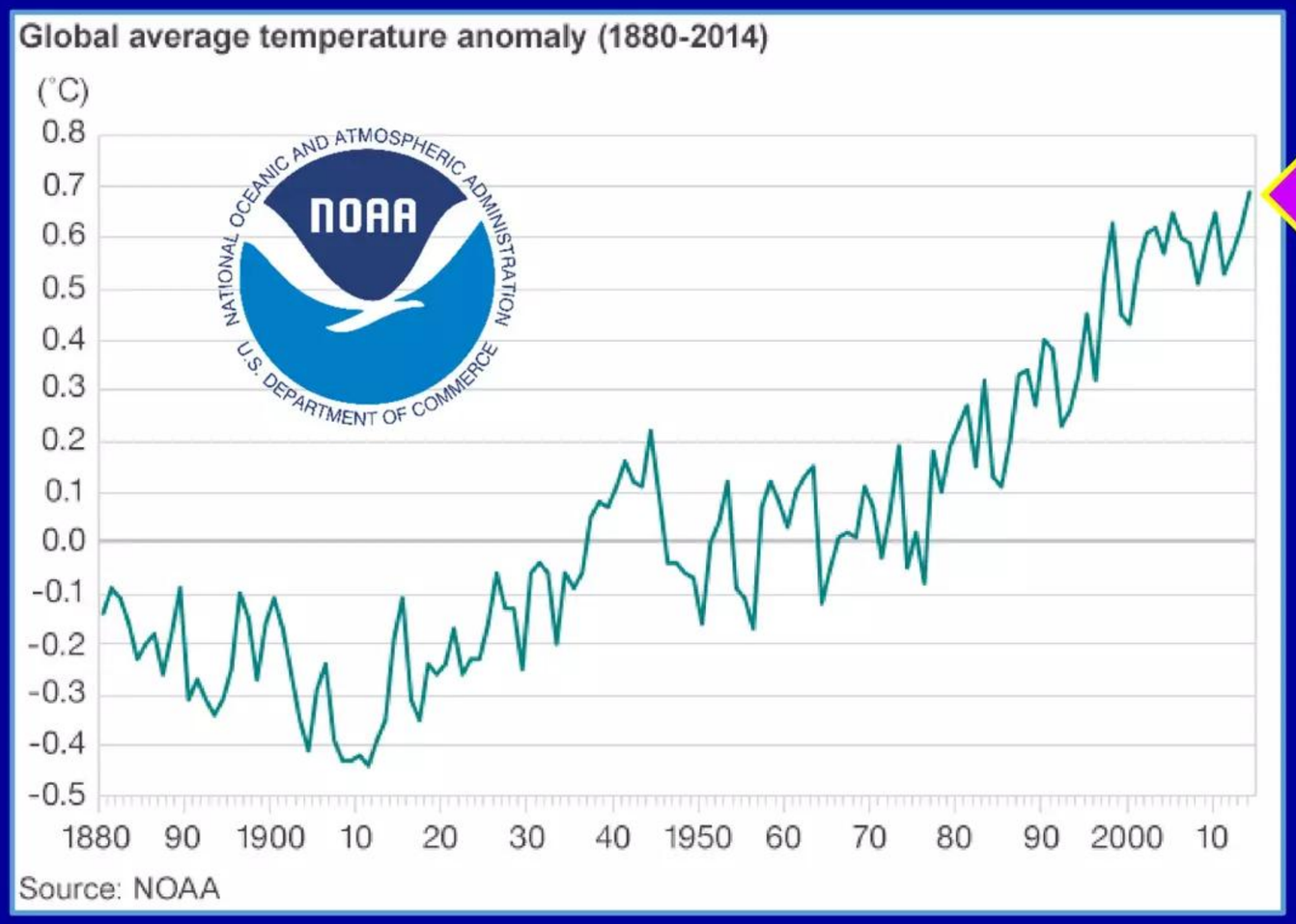
January 16, 2015: NASA and NOAA announced results of analyzed data

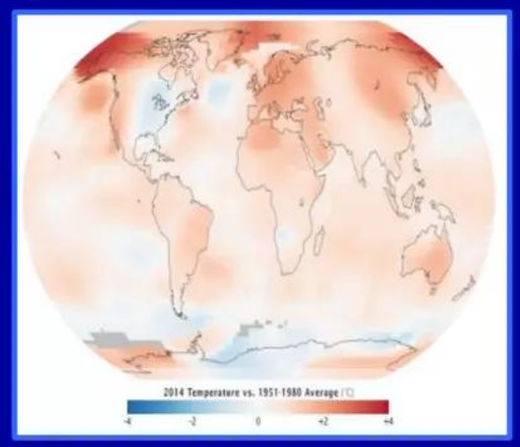
Independent studies by NASA and NOAA scientists reached the same conclusion

"This is the latest in a series of warm years, in a series of warm decades. While the ranking of individual years can be affected by chaotic weather patterns, the long-term trends are attributable to drivers of climate change that right now are dominated by human emissions of greenhouse gases," GISS Director Gavin Schmidt

http://www.giss.nasa.gov/research/news/20150116/

Fig. SPM-10 pp. 26 in IPCC's "Summary for Policy Makers" which was released in conjunction with "Climate change 2014 - Synthesis Report"





2014 temperature anomaly

Increase in atmospheric CO_2 in Feb 2016 is also alarming

Researchers have observed four straight years of CO_2 increases > 2 ppm

The Washington Post

"Atmospheric carbon dioxide levels are showing a startling increase"

Chris Mooney and Brady Dennis - March 10, 2016 - excerpts quoted below

https://www.washingtonpost.com/news/energy-environment/wp/2016/03/09/atmospheric-carbon-dioxide-levels-are-showing-a-startling-increase/

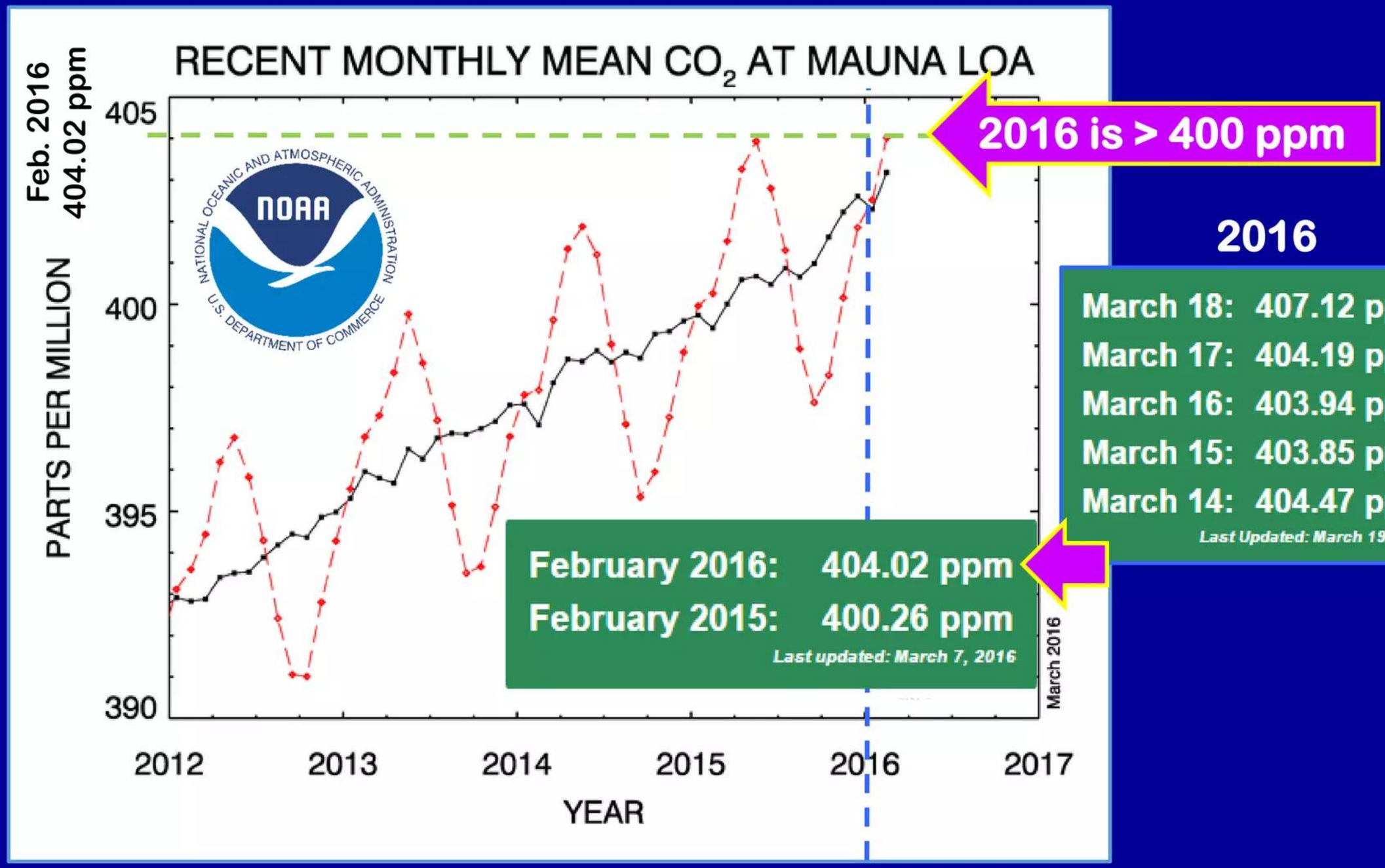
"Atmospheric carbon dioxide concentrations have spiked more in the period from February 2015 to February 2016 than in any other comparable period dating back to 1959, according to a scientist with the National Oceanic and Atmospheric Administration's Earth System Research Laboratory.
The change in average concentrations from February of last year to February of this year was 3.76 parts per million at the storied Mauna Loa Observatory in Hawaii, leaving the concentration at 404.02 parts per million for February, based on preliminary data. Pieter Tans, lead scientist of NOAA's Global Greenhouse Gas Reference Network, confirmed that the increase, reported previously by *New Scientist*, represented a record year-over-year growth for Mauna Loa. He also said that in addition to the stark rise in carbon dioxide levels over the past year, researchers have now observed four straight years of increases of more than 2 parts per million in the atmosphere."

"We've never seen that," Tans said. "That's unprecedented."

Increase in atmospheric CO_2 in Feb 2016 is also alarming

Value for CO_2 ppm normally exhibits a pronounced seasonal oscillation

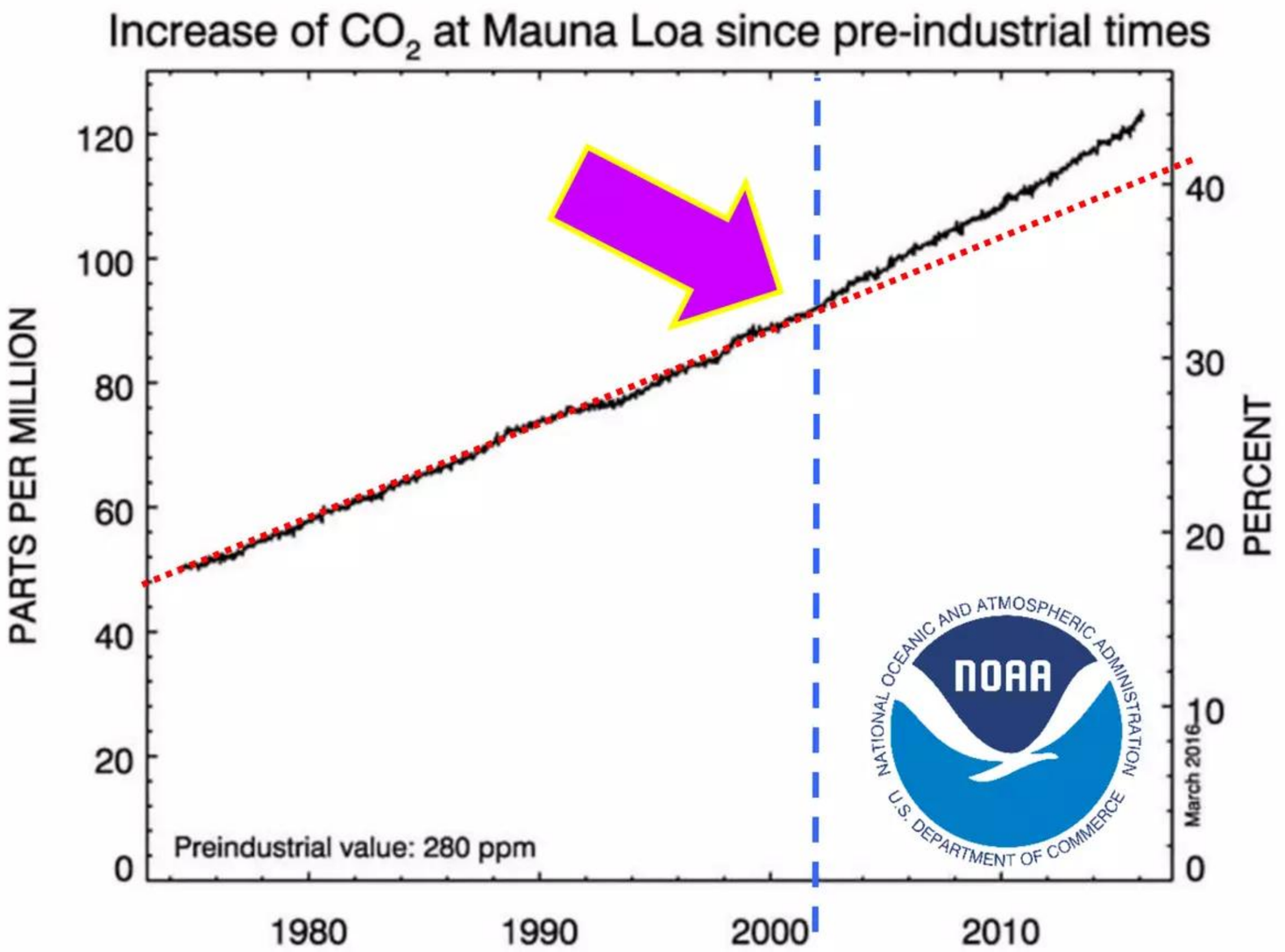
http://www.esrl.noaa.gov/gmd/ccgg/trends/index.html



Did slope of ppm vs. red trendline suddenly increase in 2002?

Atmospheric CO_2 ppm measured by NOAA at Mauna Loa trending higher

http://www.esrl.noaa.gov/gmd/ccgg/trends/index.html



Atmospheric increase of CO_2 over 280 ppm in weekly averages of CO_2 observed at Mauna Loa.

IPCC: global warming is definitely an ongoing process

"Warming of the climate system is unequivocal" --- IPCC report 2014

Societal response to global warming may be to restrict combustion of fossil fuels

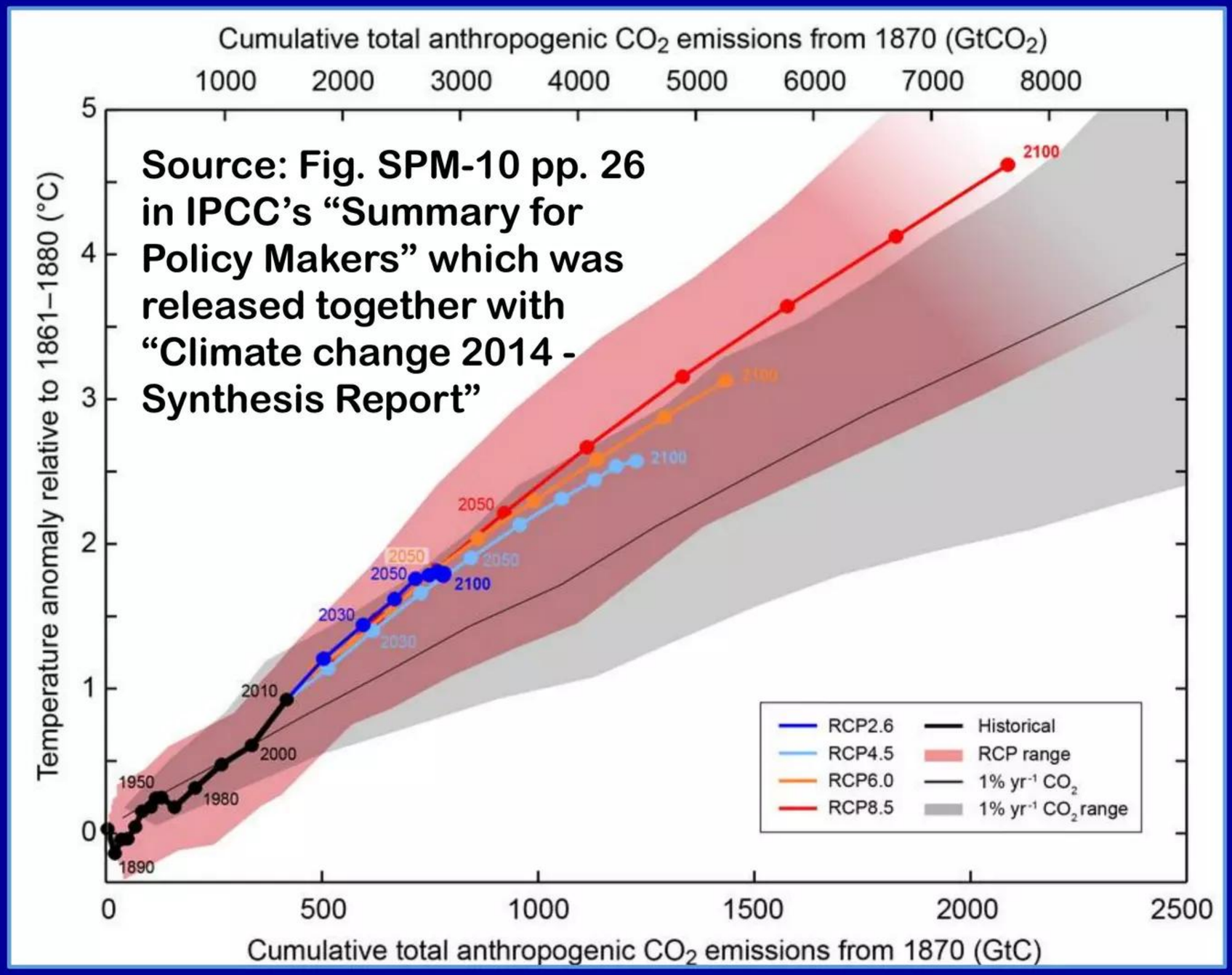
"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen … Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are *extremely likely* to have been the dominant cause of the observed warming since the mid-20th century … Cumulative emissions of carbon dioxide largely determine global mean surface warming by the late 21st century and beyond."

http://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_LONGERREPORT_Corr2.pdf

IPCC: global warming is definitely an ongoing process

Effect of increasing CO_2 emissions on temperature is shown in chart

Societal response to global warming may be to restrict combustion of fossil fuels



Study published in *Nature* in 2015 supports IPCC's report

Impact of CO_2 increases in Pliocene era provides insight about today

"Earth's temperature should increase by 1.5 K to 4.5 K per doubling of CO_2 levels

"Evidence from warm past confirms recent IPCC estimates of climate sensitivity"

http://www.sciencedaily.com/releases/2015/02/150204134115.htm

"Today the Earth is still adjusting to the recent rapid rise of CO_2 caused by human activities, whereas the longer-term Pliocene records document the full response of CO_2-related warming," says Southampton's Dr Gavin Foster, co-author of the study.

"Our estimates of climate sensitivity lie well within the range of 1.5 to 4.5° C increase per CO_2 doubling summarised in the latest IPCC report. This suggests that the research community has a sound understanding of what the climate will be like as we move toward a Pliocene-like warmer future caused by human greenhouse gas emissions."

"Plio-Pleistocene climate sensitivity evaluated using high-resolution CO_2 records"
M. Martinez-Boti *et al.*, *Nature* 518 pp. 49 - 54 (2015)

http://www.nature.com/nature/journal/v518/n7537/full/nature14145.html

Scientists estimate CO_2 emissions 56 - 66 million years ago

"… emissions in the PETM were … an order of magnitude slower than … today"

BBC NEWS Science & Environment

"Rate of Carbon emissions put in context"

Jonathan Amos, BBC Science Correspondent
March 21, 2016 see excerpts quoted below

http://www.bbc.com/news/science-environment-35867438

"The researchers have examined ocean sediments laid down during the so-called Palaeocene - Eocene Thermal Maximum - a dramatic warming event some 56 million years ago … They find the amount of CO_2 going into the air at its onset was four billion tonnes a year at most."

"Today's figure is 10 times as big."

"The PETM was an extraordinary occurrence in Earth history. Previous research has shown that ocean surface temperatures rose by about five degrees in a relatively short timescale, in the geological sense. This phase of global warming drove a rapid turnover in species, both in the sea and on land. CO_2 concentration in the atmosphere very probably went above 1,000 parts per million by volume, compared with the 400 ppm it stands at today."

"In their paper, Richard Zeebe and colleagues do not concern themselves with the cause; what they wanted to pin down was simply the rate of emissions."

Important new data was reported in *Nature Geoscience*

Today's rates of Carbon emission have not occurred for 66 million years

nature geoscience

"Anthropogenic Carbon release rate unprecedented during the past 66 million years" see excerpts below

R. Zeebe *et al.*, *Nature Geoscience* - published online March 21, 2016

http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo2681.html

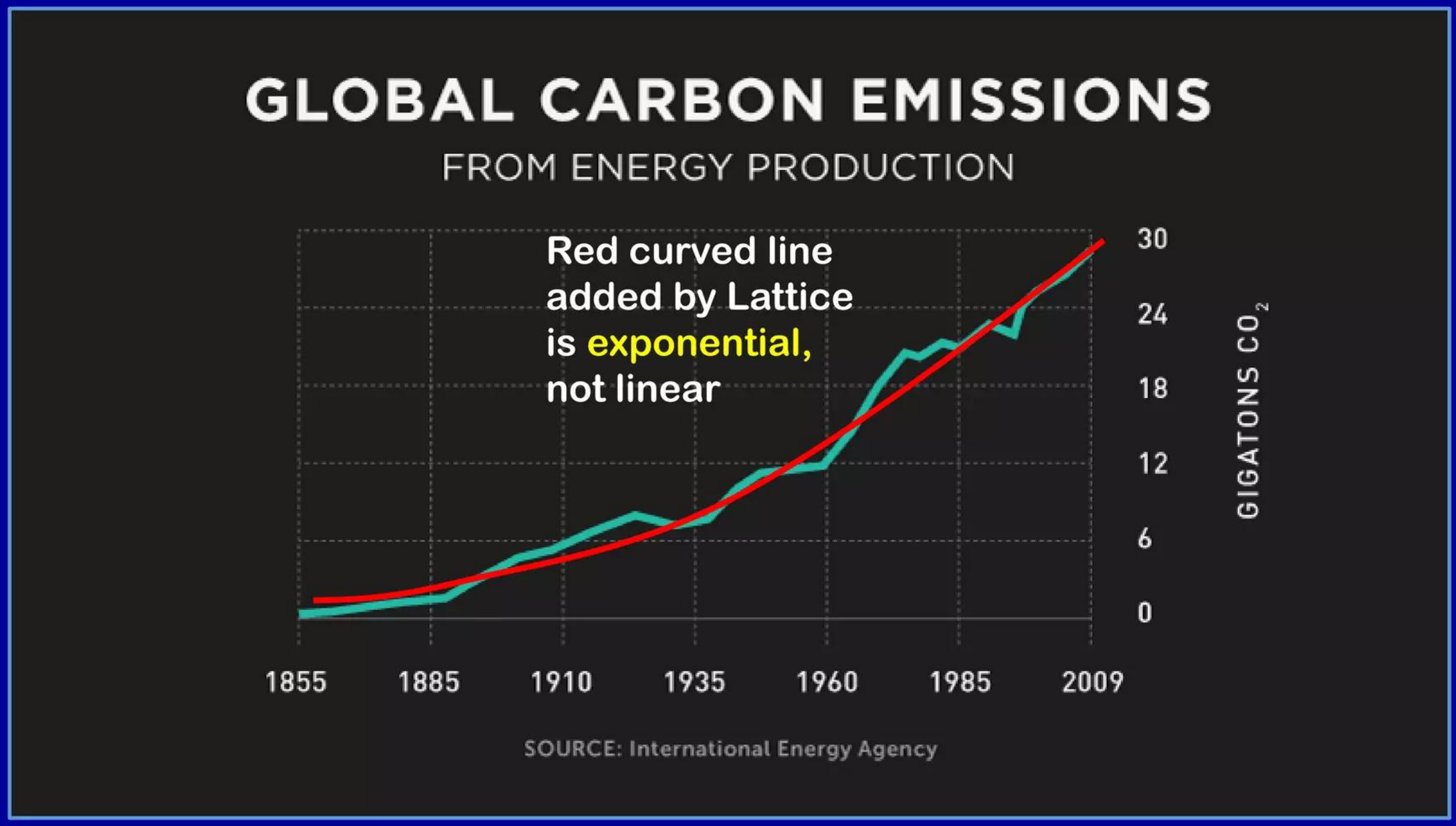
"Carbon release rates from anthropogenic sources reached a record high of ~10 Pg C yr^{-1} in 2014 … "

"… The Palaeocene - Eocene Thermal Maximum (PETM) is known at present to have the highest carbon release rates of the past 66 million years … Here we introduce a new method to extract rates of change from a sedimentary record based on the relative timing of climate and carbon cycle changes, without the need for an age model. We apply this method to stable carbon and oxygen isotope records from the New Jersey shelf using time-series analysis and carbon cycle - climate modelling. We calculate that the initial carbon release during the onset of the PETM occurred over at least 4,000 years. This constrains the maximum sustained PETM carbon release rate to less than 1.1 Pg C yr^{-1}. Given currently available paleorecords, we conclude that the present anthropogenic Carbon release rate (~ 10 Pg C yr^{-1}) is unprecedented during the Cenezoic (past 66 Myr^{-1}) … Given that the current rate of Carbon release is unprecedented throughout the Cenozoic, we have effectively entered an era of a no analogue state, which represents a fundamental challenge to constraining future climate projections."

Increase in CO_2 ppm parallels growth in Carbon emissions

If combustion of fossil fuels increases ppm CO_2 in air then must curb it

As long as $$$ costs aren't too high, vastly reducing CO_2 emissions couldn't hurt



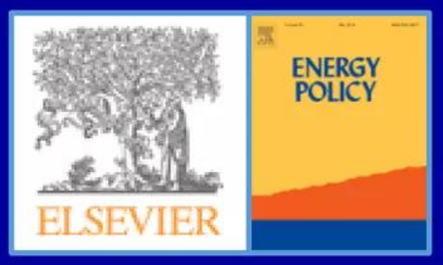
Should try to reduce CO_2 emissions from power generation

Dispatchable power generation is synergistic with renewable energy

- ✓ While some harbor doubts about degree to which human activities contribute to or exacerbate climate change, published data suggests that increases in atmospheric CO_2 levels are reasonably well-correlated with increases in mean global temperatures. Consequently, attempting to combat climate change by decreasing CO_2 emissions from power generation is a desirable technological goal as long as the long-term economic costs for society can be reasonable
- ✓ Solar photovoltaic (PV), concentrated solar power (CSP), and wind generation are CO_2 -free and output can be substituted for fossil-fueled dispatchable central station power plants to cut CO_2 emissions. However, renewable energy sources are inherently intermittent. This intrinsic vulnerability to vagaries of Nature was underscored by the unexpected arrival of a mysterious U.S. wind drought in early 2015 which lasted for 6 months before vanishing, only to apparently reappear again in January 2016. During this 6-month drought event, total electricity produced by wind power in the U.S. dropped over 15%
- ✓ It would be uneconomic to build a sufficient excess of wind power generation capacity and/or enormous amounts of flow battery storage capacity to handle multi-month episodes of substantially reduced wind velocity that could slash electricity production by wind turbines. Fortunately, short-notice dispatchable power generation resources can readily provide low-cost electricity to fill such supply gaps and thereby function as an essential component of modern grids

Thought provoking *Energy Policy* paper by Jones & Warner

Deployment of LENR technology can potentially fulfill their requirements



"The 21st century population-energy-climate nexus"
G. Jones & K. Warner
Energy Policy 93 pp. 206 - 212 (2016)

http://www.sciencedirect.com/science/article/pii/S0301421516300830

Abstract: "World population is projected to reach 10.9 billion by 2100, yet nearly one-fifth of the world's current 7.2 billion live without access to electricity. Though universal energy access is desirable, a significant reduction in fossil fuel usage is required before mid-century if global warming is to be limited to < 2 °C. Here we quantify the changes in the global energy mix necessary to address population and climate change under two energy-use scenarios, finding that renewable energy production (9% in 2014) must comprise 87 - 94% of global energy consumption by 2100. Our study suggests > 50% renewable energy needs to occur by 2028 in a < 2 °C warming scenario, but not until 2054 in an unconstrained energy use scenario. Given the required rate and magnitude of this transition to renewable energy, it is unlikely that the < 2 °C goal can be met. Focus should be placed on expanding renewable energy as quickly as possible in order to limit warming to 2.5 - 3 °C."

See Slides #63 - 87 in Lattice PowerPoint shown below

http://www.slideshare.net/lewisglarsen/lattice-energy-llc-connecting-the-unconnected-and-empowering-the-powerless-may-12-2014

Lattice Energy LLC

Commercializing a next-generation source of dense, affordable CO_2-free energy

Spreading LENR revolution: empowering the powerless and connecting the unconnected

Lewis Larsen, President and CEO

"Over 1.2 billion people - 20% of the world's population - are still without access to electricity worldwide, almost all of whom live in developing countries. This includes about 550 million in Africa, and over 400 million in India. Access to electricity must be environmentally and socially sustainable."

Source: The World Bank (2014)

http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTENERGY2/0,,contentMDK:22855502~pagePK:210058~piPK:210062~theSitePK:4114200,00.html

Contact: 1-312-861-0115
lewisglarsen@gmail.com
http://www.slideshare.net/lewisglarsen/presentations

Revolutionary new type of safe nuclear energy technology

Unique advantages of ultralow energy neutron reactions (LENRs)

No deadly gamma radiation

No dangerous energetic neutron radiation

Insignificant production of hazardous radwastes

Vast increase in energy density vs. other technologies

Revolutionary, disruptive, and environmentally safe

Laura 13

Image credit: co-author Domenico Pacifici
From: "Nanoscale plasmonic interferometers for multispectral, high-throughput biochemical sensing"
J. Feng *et al.*, *Nano Letters* pp. 602 - 609 (2012)

LENRs: radiation-free, low-cost source of nuclear energy

Should be affordable, biosafe, and highly scalable

Enables truly sustainable global economic growth

Provides "energy miracle" sought by Bill Gates

- ✓ While solar PV and wind are decidedly CO_2-free and reasonably biosafe, their intrinsic energy densities are much lower than today's fossil fuels and they are intermittent --- not continuous --- sources of electrical and thermal power
- ✓ Renewable primary energy sources such as combustion of biomass are not the answer because they only have moderate energy densities and emit much CO_2
- ✓ Nuclear fission power has high energy densities, does not produce CO_2 and operates continuously, but emits copious quantities of very dangerous neutron and gamma radiation during operation and produces very long-lived radwastes
- ✓ Nuclear fusion power, while better than fission in terms of producing much smaller quantities of radwaste, still emits very dangerous neutron and gamma radiation during operation; also, there is still no sign of it being commercialized after 60 years of huge effort and hundreds of billions of R&D $ spent worldwide
- ✓ Ultralow energy neutron reactions (LENRs) are only primary energy technology on foreseeable scientific horizon that can provide world with dense green energy, connect the unconnected, and empower billions of powerless people

Comparison of LENRs to fission and fusion power sources

Fission, fusion, and LENRs all involve controlled release of nuclear binding energy (heat) for power generation: no CO_2 emissions; scale of energy release is MeVs (nuclear regime) > 1,000,000x energy density of chemical energy power sources

Heavy element fission: involves shattering heavy nuclei to release stored nuclear binding energy; **requires massive shielding and containment structures to handle radiation; major radioactive waste clean-up issues and costs;** limited sources of fuel: today, almost entirely Uranium; Thorium-based fuel cycles now under development; **heavy element U-235 (fissile isotope fuel) + neutrons → complex array of lower-mass fission products** (some are very long-lived radioisotopes) + energetic gamma radiation + energetic neutron radiation + **heat**

Fusion of light nuclei: involves smashing light nuclei together to release stored nuclear binding energy; present multi-billion $ development efforts (e.g., ITER, NIF, other Tokamaks) focusing mainly on D+T fusion reaction; **requires massive shielding/containment structures to handle 14 MeV neutron radiation;** minor radioactive waste clean-up $ costs vs. fission

Two key sources of fuel: Deuterium and Tritium (both are heavy isotopes of Hydrogen)

Most likely to be developed commercial fusion reaction involves:

D + T → He-4 (helium) + neutron + heat (total energy yield 17.6 MeV; ~14.1 MeV in neutron)

Ultralow energy neutron reactions (LENRs): distinguishing feature is neutron production via electroweak reaction; neutron capture on fuel + gamma conversion to IR + decays [β , α] releases nuclear binding energy: early-stage technology; **no emission of energetic neutron or gamma radiation and no long lived rad-waste products; LENR systems do not require massive and expensive radiation shielding and containment structures → much lower $$$ cost;** many possible fuels: any element/isotope that can capture LENR neutrons; involves **neutron-catalyzed transmutations of fuels into heavier stable elements** that release **heat**

LENRs superior to fission or fusion for power generation

Why build huge D-T fusion reactors if LENRs can be commercialized?

Greenness of LENRs could enable revolutionary portable nuclear power sources

- ✓ While LENRs do use ultralow energy neutrons to trigger release of nuclear binding energy (heat) from an enormous array of stable element target fuels, they are radically different from fission reactors that require criticality to operate properly. Unlike fission, LENRs don't involve multiplicative chain reactions with fuels that in turn release multiple neutrons which explosively accelerate neutron production --- nuclear runaways are not a risk with LENRs
- ✓ D-T fusion reactors like ITER and other similar Tokamaks mainly create heat by harvesting the kinetic energy of deadly 14.1 MeV neutrons. Consequently, they require massive shielding and containment systems for safe operation and unsurprisingly have enormous costs and unavoidably huge physical size. Given that the Lithium LENR fuel cycle releases nearly 27 MeV versus a total Q-value of 17.6 MeV for the D-T fusion reaction, it is hard to imagine a sound economic argument for spending 100s of billions on commercial fusion reactors if LENR technology is successfully developed and scaled-up as we discuss herein
- ✓ Lack of hard radiation and radioactive wastes permit *downward* scalability that could enable future development of revolutionary, compact battery-like portable LENR power sources that can compete directly on $ price/kwh with chemical batteries in many applications including power tools, tablets, and smartphones

LENRs are green: no energetic radiation or radwastes

Lack of hard radiation obviates need for shielding and containment

Major opportunity to develop safe, battery-like portable LENR power sources

Fission and fusion processes both emit deadly MeV-energy neutron and gamma radiation

Fission reactors need 1 foot of steel and 3 feet of concrete to protect humans from hard radiation and wastes emitted by reactor; makes systems intrinsically large and heavy

LENRs enable devices something like this: small, portable battery-like power sources that are safe and disposable

Revolution in green nuclear technology

Much larger LENR devices based on dusty plasma embodiments can potentially scale-up to megawatts; akin to today's power plants

Fossil fuels could be converted into green LENR fuels

Breakthroughs in physics and nanotechnology make this possible

Bitumen, heavy oil, and coal may be much more valuable as CO_2-free LENR fuels

In 2009 Larsen discovered that aromatic molecules can potentially be extracted and processed to be converted into green LENR fuels in which there would be no hard radiation emissions, no production of any long-lived radioactive wastes or emission of gaseous CO_2 into the atmosphere; would instead release **> 5,000 times more thermal energy versus combustion of Carbon-based molecules with Oxygen**

These fossil hydrocarbons contain aromatic ring molecules on which LENRs can be triggered

Canadian natural bitumen

Heavy viscous oils found in many fields

Various grades of coal

Fossil Carbon can be transmuted rather than combusted

Heavy oil and coal could be processed to produce CO_2-free LENR fuels

Carbon atoms found on aromatic rings good fuel for radiation-free transmutation

Radiation-free LENR transmutation

Neutrons + target fuel atoms → heavier elements + decay products + heat

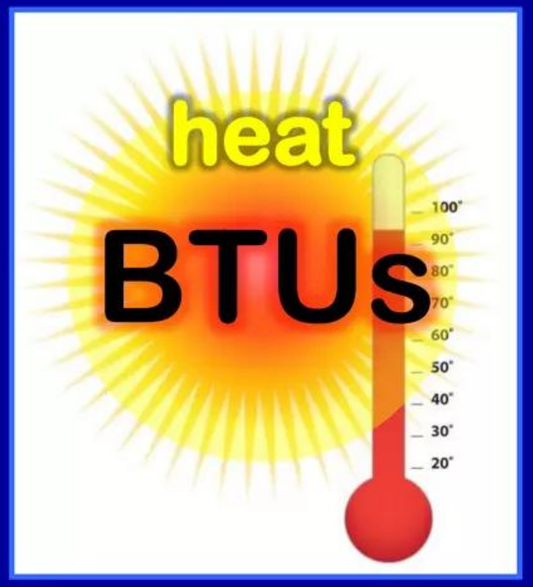
Catalytic neutron 'match'

capture +

Neutrons are readily absorbed by LENR fuels such as inexpensive Nickel, Titanium, Lithium, or Carbon atoms

produces →

Direct conversion of neutron capture and decay-related gammas to IR and beta/alpha particles create heat



Process does not emit any deadly radiation or produce troublesome radwastes

Many moieties contain or are convertible into aromatics

LENR fuels can be created from many different types of Carbon sources

Base feedstock → Aromatic molecules → Nanoparticulate fuels

Contain aromatic molecules

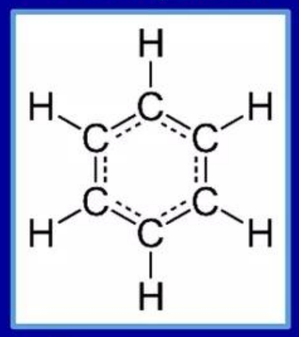
Examples:

- Heavy oils and natural bitumen — Extract
- Coal — Extract
- Lignin from renewable biomass — Digest
- CH_4 natural gas — Mo catalyst → LNG
- CO_2 → C nanofibers — Processing

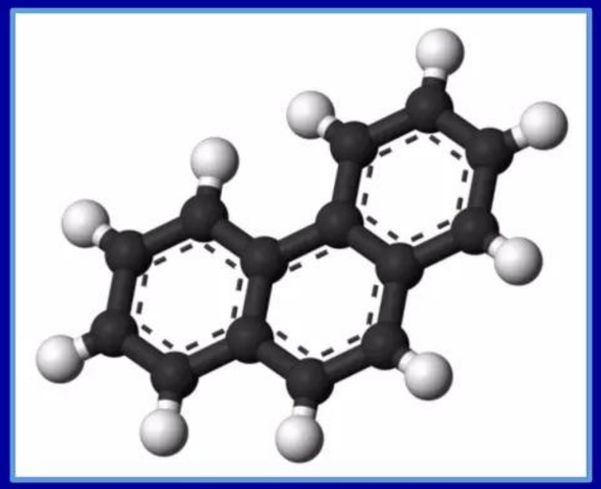
Chemical process

Variety of simple and complex aromatic molecules

Examples:



Benzene



Phenanthrene

Enormous gain in energy density makes processing conversions $$$ economic

Chemical processing

Process into

plus nanotech

Green CO_2-free LENR fuels

5,000x greater energy density

Bottom line: just about any Carbon-based moiety can be converted into aromatic ring-structure molecules using a chemical process

Transmutation of Carbon is superior to combustion

LENR technology could enable future clean energy at reasonable cost

- ✓ Successful commercialization and broad deployment of LENR Carbon transmutation in power generation applications could increase the effective economic BTU $$$ value of remaining in-ground fossil fuel resources by at least 500x by releasing thermal energy from Carbon via CO_2-emission-free transmutation rather than by continuing to rely on today's age-old chemical combustion technology
- ✓ So-called "stranded asset" fossil carbon financial risk issues would disappear
- ✓ Carbon transmutation could substantially extend the effective economic lifetime of present in-ground fossil fuel resources from an estimated <150 years per British Petroleum out to at least another 25,000 years further into the future
- ✓ LENRs are therefore vastly more synergistic rather than competitive with fossil fuels [44 slides]: http://www.slideshare.net/lewisglarsen/lattice-energy-llc-compelling-economics-of-transmutation-vs-combustion-of-carbonaceous-energy-sources-jan-14-2015
- ✓ Rather than eventually replacing fossil fuels with solar, wind, and renewable energy sources over time, LENR technology instead enables oil, gas, and coal producers to convert fossil fuels into cleaner, more valuable form of CO_2-free LENR energy --- energy producers, energy consumers, and Earth will all win

LENRs and the future of global power generation

5 -10 kwh LENR-based power systems revolutionize energy production

Systems with total output measured in megawatts not needed to accomplish this

- ✓ At system power outputs of just 5 - 10 kwh, modular LENR-based distributed power generation systems providing combined heat and electricity (CHP) could potentially satisfy the requirements of a majority of urban and rural households and smaller businesses worldwide, including today's powerless
- ✓ At system power outputs of just 50 - 200 kwh, LENR-based systems could begin to power steam or electric vehicles, breaking oil's stranglehold on transportation; provide high-quality heat for many industrial processes
- ✓ Although they could very likely be designed and built, megawatt LENR systems are not mandatory to change the world of energy for the better
- ✓ If widespread deployment of small-scale distributed generation could be achieved, nowhere near as many new, large fossil-fired and/or fission power generation systems would have to be built to supply competitively priced electricity to regional grids serving urban and many rural areas. Under that scenario, grid-based centralized power generation would be gradually displaced by vast numbers of smaller, lower-cost distributed power systems

Further in-depth reading for those who wish to learn more

Incredible opportunity to develop green renewable nuclear power

LENR fuels derived from biomass: an inexhaustible green energy source

"LENR transmutation of Carbon is superior energy strategy - slashes CO_2 emissions for vehicles as well as electric power generation"
http://www.slideshare.net/lewisglarsen/lattice-energy-llc-lenr-transmutation-of-carbon-better-energy-strategy-than-obama-clean-power-plan-aug-3-2015

"Scalability of LENR power generation systems"
http://www.slideshare.net/lewisglarsen/lattice-energy-llc-scalability-of-lenr-power-generation-systems-nov-29-2015

"Revolutionary LENRs could power future aircraft and other systems"
http://www.slideshare.net/lewisglarsen/lattice-energy-llc-revolutionary-lenrs-could-power-future-aircraft-and-other-systems-feb-16-2014

"LENRs dramatically expand financing opportunities for oil & gas industry"
http://www.slideshare.net/lewisglarsen/lattice-energy-llc-lenrs-dramatically-expand-financing-opportunities-for-oil-and-gas-industry-october-8-2015

"Index and user guide to the Widom-Larsen theory and ultralow energy neutron reactions (LENRs)"
http://www.slideshare.net/lewisglarsen/lattice-energy-llc-hyperlinked-index-to-documents-re-widomlarsen-theory-and-lenrs-september-7-2015