We Might Not Have Enough Materials for All the Solar Panels and Wind Turbines We Need, an Analysis Finds (popularmechanics.com)

Posted by msmash on Friday December 14, 2018 @11:00AM from the for-what-it-is-worth dept.

An anonymous reader writes: *Plenty of high-tech electronic components, like solar panels, rechargeable batteries, and complex circuits require specific rare metals. These can include magnetic neodymium, electronic indium, and silver, along with lesser-known metals like praseodymium, dysprosium, and terbium. These metals are mined in large quantities in countries around the world, and they make their way into the supply chains of all sorts of electronics and renewables companies.*

A group of researchers from the Dutch Ministry of Infrastructure determined how many of these important metals will be required by 2050 in order to make enough solar panels and wind turbines to effectively combat climate change. With plenty of countries, states, cities, and companies pledging to go 100 percent renewable by 2050, the number of both solar panels and wind turbines is expected to skyrocket. According to the analysis, turbines and solar panels might be skyrocketing a bit too much. Demand for some metals like neodymium and indium could grow by more than a dozen times by 2050, and there simply might not be enough supply to power the green revolution.

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Score: 5 4 3 2 1 0 -1

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- **But this is impossible! (Score:2, Funny)**
  by Tadeusz (5428298)
  We have been promised perpetual growth. Computers got better at processing information so clearly this also means that [...] better at the same rate.
  Can't we send [...] Asteroid Belt or the center of the Earth to make solar panels and send them to us?
  - 1 hidden comment
  - **Re: (Score:2)**
    by omar.sahal (687649)
    Whoosh!
  - **Re: (Score:1)**
    by fustakrakich (1673220)
    We have been promised perpetual growth.
    And we shall have it! It's a big universe out there. At a critical point we can expand our biomass outward faster than the speed of light.
  - **Re: (Score:2)**
    by PolygamousRanchKid (1290638)
    Can't we send a 3D printer to the Asteroid Belt or the center of the Earth to make solar panels and send them to us?
    Can't we just make solar panels out of coal . . . ?
    We seem to have enough of that now, that nobody wants.
    And think of the brilliant irony, of former coal miners now producing solar panels.
- **Wow yes (Score:1)**
  by Anonymous Coward
  Because there will definitely be no breakthroughs in materials science or anything like that in the next 30 years and we're definitely going to be making bearings and motors and magnets and coils using the same stuff as today for sure./
  - 1 hidden comment
  - **Re: (Score:1)**
    by Anonymous Coward
    Wires were made of copper. Then we tried something new and shiny - aluminum - didn't work out too well. The same risks are there in hoping that something new and shiny will come along to replace the problems with rare metals.
  - **Re: (Score:3)**
    by AvitarX (172628)
    It wasn't new and shiny. It was cheap.
    It was known to be inferior, but thought to be good enough (it wasn't).
  - **Re:Wow yes (Score:4, Informative)**
    by PPH (736903) on Friday December 14, 2018 @12:04PM (#57803838)
    aluminum - didn't work out too well.
    It works just fine. Look up some time. All that stuff strung between the poles and transmission towers ... aluminum. So is the stuff underground. Even the larger service lines into your house are made of aluminum. Pretty much the only copper left is small wire (branch circuits from your panel) due to the higher cost of terminating aluminum properly.
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  - **Re: (Score:2)**
    by dryeo (100693)
    When I was a kid, my Dad installed some aluminium wiring in the house. After a couple of sockets started smoking, he ripped it all out and replaced it with copper.
    Aluminium has its place in wiring, but so does copper.
  - **Re: (Score:2)**
    by drinkypoo (153816)
    When I was a kid, my Dad installed some aluminium wiring in the house. After a couple of sockets started smoking, he ripped it all out and replaced it with copper.
    American mobile homes of the 1960s and 1970s were also made with it, because it was both cheaper and lighter than copper. But yes, galvanic corrosion would cause problems like that eventually. The simpler fix, which works okay, is to install pigtails on the ends of the wires designed to solve this problem. I'm not sure exactly what's in them, but there are various ways to handle it.
  - **Re: (Score:2)**
    by somepunk (720296)
    Umm, don't count on it. Businesses making those kinds of bets get their management fired or they die. Maybe market forces will produce a substitute, but it will, at least at first, cost a lot more, and possibly perform not as well.
    Market forces might just as easily push your wind turbines out and substitute something else more economical (which may or may not be as nice by some other metric), if materials science and availability of the resources don't cooperate!
  - **Re: (Score:2)**
    by lgw (121541)
    Because there will definitely be no breakthroughs in materials science or anything like that in the next 30 years and we're definitely going to be making bearings and motors and magnets and coils using the same stuff as today for sure./
    None are even needed. Solar thermal is very low tech, and while it's a bit more expensive than modern PV panels, it's not a big difference in the scheme of things.
    Heck, looking farther forward, the plans I've see for orbital solar are solar thermal, because large mirrors can be made much lighter than large PV panels (and are easier to service as a result). Fun fact: orbital solar would actually be the cheapest sustainable power source, it's only the huge initial capital cost that makes it unappealing (tho
  - **Re: (Score:2)**
    by q_e_t (5104099)
    4 onwards is not a given. Even if 4 happens, if the energy required to mine and refine is more than the end product can produce, it's a problem (although unlikely to be the case for rare metals, which are mostly not that rare).
- **FUD (Score:3, Interesting)**
  by mspohr (589790) on Friday December 14, 2018 @11:06AM (#57803464)
  Popular Mechanics? Idiots.
  Solar panels don't use "rare earth" elements (and rare earth elements are not rare).
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  - **The dynamo in a wind turbine (Score:4, Insightful)**
    by tepples (727027) <tepples@gmail.c3.1415926om minus pi> on Friday December 14, 2018 @11:09AM (#57803484) Homepage Journal
    Solar panels don't use "rare earth" elements
    Not all renewable energy is photovoltaic. The dynamo in a wind turbine uses rare earth magnets.
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  - **Re:The dynamo in a wind turbine (Score:5, Informative)**
    by mspohr (589790) on Friday December 14, 2018 @11:12AM (#57803512)
    There's a persistent myth about wind turbines that just won't seem to go away despite reality running to the contrary: they need rare earth materials to generate electricity.
    For those not acquainted with rare earths like neodymium and dysprosium, they're used in products from your iPhone and computer to flat screen TVs and certain types of batteries.
    While they can be difficult to mine, rare is a misnomer: they exist in abundance throughout the earth's crust.
    Many people think rare earths are also a necessary component of wind turbines, but the facts find otherwise: only about two percent of the U.S. wind turbine fleet uses them, and that number shouldn't change much in the years to come.
    https://www.aweablog.org/rare-... [aweablog.org]
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  - **Re:The dynamo in a wind turbine (Score:5, Informative)**
    by Shaitan (22585) on Friday December 14, 2018 @11:36AM (#57803672)
    You do realize this article is in fact an analysis of these materials and their accessible quantities and the determination that THERE ARE NOT ENOUGH OF THEM for the demand required through 2050. Rare is a subjective term this is quantative analysis of what is actually there not guesswork based on the word "rare" which you are battling. Abundant within the Earth's crust isn't particularly meaningful, we can't get to all the earths crust by a long shot and not all of what we can get to is easily accessible or cheaply accessible and even if we can get to it easily and cheaply we can still only pull it out so fast.
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  - **Re: (Score:2)**
    by mspohr (589790)
    They fail to recognize the fact that there are constantly new sources of these elements being discovered and there are good substitutions for all of them.
  - **Re: (Score:2)**
    by LQ (188043)
    They fail to recognize the fact that there are constantly new sources of these elements being discovered and there are good substitutions for all of them.
    Oh goodness. I'm sure they didn't think of that at all.
  - **Re: (Score:2)**
    by mspohr (589790)
    Probably didn't consider this:
    https://www.cnbc.com/2018/04/1... [cnbc.com]
    Researchers have found hundreds of years' worth of rare-earth materials underneath Japanese waters — enough to supply to the world on a "semi-infinite basis," according to a study published in Nature Publishing Group's Scientific Reports.
  - **Re: (Score:2)**
    by q_e_t (5104099)
    There's lots of tritium on the moon, which is also hard to get and might as well be, er, on the moon.
  - **Re: (Score:2)**
    by mspohr (589790)
    Tritium?
    Not a rare earth; not a material for solar panels or wind turbines.
    OTOH, the seabed is very easy to access all of these newly discovered rare earths.
  - **Re: (Score:3)**
    by PPH (736903)
    California has some 'rare earth' deposits worth considering. Seeing how they are pushing alternative energy so hard, lets bring on the strip mining.
  - **Re: (Score:2)**
    by mspohr (589790)
    ... but not so much about the rare earth elements market
  - **Re:The dynamo in a wind turbine (Score:5, Insightful)**
    by jeff4747 (256583) on Friday December 14, 2018 @11:14AM (#57803524)
    The dynamo in a wind turbine *currently* uses rare earth magnets.
    FTFY.
    Neodymium magnets are used to make the generators smaller and a little more efficient. We already have other materials that will do the job, it will just be larger or a little less efficient. And if neodymium ends up being the bottleneck, well we'll get to figure out more about magnetism since we'll have a huge incentive for an alternative.
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  - **Re: (Score:2, Funny)**
    by Shaitan (22585)
    Or we could just... build nuclear. Wind kills birds and disrupts air currents in the same manner that harvesting tidal energy or damming falls does. These technologies significant impact existing natural energy flows with consequences that in some cases we likely don't even know about yet. The same is probably true of suddenly sucking up all that light energy which should be reflecting around and warming things over a huge portion of the Earth's surface.
    Nuclear on the other hand isn't harnessing and disrupt
  - **Re: (Score:2)**
    by ProzacPatient (915544)
    I always felt nuclear was the true green energy. Unfortunately since enthusiasm about nuclear has cooled down and the paranoia created by Chernobyl and three mile island it seems like we'll never get to the next generation of reactors that can use all the "spent" rods we've been piling up. Even if there was no hope of ever being able to re-use the spent rods then at least they could be buried deep inside the Yucca mountain range underground where.. y'know.. the uranium came from to begin with; underground.
  - **Re: (Score:2)**
    by cb88 (1410145)
    No events and worried about it is cautious, one even in a very long time and you're worried about it maybe a little parranoid, a second event under separately engineered system from the same error maybe still a little paranoid, but after all that and a 3rd event occurs it's starting to move into maybe we should not do this until we can design in passive failsafe's cost effectively territory.

    If we ever figure out fusion... then it'll be a no brainer.
  - **Re: (Score:2)**
    by atrex (4811433)
    The same is probably true of suddenly sucking up all that light energy which should be reflecting around and warming things over a huge portion of the Earth's surface.
    Considering that too much of that light energy being trapped and reflected around thanks to greenhouse gases is the problem causing climate change, absorbing more of it should only benefit us in combating the problem.
  - **Re: The dynamo in a wind turbine (Score:2)**
    by peragrin (659227)
    You really don't know nuclear then.
    Nuclear tends to warm the lakes it dumps into. yes it does through multiple heat exchangers. Check out how nuclear functions. Especially the cooling systems.
    So nuclear is just as environmentally alternating as everything else.
  - **Re: (Score:2)**
    by dryeo (100693)
    Yes, turbines kill some birds, so do windows in buildings, which kill more and those same buildings disrupt the wind. Then there are cats, which kill many more birds, but at least don't disrupt the wind unless you plant trees for the cats to climb.
  - **Re: (Score:2)**
    by q_e_t (5104099)
    Or we could just... build nuclear.
    Which use generators to turn heat into electrical power... So are more efficient with neodymium.
  - **Re: (Score:3)**
    by whoever57 (658626)
    Indeed:
    https://www.cnbc.com/2018/04/1... [cnbc.com]
  - **Re: (Score:2)**
    by Nethemas the Great (909900)
    Best turn around; scrap everything. Drill baby drill!
  - **Re: (Score:3)**
    by MobyDisk (75490)
    RTFA before trying to debunk it. The article and linked research explains what rare earth elements are, their respective rarities, which things use them, how much is used, and what they cost. Your comment adds nothing meaningful.
  - **Re: (Score:3)**
    by Zorpheus (857617)
    Does it talk about alternaives though?
    Indium is used in the transparent conductor Indium Tin Oxide. There are alternatives, such as Aluminium tin Oxide. Not as good, but it will be used if we are running out of Indium.
    And others already wrote that Neodymium is not needed for wind turbines. It is just a generator in there, it can be built in many different ways.
  - **Re: (Score:2)**
    by mspohr (589790)
    And TFA is completely wrong.
- **You mean like peak oil? (Score:1)**
  by Qbertino (265505)
  We were supposed to reach that 25 years ago or so. So I'm not holding my breath. Besides: what about recycling? Do that correctly, including taxes for electronics that go faulty too fast and you've fixed some of the problems with resources.
  - 1 hidden comment
  - **Re: (Score:1)**
    by Anonymous Coward
    Hubbert's prediction was that *if things did not change* and continued to follow the same pattern, oil production would peak and continue to decline.

Of course, things did change. New extraction technologies came into play. So he was not wrong.

- **Re: (Score:2)**
  by Dunbal (464142) *
  I'm certainly not going to start shorting my oil picks any time soon.

- **Re: (Score:3)**
  by Oswald McWeany (2428506)
  We were supposed to reach that 25 years ago or so. So I'm not holding my breath. Besides: what about recycling? Do that correctly, including taxes for electronics that go faulty too fast and you've fixed some of the problems with resources.
  We did hit a "peak oil" in that it became increasingly more expensive to extract oil- but then new technologies pushed the slide back a little. We will probably see several mini-peaks where what's available becomes harder to extract and more expensive, and then new technology comes along that will make it cheaper again.

- **Re:You mean like peak oil? (Score:5, Insightful)**
  by mspohr (589790) on Friday December 14, 2018 @11:31AM (#57803628)
  The stone age didn't end because they ran out of stones.
  The oil age will not end because we run out of oil.
  The oil age will end because we have better, cheaper sources of energy and we need to stop burning fossil fuels.
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- **Re: (Score:2)**
  by cb88 (1410145)
  Even if the oil age ends, hydrocarbons will still likely rule, as the safe, simple and efficient and cost effective fuel for decades to come. We'll just figure out more and more ways to make it cleaner and carbon neutral.

  Solar -> electricity + co2 + h2o -> metane or Biomass -> biodiesel are good methods of putting reducing the CO2 load on the atmosphere by closing the cycle.

- **Re: (Score:2)**
  by q_e_t (5104099)
  The oil age will end because we have better, cheaper sources of energy and we need to stop burning fossil fuels.
  Ideally, yes. Running out of oil is not an impossibility in the end.

- **Re: (Score:2, Troll)**
  by cascadingstylesheet (140919)
  We were supposed to reach that 25 years ago or so. So I'm not holding my breath. Besides: what about recycling? Do that correctly, including taxes for electronics that go faulty too fast and you've fixed some of the problems with resources.
  We did hit a "peak oil" in that it became increasingly more expensive to extract oil- but then new technologies pushed the slide back a little. We will probably see several mini-peaks where what's available becomes harder to extract and more expensive, and then new technology comes along that will make it cheaper again.
  So, in other words, we *didn't* hit peak.

- **Well that settles it (Score:4, Funny)**
  by AlanObject (3603453) on Friday December 14, 2018 @11:09AM (#57803486)
  I guess we should just call off all the green initiative stuff (hippy liberal anyway) and fire up more coal plants.
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- **Re: (Score:3)**
  by Oswald McWeany (2428506)
  I guess we should just call off all the green initiative stuff (hippy liberal anyway) and fire up more coal plants.
  I'm buying all the beachfront property in Oregon for when it becomes the new tropical tourist hot-spot.

- **Re: (Score:3)**
  by mspohr (589790)
  Unfortunately, you beachfront property will be under water.

- **Re: (Score:2)**
  by penandpaper (2463226)
  At least fossil fuels and green tech have the same mantra now. Drill baby drill!
  Finally some unity.

- **Re: (Score:2)**
  by ProzacPatient (915544)
  I think we should emphasize more on the glowing green revolution. Nuclear power doesn't get the kind of love and attention it deserves but unfortunately I think people are paranoid about nuclear reactors and therefore there is no political willpower to back it and get us to the next generation of reactors.

- **Re:100% (Score:5, Informative)**
  by mspohr (589790) on Friday December 14, 2018 @11:36AM (#57803680)
  Multiple studies have shown that 100% of energy needs can be met by renewables. We don't need fossil fuels.
  Here's a few... try Google for more...
  https://interestingengineering... [interestin...eering.com]
  https://physicsworld.com/a/100... [physicsworld.com]
  https://www.sciencedirect.com/... [sciencedirect.com]
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- **Re: (Score:2)**
  by cascadingstylesheet (140919)
  Multiple studies have shown that 100% of energy needs can be met by renewables. We don't need fossil fuels. Here's a few... try Google for more... https://interestingengineering... [interestin...eering.com] https://physicsworld.com/a/100... [physicsworld.com] https://www.sciencedirect.com/... [sciencedirect.com]
  Then how come we aren't?
  Because of rich guys in top hats smoking cigars, cackling with glee as the planet burns?

- **Re: (Score:2)**
  by mspohr (589790)
  Yes.
  A few rich people making lots of money from fossil fuels have screwed the rest of us... and will continue until we come up with the French solution.

- **Re: (Score:2)**
  by AvitarX (172628)
  So we're already at the global peak of non fossil fuels?
  https://data.worldbank.org/ind... [worldbank.org]

- **THE SKY IS FALLING (Score:3)**
  by wizkid (13692) on Friday December 14, 2018 @11:11AM (#57803494) Homepage
  Details on the Evening news.
  Note, as time goes on, we find better ways to build this kind of stuff. By 2050, it's likely we'll have more efficient systems, and we'll find ways to build this stuff with less rare-earth materials.
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- **Duh! (Score:1)**
  by macraig (621737)
  I've been saying this for a decade. The conclusion didn't require a team of overpaid researchers to deduce.
- 1 hidden comment
- **Re: (Score:2)**
  by hublan (197388)
  I've been saying this for a decade. The conclusion didn't require a team of overpaid researchers to deduce.
  And you can keep saying it for another decade and still be wrong. Up until recently there was no incentive to open up more rare earth mines because the Chinese were supplying everyone cheaply. But then they stopped and now rare earth mines are opening up [theverge.com], thus solving the supply issue. Amazing, eh?

- **Of course (Score:5, Funny)**
  by jlowery (47102) on Friday December 14, 2018 @11:15AM (#57803532)
  They stopped teaching alchemy in schools ages ago, and now look where we are.
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- **Have we run out of imagination as well? (Score:5, Insightful)**
  by munch117 (214551) on Friday December 14, 2018 @11:17AM (#57803538)
  There are so many different ways of building wind turbines. Neodymium and indium is used today because it's readily available. When it becomes scarce, we will come up with different designs. Or maybe we will just find new places to dig neodymium and indium out of the earth. This is not a real problem.
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- **Re: (Score:2)**
  by squiggleslash (241428)
  Yeah, can't you make a wind turbine with just plain old copper anyway? The solar panels thing I understand, but I'm having a hard time understanding why rare metal shortages would eliminate the possibility of making more wind turbines. The latter may be using them to make them more efficient or something, but ultimately it's a wind mill - which could be made out of wood if we needed to - hooked up to a dynamo - which could be copper or even iron.

- **Re: (Score:2)**
  by es330td (964170)
  but I'm having a hard time understanding why rare metal shortages would eliminate the possibility of making more wind turbines.
  It isn't that that they can't be made; instead, it changes the cost-benefit equation. Let's say for example that element Imaginium improves the efficiency of generator windings by 50% and has the same mass as copper. A generator motor will then weigh substantially less than one using only copper. This then means that the tower to support the generator can be made with less material and the blades to turn it will have less stress. Removing the Imaginium then increases the cost and increases the lifetime main

- **Re: (Score:2)**
  by squiggleslash (241428)
  I wonder if that's a serious consideration though, given you presumably want something that's pushing against wind all the time to have some serious helf to it.
  (Disclaimer - know little about subject, genuinely interested in answers)

- **funded by? (Score:1)**
  by Anonymous Coward
  the oil or coal industry?

- **idiots spewing junk science (Score:2)**
  by iggymanz (596061)
  the crust of the earth is 20 miles thick.
  the elements in use in fiber optics and magnets are not rare at all.
  we've "barely scratched the surface"
  there will be no shortages, it's impossible

- **Re: (Score:2)**
  by Dunbal (464142) *
  he crust of the earth is 20 miles thick.
  I am not a geologist, but a rational person would also expect the heavier/denser stuff to settle closer to the bottom than to the top, over time...

- **Re: (Score:2)**
  by penandpaper (2463226)
  Drill baby drill.

- **Re: (Score:2)**
  by hierofalcon (1233282)
  Rarity has nothing to do with it. The problem is the economic cost of mining them. People have commented that the ocean is full of Lithium so why worry about that. The reason people aren't extracting it is that it isn't economically feasible. The more costly it becomes to produce electricity, the more your utility rates will jump. The bigger the holes and the deeper the mines and the more associated waste and environmental destruction ensues from going after the rare earths, the more people will scream. The

- **And there's a solution for this (Score:5, Interesting)**
  by necro81 (917438) on Friday December 14, 2018 @11:22AM (#57803562) Journal
  I predict that when the coming resource crunch comes, if ever, the rising price of such-and-such raw material will rise enough that an alternative will emerge. Neodymium too costly? You can make a perfectly good electric generator using other magnets or inductance. Indium too expensive? Well, perhaps we won't use as many CIGS solar panels, and instead stick with silicon.

  And, who knows, we'll probably be prospecting asteroids by 2050. If the cost for certain materials on earth is high enough, there may be a business case for it. Indium costs about $5/gram presently, or $5M/tonne. If there's a resource crunch and the cost goes up, say, 5-fold, perhaps someone will have enough incentive to mine asteroid indium for $25M/tonne.
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- **Re: (Score:2)**
  by 140Mandak262Jamuna (970587)
  Indium too expensive? .
  Come on, if Indium is too expensive how come 90% of the H1Bs go to India? Wait... oops.

- **I'm not worried (Score:3)**
  by Dunbal (464142) * on Friday December 14, 2018 @11:22AM (#57803568)
  I'm pretty sure if we can mill grain and pump out seawater using canvas, wood, hemp and stone, we'll figure something out. These materials are not required for alternative energy production. They're required for efficient alternative energy production. What we lose is efficiency. OK, build more. Or even better, stop making babies.
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- **Basic assumption. (Score:5, Insightful)**
  by 140Mandak262Jamuna (970587) on Friday December 14, 2018 @11:27AM (#57803590) Journal
  1. The known reserves of these elements today, will be the same reserves we will have till 2050
  2. The known techniques and cost for extracting them today, will be the same till 2050
  3. Similar study done in 1868 would have concluded there is not enough oil in Pottsville, PA to replace coal as a major source of fuel
  4. Similar study done in 1750 would have concluded there is not enough coal to replace whale oil as a fuel for lighting
  5. Similar study done in 1550 would have concluded the known reserves of whales and the cost of extracting oil from their blubber would be prohibitive and wax candles will be used forever for lighting.
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- **Silicon Dioxide is everywhere (Score:2)**
  by bussdriver (620565)
  Silicon Dioxide is all over the place! Most abundant stuff on earth. We also have a lot of aluminum which is easy to recycle.
  Lithium might be an issue for a while until we adapt... as we did in history. Recycling will eventually be the future.
  Rare magnets are NOT at all required for generators; or electric motors for that matter; it's not the end... maybe of cheap Chinese neodymium which might even be found as cheaply elsewhere.
  Besides, all these matters are usually about CHEAP easy sources running out ta

- **Stop ignoring tidal and geothermal FTW (Score:3)**
  by Seven Spirals (4924941) on Friday December 14, 2018 @11:31AM (#57803626)
  Last time I checked digging a hole in the ground didn't require any rare Earth metals. There are places where you don't even have to dig down very far to be able to create steam. I know that not all areas are suitable (swamp might be tough for example), but it seems like the real miracle technology we need right now isn't just some cheap form of producing energy it's more that we need a cheap way to *store* it and *move* it. Liquid fuels provide tremendous energy density and are pretty ideal other than their CO2 issues. So, I wish that the efficiency of tech to convert CO2 to wood alcohol (running a fuel cell "backwards") would improve or something like that would emerge. Imagine building a solar farm in the desert but then using trucks, trains, or pipelines to move liquid fuels anywhere they are needed. Tidal power also seems like an easy win, but I'm no energy scientist or mechanical engineer; so I realize I'm just wishing and speculating.
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- **Nuclear (Score:1)**
  by PeeAitchPee (712652)
  Quit discounting it or ignoring it. Modern, safer reactor designs are absolutely an integral part of combating climate change and divesting ourselves of fossil fuels.

- **Re: (Score:1, Insightful)**
  by fluffythedestroyer (2586259)
  whats next, clean coal ? lmao. Sure it works its safe. its when it breaks or something goes wrong. You get another Chernobyl

- **Re: (Score:2)**
  by CrimsonAvenger (580665)
  Sure it works its safe. its when it breaks or something goes wrong. You get another Chernobyl
  Yeah, it would be terrifying to have a Chernobyl happening every day, wouldn't it? I mean, that would mean that nuclear power would produce almost as many fatalities as New York City traffic does....
  Assuming a Chernobyl every day, of course. If we had TWO Chernobyls daily, we'd have almost as many nuclear-related fatalities as New York City AND Los Angeles traffic deaths produce.
  Note, by the by, that the New Yo

- **Re: (Score:2)**
  by es330td (964170)
  Modern, safer reactor designs are absolutely an integral part of combating climate change and divesting ourselves of fossil fuels.
  I don't think design is the problem so much as regulatory and public resistance. The US navy uses two reactors rated at ~500MW on each Nimitz class carrier. Setting one of these up near a large body of water for cooling would be a trivial matter; these are already mounted in a ship. The Navy has plenty of retired personnel quite knowledgeable in the operation and maintenance of these and thus far their operational history is without incident.
  I don't think widespread nuclear adoption is a difficult task fro

- **Nuclear, alternatives or space mining (Score:4, Insightful)**
  by rsilvergun (571051) on Friday December 14, 2018 @11:36AM (#57803668)
  All perfectly doable if we can just stop fighting among ourselves and spending 1/3 of our entire civilization's output on war and war profiteering.

  Also, human population is in decline where ever you find significant technical civilization. Assuming we don't regress (which, don't get me wrong, a not insignificant portion of humanity wants to) then it's a problem that will solve itself. People don't actually breed uncontrollably if they've got options. Japan, Singapore and now the US with their declining birthrates prove that.

  Folks mostly have a ton of kids as a kind of makeshift retirement program and between automation and productivity increases we just aren't going to need the vast labor pool we used to. We are going to need a way to distribute the wealth from the bots an A.I.s. Either that or we're going have have a dystopia where the 1% have everything and the rest of the world looks like a mix of Ethiopia, Somalia and the worst years of the American Indian Reservations.
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- **Remember the Lithium Shortage? (Score:2)**
  by Artagel (114272)
  I remember when they were predicting lithium shortages for EVs. Didn't happen. It may be that environmentalists have to decide which of their loathed pollutions to live with: byproduct of magnet materials or carbon, but the materials can be obtained if not outlawed.

- **No problem (Score:2)**
  by nospam007 (722110) *
  There countries actually working on the problem.
  https://spaceresources.public.... [public.lu]

- **Solar Molten Salt FTW (Score:2)**
  by turp182 (1020263)
  If we can make mirrors we can make solar plants that use molten salt (which can work for baseline as it continues to produce energy after the sun sets).
  And they look awesome!
  https://gbtimes.com/asias-firs... [gbtimes.com]

- **Re: (Score:2)**
  by turp182 (1020263)
  Here's the Crescent Dunes installation in Nevada.
  https://www.solarreserve.com/e... [solarreserve.com]
  Google Map link:
  https://www.google.com/maps/pl... [google.com]

- **Where there is high demand (Score:2)**
  by SCVonSteroids (2816091)
  There will be high levels of innovation to drive down cost/find more efficient ways to design said solar panels and wind turbines.
  2050 is in 32 years. Enough said.

- **See? Donuts Trump (Score:2)**
by AndyKnox (937105)
See? Donald Trump knew this all along and that's why he's opening up the way for more coal production. I would even go so far as to say that he's a very stable genius. Randy thinks so too! https://www.youtube.com/watch?...
[youtube.com]
-
- **Alternatives (Score:2)**
by airnx (4811433)
I expect that in the 32 years prior to 2050, if our supply of "rare earths" becomes an issue then we'll either find a way to create them artificially or find alternative elements or methods that don't require them.
-
- **Bio fuel (Score:1)**
by aliquis (678370)
But there will be plenty of SJWs we can recycle for energy.
-
- **Sand, Electricity (Score:2)**
by WillAffleckUW (858324)
Check.
Stop worrying.
-
-

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