Biggest Nuclear Boondoggle Ever: Taxpayers, Pull out Your Wallet, Costs Exploded Again

by Wolf Richter • October 15, 2016 • 34 Comments

How the Nuclear Energy Lobby Eats up Global Taxpayer Billions

The well-funded lobbyists of the powerful nuclear energy industry are tirelessly working over governments around the world. Occasionally, there are minor setbacks, such as Fukushima or the current multi-billion-dollar scandal around the decommissioning costs of California's San Onofre nuclear power plant, that threaten to expose just how horridly expensive nuclear power really is for taxpayers, ratepayers, and other stakeholders, from conception of the plant to final decommissioning and proper disposal of nuclear waste and contaminated materials – none of which has yet been accomplished and paid for.

But here's the project that was first conceived in 1985, is still far from completion, and has now thrown back the date of first power generation to 2035, if it can ever be accomplished, and there are grave doubts it can.

The hoped-for experimental power generator would be a capacity of a measly 500 megawatts, or about the capacity of 62 top-notch wind turbines, generating electricity in places like West Texas and the Oklahoma Panhandle. A farmer can put up a few of those on his fields for extra income. At an installed cost of about $1.5 million per MW capacity, a utility-scale project of that size might cost $750 million. And the wind is free.

A smallish natural-gas-fired power plant generates that much power and costs even less, but the gas is not free. Bigger plants generate four times as much.

This vaunted project has now come up with new cost estimates which, so to speak, exploded. Taxpayers in the US and around the globe are on the hook.

Our hero is the International Thermonuclear Experimental Reactor (ITER), currently being cobbled together in Cadarache in southern France. The backers include taxpayers in the US, Europe, Japan, China, Russia, Korea, and India. In the end, it's trying to generate electricity from a sun-like nuclear fusion process. This goal has now been moved out to 2035 at the earliest.

The project's Director-General, Bernard Bigot, told The Nikkei that there will be big delays and that construction costs will exceed the most recent estimate in 2010 by €5 billion ($5.5 billion). This takes the current cost estimate to €20 billion ($22 billion).

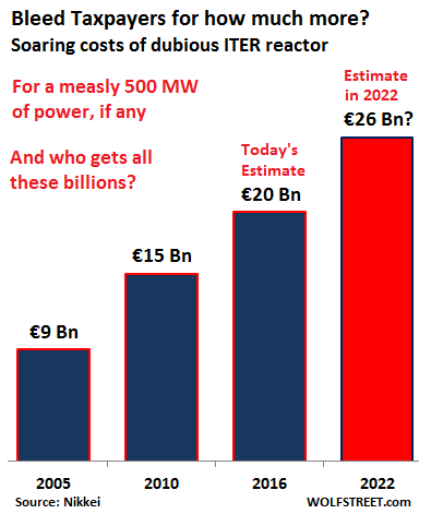
This time, Monsieur Bigot blamed rising labor costs.

In 2010, the original cost estimate had already been raised by €6 billion, from €9 billion to €15 billion. So in about a decade, the cost estimate has jumped from €9 billion to €20 billion, or by 122%! The Nikkei:

> Costs snowballed as assembling the reactor with parts contributed by project members proved more challenging than initially thought. As a result, the ITER decided to delay heating of the first plasma until 2025 and achieving full-power fusion until 2035.

Once again, Monsieur Bigot was confident about meeting the newly delayed targets.

But I suspect that a few years from now, cost estimates will once again explode, and at the current rate, they'd hit about €26 billion by 2022, when further big delays will be announced. The chart shows the development of the estimates (dark blue) and what I think the revision will look like in a few years (in red):



Now remember, this project may never generate any electricity, and if it does, its capacity will max out at the level of 62 of

today's top-notch wind turbines.

On its propaganda site, ITER remains relentlessly optimistic:

One million components, ten million parts … the ITER Tokamak will be the largest and most powerful fusion device in the world. Designed to produce 500 MW of fusion power for 50 MW of input power (a power amplification of 10), it will take its place in history as the first fusion device to create net energy.

Note the phrase: "to create *net energy*." That's the hard part with fusion. Fusion has been accomplished, but so far it takes more energy to get fusion to occur than the fusion itself releases. Hence, net loss of energy. So not a good deal.

The additional costs will be allocated to the taxpayers of the ITER member nations, unless governments put a stop to this money-suck in Southern France.

The Time line of the project:

1985: Project conceived during summit between President Reagan and USSR General Secretary Gorbachev

2005: **Cost estimate: €9 billion.** Decision to site the project in France

2007: Formal creation of the ITER Organization

2007-2009: Land clearing and leveling (that was the easy part)

2010: **Cost estimate raised to €15 billion**

2010-2014: Ground support structure and seismic foundations

2012: ITER becomes a Basic Nuclear Installation under French law

2015: The first large components were delivered to the ITER site

2016: **Cost estimate raised to €20 billion**

For the rest, uncertainty reigns. The ITER Timeline still says that the year when "Deuterium-Tritium Operation begins" is "tbc" – to be confirmed.

Whether this happens or not by 2035, if ever, after many more billions in cost increases, by then probably pushing total costs past $40 billion, hundreds of companies and thousands of investors, engineers, government functionaries, and others will have walked away with one of the biggest taxpayer-funded boondoggle kiddies the nuclear energy lobby has ever been able to conceive. We still don't know how they got President Reagan to carry their water at that summit.

In the US, something strange happened with nuclear energy. In 2011, right before the Fukushima meltdown, and even a year afterwards, an unchanged 57% of Americans were in favor of nuclear power. But now, for the first time, the majority of Americans opposes nuclear power. Read… What Happened to Nuclear Power in the US?

Tags:boondoggle ITER nuclear energy nuclear energy lobby

34 comments for "Biggest Nuclear Boondoggle Ever: Taxpayers, Pull out Your Wallet, Costs Exploded Again"

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Nicko

October 15, 2016 at 5:39 pm

ITER and other fusion efforts is the holy grail of energy. It's the ultimate renewable energy source. $40 billion? That's just over a month of oil consumption for the US. The cost is peanuts in comparison to the global economy. Not to mention, associated technology spin-offs.
In a world approaching 10 billion people in a little over thirty years, the earth will not survive without such advancements. I'm not sure if you'll be alive to see it, but I sure will be.

Wolf Richter

October 15, 2016 at 5:40 pm

Did anyone ever find the Holy Grail? Nope.

RepubAnon

October 15, 2016 at 7:58 pm

I wouldn't call fusion "renewable" – once the hydrogen is fused into helium, it's done. Of course, there's lots of hydrogen around…

I wouldn't hold out much hope for practical fusion reactors, though. The joke: "practical fusion reactors are 20 years away – and always will be" is a painful description of the current state of the effort.

Chicken

October 16, 2016 at 12:04 am

And, there isn't much helium around as far as I know, unless some of the new natural gas wells are producing it.

Bob

October 16, 2016 at 5:29 am

It consumes hydrogen, not helium. Hydrogen is plentiful (each water molecule has two hydrogen atoms and one oxygen)). Helium is what is produced by the fusion of two hydrogen atoms with the release of energy.

Joachim Gruber

October 16, 2016 at 4:22 am

Your comment is awaiting moderation. We have -and use- an operable fusion reactor already. It is far enough away to operate safely, i.e. it will not contaminate us in operation, in an accident (release of tritium, doubling the atmospheric tritium concentration in one accident alone) or after decommissioning, although it will probably blow up our planet some millions years in the future: our sun.

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Lars

October 15, 2016 at 6:13 pm

Our Sun does NOT run on a fusion powered core as the current mainstream consensus physics community hypothesizes, our Sun is ELECTRICAL in 97% of its processes. Only about 3% of its energy output is a result of nuclear fusion processes in the outer layers above its surface, the other 97% of its energy output comes from its electrical processes.
So, what are the French really spending all that money on ?

Vasile

October 15, 2016 at 8:21 pm

Very interesting, didn't know that. Would you care to point me to some relevant technical/scientific sources of info? Thanks.

nick kelly

October 15, 2016 at 8:48 pm

It's output may be electrical (its radiation is electro-magnetic) but the energy is created by the fusion of hydrogen atoms. Mass is transformed into energy in the process-the sun is constantly losing mass. As the formula E=MC squared indicates, you get a lot of energy from not much mass
No process electrical or otherwise can produce power from nothing- this violates fundamental laws of physics- the conservation of mass and energy. Neither can be destroyed but one can become the other.
As late as the 1930's it was thought that the sun might only be 100K years or so old, because its fuel would have been used up by then.
And it would have been if anything other that a matter- to- energy reaction was occurring e.g a chemical combustion of some kind.

Joachim Gruber

October 16, 2016 at 6:28 am

Your comment is awaiting moderation. ITER uses the fusion of deuterium (D) and (radioactive) tritium (T). Each D-T-fusion produces an intermediate nucleus which emits a neutron having an energy of 14.1 MeV and is thereby receiving a recoil energy of 3.5 MeV.
https://en.wikipedia.org/wiki/Nuclear_fusion#Thermonuclear_fusion
These 17.6 MeV are
(1) mostly turned into radiation, which Lars and Nick referred to as electrical energy, but part of the 17.6 MeV is
(2) dispersed in nuclear reactions mostly in the reactor structure, e.g. for breeding T from lithium, and render stable reactor structure radioactive.
The radiation energy (1) ends up as thermal energy and is eventually converted by turbines into electrical energy like in conventional power plants.
Because of processes (2) a fusion reactor power plant poses a radioactive hazard.
(a) Containment of the bred T inventory in an accident is yet unsolved, and its release from one fusion power plant might double the present atmospheric tritium concentration on the earth. http://acamedia.info/sciences/J_G/eufuss.html
(b) The waste from fusion power plants contains radioisotopes with similar half-lives as waste from fission power plants. Comparing the hazard of fusion and fission waste is presently not possible because we do not know enough about waste behavior
(*) in the repository,
(*) in the isolating rock formations enclosing the repository,
(*) in the biosphere and food chain and ultimately
(*) in the living organisms (particularly its long-term radiation damage).
http://acamedia.info/sciences/J_G/fusion.html

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Charlie

October 15, 2016 at 6:17 pm

Wolf: You seem to be confusing apples and oranges. Fission reactors are a tried and true, practical and safe method for generating electricity, and there are several hundred such operational reactors world-wide. There are no operational fusion reactors at this time, because they are not, as you point out, currently practical. Also, for every installed wind turbine, a back-up power system is required to generate electricity during times when the wind does not blow; this inconvenient fact more than doubles the cost of wind power. As Nicko indicated above, nuclear power is ultimately the only practical means of generating electricity if fossil fuels are to be eliminated from the energy mix.

Wolf Richter

October 15, 2016 at 6:31 pm

Are you KIDDING me: "…Fission reactors are a tried and true, practical and safe method for generating electricity…"
How can you STILL say this nonsense after Fukushima and Chernobyl?
And check out the total costs of decommissioning these plants, including San Onofre in California. NOTHING is more expensive and impractical long term than nuclear power.
How much does the industry pay you to spread this nonsense?

Jean Monti

October 15, 2016 at 9:50 pm

I agree with you wolf, nobody know really where put nuclear garbage for more 1000 years minimum with not risk for future generations.
About put cleaning energies when not sun or wind http://www.hydrostor.ca/ have a smart solution.

Lee

October 15, 2016 at 7:11 pm

Well in the state of South Australia they went for renewables big time.

Right now in that state there is 979 MW of electricity being generated.
Of that 80 MW is from gas, 56MW from small scale solar, and a whopping 843 MW from wind.
And what happens when the sun the sun doesn't shine and the wind doesn't blow? Well……
They import power from Victoria at huge market rate prices which has caused South Australia to have some of the highest power prices in Australia.
Guess what happens when the wind blows too hard and the wind power turbines have to be shut down……..
Or it gets really, really hot in summer and the demand soars……..

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Bruce Adlam

October 15, 2016 at 6:21 pm

With a lot of the world's population in decline I'm not so sure we will get to 10 billion people

Felix_47

October 16, 2016 at 3:51 am

Have you spent any time in Afghanistan, Iraq or India or Pakistan recently? How about Honduras? I have and these are dystopian hell holes…..rapidly exploding populations and limited resources. Africa with birth rates exceeing 6 per woman comes to mind as well. The standard of living for the masses is dropping rapidly. Really the only real money coming into these places is from Uncle Sam. None of the natives want to stay in these places….they dream of the US and Germany or Sweden and are doing all they can to get there. Just as science enabled us to prolong life world wide we need to do our best to progress. Lack of CO2 neutral and conflict neutral energy is leading to all our current conflicts worldwide and the war budget worldwide is a lot higher than what is being spent on ITER. Unless we are prepared to aerosol spray sterilization chemicals over the world or force sterilization or force birth control like the Chinese do we have any other choice? The technical challenges of fusion will throw off economically useful technologies just as radar development in WW2 threw off semiconductors, digital computers, transistors etc. If we cannot develop this energy is our only solution going to be endless war? We are not going to feed billions without factory farming, power implements, and all the technology we can muster.

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Smitty

October 15, 2016 at 6:39 pm

Sounds like a really big "model", not an actual economically viable machine.
I'd scrap it and pull out immediately, let Slim Helu and Bill Gates fund the glory-with their cash.
They can't even make solar work. http://www.wsj.com/articles/ivanpah-solar-plant-may-be-forced-to-shut-down-1458170858

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Raymond Rogers

October 15, 2016 at 7:09 pm

None of these should be subsudised. If solar, wind, and nuclear cannot operate in the free market system, then the heck with them.
The problem with humanity is overpopulation. You wouldn't need to worry about hoaxes called "climate change" and energy needs if there was less demand. With this we have to ask ourselves should we live in a world of ten billion with a North Korean standard of living or with less people with a higher quality of life?

night-train

October 16, 2016 at 2:01 am

So, you are saying that Exxon was lying in the late 60s when their top notch interdisciplinary science team discovered that man's activities were altering the climate?

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Emanon

October 15, 2016 at 7:47 pm

Wolf, I think that you don't understand the state of the art of fusion reactors.
They are still experimental scientific and engineering projects rather than commercial enterprises, such as the 100 or so power reactors that generate about 20% of the electricity in the USA.
Fission and fusion are two completely different processes. Fission, like inmates doing hard labor by breaking stones in prison, takes big atoms (uranium and plutonium) and makes them into smaller atoms. Fusion takes small atoms (hydrogen (tritium isotope) and helium) and makes them into bigger ones.
The escalating cost of ITER is a good thing to question, however. It's the old dilemma of big science vs. little science. Some things, such as particle accelerators, require big multi-billion-dollar investments. Fusion might actually be made commercially viable sooner if a dozen smaller projects are allowed to try higher-risk strategies, rather than doing One Big Project and nothing else for the next two decades.
We just need to find one working solution, so if we gamble on ten cheaper projects and nine out of ten fail, then we still will have solved the problem with just a 10% "success" rate.
The MIT fusion lab was just shut down as the DOE is diverting its budget to ITER. They mentioned that the records that they set there may not be broken for 15 years. That's way too long to accept as a gap in active research.
A good article on the MIT lab's last day of operation (Sept. 30) is here:
http://phys.org/news/2016-10-alcator-c-mod-tokamak-nuclear-fusion.html

Wolf Richter

October 15, 2016 at 9:03 pm

I fully understand the experimental nature of this.
The point in this article: why should taxpayers pay tens of billions of dollars/euros to enable the nuclear industry to chase after its next big dream?
We already know about the nightmare that its fist big dream has turned into: who pays for the damage caused by meltdowns? Who pays for decommissioning aging reactors? (check San Onofre for an answer). Who pays for putting nuclear waste into storage that will be safe for 100,000+ years? Currently, nuclear waste is just temporarily stored….
We know who is NOT going to pay: the nuclear industry (stockholders, bondholders some with government-guaranteed bonds, executive compensation packages, pensions, etc).

Emanon

October 16, 2016 at 12:43 am

Fusion research is still a scientific and engineering research project.
It is NOT directly connected with commercial nuclear power companies because right now there are NO commercial fusion reactors. Nobody even expects to build any for at least 10-15 years.
Does it make sense for the world to hedge its bets by spending a few billion a year for the next 20 years on something that may not even work?
Well, yes. That's why we research stuff in the first place: we don't KNOW if something is workable or not.
Compared to the trillions of dollars that will be invested in fossil fuels over the next two decades, it's a relatively cheap hedge.
We know that fusion can work as a power source because the sun has been using it for over four billion years. It remains to be seen if humans can get it to work here on Earth as a practical source of power.

Bob

October 16, 2016 at 5:45 am

Thank you, Emanon, for emphasizing that in many respects this really is basic research. And basic research never can promise results. You have made the point I wanted to present far better than I could have. I don't mind paying for research such as this. It's far better than the proposal to "modernize" our nuclear weapons at a cost of $1 trillion as proposed by Pres. Obama. Now THAT is a waste of money. http://billmoyers.com/story/the-trillion-dollar-question-the-media-have-neglected-to-ask-presidential-candidates/

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nick kelly

October 15, 2016 at 7:50 pm

Wow! I thought this was just another reactor nightmare story- dime a dozen, well a few trillion for a dozen, then I read FUSION!!!
I've taught high school physics and like to keep broadly informed and I had no idea that the weird lab experiments where you inject a million times the power you get out to create a fusion process for a few nanoseconds- had progressed to the point where someone was going to produce a commercial reactor.
My first question: where in heaven is the prototype? How long has it been operating?
Please don't tell me someone is trying to go from the blackboard to commercial production without at least a one- tenth scale reliably working prototype.
Anyway- I'm off to read about developments in the field, which sure haven't leaked out into the press.
I've heard of Tokomak (sp?) but only in connection with lab work.
I guess I'm falling behind.
To the comments about progress going forward -great- but in measured steps. commercial production being the last one.

nick kelly

October 15, 2016 at 8:19 pm

On Friday Sept.30 2016, MIT's Tokamak reactor set a record for the plasma pressure creating the high temperatures necessary for fusion.
(Tokamak means contained by magnetic fields because a physical container wouldn't be heat resistant enough and would also leach heat from the reaction, putting it out)
The reaction lasted for 2 seconds.
The one being built in France will be 600 times larger. The only logical reason for skipping the normal progression can only be that this size is necessary to produce a sustainable reaction. In other words (mine cuz I'm not sure what these guys are thinking) a one- tenth scale or so prototype wouldn't work. Go big or go home (where maybe you should have stayed)
The amazing thing is a that such an iffy dream can be financed not as government research but as a commercial venture.
These guys must be super salesmen. Sell the sizzle takes on new meaning.
2032?
Far out baby, far out.

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Atilla

October 15, 2016 at 9:17 pm

What I often wonder is why Tidal power is never given any press. Cheaper than fission and more reliable than wind (unless someone Nukes the moon!).
Possibly it's a permitting thing. Underwater turbines would seem to be a sure thing with enough investment.
https://en.wikipedia.org/wiki/Tidal_power

Wolf Richter

October 15, 2016 at 11:06 pm

I read about them quite a bit – so they're getting at least some press.

MC

October 16, 2016 at 1:38 am

The UK and France experimented a lot with tidal power back in the 60's.
The two big problems with it are environmental and maintenance costs.
Even if one cares nothing about environmental costs, high speed turbines and salt water don't go that well together.
This means scheduled and extraordinary maintenance will drive costs up, to say nothing of the need to manufacture turbines and their ancillaries in corrosion-resistant materials.

With natural gas cheaper than it was in the 80's even using official inflation data, it makes very little economic sense.

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Merlin

October 15, 2016 at 10:32 pm

Waste is the never-solved issue. In the photo below, every cylinder of depleted uranium ever used at the Paducah Gaseous Diffusion Plant since 1952 is still there.
https://www.google.com/maps/@37.1038969,-88.8111003,848m/data=!3m1!1e3

Wolf Richter

October 15, 2016 at 11:08 pm

Thanks for the link to the image. Great shot! This unresolved situation with the waste is really terrible.

Korkin

October 16, 2016 at 6:32 am

The used nuclear fuel during long time is successfully processed in France and Russia. Result of processing is MOX-fuel reception.
On August, 17th 2016, Russia.
"The Beloyarsk atomic power station (it is located in Sverdlovsk area, Average Ural Mountains) has placed in operation on a total power its fast neutrons of the power unit № 4."
http://tass.com/economy/894827
Main objective БН-800 – full testing of elements of the closed nuclear fuel cycle that allows to involve in operation now not used uranium-238 (depleted uranium) of an isotope which repeatedly to expand fuel base of atomic engineering to reduce to a minimum of a radioactive waste and for a reuse of the fulfilled nuclear fuel in other reactors.
The ultraliberal economic policy led the American nuclear industry in decline and loss key Competences. I agree, now it is too difficult and expensive to the USA and Europe.
I am sorry for bad grammar.)

nick kelly

October 15, 2016 at 11:44 pm

And what if that waste falls into the wrong hands?
You need immense technical know-how to produce even an A-bomb.
You need almost no knowledge to make a dirty bomb- you just need the radio-active waste. To this you attach conventional explosive, which scatters the waste in a cloud.
One man's junk is another man's treasure.

night-train

October 16, 2016 at 2:07 am

Well, at least the waste produced at the Hanford Reservation in Washington State isn't just still there. A lot of it has gone into the groundwater and migrated into the Colombia River.

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Chicken

October 16, 2016 at 12:20 am

I thought the new Toshiba reactor designs were capable of burning the waste to nothing? Or was that Hitachi?

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MC

October 16, 2016 at 2:36 am

Cadarache already houses one of the three Tokamak built in France, the Tore Supra.
It has been in activity since 1988 and it has been the most successful Tokamak in history, which is really nothing to boast about, as it means it functioned non-stop for 6 minutes and 30 seconds.
The first Tokamak went operative in 1960 in the USSR and since then this concept has held an unhealthy fascination over the mind of central planners worldwide.
Financing the building of a few, small scale research Tokamak, such as the TCV in Lausanne, would have been fine and would have been a "pocket change" project to see if any good would come out of the concept.
In over 50 years of research what the world's best physicists understood is that getting a Tokamak to work reliably, such as any other power-generating device, is impossible. Apart from the difficulties of plasma physics and the need to deal with "microdébris" (the byproducts of plasma production in the real world), a Tokamak presents phenomena known as disruptions, which cannot be avoided and which result in the erosion or melting of the equipment.
Disruptions can only be "mitigated" and one of the aims of ITER is on how to do that while having something akin to continuous plasma generation.
It can be argued all of this is for the higher good as, even if nothing practical comes out of it, it's knowledge.
Technically speaking ITER should be the final word on Tokamak, meaning the project that will either make it work or deliver it to the history books. After over 50 years it would be about time.
But while ITER and its budget (50% of which is covered by France) balloon out of proportions, DEMO is already being planned.
DEMO will be the prototype of an industrial Tokamak. Yes, before the feasibility of Tokamak is definitely assessed, it has already been decided the technology will work, end of story.

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Dan Romig

October 16, 2016 at 6:30 am

In the 1950s when work was being done on the H bombs and fusion, John D. Lawson came up with the "Lawson criterion". First published in 1957, this was a calculation of how much electron density, temperature and confinement time was need to produce fusion.
It takes an immense amount of heat and pressure to squeeze two hydrogen atoms into helium. Engineers may be able to do so in a small and momentary event, but it is not likely that fusion will be sustainable for electric generation.
Of course, a few hundred years ago, not many humans thought we could fly through the air like birds. Good luck to those physicists working on it.

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