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## theguardian

# Burying electricity power lines 'cheaper than National Grid claims'

Countryside campaigners say government should reconsider 200 miles of overhead pylons in wake of report

John Vidal guardian.co.uk, Tuesday 31 January 2012 15.51 GMT



Electricity pylons near Dalwhinnie in the Scottish Highlands. Photograph: Paul White/Alamy

Countryside campaigners fighting hundreds of miles of 50-metre tall electricity pylons said on Tuesday that they have been vindicated by <u>an independent report</u>, which says burying cables is far cheaper than has been claimed by the <u>National Grid</u>.

The report by engineering consultants Parsons Brinckerhoff into the comparative costs of routing transmission lines was commissioned by government planning body the Infrastructure Planning Commission (IPC). It found that underground cabling was 4.5-5.7 times more expensive than traditional overhead pylons. This compares with the claim of being 10-20 times more expensive, which is often made by the National Grid company in planning applications. The National Grid has been the monopoly supplier of UK pylons for 60 years.

When costs are calculated over 40 years, overhead cables were found to cost between  $\pounds 2.2m/km$  and  $\pounds 4.2m/km$  to install and maintain, compared with between  $\pounds 10.2m/km$  and  $\pounds 24m/km$  for those buried. Costs varied according to the technology used and the voltage of the lines.

Campaign to Protect Rural England (CPRE) said the latest figures made it feasible for the government to insist that cables are buried when crossing national parks, or protected areas like areas of outstanding national beauty.

Calling for a new study to consider environmental and social costs, a spokesman for the group said: "We are not saying that you should bury all cables, and we accept that this is a more expensive option, but we think people would be prepared to pay a few extra pounds a year to have them buried in treasured landscapes like national parks and areas of outstanding beauty."

The report's authors considered several ways to bury the cables, including putting them in tunnels, directly into the ground and in gas-insulated pipes. On every count, it was far cheaper to use overhead lines.

The report did not try to calculate the social and environmental costs of the pylons, which have been deeply resented when proposed in some areas. However, it concluded that there may be visual intrusion, community disruption, loss of property values and concerns about radiation.

However, National Grid said the study's findings were broadly in line with the costs it had been quoting. David Mercer, National Grid's major infrastructure development manager, added: "This report will be a valuable contribution to the public debate on the right balance between visual impact and costs that must ultimately be paid for by consumers."

More than 200 miles of new transmission lines are expected to be demanded in the next 10 years, in order to connect new nuclear power stations and onshore and offshore windfarms to the grid.

The masts have been strongly opposed in Scotland, the Lake District and mid-Wales. Some of the proposed lines would cut through England's finest landscapes like the Mendip Hills, Somerset, and the Dedham Vale on the Essex-Suffolk border.

The Campaign for National Parks (CNP) welcomed the report's findings. Its deputy chief executive, Ruth Chambers, said: "We welcome the report's conclusion that underground solutions for electricity transmission are cheaper than previously thought. There will now be a more level playing field between overhead and underground technologies, making it easier for solutions that respect England's finest landscapes to be implemented."

"This is only part of the jigsaw. We wanted to give the IPC a tool to apply to future applications," said Mark Winfield, consultant with Parsons Brinkerhof and lead author of the report.

Last year, a Danish "T-Pylon" design by Copenhagen-based practice Bystrup <u>won a</u> competition by the Department of Energy and Climate Change to design new pylons.

# Comments

50 comments, displaying

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Report

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<u>MrEurope</u> 31 January 2012 4:05PM

Interesting... somehow the common sense position would seem to be that BURYING cables ought to be cheaper... you know, less weathering, etc... yet it appears it not so, by quite a margin.

Goes to show how "common sense" can be very unhelpful when complex problems are being analized. Take Global warming for instance ;)

uhf101	Recommend (27)
31 January 2012 4:14PM	Responses (0)
Pylons are fucking massive, why not just bury the wires ?	<u>Report</u>
	<u>Share</u>
Oggers	Recommend (3)
31 January 2012 4:23PM	Responses (0)
Good point uhf.	<u>Report</u>
I expect the author will claim he doesn't write the headlines. Burying pylons FFS.	<u>Share</u>

SpirifOfAmerica	Recommend (6)
31 January 2012 4:31PM	Responses (o)
There are a lot of problems with burying these types of lines.	<u>Report</u>
Inspections, separation and insulation between lines, rodent attacks, preventing accidental damage from vehicles or digging, to name a few. It seems that stringing cables along a metal framework with cheap insulators generally is the cheapest method for most situations.	<u>Share</u>
Agir	Recommend (5)
31 January 2012 4:31PM	Responses (1)
Is the transmission loss the same for above and below ground	<u>Report</u>
cables?	<u>Share</u>
dyatel42	Recommend (1)
31 January 2012 4:34PM	Responses (0)
It would be helpful to carry out a brief survey of the long distance	<u>Report</u>
transmission of electricity in other countries because they would have precise costs available for each system used.	<u>Share</u>
Japanese towns often seem a bit messy when you first see them because the cables seem to be string all over the place rather than buried beneath the pavements like we do in the UK but I don't know what they do between towns and power stations.	
But some of prices quoted for a kilometer of buried cable seem to equate to a kilometer of 6 lane motorway!	
JennyPole	Recommend (3)
31 January 2012 4:34PM	Responses (0)
Response to MrEurope, 31 January 2012 4:05PM	<u>Report</u>
Theres lots of examples of contributors and commenters	<u>Share</u>

Theres lots of examples of contributors and commenters analizing problems on these pages.



<u>ajchm</u> 31 January 2012 4:37PM

Even if you exclude the higher cost, burying has problems as groups will then object to the route of the cable. I don't think they look that bad anyway, no worse than the mobile phone transponders everywhere (and people would moan if they couldn't get a signal whilst half way up a mountain).



<u>24thfloor</u> 31 January 2012 4:39PM

The major problems are heat, loss rates, EMC and mantenance. Heat is the worst, sometimes you have to cool the wires and as teh wires are in the ground theres water as well. Sticking the wires in Air quite simply is teh best technical and cost solution. These Greenies who want to put up the electricity bills of the working class for already expensive wind energy should start to live in the real world. Do they really think that a pre 1890 Britain, without electricity was a better place, take up region not energy ecomonics please. Recommend (11) Responses (1) <u>Report</u> <u>Share</u>

Recommend (4)

Responses (0) <u>Report</u>

<u>Share</u>



Geologybob 31 January 2012 4:39PM

http://www.landsnet.is/uploads/1068.pdf

Quite apart from the fact that a lot of heavy digging across some areas of natural beauty, this PDF shows that it isnt just a cast of digging a long trench and burying the cables. Magnetic fields, cooling and risk of damage all seem to come into it. Its more complicated than just a hole in the ground, I think.

This issue has echoes of the enormous hoo-haa going on in Norway about a plan to run pylons across the Hardanger.

### NickRouse 31 January 2012 4:41PM

Underground cables have to be insulated with plastic or oil soaked paper which is expensive in the quantities needed. Overhead cables are insulated with air which is cheap and does not degrade with age. The heat dissipated by resistive losses is more of a problem underground where the heat builds up. In overhead cables the heat is carried away by the air. AC underground cables are limited to about 50 km before the current through the capacitance to ground causes losses to build up to unacceptable levels. This requires the use of high voltage DC transmission, which has its advantages but requires very expensive AC to DC converters at each end rather than much cheaper transformers.

JSimmo88 31 January 2012 4:43PM	
The issue is you can't simply bury the line. With an overhead line	
the air acts as insulation where as with a cable you need some	
form of insulating material to prevent short circuits. This	
increases the cost of the installation initially.	
Also I believe the losses in cables are far higher than in a transmission line due to the capacitive effect of the insulation on the line making them more expensive to run.	
Cables have the major advantage on a transmission system of	

Cables have the major advantage on a transmission system of being less prone to faults, however for large distances such as 200km of cable the cost makes it too expensive I believe.

At the end of the day, the cost of this infrastructure replacement is paid for out of your electricity bill, which is already going up massively. I'm sure if National Grid agreed to bury the lines as cables the same people and probably more would be complaining that their bills go up again :P

InebriatEd	Recommend (0)
31 January 2012 4:44PM	Responses (0)
Response to Agir, 31 January 2012 4:31PM	<u>Report</u>
If the lines are made of the same materials transmitting the same voltage and current, then yes.	<u>Share</u>
JSimmo88	Recommend (0)
31 January 2012 4:44PM	Responses (0)

Recommend (2)
Responses (0)
<u>Report</u>
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Recommend (9)
Responses (1)
<u>Report</u>
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Recommend (8) Responses (0)

<u>Report</u> <u>Share</u>

Response to NickRouse, 31 January 2012 4:41PM	<u>Report</u>
You beat me to that :P	<u>Share</u>
InebriatEd	Recommend (1)
31 January 2012 4:46PM	Responses (0)
Actually I take that back having read the posts of more informed	<u>Report</u>
people like Nick and Simmo.	<u>Share</u>
Geologybob	Recommend (3)
31 January 2012 4:51PM	Responses (0)
Theres also the practicalities to consider. Look at the picture at	<u>Report</u>
the top of the article. Theres sodden peat bog and solid rock in varying quantites. That would be a nightmare to dig a trench	<u>Share</u>
across, requiring access by heavy machinery, requiring access roads to be built. All of which would rather defeat the object of burying the lines.	
anthod	Recommend (5)
31 January 2012 4:54PM	Responses (1)
Why will we need extra lines to connect proposed new nuke	<u>Report</u>
plants? They are all proposed to be built at existing sites, which are already connected.	<u>Share</u>
Ocoonassa	Recommend (1)
31 January 2012 5:07PM	Responses (0)
If people had personal power such as local turbines and fuel cells	<u>Report</u>
then that would save a shitload of cash for everybody involved.	<u>Share</u>
Just look at Wildpoldsried in Germany for example.	
RodriguanFruitBat	Recommend (3)
31 January 2012 5:40PM	Responses (0)
Do they actually dig right down to the height of the pylon to bury	<u>Report</u>
hem standing up, or do they lay them on their sides first?	<u>Share</u>
Galvanize	Recommend (4)
31 January 2012 5:42PM	Responses (0)
Why will we need extra lines to connect proposed	<u>Report</u>
new nuke plants?	<u>Share</u>
Don`t worry. It is just made up anti nuke BS. The next generation of nukes are being built on existing sites. Sure, the infrastructure made need renewing etc, but it will be because of its age and nothing else.	
Kovich	Recommend (3)
31 January 2012 5:46PM	Responses (1)
Vour article seems to contain a large error	Report
Your article seems to contain a large error:	<u>Share</u>
"It found that underground cabling was 4.5-5.7 times more expensive than traditional overhead pylons."	

"When costs are calculated over 40 years, overhead cables were

Recommend (3)

Responses (0)

Report

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found to cost between £2.2m/km and £4.2m/ km to install and maintain, compared with between £10.2m/km and £24m/km for those buried"

The full range would seem to be between 2.4 times more expensive (in the case where pylons were £4.2m/km and buried cables £10.2m/km) and 10.9 times more expensive (where pylons were £2.2m/km and buried cables £24m/km). However, it's impossible to check as you don't provide a link to the report. How can it be news if we can't read the report?



<u>Bangorstu</u>

31 January 2012 7:02PM

Ease of maintenance is another issue - wires strung between pylons are a lot easier to maintain than those buried underground. Finding a fault is much much easier.

Even if the report is correct, burying wires is vastly more expensive.

As it is, there are two 400kV lines across Snowdonia. Does anyone remember seeing them?

As for new lines - you can only send so much power down one line - so if the power station produces a lot, it needs two lines. Sizewell has a double line coming out of it.

Wylfa will need another one if Wylfa B is built.

shoot of all the contenders here.

free.

LordMike	Recommend (1)
31 January 2012 7:18PM	Responses (o)
Just bury them, they are so ugly!!	<u>Report</u>
	<u>Share</u>
riggbeck	Recommend (3)
31 January 2012 7:33PM	Responses (1)
I accept that overhead pylons are the cheapest, but do they have	<u>Report</u>
to be so ugly? The Energy Department and the National Grid recently sponsored a competition to find find the best new	<u>Share</u>
design, reported <u>here</u> by the BBC. The Guardian has a photo-	

The winner, T-Pylon, is quite elegant and graceful. Better these than an army of Martian invaders trampling over the country. Unfortunately there's no commitment to using the design. At the very least there should be a study to find out if it's cost-effective.

ShuffleCarrot	Recommend (0)
31 January 2012 7:40PM	Responses (0)
Given the type of ground they got to cover , hills and valleys you	<u>Report</u>
got chance of burying these lines in some instances , Ironically	<u>Share</u>
these tend to be in the 'pretty bits' that they want to keep pylon	

Bangorstu	Recommend (1)
31 January 2012 8:22PM	Responses (1)
The report did not try to calculate the social and	<u>Report</u>
environmental costs of the pylons, which have been	<u>Share</u>

http://www.guardian.co.uk/environment/2012/jan/31/burying-electric-pylons-cheaper-g... 26.9.2012

deeply resented when proposed in some areas. However, it concluded that there may be visual intrusion, community disruption, loss of property values and concerns about radiation.

#### Visual intrusion I'll grant. Ditto property values.

Community disruption? People live alongisde pylons throughout the UK. They're no more disruptive than trees.

Cocnerns about radiation? Only to those who don't udnerstand science - I don't thin kthere's been any link proved.

Environmental costs - pylons will, ecologically spekaing, be the more environmentally friendly option. They have a small footprint compared to a trench dozens of miles long. And that trench will of course be more disruptive to dig and maintain than a series of small construction sites 300m apart.



As lo seco else. <u>Plutonium</u> 31 January 2012 9:11PM Recommend (o) Responses (o) <u>Report</u>

**Share** 

I seem to recall the 1967 New York City blackout was made worse because the underground cables cooled off and the circulation oil systems lost reservoir levels. Underground cable cooling systems had to be topped off before restart.

batman11	Recommend (5)
31 January 2012 9:23PM	Responses (0)
long as all the cables are buried within a 20 mile radius of my	<u>Report</u>
ond home in the country. I don't give a shit about anywhere	Share

Yours faithfully, NIMBY second home owner

Kovich	Recommend (1)
31 January 2012 9:55PM	Responses (1)
Response to riggbeck, 31 January 2012 7:33PM	<u>Report</u>
Cost, constructability and practicality formed part of the	<u>Share</u>
competition judging process I understand.	

SP.

TBombadil 31 January 2012 11:31PM

It is easier to hide high voltage DC cables than AC. They can be laid in the sea or in rivers or underground without significant loss of power. The optimum may be to design a HVDC grid to transfer power north and south and east and west with AC hubs for local distribution. Recommend (2) Responses (0) Report Share

Bonzaboy	Recommend (o)
1 February 2012 2:15AM	Responses (0)
SpirifOfAmerica	<u>Report</u>
Preventing accidental damage from vehicles or digging.	<u>Share</u>

Not really a problem in National Parks or areas of outstanding national beauty, unless you know something I don't?



pylons is their ugliness, and that can easily be fixed by getting some designers in. In fact, didn't The Guardian recently run an article on designer pylons?

> ⊷ <u>Bonzaboy</u> 1 February 2012 2:23AM

the Infrastructure Planning Commission (IPC). It found that underground cabling was 4.5-5.7 times more expensive than traditional overhead pylons.

#### That's a lot.

Calling for a new study to consider environmental and social costs, a spokesman for the group said: "We are not saying that you should bury all cables, and we accept that this is a more expensive option, but we think people would be prepared to pay a few extra pounds a year to have them buried in treasured landscapes like national parks and areas of outstanding beauty."

I would rather the money was spent on mitigating climate change, actually. Such as by changing how the electricity is generated in the first place.

Also, I wouldn't mind if more money were diverted away from defending oil resources in Saudi Arabia and towards advancing cleaner technologies.

r	
ι.	
	1

geofarce 1 February 2012 6:27AM

Response to 24thfloor, 31 January 2012 4:39PM

These Greenies who want to put up the electricity bills of the working class

To be fair, this is a CPRE push. CPRE often object to renewable energy schemes in the countryside so it is unfair to generalise that this predominently a push from the 'greenies'.

Recommend (2)
Responses (0)
<u>Report</u>
<u>Share</u>

That's good to know. I hope the National Grid will pull its finger out and start using the winning design. Unless the competition was a cynical PR exercise,



Re

**geofarce** 1 February 2012 8:24AM

Response to anthod, 31 January 2012 4:54PM

Why will we need extra lines to connect proposed new nuke plants? They are all proposed to be built at existing sites, which are already connected.

Recommend (0)	
Responses (0)	
<u>Report</u>	
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Recom	mend (4)
Respon	ses (0)
<u>Report</u>	
<u>Share</u>	

Recommend (1) Responses (0) Report

<u>Share</u>

It could be the increased power output. One of the new EPRs is rated at <u>1650 MWe</u> compared to ~1200MWe for one of the <u>old</u> <u>AGRs</u> or 500-900MWe for the even older <u>Magnox sites</u>.

AdamVaughan 1 February 2012 9:21AM	Recommend (1)
	Responses (0)
g	<u>Report</u>
Response to <u>Kovich, 31 January 2012 5:46PM</u>	<u>Share</u>
We usually link to reports but the report wasn't online yesterday;	
I've been trying to get hold of a copy of it to host on our site.	
Hopefully it will go up today	
AdamVaughan 1 February 2012 11:17AM B Report is <u>here</u> - and I have added link to the article	Recommend (1)
	Responses (0)
	<u>Report</u>
	<u>Share</u>
geofarce 1 February 2012 12:09PM	Recommend (1)
	Responses (1)
Response to Bangorstu, 31 January 2012 8:22PM	<u>Report</u>
Cocnerns about radiation? - I don't thin kthere's been	<u>Share</u>

any link proved.

The epidemiological studies have <u>had mixed results</u> in relation to the power line health effects. As a parent, where rational decisions err very much to the cautious side, I would choose a home / school away from pylons if I had a choice.

Only to those who don't udnerstand science

Hmmm. As a scientist, I remember alarm bells going off when John Gummer got his daughter to each a beef burger whilst saying that there was no evidence that mad cow disease affected humans. Thing was, at the time, the prevalent theory was that if we were not affected by eating sheep with scrappie then we would not be affected by Bovine Spongiform Encephalitis - but no one had published a studied on the question. There are similar issues with radiation. We were assured when mobile phones came out that they were harmless as the RF power levels were too low to affect biological material then the US National Institutes of Health suggested that <u>mobile phones could have an</u> <u>effect on the brain</u>. The measured increase in brain metabolism was not necessarily harmful (and who knows, it may be a beneficial boost to brain activity) but the point is that the effect was not predicted by the theories at the time.

jgb1982	Recommend (1)
1 February 2012 1:15PM	Responses (0)
Response to MrEurope, 31 January 2012 4:05PM	<u>Report</u>
Actually, common sense would tell me that digging up hundreds	<u>Share</u>

Actually, common sense would tell me that digging up hundreds of miles of the country to be able to lay cables, then the upkeep and maintaining of these cables when they are far less accessible than their overground counterparts would be slower and more expensive than throwing up a pylon every few hundred yards which can then be accessed fairly easily and rapidly. Perhaps this goes to show why some peoples idea of common sense is fairly non sensical to others...

misterbaxter	Recommend (1)
1 February 2012 2:33PM	Responses (1)
I beard resently (mymour only but from a yew informed source)	Report
I heard recently (rumour only but from a very informed source) that the T-Pylons that won the design competition recently have a significant flaw: they can only be used to run wires in dead straight lines. They don't have enough lateral stability to hold the wires up around even the slightest corner. The existing pylons can only take a turn of a few degrees, but that's enough, when used in conjunction with one-off corner-pylons. The way I heard it, not one of the entries to the pylon design competition actually met all of the design specs. The T-pylons we the least worst.	<u>Share</u>
coran	Recommend (0)
1 February 2012 3:43PM	Responses (0)
Just a small point re some of the comments above, but the report	<u>Report</u>
has assessed the costs over the full lifecylce of the individual technologies, so this takes on board maintenance costs etc as well as build costs.	<u>Share</u>
Bangorstu	Recommend (0)
1 February 2012 4:54PM	Responses (1)
Response to geofarce, 1 February 2012 12:09PM	<u>Report</u>
We've had HV lines for decades now - f there was a proveable link we'd have found it by now. There's no link with National Grid workers who spend hours exposed to higher levels of radiation than you get from being 15m beneath a HV ine.	<u>Share</u>
That people under HV lines suffer from poor health is probably due to the fact that area where HV lines occur aren't usually affluent hence the poor health is due to poverty.	
Bangorstu	Recommend (0)
1 February 2012 4:56PM	Responses (1)
Response to misterbaxter, 1 February 2012 2:33PM	<u>Report</u>
The existing pylons can handle turns of 45 degrees quite easily.	<u>Share</u>
In the interests of full dislcosure, I do make money out of these things. I undertake tree surveys along the National Grid each winter to ensure trees don't come too close to the wires - whereupon Bad Things Happen.	
foilist	Recommend (0)
1 February 2012 5:23PM	Responses (1)
@ <b>Bangorstu</b> - do you get to use the helicopter mounted tree trimming thingy that featured in a past James Bond movie? That could be fun!	<u>Report</u>
	<u>Share</u>
geofarce	Recommend (o)
1 February 2012 5:47PM	Responses (1)

#### Response to Bangorstu, 1 February 2012 4:54PM

We've had HV lines for decades now - f there was a proveable link we'd have found it by now.

I am not saying that their is a provable link, and if there is it is probably quite subtle, but you would need to look for the right link. If you never look for it (and, *a priori*, one would not know what it might be) then it will never be found. People had been smoking for centuries (not decades) before the right epidemiological study revealed the lung cancer link in the 1950's. That was a whopping effect so spotting more subtle ones would be no mean feat.

There's no link with National Grid workers who spend hours exposed to higher levels of radiation than you get from being 15m beneath a HV ine.

For sure, but such a limited sub-section and number of the human population cannot be used to study universal safety. For instance, not many National Grid workers are in their first or second trimester of development. Adult human response to environmental stimuli can be quite different from children who are undergoing formative development with a whole range of different genes and biochemical pathways active.

That people under HV lines suffer from poor health is probably due to the fact that area where HV lines occur aren't usually affluent.... hence the poor health is due to poverty.

My understanding of epidemiological studies is that they use a multi-variant analysis to allow for pre-existing health and socioeconomic factors.



Bangorstu 1 February 2012 6:06PM

Response to foilist, 1 February 2012 5:23PM

Alas all I get is a hand held data recorder, a laser to measure distances and some maps... I don't do the trimming, just the walking and measuring.

Still, being paid to walk across North Wales isn't a bad way to spend the winter, though it was a bit chilly around Arenig this afternoon :)



Bangorstu 1 February 2012 6:10PM

Response to geofarce, 1 February 2012 5:47PM

Geofarce - I entirely agree I was perhaps too dismissive - though note the link to cancer with cigarettes was widely surmised a long time before the 1950s. They were nickanmed cancer sticks and coffin nails for a reason.

However, I still think that given how alert we are these days to health risks, given the hundreds of thousands of people living or working near these things in the UK alone, any problem would have showed up by now.

My understanding of epidemiological studies is that they use a multi-variant analysis to allow for preexisting health and socio-economic factors. <u>Report</u>

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Recommend (o) Responses (o) <u>Report</u> <u>Share</u>

Recommend (0)

Responses (0) <u>Report</u>

<u>Share</u>

And it's very difficult to do...

1 February 2012 6:16PM	Recommend (0)
	Responses (1)
Response to Bangorstu, 1 February 2012 4:56PM	<u>Report</u>
Have you heard anything re the T-pylon design issues? It seems unbelievable but I heard it from a very credible source.	<u>Share</u>
Bangorstu 1 February 2012 6:29PM	Recommend (0)
	Responses (0)
Response to misterbaxter, 1 February 2012 6:16PM	<u>Report</u>
Not my department, sorry.	<u>Share</u>
I'm a sub-contractor of a sub-contractor. The only time I have much to do with the National Grid is when doing their safety training	
I do know there's a lot of infrastructure being built locally though due to the offshore wind farms.	

Comments on this page are now closed.

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