Re: Lunar Solar Power Stations vs. The O'Neill Proposal

Source: http://sci.tech−archive.net/Archive/sci.space.policy/2006−06/msg00851.html

- *From*: Hop David <hopd@xxxxxxxxxxx>

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Fred J. McCall wrote:

> :Power is often distributed to places near the power plant. So, even if :your figure is correct, that doesn't demonstrate the efficiency of long :distance power lines.
>
> But I would be surprised if it doesn't. 'Local' distribution uses lower voltages (and hence has higher relative I2R loses).

Not necessarily. If you reduce the current by a factor of 10 and boost resistance by a factor of 1000, you'd still have a line 10 times more lossy.

Personally,

> I'd think it was all the voltage changes (as you distribute) and such that would be the greatest loss.

I don't know, but what you say may be possible. If you lose power when high voltage is reduced at substations, then that loss should be counted against the long distance lines.

> "It is necessary to transmit the electricity at high voltage to reduce the percentage of energy lost. For a given amount of power transmitted, a higher voltage reduces the current and thus the resistive losses in the conductor. Long distance transmission is typically done with overhead lines at voltages of 110 to 765 kV. However, at extremely high voltages, more than 2 million volts between conductor and ground, corona discharge losses are so large as to offset the advantage of lower heating loss in the line conductors."
>
> "Transmission and distribution losses in the USA were estimated at

> 7.2% in 1995 [1], and in the UK at 7.4% in 1998. [2]"
>
> http://www.answers.com/topic/electric−power−transmission

From the same article:

"The capital cost of electric power stations is so high, and electric demand is so variable, that it is often cheaper to import some portion of the variable load than to generate it locally."

and

"Long−distance transmission of electricity is almost always more expensive than the transportation of the fuels used to make that electricity. As a result, there is economic pressure to locate fuel−burning power plants near the population centers that they serve."

> :> 'Long lines' use extremely high voltage, which drops the
> :> current (and power losses) in long distance power transmission
> :> significantly.
> :
> :Even so, long haul power lines can lose a third of the power they start :out with (see Henry Spencer's reply to your post).
>
> I'd like to see a source for his numbers. I can see how SOME long haul lines might be that lossy (the older, lower voltage ones). But there are some 80,000 miles of HV transition lines in the US system and if they were typically that lossy I would expect system losses a lot higher than 7.2%, given that most power flows over those lines at one time or another.

And the interstate highway systems totals around 50,000 miles. Much of the produce at my local grocery store was shipped via interstate highways. Regardless, much of said produce is locally grown.

I live not far from the Palo Verde Nuclear Power Plant in Arizona. A lot of this plant's power is sent through 40 miles of HV transmission lines to Phoenix, Arizona and very little is sent to Boston.

> :And I suspect (as does Jeff Findley) that the cost savings of building :and maintaining long distance transmission lines would be considerable.
>
> You'd have the same sorts of problems, though. You have to put your rectennas someplace and you then need to get power from there to the users (who aren't going to want to live near your rectenna). Hundred

> mile long lines are 'long distance'.

A lot of load variation comes from climate differences from region to region. So it becomes desirable to move power several hundreds, maybe thousands of miles, even if it's expensive.

Building rectenna farms 100 miles apart would be silly. But 2000 miles apart is a different story.

> We tend to run long lines at close to their theoretical load limits (corona discharge limits) and there's some talk of putting in superconducting lines for some of the bigger segments (which it is estimated would save half the energy currently lost − only half because the cooling equipment for the superconducting lines requires some of that power).

Yes, cooling 1000s of miles to superconducting temperatures would take some power.

Hop
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