

Importance of Transient Modeling for The Feasibility of Concentrating Solar Thermal Application

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WHY?

One of the World's Largest Solar Facilities Is in Trouble

California's Ivanpah concentrated solar power plant has underdelivered on its energy contracts and now has a year to shape up, or it could be shut down.

by **Richard Martin**

Mar 18, 2016

One of the most ambitious solar energy projects on the planet is in trouble.

The \$2.2 billion Ivanpah concentrated solar power facility in California has fallen well short of its expected power output and now has a year to get itself back on track, or it risks being forced to shut down.

The California Public Utilities Commission granted a reprieve to the plant on Thursday, preventing it from going into default on its contract with Pacific Gas & Electric and Southern California Edison.

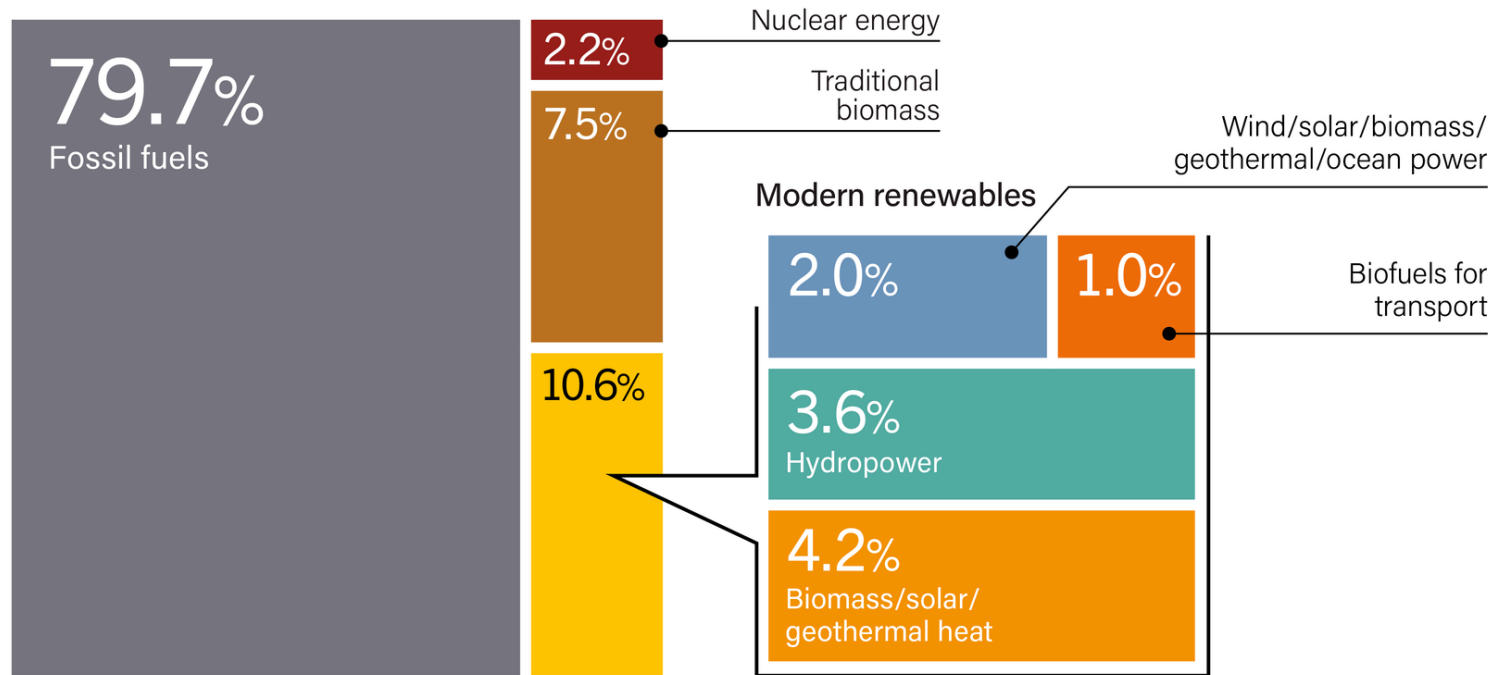
Built with great fanfare by BrightSource Energy, NRG Energy, and Google, Ivanpah has been dogged by criticism from environmentalists since construction began. The plant uses thousands of mirrors to concentrate the sun's energy and heat water to produce steam and generate electricity. But since it came online in 2014, the power it produces has been much more expensive than electricity from solar plants that get their energy from photovoltaic cells, to say nothing of power from natural gas.

WHY?



Current Situation

Estimated Renewable Share of Total Final Energy Consumption, 2017

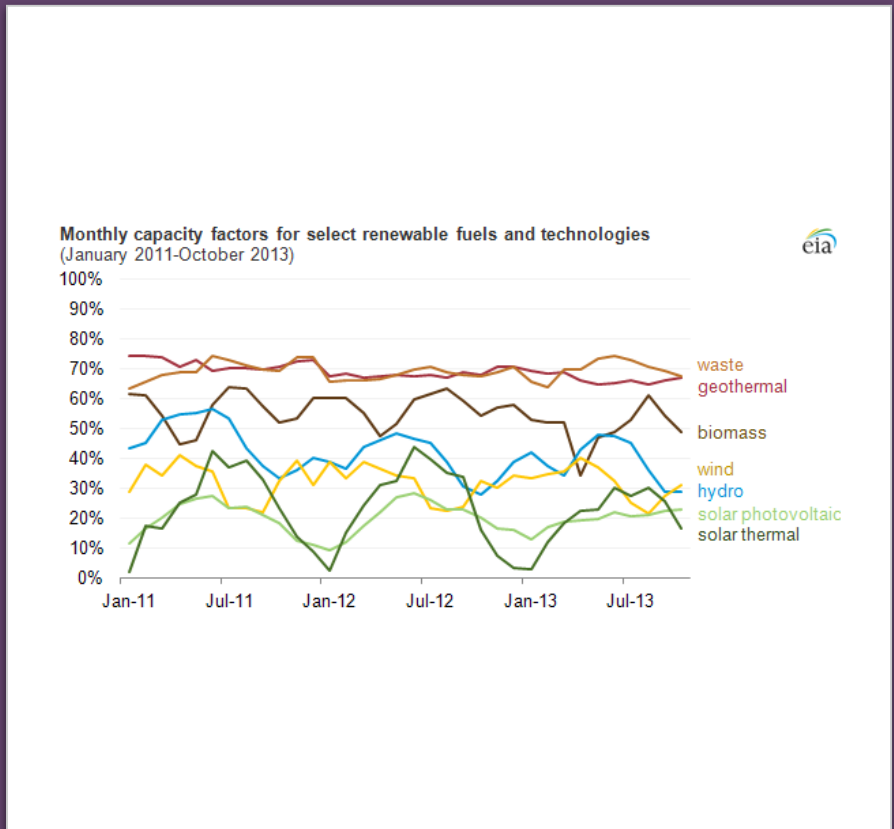
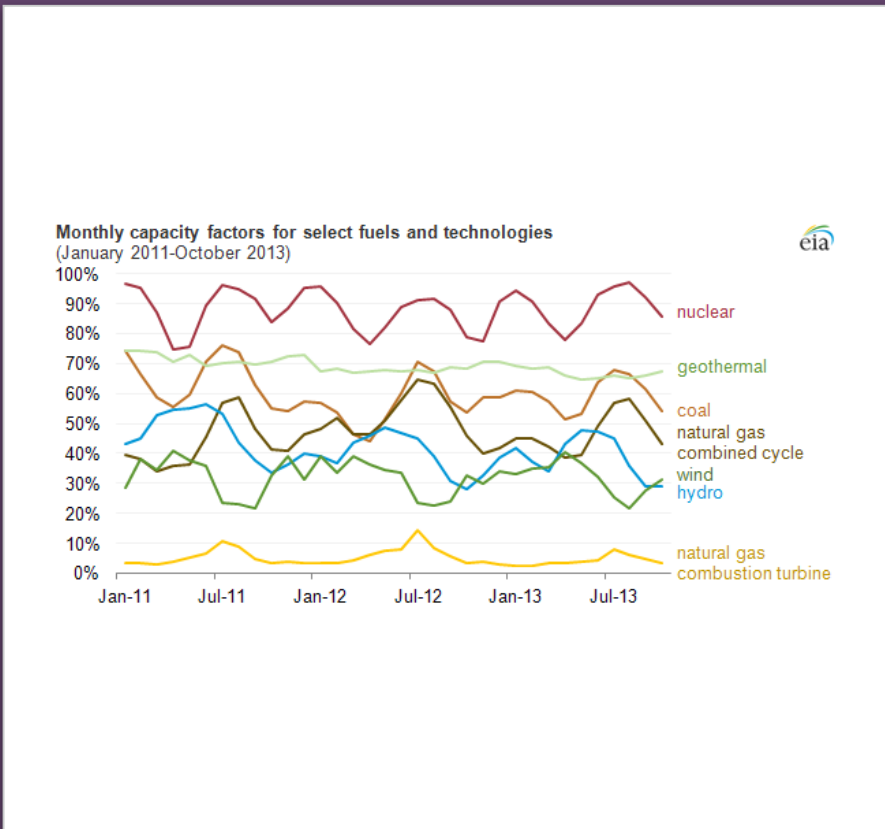


Note: Data should not be compared with previous years because of revisions due to improved or adjusted data or methodology. Totals may not add up due to rounding.

Source: Based on OECD/IEA and IEA SHC.

... and the difference is not clear ...

Most recent data can be downloaded from:
https://www.eia.gov/electricity/monthly/current_month/epm.pdf
 figures from:
<https://www.eia.gov/todayinenergy/detail.php?id=14611>

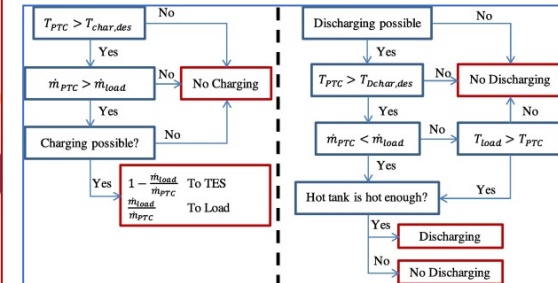
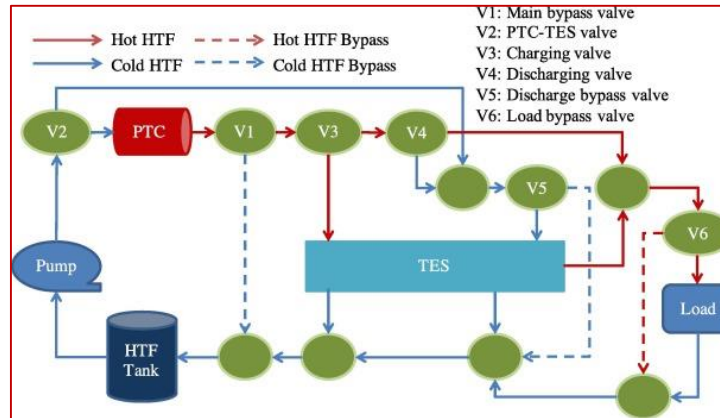


High Capacity Factor Fluctuations Requires Different Operation Strategies When Fuel is not ready to use

Proposed Solutions

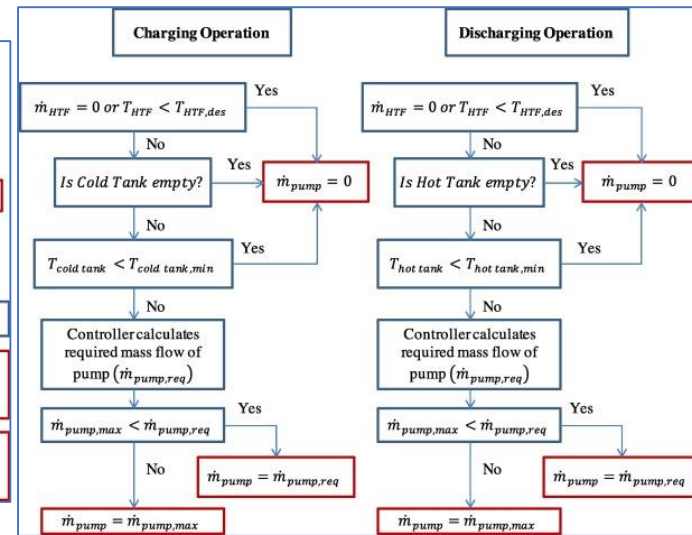
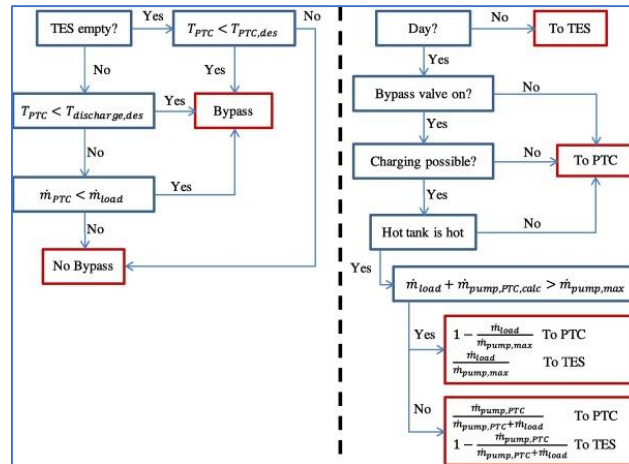
We did

- ✓ Storage
- ✓ Higher Capacity Factor
- ✓ Efficient Components
- ✓ Optimization



We need

- Multiple generation
- Modular power block
- Including impact of component and fluid inertia
- Adaptable to large DNI range
- From fore to nowcasting



T. Akba, D. Baker, and A. G. Yazıcıoğlu. Modeling, transient simulations and parametric studies of parabolic trough collectors with thermal energy storage. Solar Energy, 199:497 – 509, 2020. ISSN 0038-092X. doi: <https://doi.org/10.1016/j.solener.2020.01.079>. URL: <http://www.sciencedirect.com/science/article/pii/S0038092X20300864>.

Need to learn operating highly transient, modular plant and multiple generation modes.

Thank You

Completed EU projects:



Links:

Slide #3: <https://www.technologyreview.com/s/601071/one-of-the-worlds-largest-solar-facilities-is-in-trouble/>

Slide #4: https://www.ren21.net/wp-content/uploads/2019/05/gsr_2019_figures_and_infographics.zip

Slide #5: <https://www.eia.gov/todayinenergy/detail.php?id=14611>

Slide #6: <http://www.sciencedirect.com/science/article/pii/S0038092X20300864>