



The Nuclear Industry and the Future of Spent Fuel

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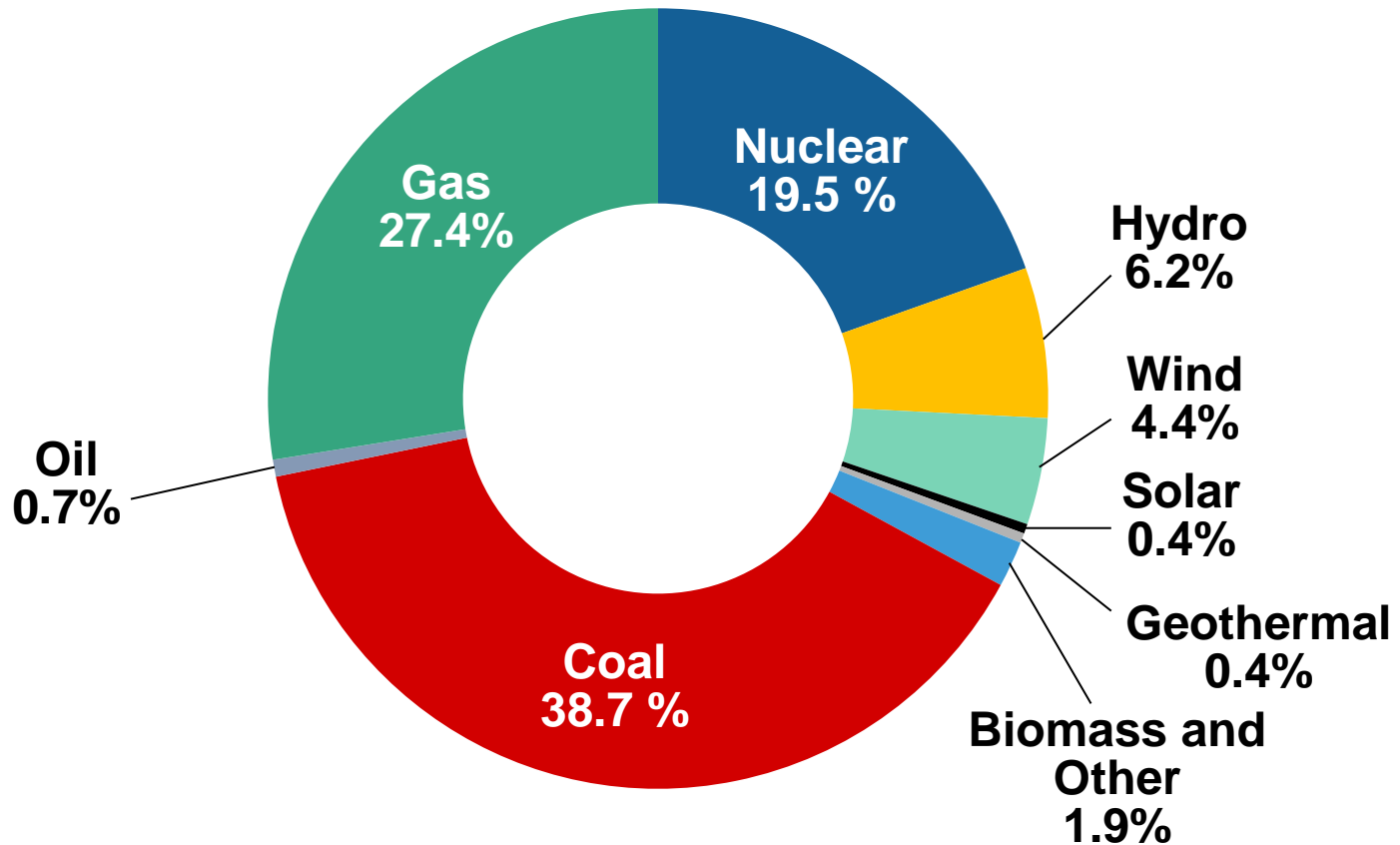
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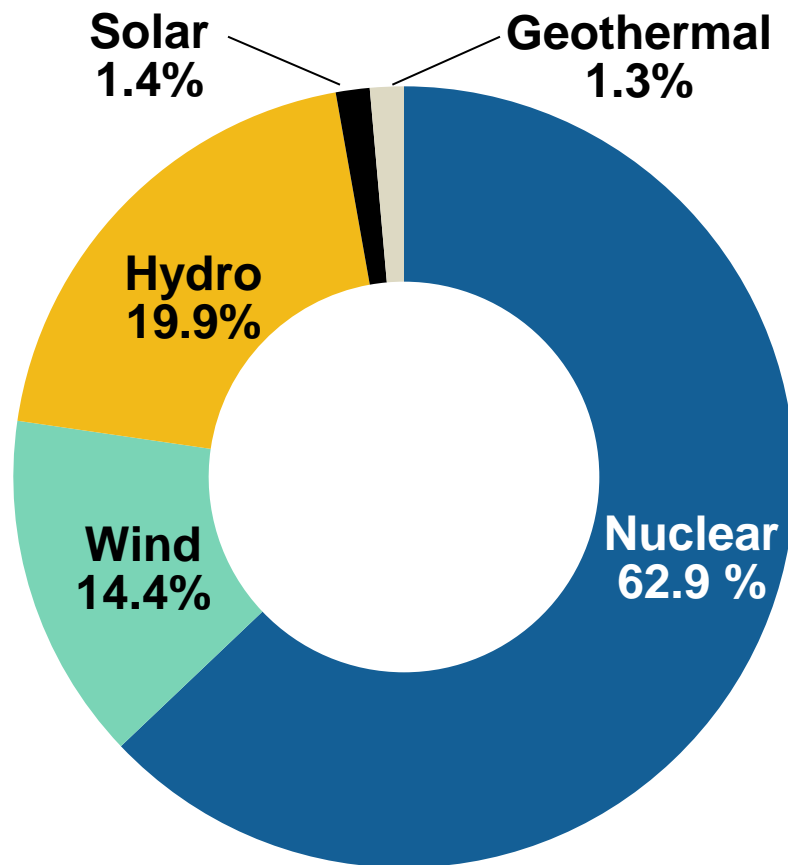
U.S. Electricity Generation Fuel Shares

2014



Source: Energy Information Administration
Updated: 5/15

U.S. Electricity Sources Which Do Not Emit Greenhouse Gases During Operation 2014

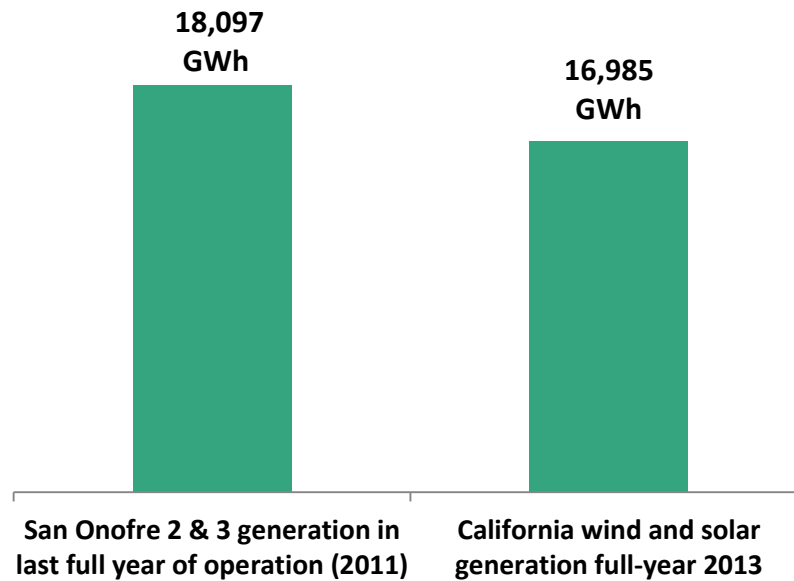


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Nuclear Plant Shutdowns: The Situation

- Reactor shutdowns
 - Four in 2013
 - One at the end of 2014
 - Two so far in 2015
- Crystal River 3, San Onofre 2 and 3 were unique events (expensive repairs for containment & steam generators replacement)
 - Over 110 PWRs (57 in the U.S.) have replaced steam generators
- Kewaunee, Vermont Yankee shut down because of adverse market conditions and Pilgrim (2019), Oyster Creek (2019) and FitzPatrick will (2017)

The carbon-free electricity lost when San Onofre closed down was greater than the carbon-free electricity from all California's wind and solar generating capacity



Market Issues ... In Brief

- Low growth (in some cases, no growth) in electricity demand coming out of 2008 recession
- Continuing surge in supply of low-cost shale gas
- Transmission constraints
- Price signals inadequate to support operating capacity or investment in new capacity (except gas-fired)
- Prices suppressed by RTO policies and actions, and by state and federal mandates and subsidies
- Fuel/technology diversity is taken for granted and undervalued

Nuclear Provisions in Clean Power Plan

- Credit for new reactors under construction
- Credit for uprates at existing nuclear facilities
- Does not address factors contributing to “at-risk” plants
- Does not provide credit for license renewal at existing reactors
- Incentivizes mass-based system and carbon credit trading

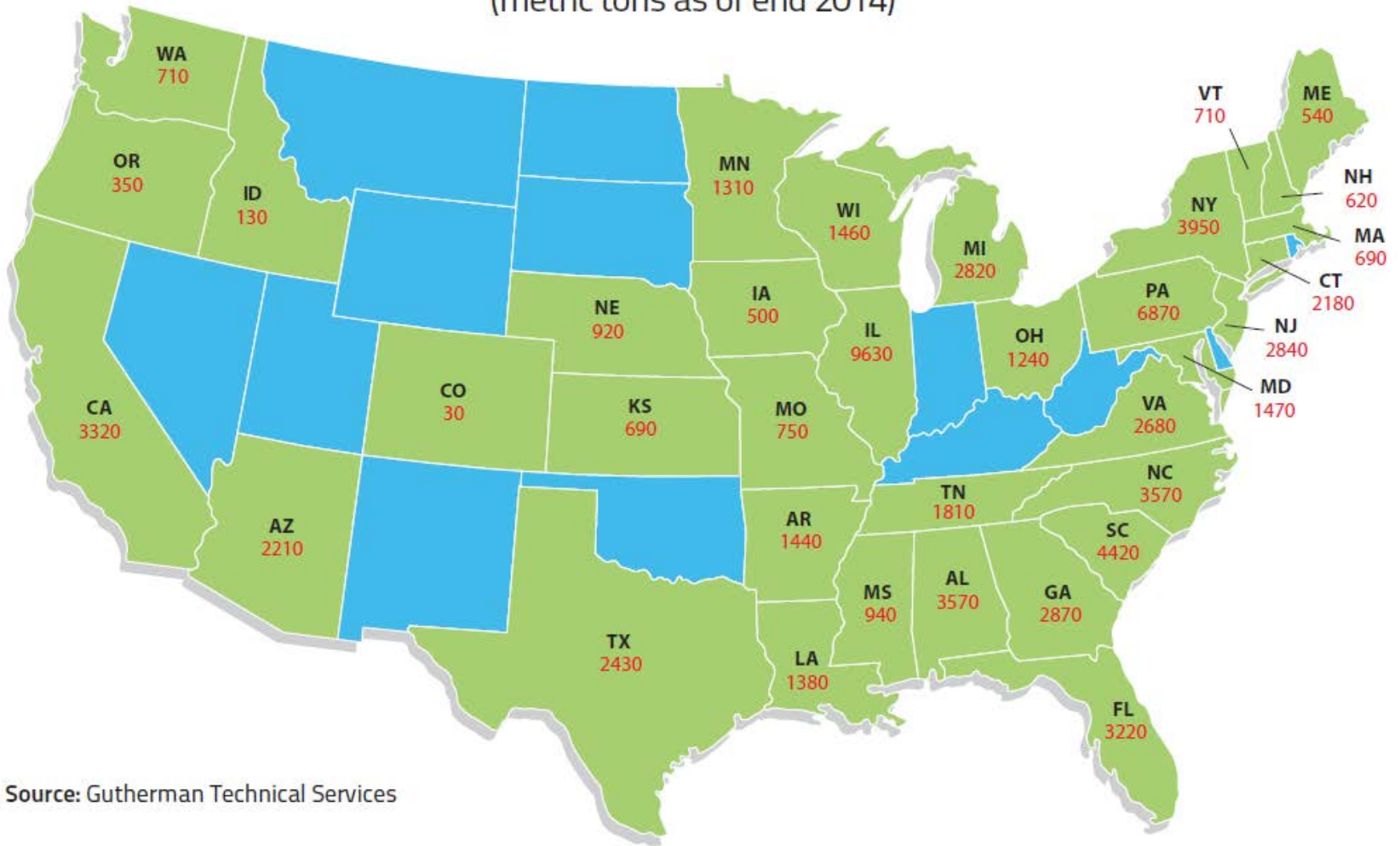
Opportunities

- Over next 30 years, a significant amount of the existing generating capacity will be retired
- The decisions as to what technologies to build will be made within the next 10-20 years
- Large light water, small modular light water, and advanced reactor technologies all have a role in the future of nuclear power
- If utilities are to consider advanced (Generation IV) non-light water reactors in their future decision making, significant progress toward commercialization is necessary

Used Fuel Storage

- All US nuclear plants were designed with a spent fuel pool – size and configuration vary between reactors (e.g. each reactor has its own pool or common pool for two reactors)
- Spent fuel pools were originally configured to contain a limited quantity of fuel – pool capacity increased through reracking
- Dry cask storage used when pool capacity reached

Quantities of Used Fuel Stored By State (metric tons as of end 2014)



Data Source: Gutherman Technical Services

Shutdown Sites Without An Operating Reactor

- **California**

- Humboldt Bay*
- Rancho Seco*
- San Onofre



Humboldt Bay

- **Colorado**

- Ft. St. Vrain
(DOE Fuel)



Rancho Seco

- **Connecticut**

- Connecticut Yankee*

- **Florida**

- Crystal River

- **Illinois**

- Zion*

- **Maine**

- Maine Yankee*



Trojan

- **Massachusetts**

- Yankee Rowe*

- **Michigan**

- Big Rock Point*

- **Oregon**

- Trojan*

- **Vermont**

- Vermont Yankee

- **Wisconsin**

- LaCrosse*
- Kewaunee

* total of 248 used fuel casks and 11 GTCC casks at these sites

Yucca Mountain



- 1982 Nuclear Waste Policy Act (NWPA) sets deep geologic disposal as national policy
- Target of removing fuel by 1998
- 1987 Amendment to NWPA designates Yucca Mountain
- 2002 DOE issues affirmative finding on suitability of Yucca Mountain
- Congressional approval

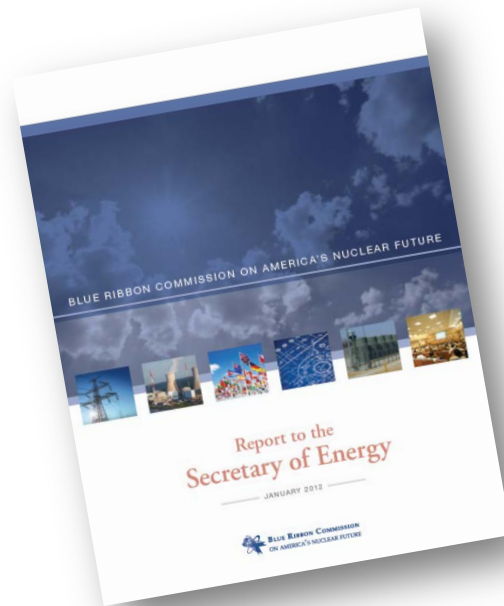
Yucca Mountain



- License application submitted in June 2008
- President Obama reverses course, requests license withdrawal March 2010
- All activity ceases
- August 2013 US Court of Appeals restarts NRC review of the license

Blue Ribbon Commission (BRC) 2012 Report

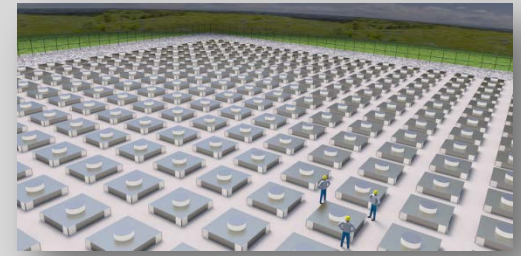
- Develop consolidated interim storage (CIS)
- Start with shutdown plants
- Need legislative authority/action to amend NWPA



Whether Spent Fuel Policy?

- House Republicans insist Yucca proceed as “law of the land”
- Legislation introduced in the House by Rep. Conaway (R-TX) for CIS
- Bipartisan group of Senators promote BRC/ CIS interim solution
- Appropriations Chair Rep. Mike Simpson (R-ID) interested in CIS and Yucca
- Compromise?

Why CIS?



- Easier to build than Yucca
- Technology exists, could lead to better location
- Save federal dollars under NWPA – up to \$50 billion if no or greatly delayed Yucca

Why Yucca?



- Law of the land, but political opposition
- Final disposition requires a site, Yucca has met EPA and NRC staff requirements
- CIS could be an unnecessary expense (move fuel twice)
- Concern CIS would become the permanent repository

Dairyland's View

- Our annual cost is \$2 million plus
- We need CIS and we need Yucca
- Support all efforts to move forward either
- Need a greater sense of urgency
- Politics, not science or technology, has been the issue
- Failure to address spent fuel issue will hamper new nuclear development

LACBWR Key Facts

- BWR (50MWe)
- AEC demonstration reactor
- Owned by Dairyland Power Cooperative (DPC)
- Operated from 1967 to 1987
- Licensed site shared with operational fossil plant



LACBWR Site



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LACBWR and Energy Solutions

- Agreement with Energy Solutions to transfer our license
- Energy Solutions will create a La Crosse Solutions group
- Decommissioning will occur
- License will be returned with only ISFSI remaining



Why Energy Solutions?

- Dairyland is a relatively small utility, with no staff to accomplish
- Technical expertise – experience with Zion plant
- Disposal site
- Risk transferred to Energy Solutions
- Remove the building which has no practical use

What's Next?

- NRC will review transfer of the 10 CFR 50 license
- Hope to have project completed by 2020



Closing Thoughts

- In an era of climate concern, loss of operating plants makes no sense
- Nation needs a nuclear policy based on science and respect for technology
- Politicians need to develop a realistic strategy for spent fuel