U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Evaluation of 2008 Proposed Funding Allocation Formula for Grants under Nuclear Waste Policy Act Section 180(c)

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Disclaimer

- **The transportation scenarios described in this presentation are for analytical purposes only and should not be considered an indication of a particular future Department of Energy action or commitment. Analyses in this report have been provided to inform discussions between the Department of Energy and state and tribal representatives regarding the future development of a Nuclear Waste Policy Act Section 180(c) training and technical assistance program and are for illustrative purposes only.**
- **This is a technical presentation that does not take into account contractual limitations or obligations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961). For example, under the provisions of the Standard Contract, spent nuclear fuel in multi-assembly canisters is not an acceptable waste form, absent a mutually agreed to contract amendment. To the extent discussions or recommendations in this presentation conflict with the provisions of the Standard Contract, the Standard Contract governs the obligations of the parties, and this presentation in no manner supersedes, overrides, or amends the Standard Contract.**
- **This presentation reflects technical work that could support future decision making by the US Department of Energy (DOE or Department). No inferences should be drawn from this presentation regarding future actions by DOE, which are limited both by the terms of the Standard Contract and Congressional appropriations for the Department to fulfill its obligations under the Nuclear Waste Policy Act including licensing and construction of a spent nuclear fuel repository.**

DOE has developed and modeled potential shipment scenarios and funding outcomes using the formula proposed in a 2008 Federal Register notice

- **This activity was a recommendation from the NWPA Section 180(c) Proposed Policy Implementation Exercise lessons learned report**
  - It was recommended that the formula proposed in the 2008 Federal Register Notice (FRN) for funding training grants to states be evaluated to help inform future discussions between DOE and tribal and state representatives regarding the Section 180(c) funding allocation formula
  - In this work, twenty different hypothetical scenarios for removing SNF from all nuclear power plant sites were modeled
  - The transportation scenarios developed and considered are for analytical purposes only and should not be considered an indication of a particular future DOE action or commitment

The results of this analysis are dependent on assumptions with high levels of uncertainty

- **Hypothetical total funding amounts are for discussion purposes only and should not be interpreted as any indication of future Congressional appropriations**
- **Hypothetical destinations were selected in order to conduct a destination-neutral analysis and are for illustrative purposes only**
- **Rail routes were chosen to minimize transit time; this should not be taken as indicative of any particular route selection process under DOE consideration**
- **Shipment and allocation strategies are for illustrative purposes only; they were chosen to present a range of options for picking up SNF from shutdown and operating reactors and do not indicate any particular DOE future action or commitment**
- **Tribal data is based on existing US Census data, but results subject to change with improved data**
  - Some non-Federally recognized Tribes may be erroneously included in this analysis

The 2008 FRN proposed an approach for allocating available funds among eligible states and Tribes

- **Training grants proposed in the FRN included a base grant not to exceed $100,000, adjusted annually for inflation, to every eligible state, and an additional variable amount from any remaining funds so that the variable share allocated to each state was**
  - (0.3 x the percentage of the national total affected population that year along routes within the state)

  + (0.3 x the percentage of the national total mileage that year within the state)
  + (0.3 x the percentage of the total number of shipment that year passing through the state)
  + (0.1 x the percentage of the total number of shipping sites that year within the state)
- **Per the FRN, the variable portion of the training grant for Tribes was proposed to be determined based on the results from each Tribe's needs assessment**
  - For analysis purposes only, two approaches were taken for evaluating funding to Tribes
    - for 5% of the total available annual funding to be set aside for Tribes, and
    - that funding allocations would be made to Tribes following the formula used for determining funding allocations to states
  - Tribal funding scenarios are for illustrative purposes only and do not indicate any particular future DOE action or commitment; DOE is engaging in further dialogue with tribal representatives on this matter

The amount of funding which will be available for actual grants is subject to Congressional budget appropriations

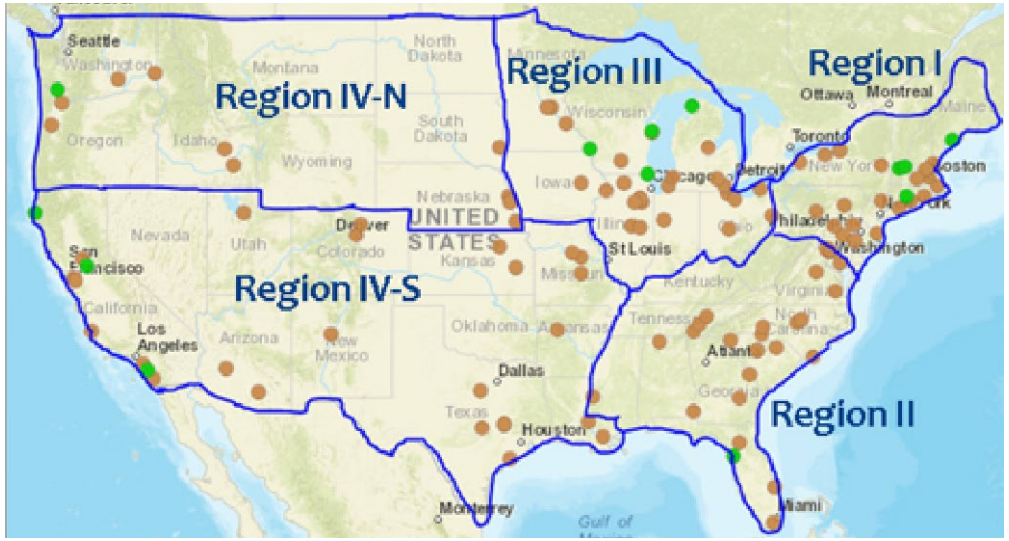
- **This analysis assumed that an annual total of $10 million was made available for grants during full-scale operations of the SNF transportation system**
  - At full scale, 3,000 tons of SNF would be shipped every year
  - The system would ramp up to full scale operations:

Year	Prior to 2024	2024	2025	2026	2027	2028	2029 and beyond
Maximum MTU/yr accepted by the waste management system	0	500	1,000	1,500	2,000	2,500	3,000

  - The analysis assumed that the amount of funds available would be scaled in proportion to the amount of SNF shipped in the first five years of the system
  - For illustrative purposes only, the first year of shipments is given as 2024; this should not be taken as any particular indication of DOE scheduling

In order to present a wide range of results, scenarios simulated hypothetical destination sites in different regions within the country

- **Five hypothetical destination sites were chosen to keep the analysis destination-neutral, but do not indicate any particular future DOE action or commitment**
  - All five sites were points along railroads
  - Three sites were the geographic centers of NRC regions I, II, and III
  - Due to the large size of NRC Region IV, this region was split in half so that a destination point could be set at the center of the northern half of the region and the center of the southern half of the region
  - Thus routes were modeled to destinations in the northeast, southeast, Midwest, northwest, and southwest



This analysis is based on hypothetical future routes: representative rail routes were selected for this exercise

- **Routes are for illustrative purposes and do not depict actual DOE routes**
- **Rail routes were chosen to minimize travel time**
  - Routes were generated using DOE's START tool from all 75 origin sites to all 5 destination sites
  - This is not indicative of any current or future routing methodology proposed by DOE
- **Barge transportation was not modeled in this exercise**
  - This was done for consistency among sites without rail access; it does not represent any decisions regarding transportation mode from any or all sites
- **For sites without rail access, the route begins at a nearby railroad**
  - The heavy haul segment of the route was not included in this analysis
  - This has an effect on the actual route results, but the effect is expected to be minor since
    - Heavy haul segments are generally short distances relative to the rail routes
    - Origin sites requiring heavy haul (or barge) transportation are found in all regions of the country
  - How heavy haul route segments and transloads are handled in the formula needs clarification
    - When five casks are moved by heavy haul to a single rail consist, is that one shipment or five?

DOE's START routing model was used to identify representative rail routes used in the analysis

- **Route data necessary for evaluation of the formula was obtained from START**
  - The number of miles through each state and tribal jurisdiction from each origin site to each destination
  - The population within 2500 m of the route from each origin site to each destination, by state and Tribe
- **Population and distance were not double-counted if shipments from two sites used the same route for part of the shipment**
  - Each mile of route and each person along the route counts equally in all calculations: either SNF is shipped along the route in a given year or it is not
  - The number of shipments through a jurisdiction is also included in the formula, but is dependent on allocation strategy and not dependent on the route or any other data from START

The total route mileage and total population within 2500 m of routes were calculated for each hypothetical destination

- In looking at all five hypothetical destinations, the total mileage along rail routes ranged from 17,266 miles to 22,156 miles
- In looking at all five hypothetical destinations, the total population within 2500 m of rail routes ranged from 26,267,817 to 37,094,337
- Actual route mileage and population will vary based on the actual destination, but these are presented to give an idea of approximately how many people will live near transportation routes and how many miles of routes must be ready for shipments (it was not assumed that all of the routes would be used in any given year)

Four allocations strategies for picking up SNF from commercial nuclear power plant sites were developed and analyzed

- **Oldest Fuel First (OFF)**
  - The oldest SNF, as measured from the date of permanent discharge from the reactor, is given the highest priority in the acceptance queue
  - OFF is the methodology used in the Standard Contract
- **Oldest Fuel First with Shutdown Priority (OFF SP)**
  - Clears SNF from shutdown sites before any SNF is picked up from an operating site, then proceeds along the OFF strategy
  - The shutdown site list was compiled in summer 2016, and so includes sites which have changed their plans to shut down (e.g., Clinton), and does not include others which have since announced early shutdown dates (e.g., Palisades)
    - Humboldt Bay, Morris*, La Crosse, Rancho Seco, Yankee Rowe, Trojan, Haddam Neck (Connecticut Yankee), Maine Yankee, Big Rock Point, Zion, Crystal River, San Onofre, Kewaunee, Vermont Yankee, Fort Calhoun, Clinton, FitzPatrick, Quad Cities, Pilgrim, Oyster Creek
    - *Morris is not a reactor site; the youngest assembly at the site was discharged in 1986

Four allocations strategies for picking up SNF from commercial nuclear power plant sites were developed and analyzed

- **Dry Storage with Shutdown Priority (DS SP)**
  - First, the initial group of shutdown sites (same list as used in OFF SP) would be cleared
  - The allocation each year thereafter would be determined by two steps
    - To eliminate the need for operating sites to load SNF into onsite dry storage to maintain capacity within the spent fuel pools by allocating shipments to sites with full pools and planned core discharges in the year.
    - To allocate the remainder of the maximum annual allocation (3,000 MTU) to sites in the order in which the sites' operating licenses expire.
- **Prioritizing Shutdown Sites by Region (SR)**
  - Shutdown sites are cleared according to their geographic regions
  - Once all SNF has been picked up from shutdown sites, shipments from remaining sites would be allocated in the order of their license expiration dates
- **All four allocation strategies were used for all five destinations; allocation strategies are not destination-dependent**
- **Allocation strategies are presented for illustrative purposes only and do not indicate any particular future DOE action or commitment**

Pickup schedules were defined and developed based on the four allocation strategies

- The pickup schedule specifies how many casks (by cask type) must be picked up from each site annually
- The exact location of the destination site and the transportation routes are not required for developing a pickup schedule
- There is uncertainty in the pickup schedules, since they make assumptions about the SNF and the casks that will be used in shipments using current information subject to change before shipments begin
- Pickup schedules analyzed are for the first 20 years of shipments, although it is expected that it would take 48 years for all of the SNF from current reactors (including SNF from future power generation) to be picked up, with the assumptions used in this analysis

For each scenario, funding figures were estimated for each state for the first 20 years of shipments

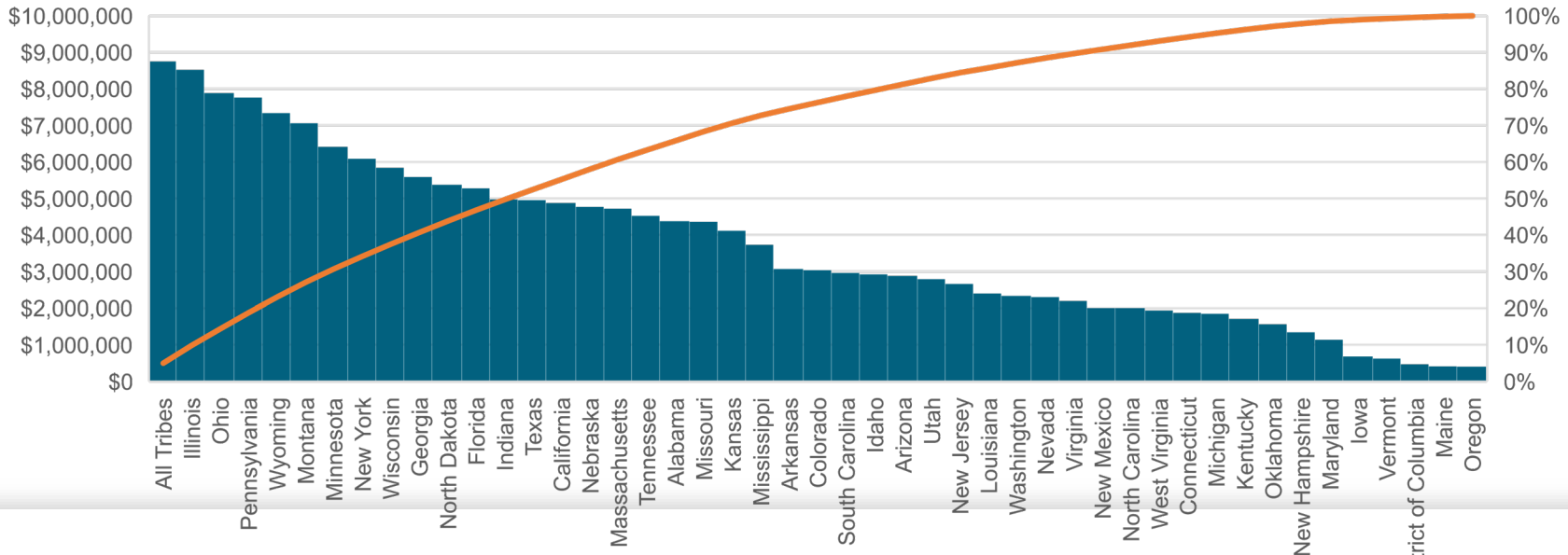
- The uncertainties in how the transportation campaign will be conducted are high, and this analysis focuses only on the first twenty years of shipments
- Allocated funding figures were determined on an annual basis to each Tribe and state individually using the funding formula for two hypothetical destinations (SE and SW)
- For all five destinations, 5% of the total available funds were set aside for Tribes and the funding formula was used to determine funds allocated to eligible states individually
- Neither of these approaches for estimating funds to Tribes should be implied to indicate any future DOE action

For each scenario, funding figures were estimated for each state for the first 20 years of shipments

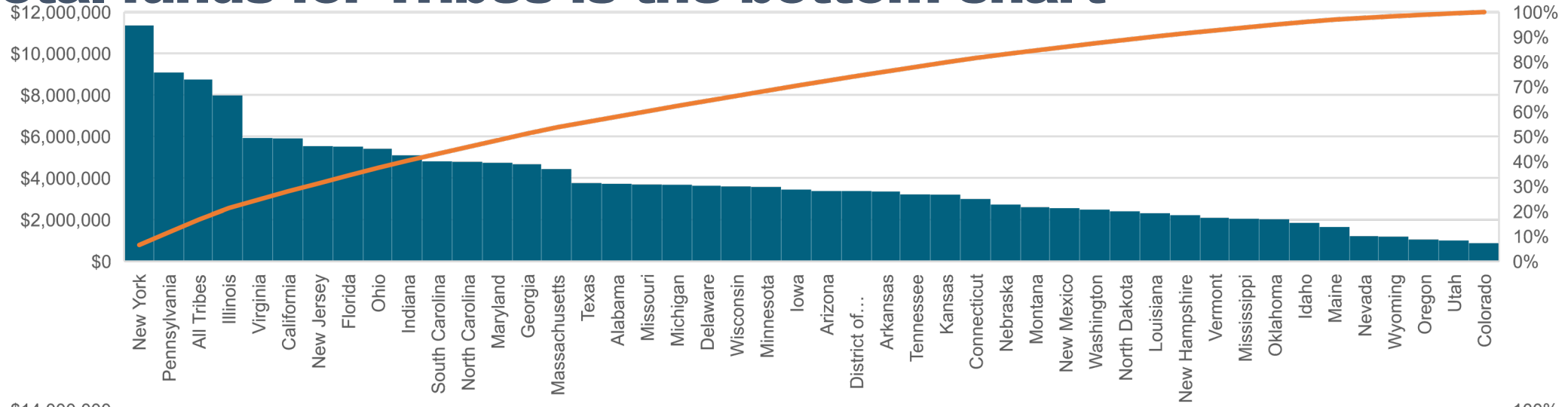
- **In the rest of this presentation, charts are presented showing the total amounts determined to be available to each state and Tribe over the cumulative 20-year period under the hypothetical scenarios that were analyzed**
  - The next slide shows an example chart; subsequent slides will place two charts side-by-side for comparison and discussion
- **Tribal and state grant applicants would always need to appropriately justify their grant proposals and budgets – they are not guaranteed to receive all available funds**
  - Large funding allocations produced by the formula do not necessarily reflect actual future funding allocation results

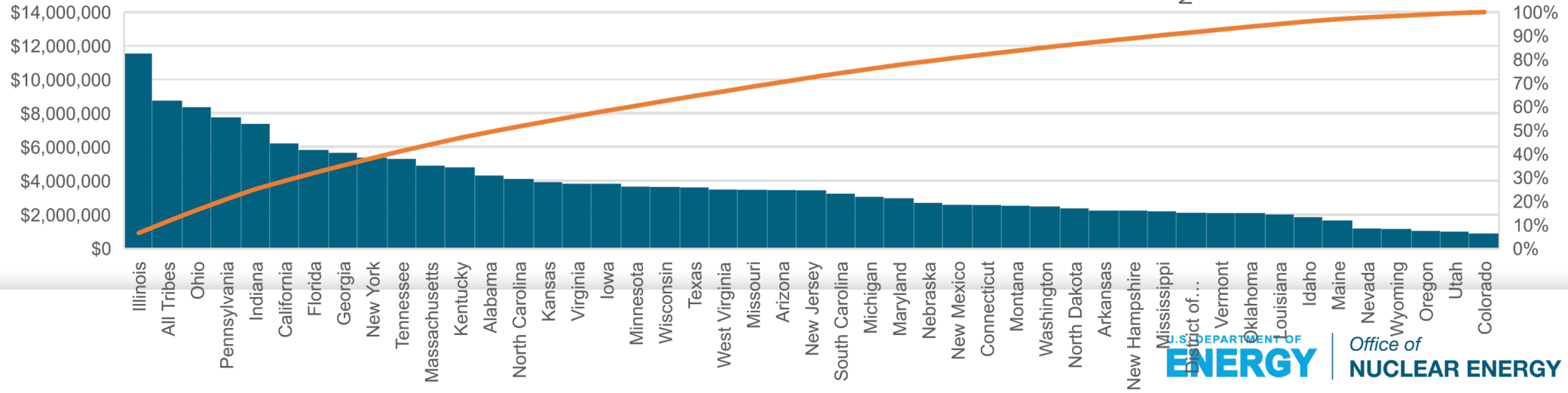
Charts show the states and Tribes in order of total funding eligibility over 20 years under hypothetical scenarios

- **For example, this chart shows the DS SP scenario to hypothetical ISF in the NW**
  - The bars show the maximum cumulative 20-year amount for which each jurisdiction is eligible
  - The line shows how much of the available funds have been allocated by that point in the chart
    - For example, 50% of the funds would be available to 13 of the 47 eligible jurisdictions according to the formula as evaluated



The OFF scenario to the NE which sets aside 5% of the total funds for Tribes is the top chart; the OFF scenario to the MW which sets aside 5% of the total funds for Tribes is the bottom chart





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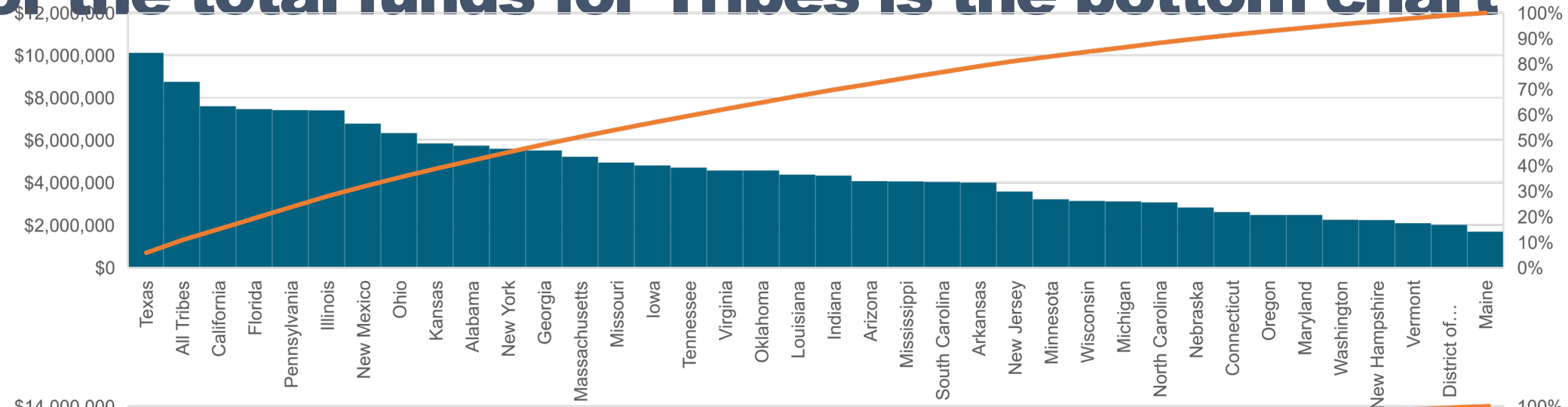
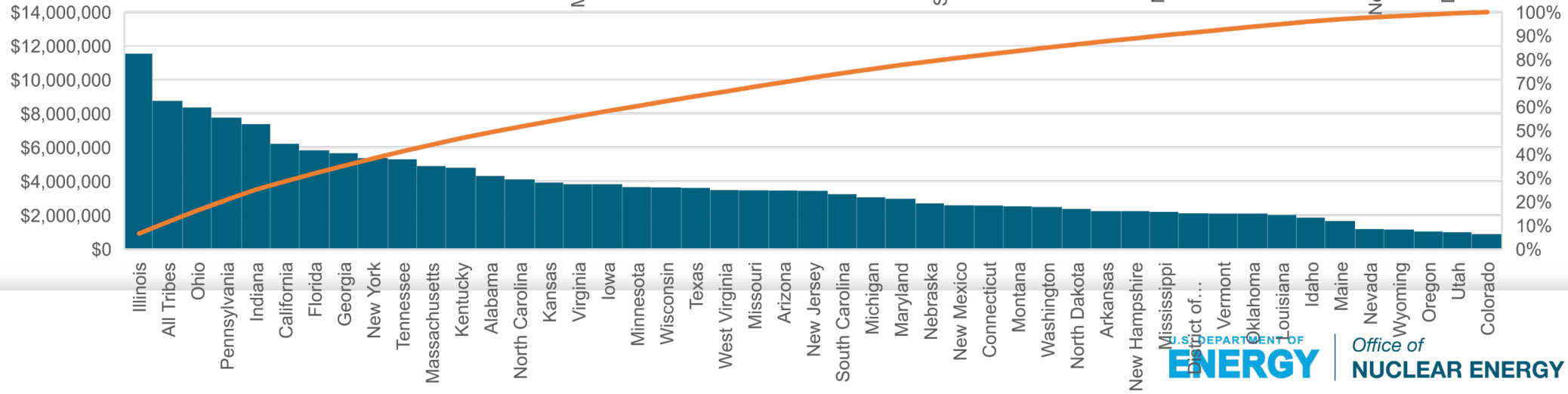
The OFF scenario to the SW which sets aside 5% of the total funds for Tribes is the top chart; the OFF scenario to the MW which sets aside 5% of the total funds for Tribes is the bottom chart





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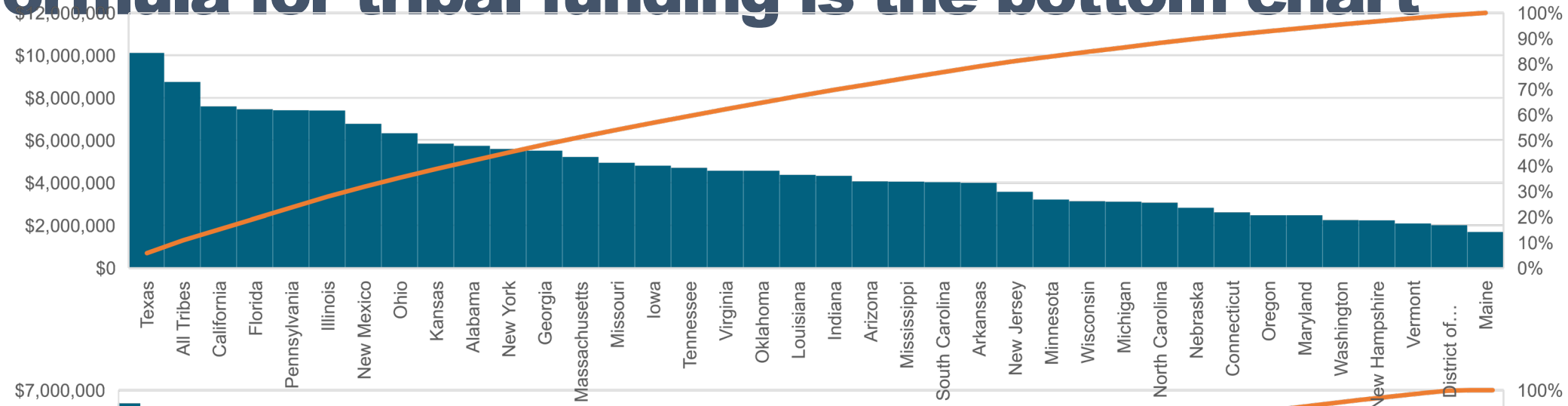
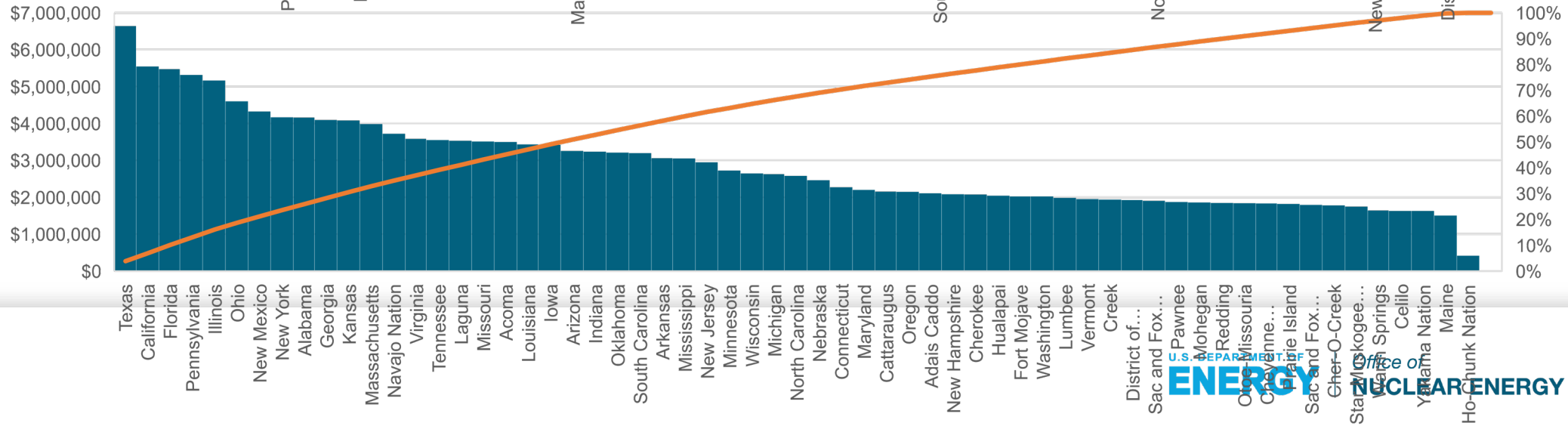
The OFF scenario to the SW which sets aside 5% of the total funds for Tribes is the top chart; the OFF scenario to the SW which uses the formula for tribal funding is the bottom chart





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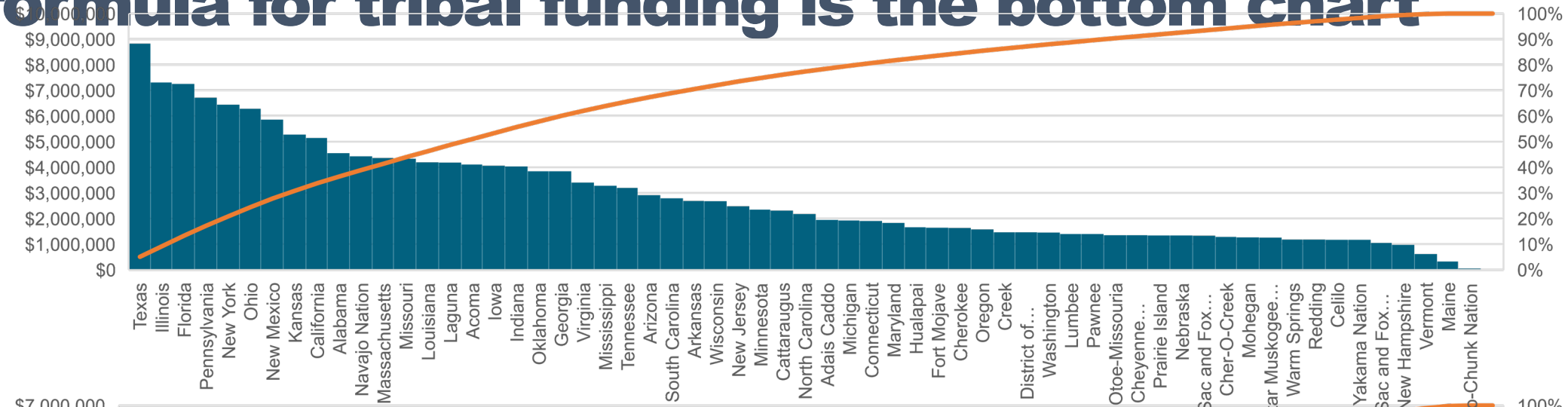
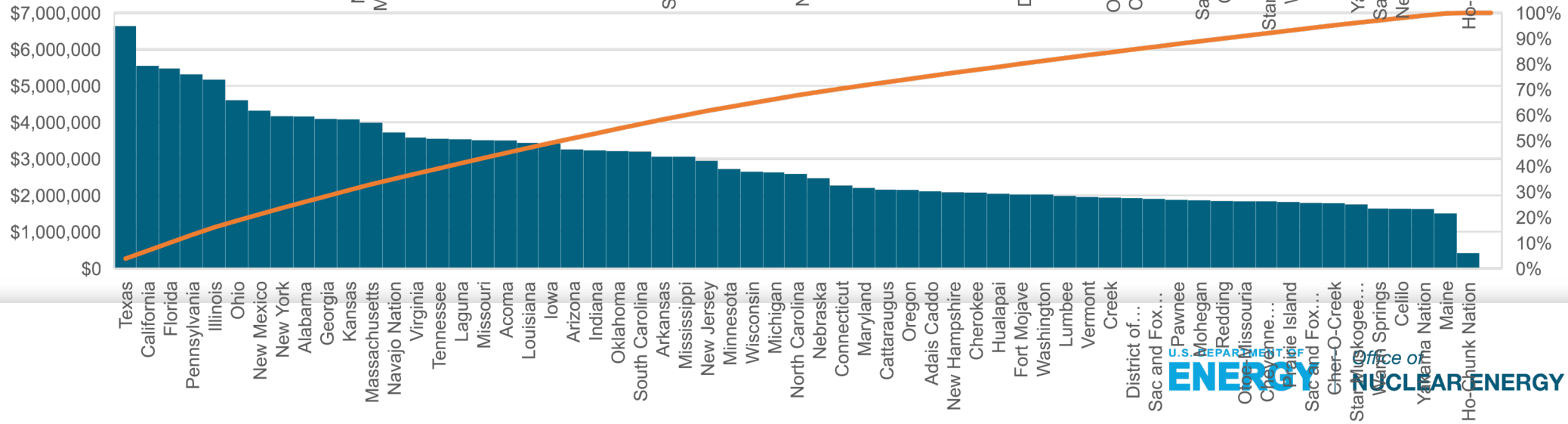
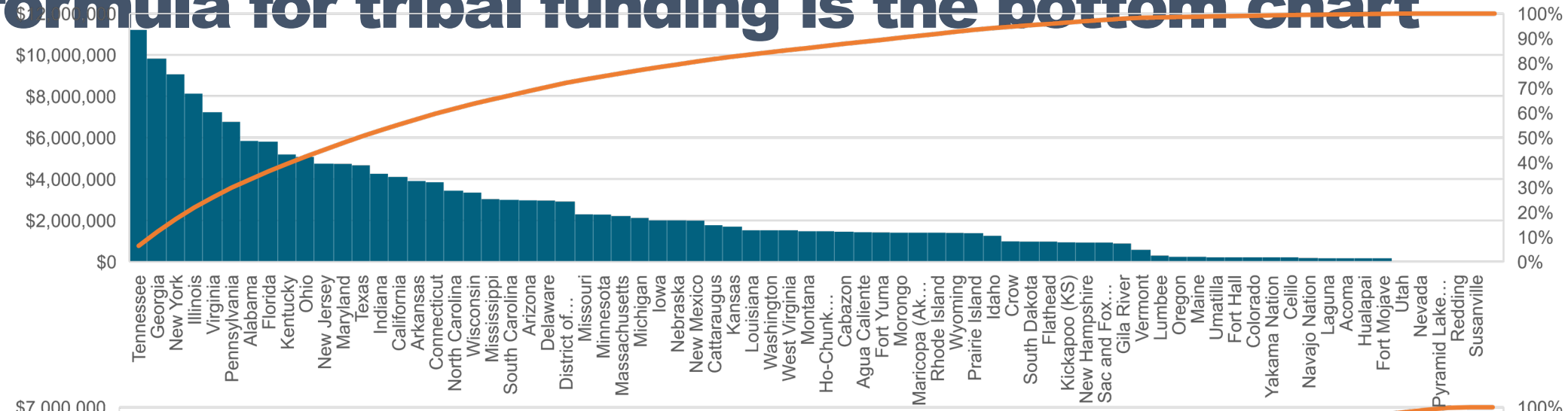
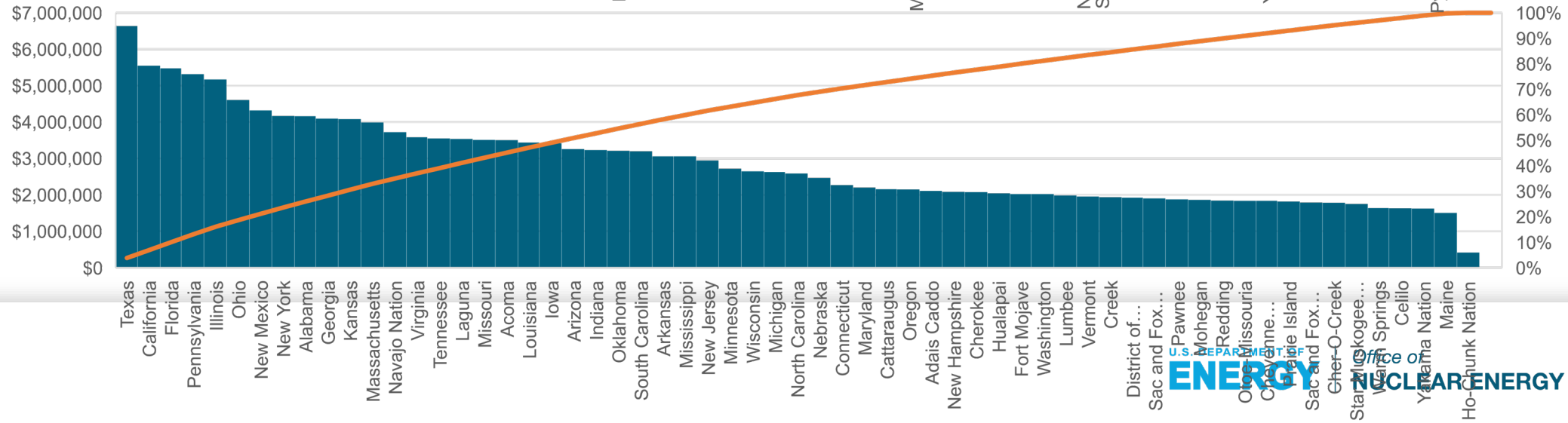




The OFF SP scenario to the SE which uses the formula for tribal funding is the top chart; the OFF SP scenario to the SW which uses the formula for tribal funding is the bottom chart





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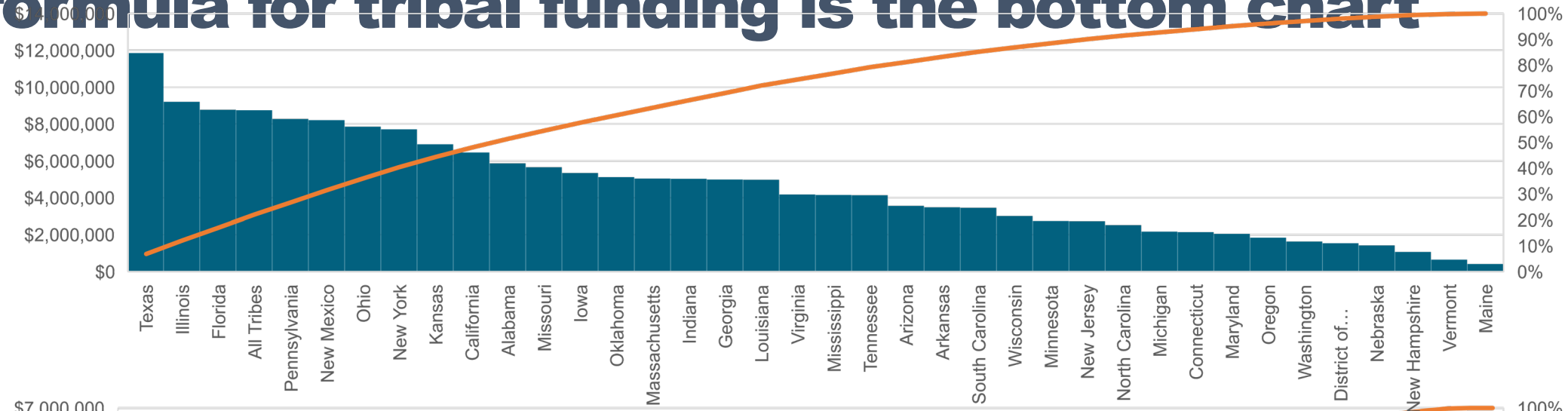

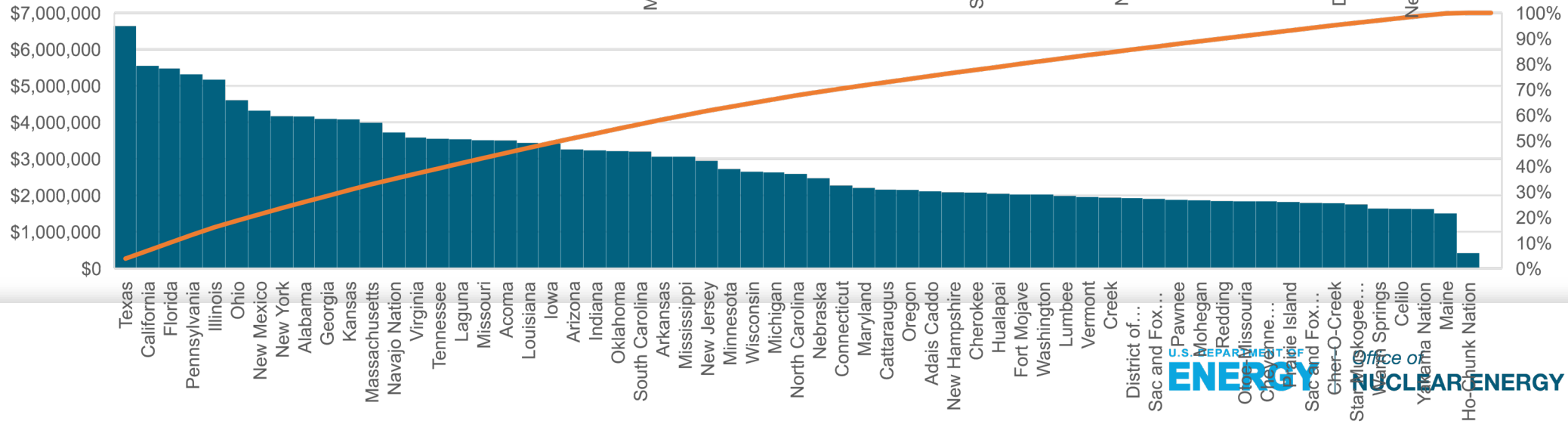

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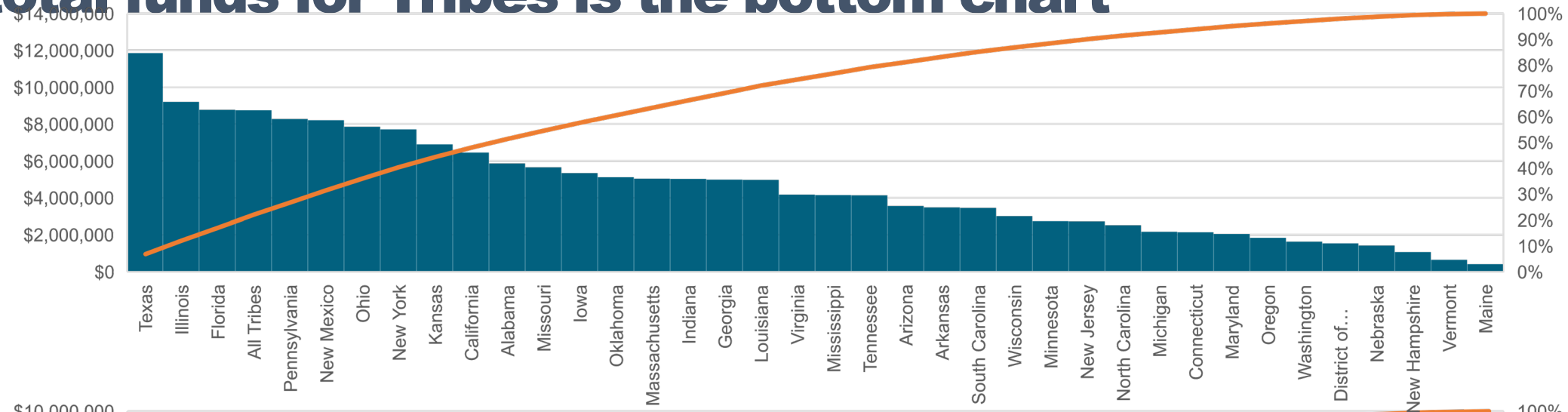

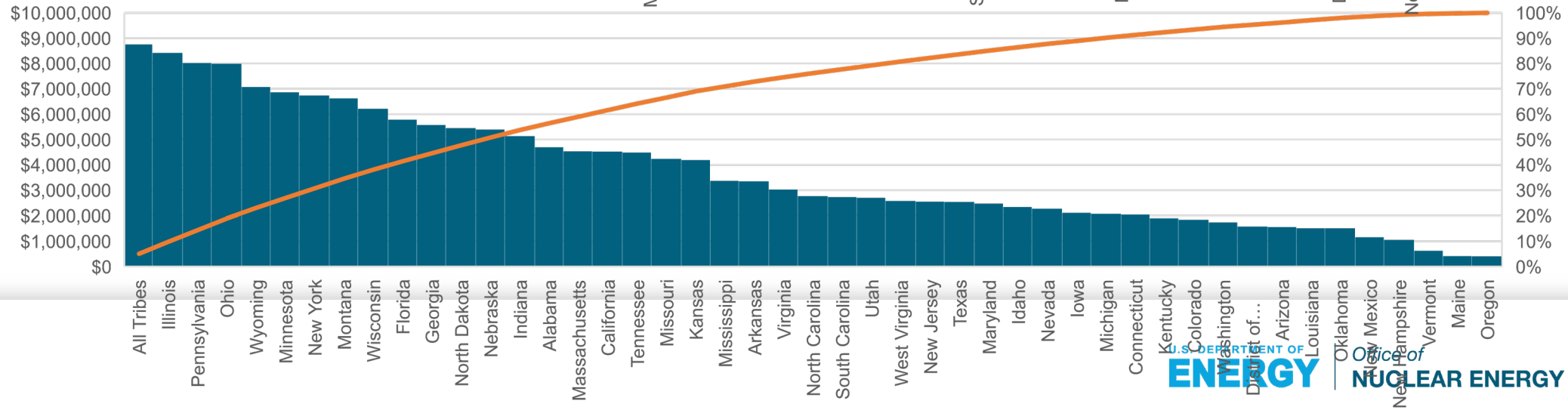

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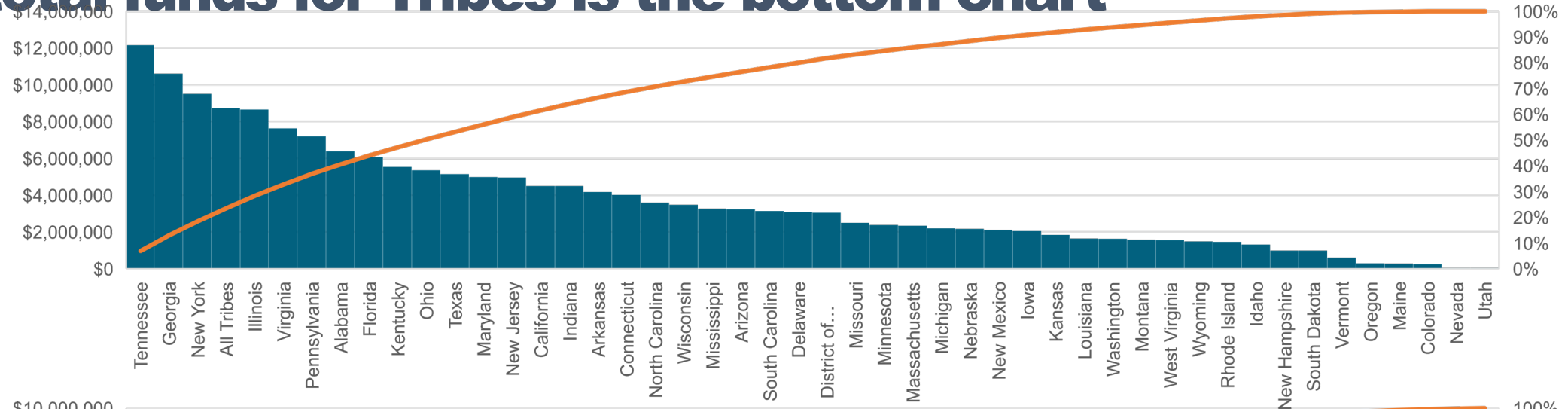

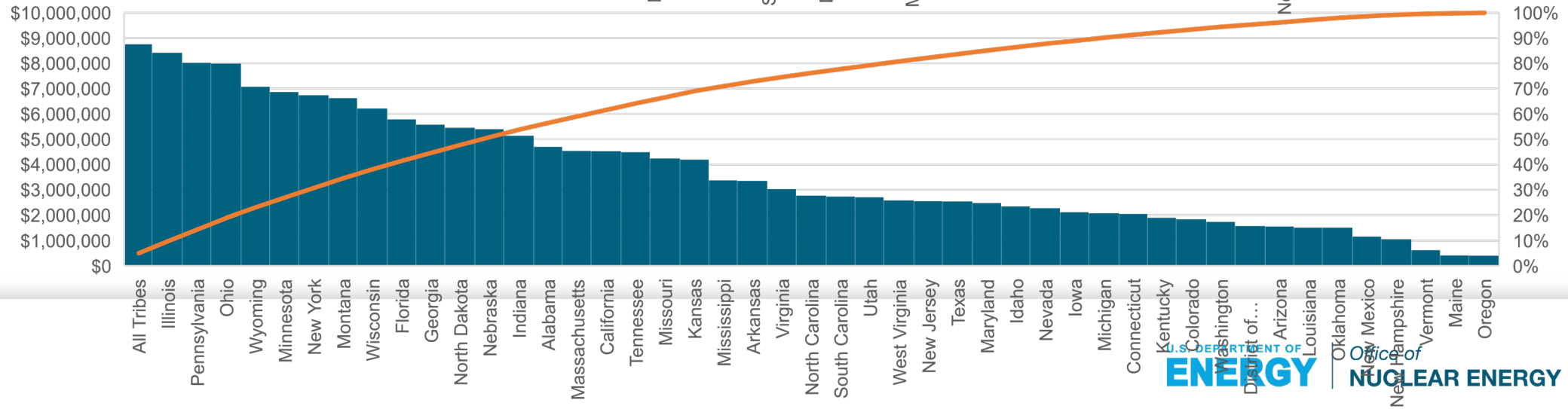

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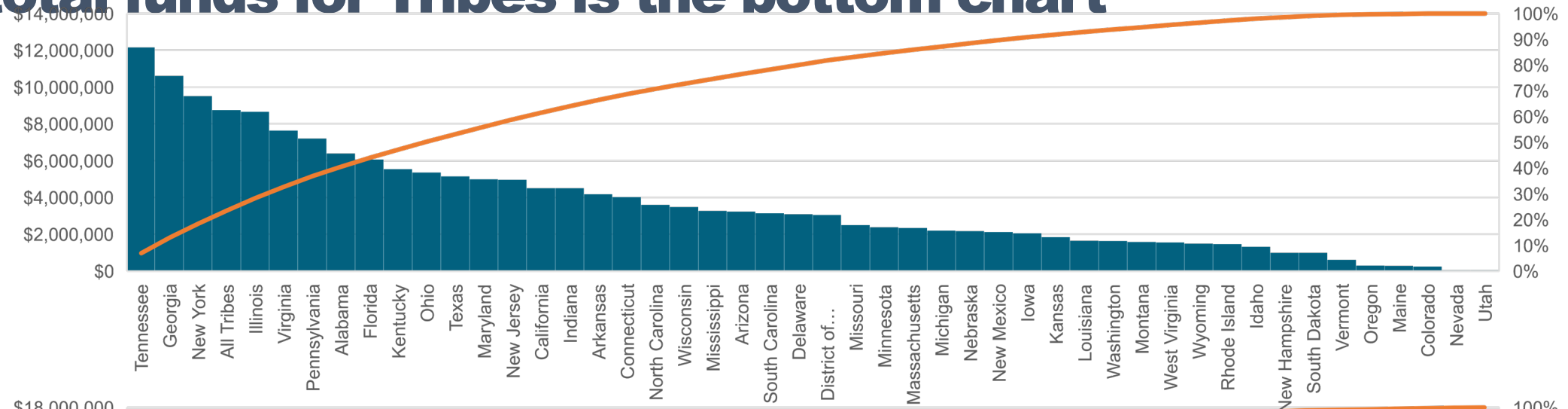

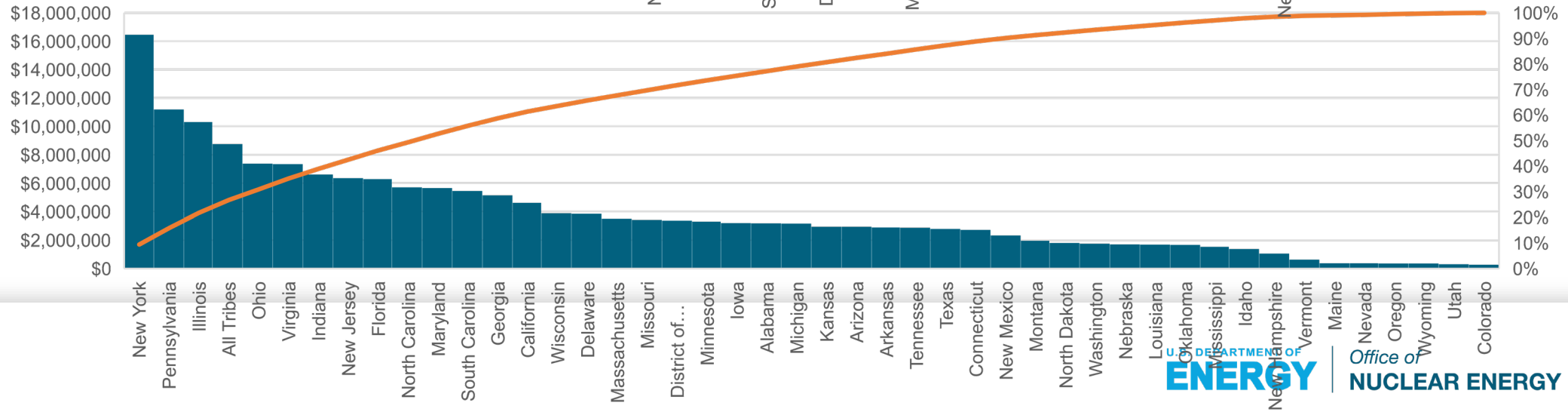

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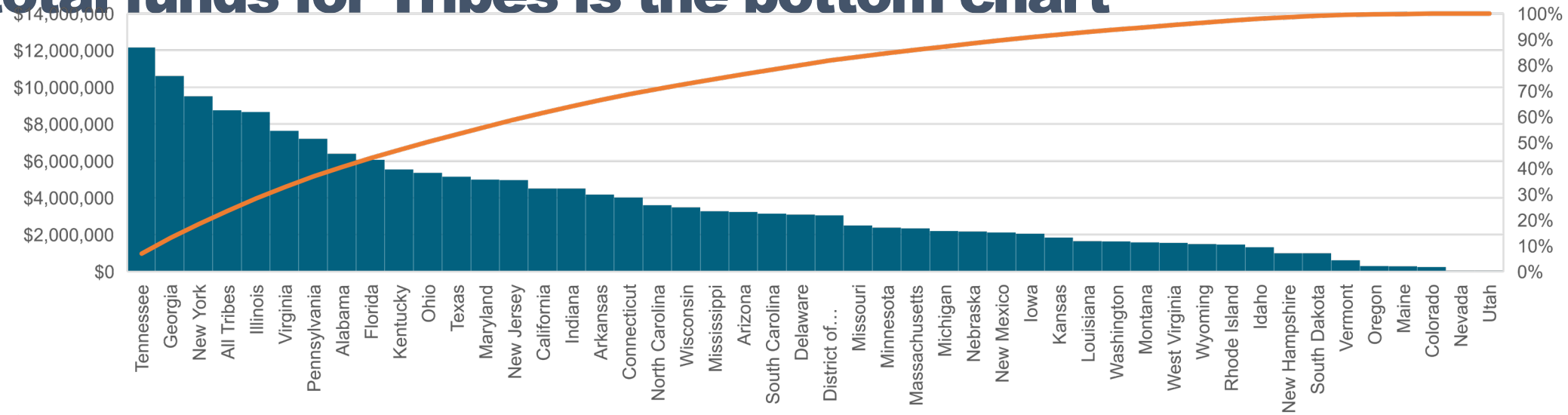

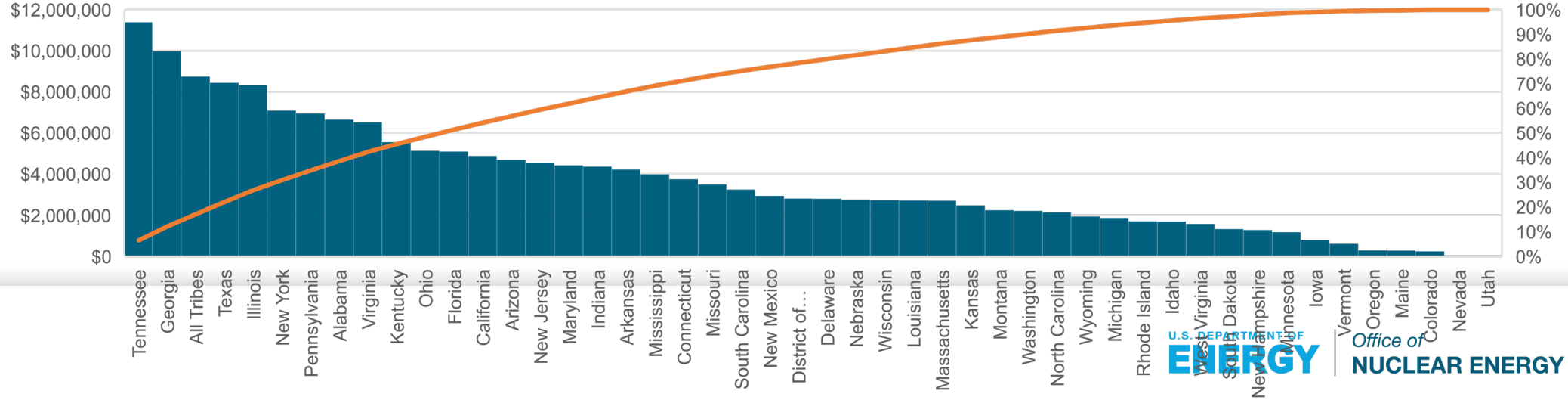

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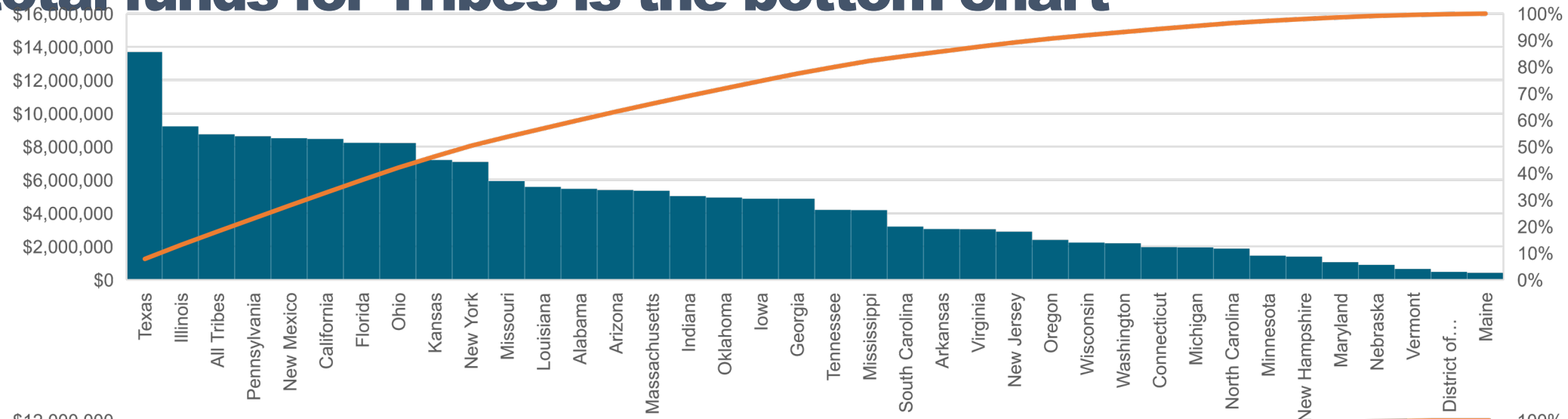

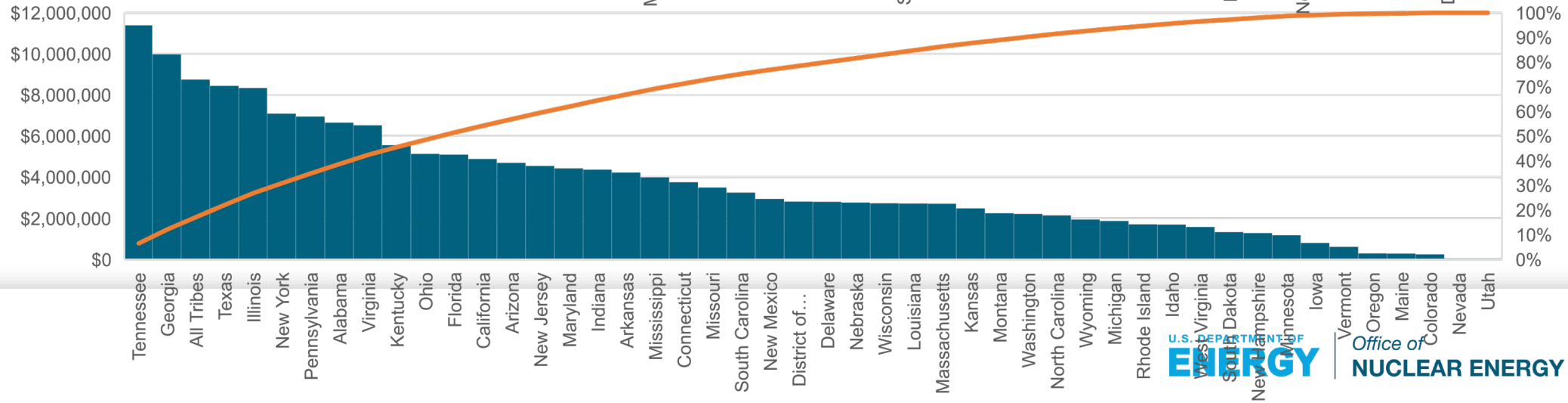

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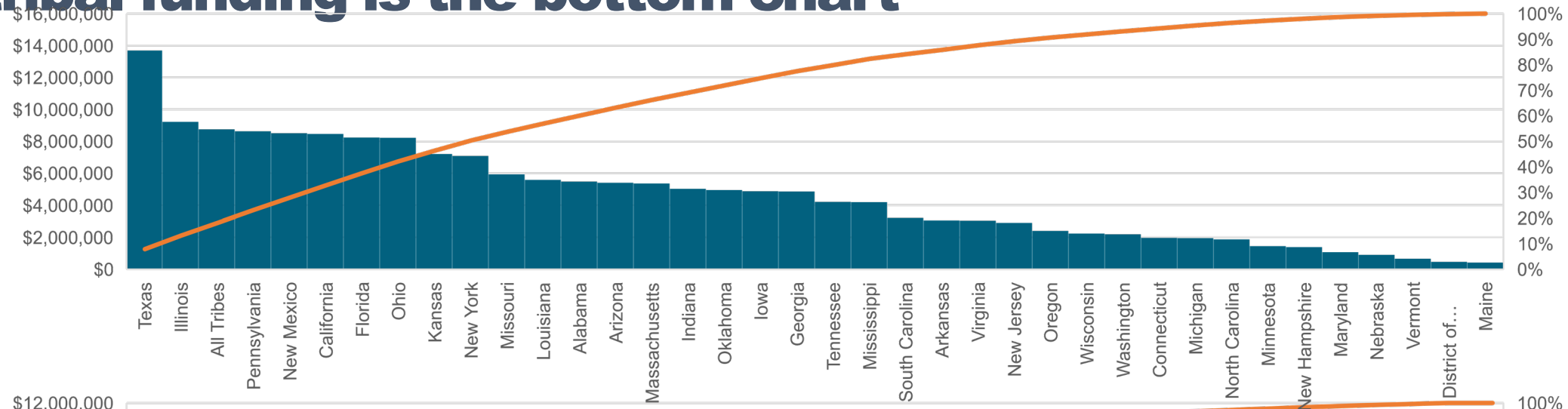

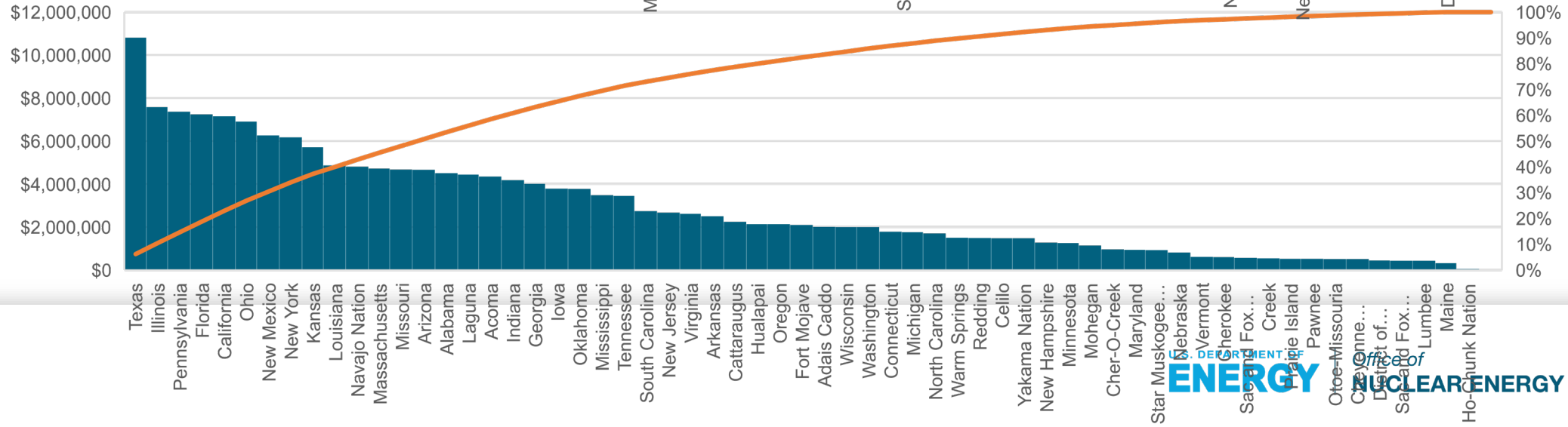

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