OXFORD ECONOMICS

Economic, Employment & Environmental Benefits of Renewed U.S. Investment in Nuclear Energy

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Overview

- Without new investment nuclear capacity will drop to zero by 2050

- New investment will generate significant benefits
  - Jobs: 350,000
    - of which 45,000 high-tech, high value added manufacturing jobs
  - Value-Added: $45 billion
  - Carbon savings: 450mn tCO2
  - Import saving up to: $49 billion

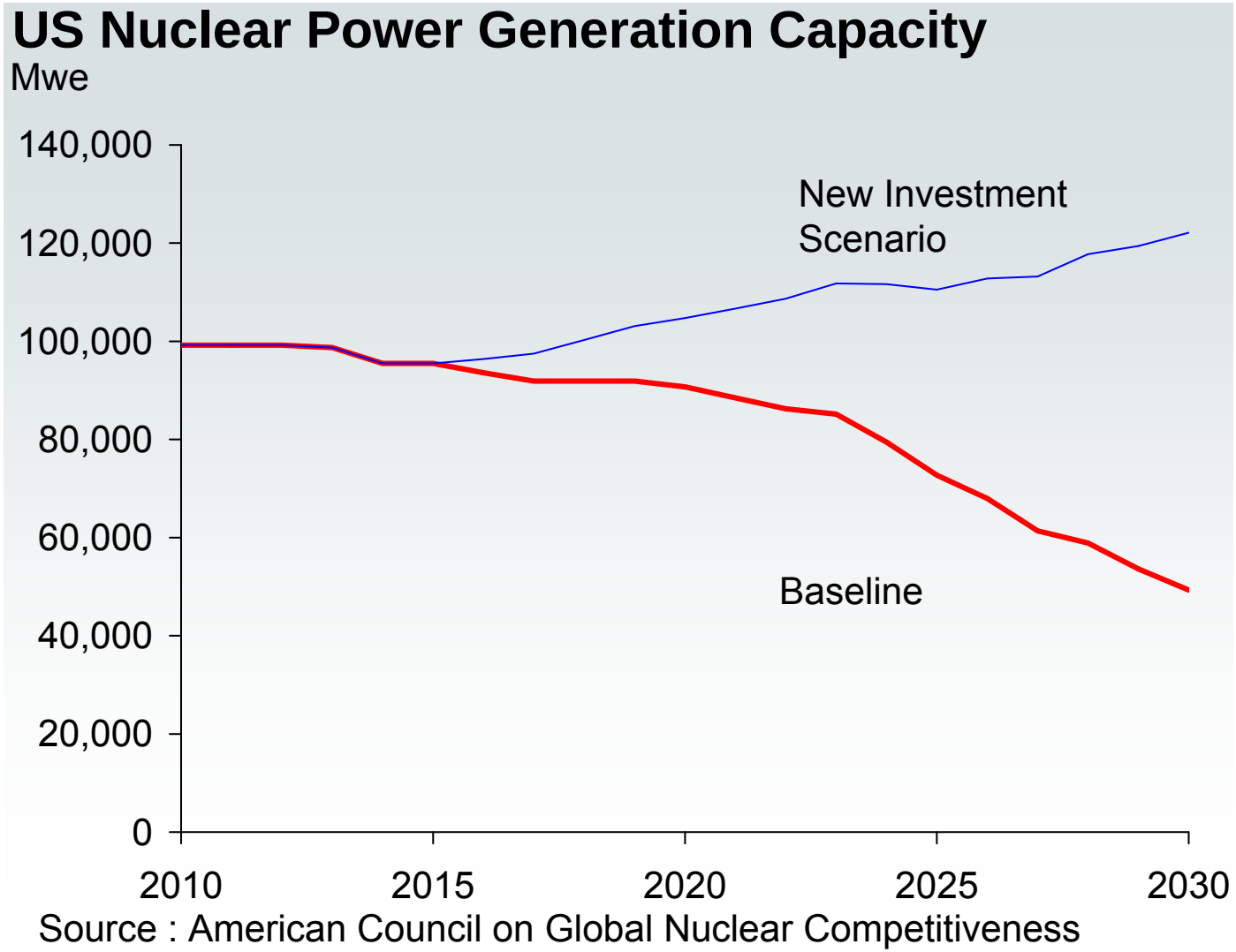
- Jobs created are greater, more highly skilled and better rewarded than for expansion of conventional generation capacity

Assumed investment program

- Improved nuclear infrastructure is assumed to be put in place by 2020 to improve global nuclear competitiveness, specifically:
  - Fuel reprocessing plant (2,500 tonnes)
  - Four uranium enrichment plants (14.3 SWU mn). This will generate more fuel than required by planned generation capacity - export potential.

- 52 new reactors (1,400MWe) to begin operations by 2030
  - Replacement of aging capacity
  - Arrest decline in nuclear share of generation

52 replacement reactors

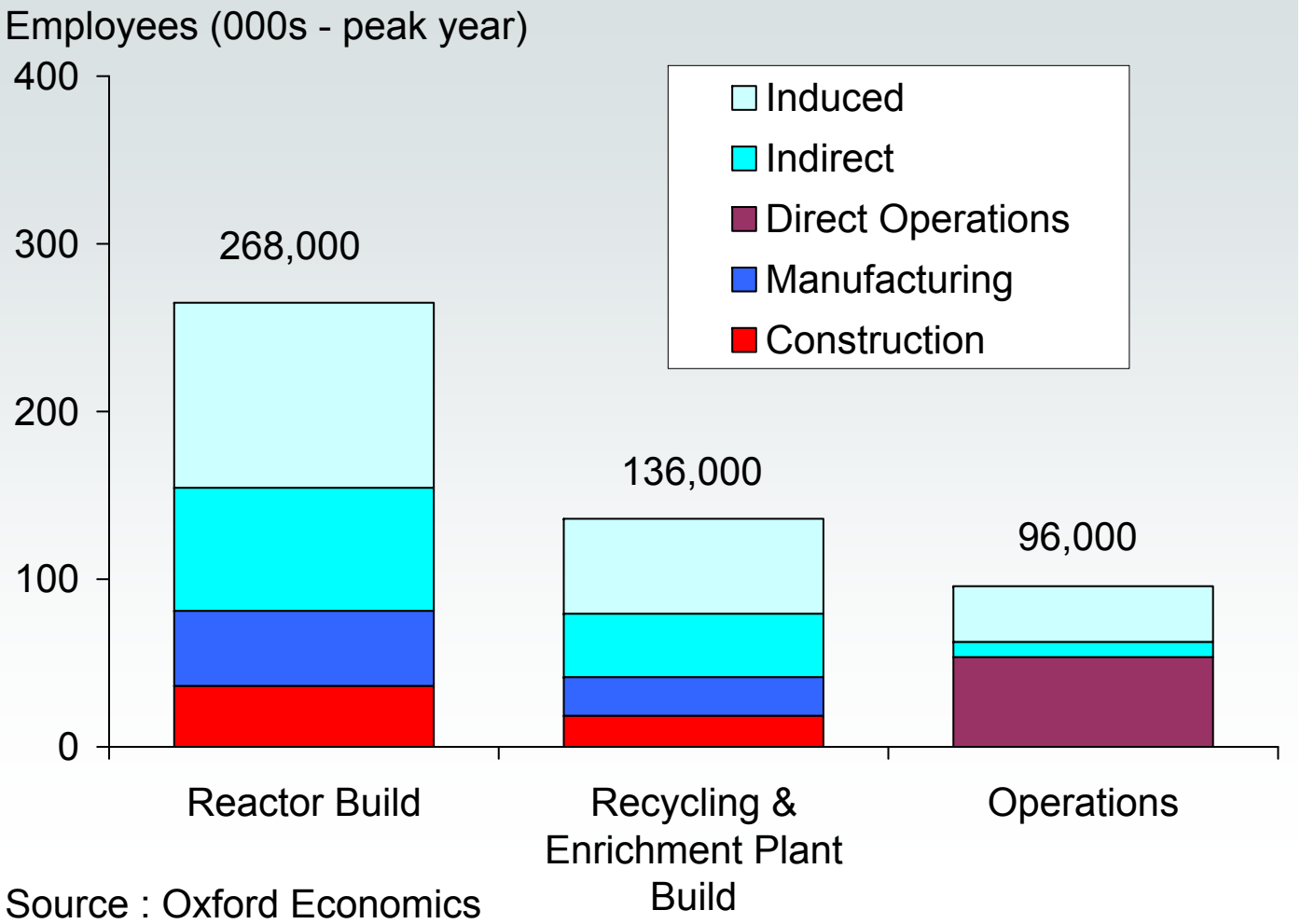


Source : American Council on Global Nuclear Competitiveness

Whole Economy Benefits

52 replacement reactors (peak year)

Employment Benefits of Investment Program

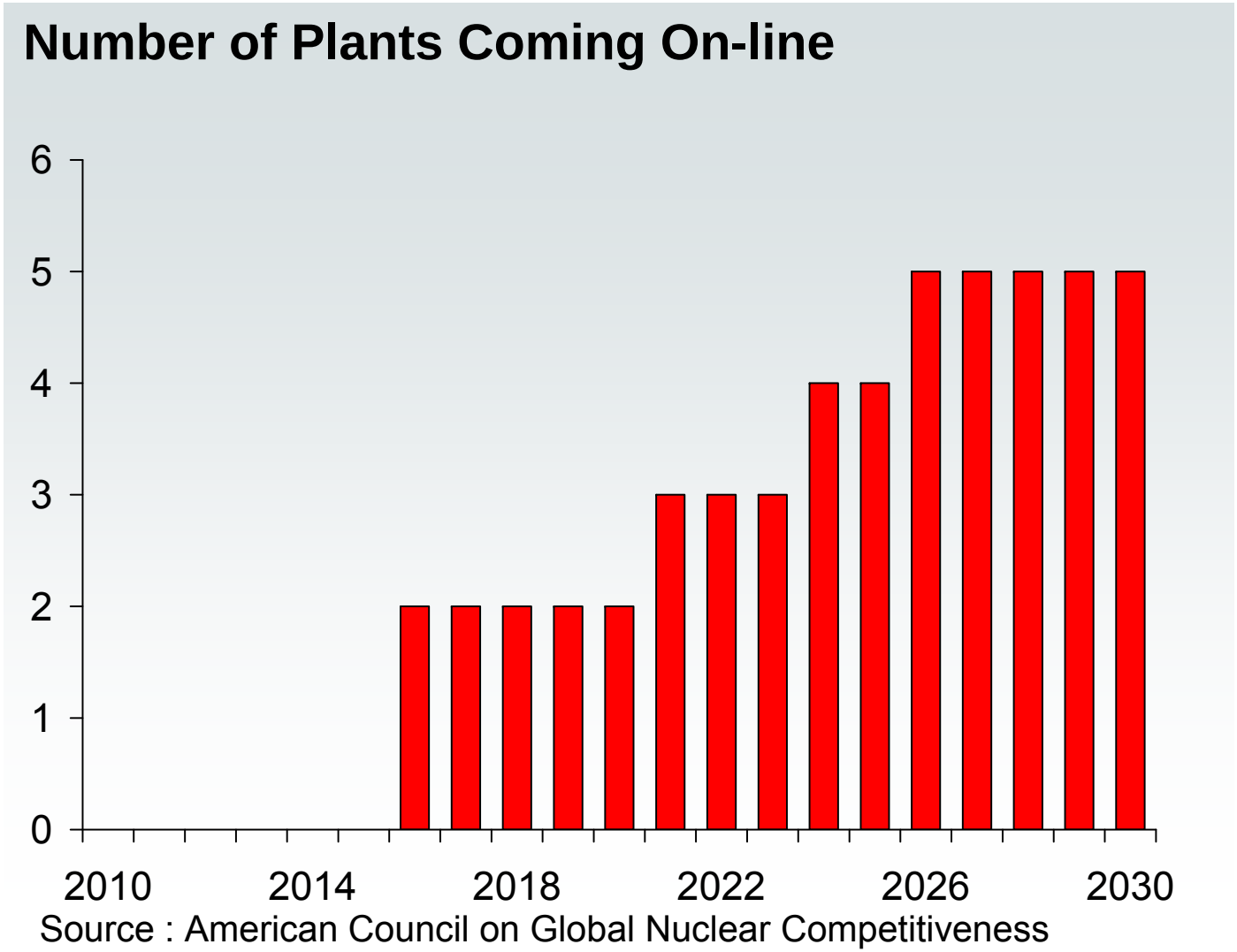


Source : Oxford Economics

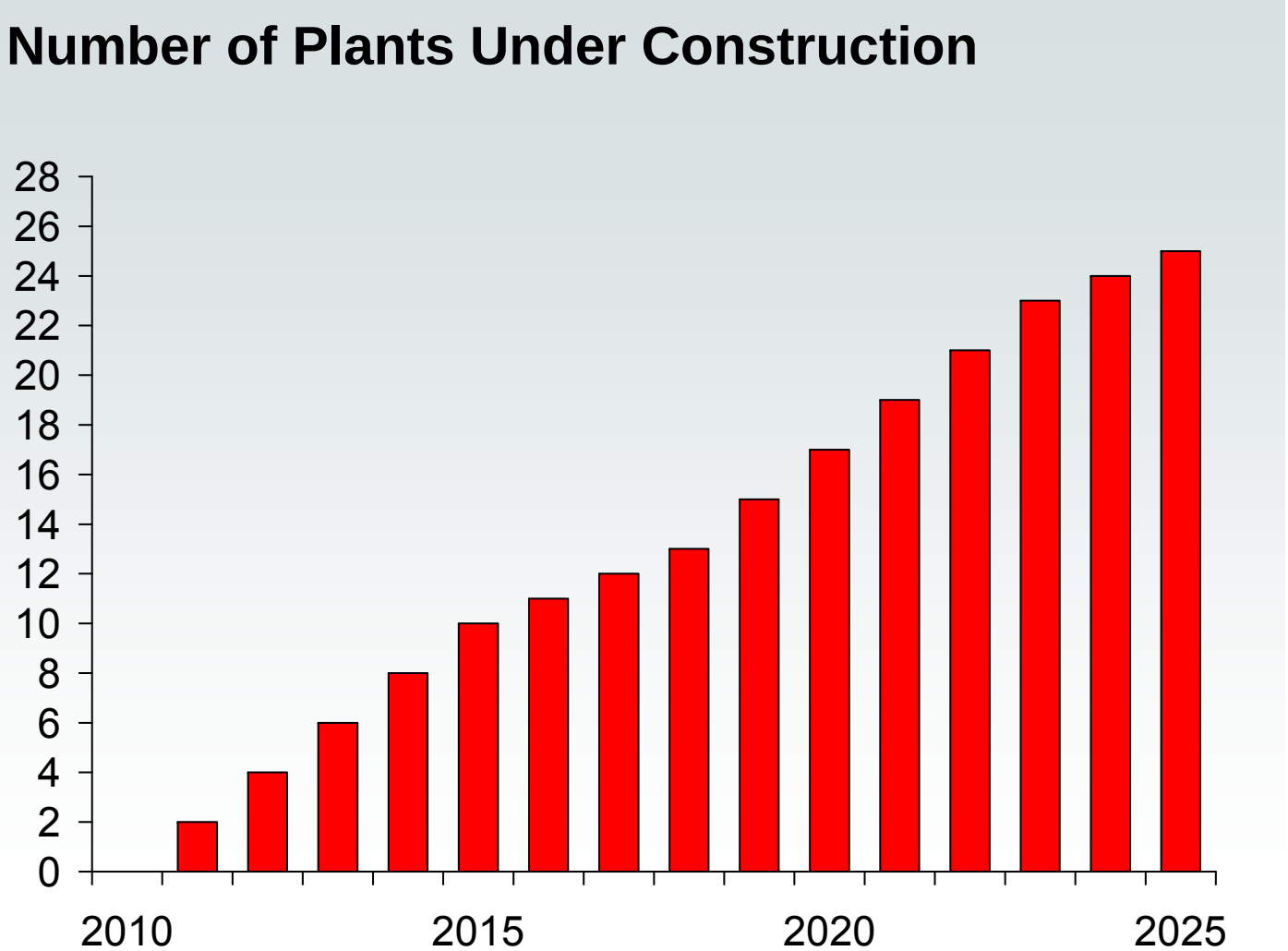
Construction Phase

- Assumed 5-year construction period per plant
- Peak labor demand in year 3 of 2,350 workers per reactor
- For every employee in direct construction, 1.17 further jobs are generated in the wider economy through the supply chain and by spending of wages

Construction – Assumed Schedule

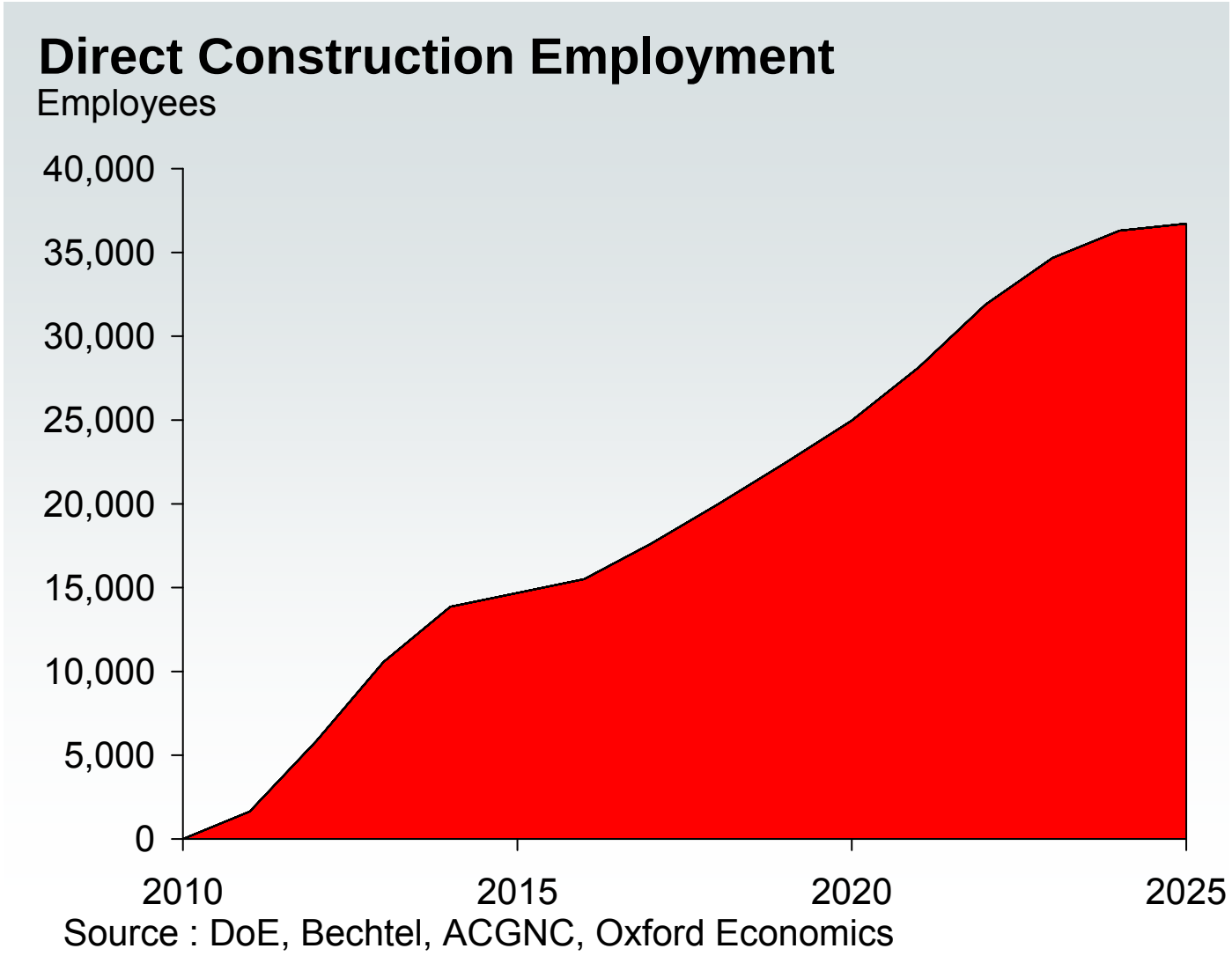


Construction – Assumed Schedule



Source : American Council on Global Nuclear Competitiveness, DoE

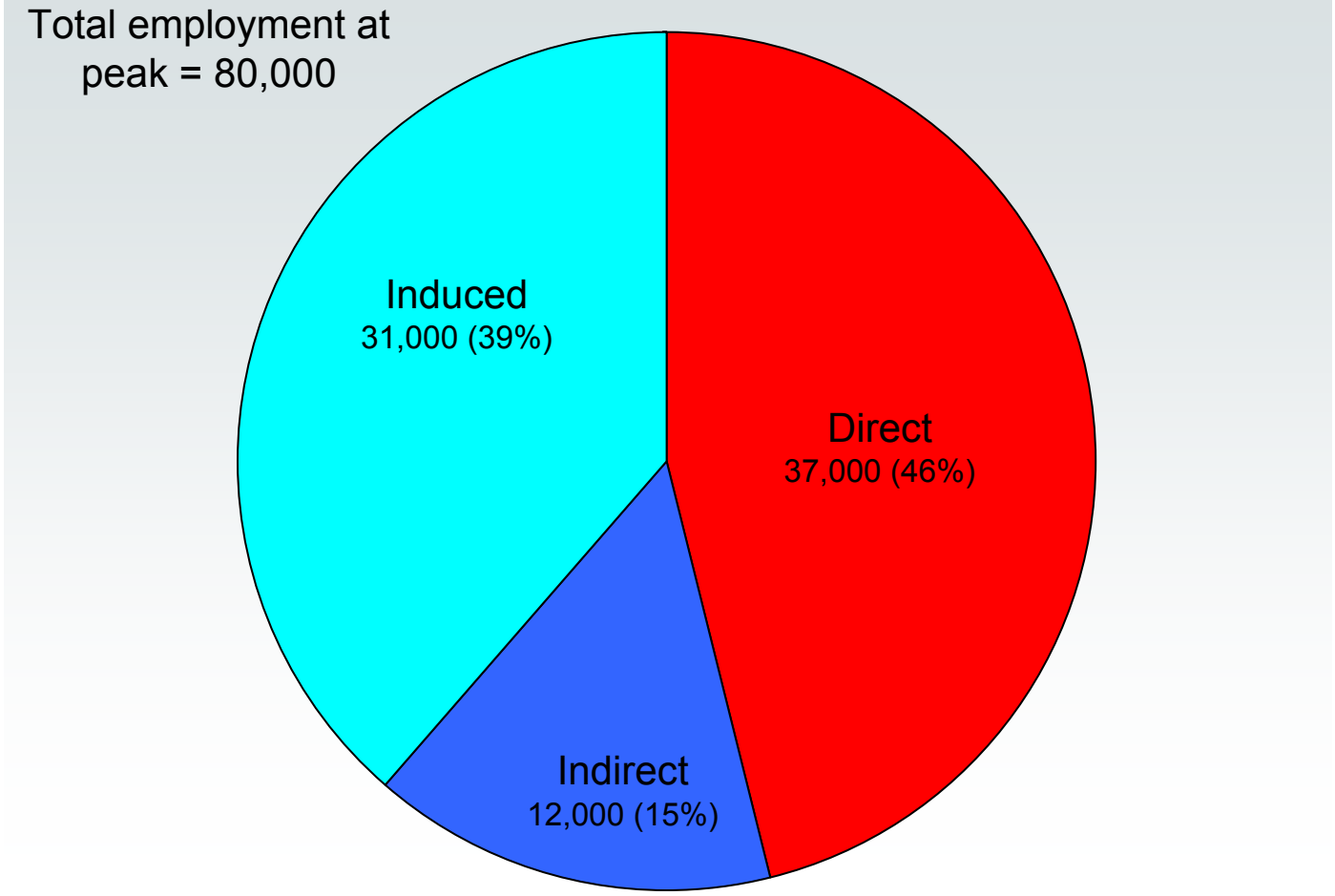
Construction – Direct Effects



Source : DoE, Bechtel, ACGNC, Oxford Economics

Construction – Total Effects

Total Peak Construction Employment (2025)

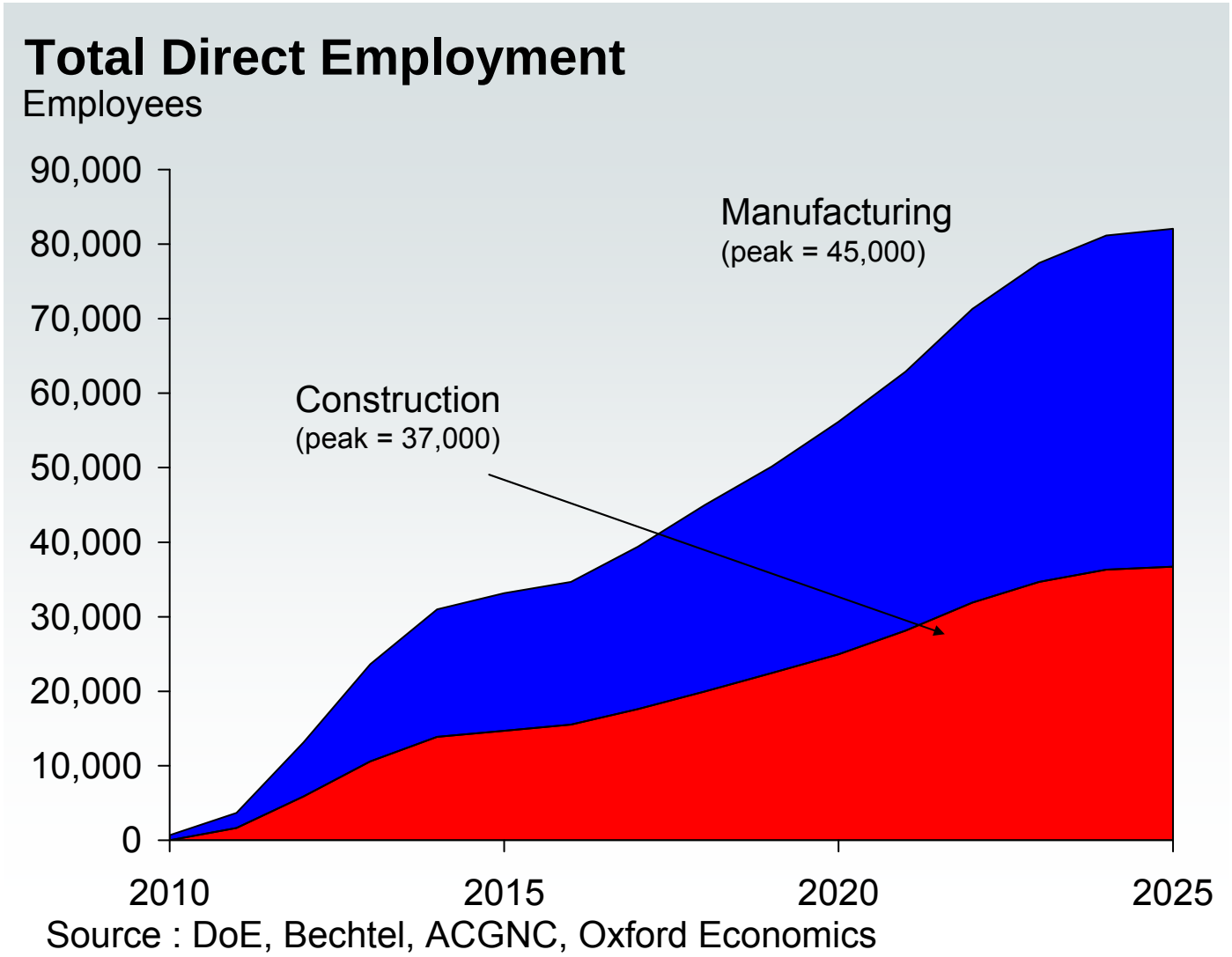


Source : Oxford Economics

Manufacturing Phase

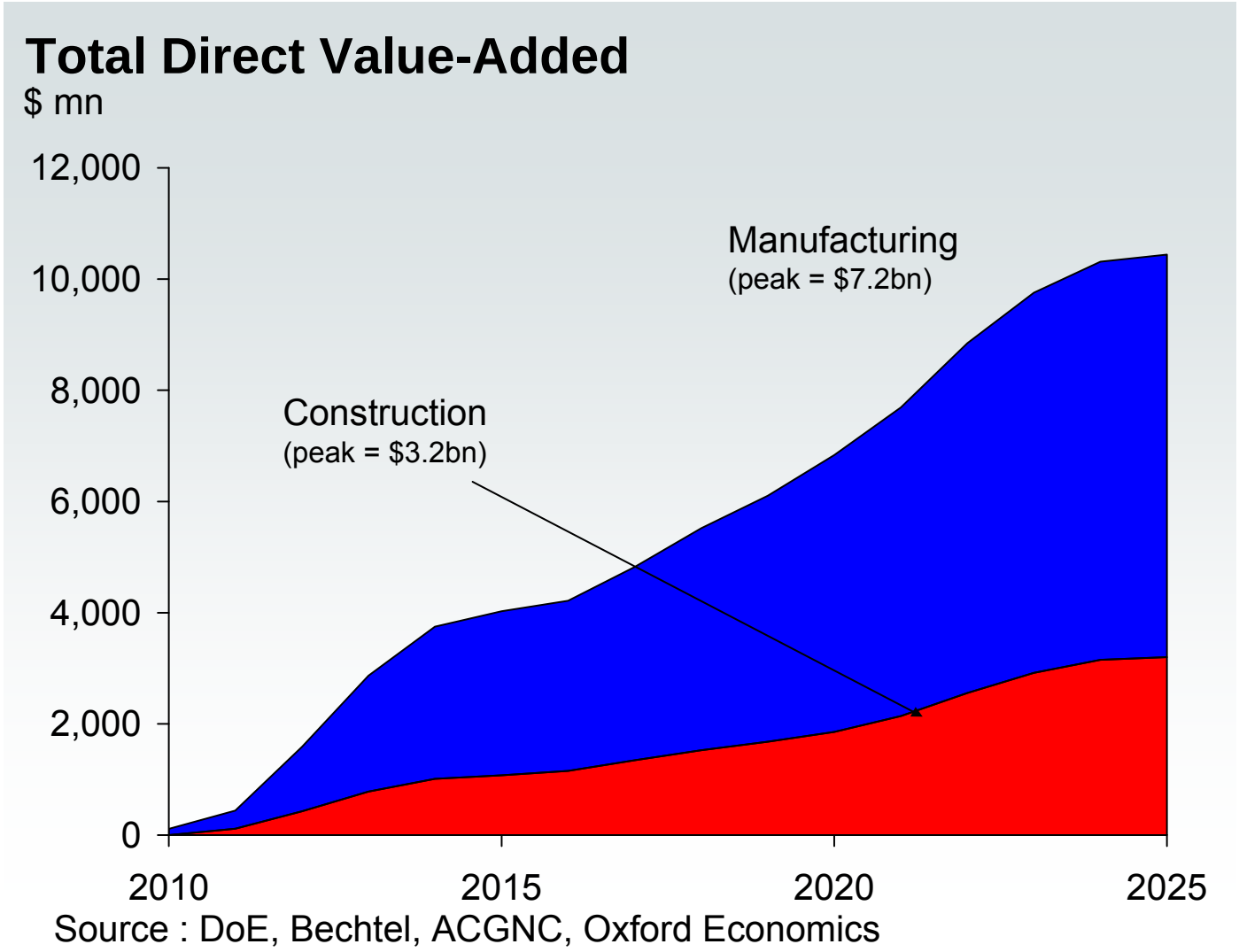
- Specific demand for manufactured products also generate employment and value-added benefits with a 5-year phased profile
- Peak employment impact per reactor is estimated to be 24% larger than for direct construction employment
- For every worker directly employed in these manufacturing jobs, 3.15 further jobs are generated in the wider economy through the supply chain and by spending of wages

Direct Investment Benefits



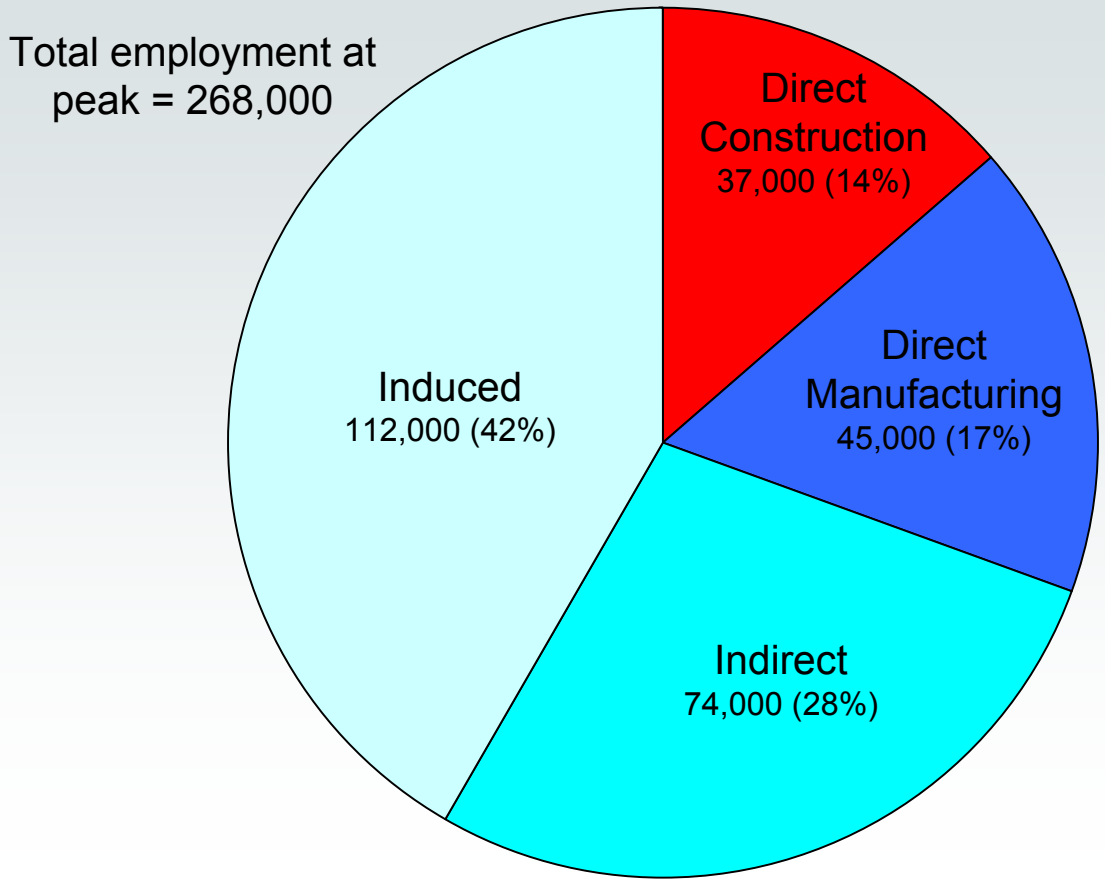
Source : DoE, Bechtel, ACGNC, Oxford Economics

Direct Investment Benefits



Reactor Build – Total Effects

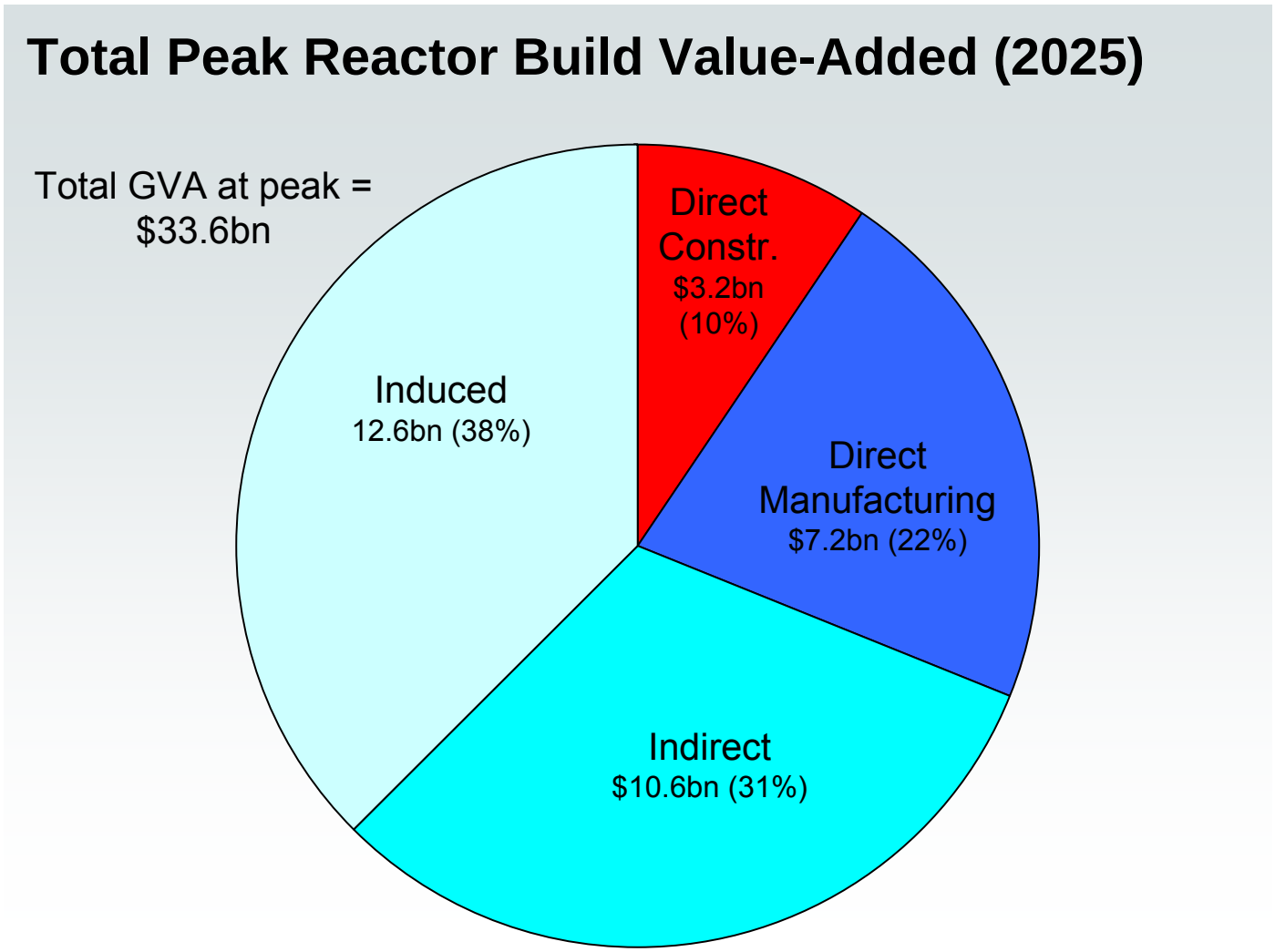
Total Peak Reactor Build Employment (2025)



Source : Oxford Economics

Reactor Build – Total Effects

Total Peak Reactor Build Value-Added (2025)

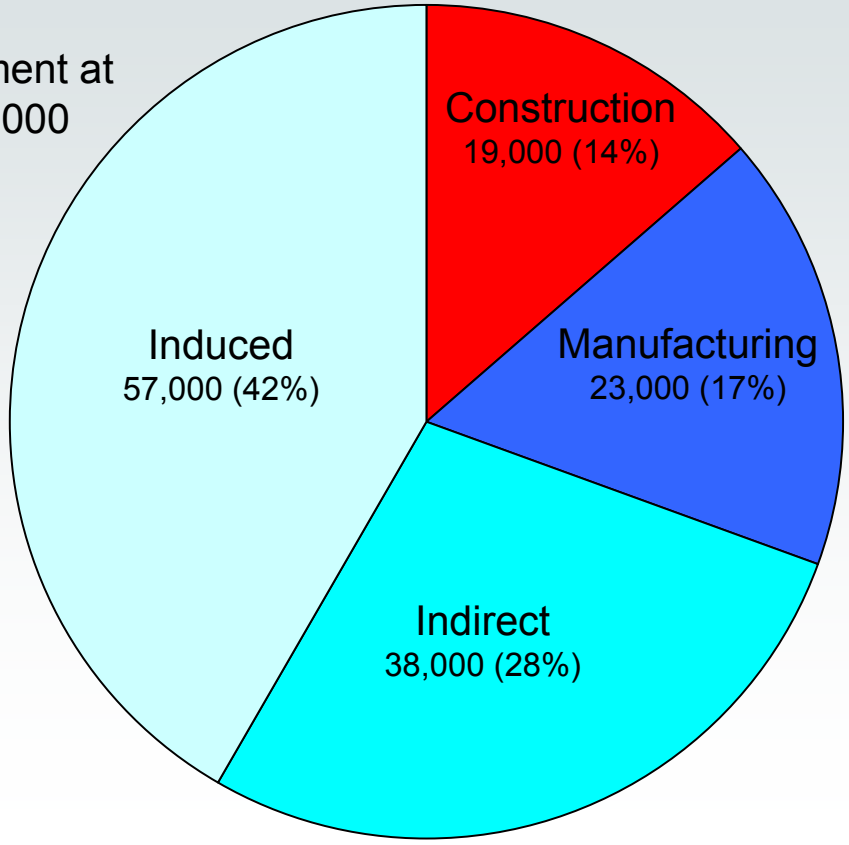


Source : Oxford Economics

Recycling & Enrichment Plant Build

Total Peak Recycling & Enrichment Plant Build Employment (2017)

Total employment at peak = 136,000

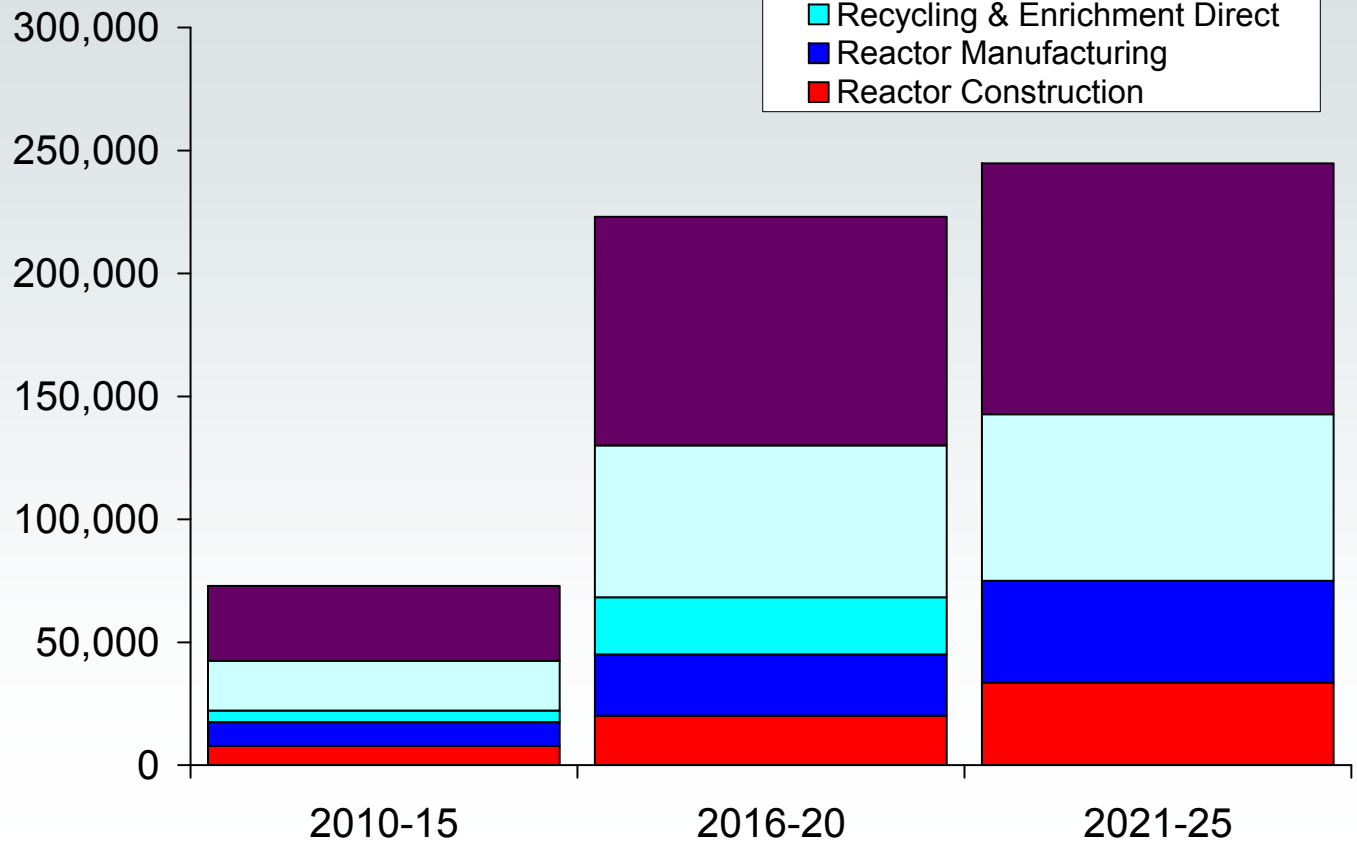


Source : Oxford Economics

Total Investment Effects

Total Build Employment

Employees: Peak = 268,000 (2017)



Source : Oxford Economics

Operations Phase

Reactors

- 900 full-time jobs generated for each reactor
- 47,000 full-time jobs generated by 2030

Recycling & Enrichment

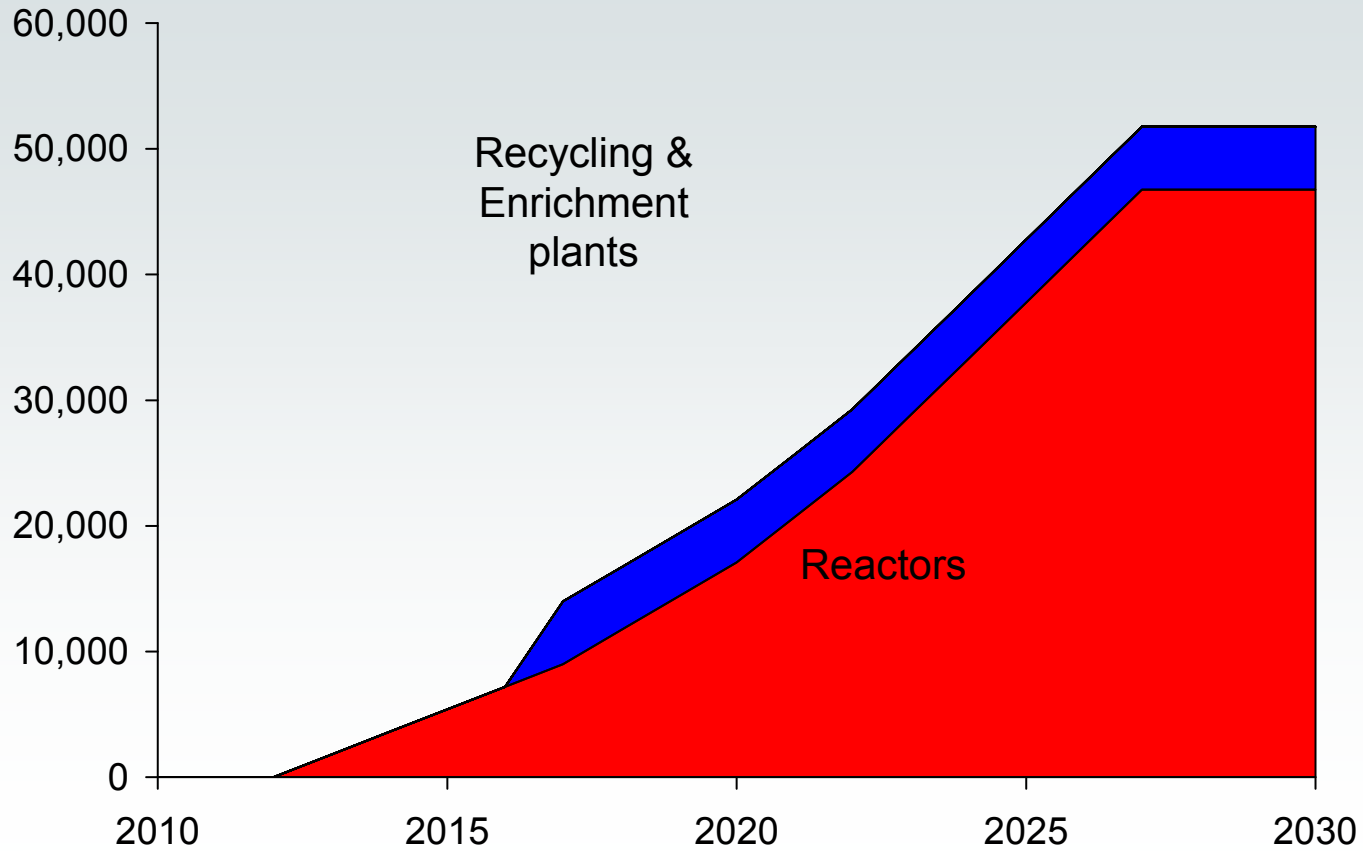
- 5,000 full-time jobs generated by 2020 in the assumed recycling plant
- 2,000 further full-time jobs generated in planned enrichment plants

- Direct employment in these high-value-added jobs generate further significant economic benefits

Operations – Direct Effects

Direct Operations Employment

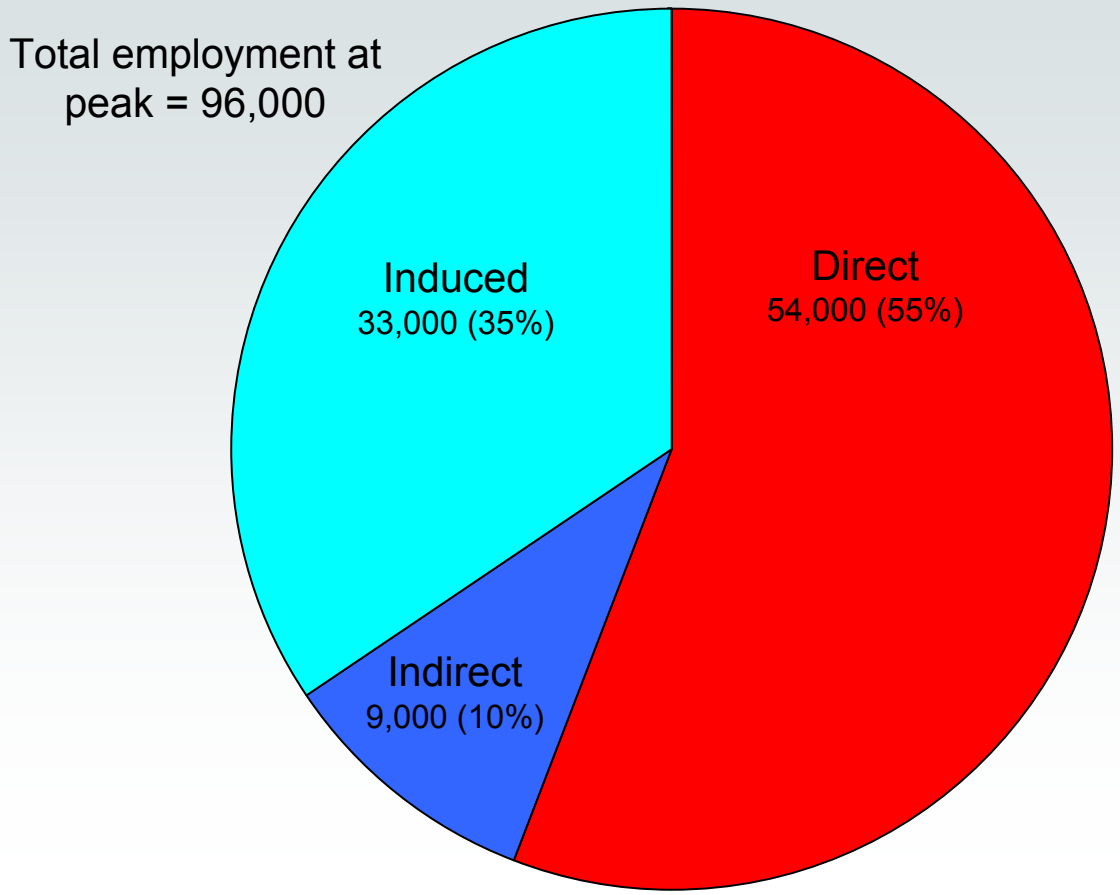
Employees: Peak = 54,000 (2027-)



Source : Bechtel, ACGNC, Oxford Economics

Operations – Total Effects

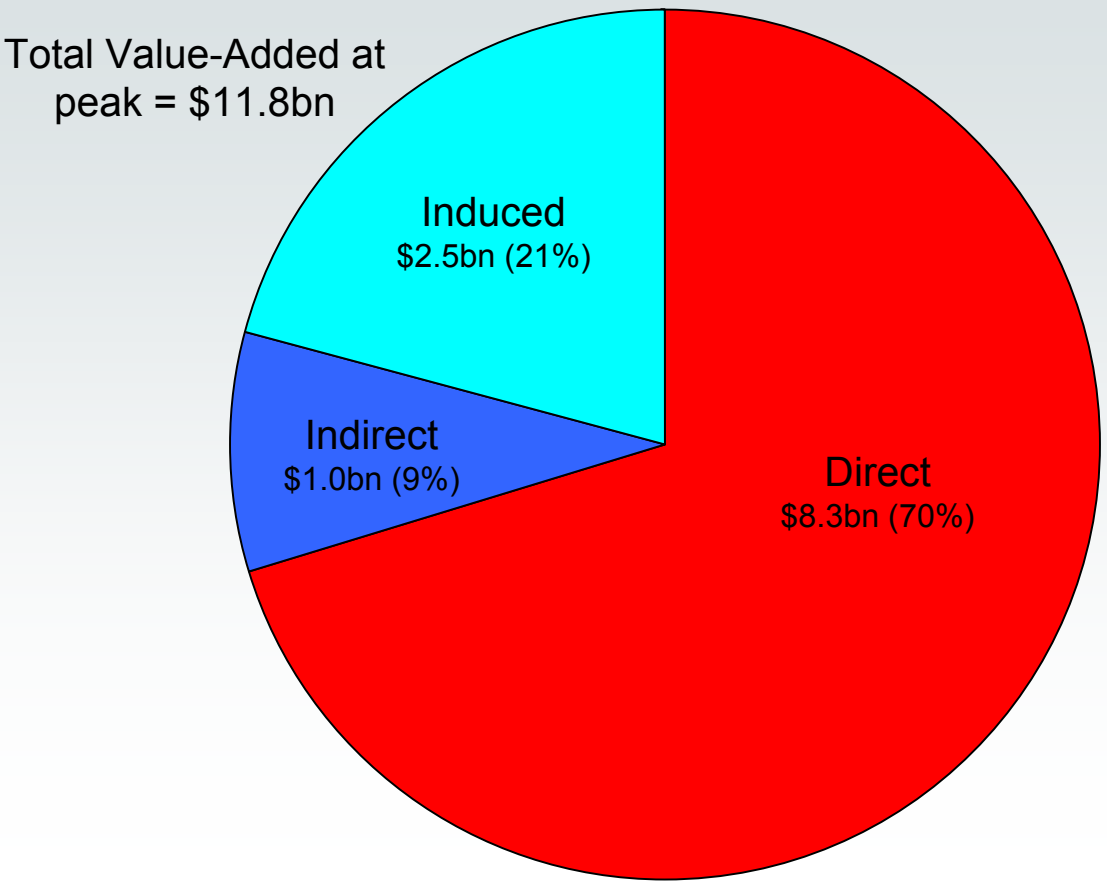
Total Operations Employment (2027-)



Source : Oxford Economics

Operations – Total Effects

Total Operations Value-Added (2027-)



Source : Oxford Economics

State Level Benefits

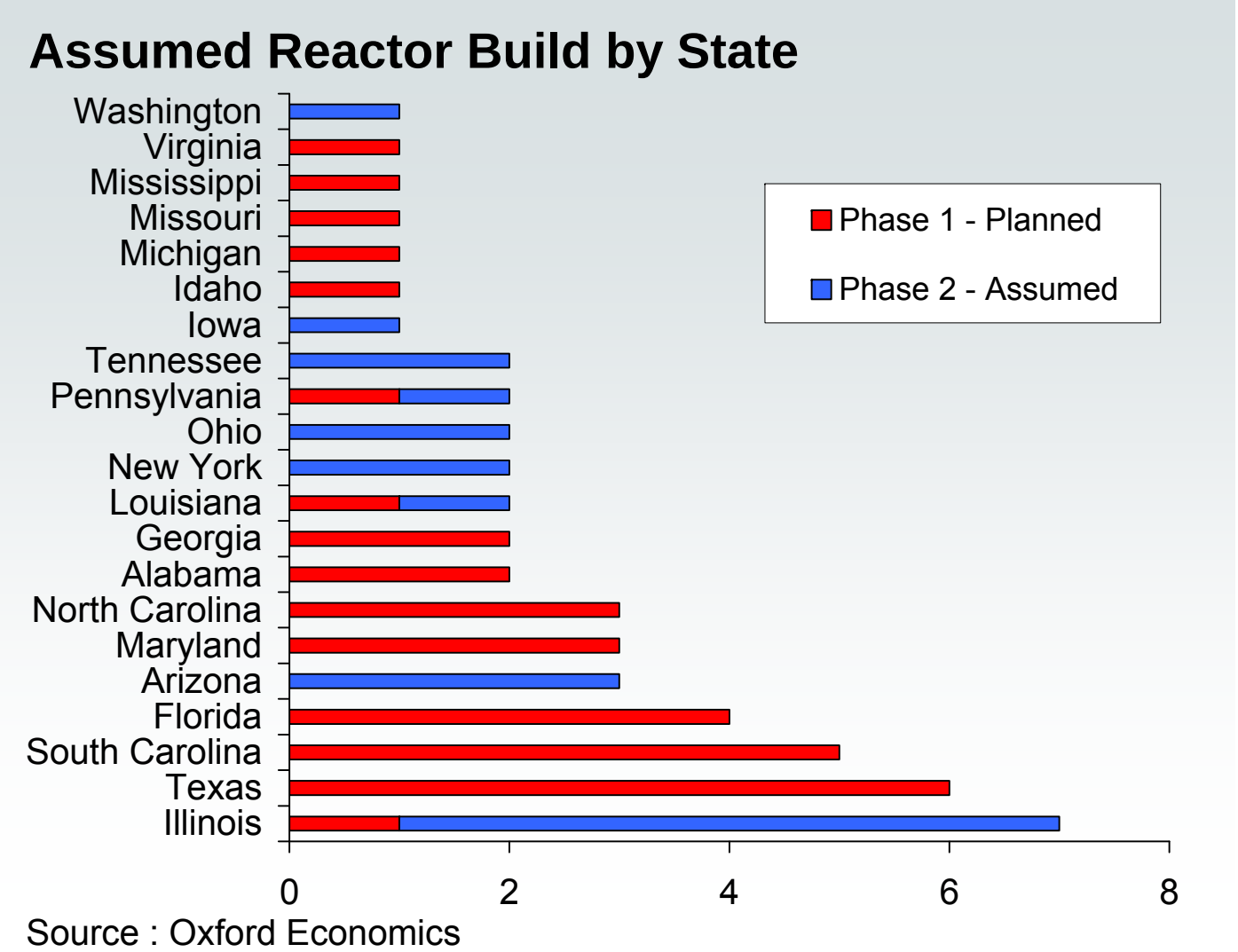
State Analysis Assumptions

- Phase 1 - 33 new reactors are currently planned and it is assumed that these are constructed

- Phase 2 – a further 19 reactors are assumed to be constructed according to the current timetable of decommissioning

- New reactors are assumed to replace existing capacity by state, which will otherwise disappear. New nuclear capacity would displace any new fossil fuel capacity in the counterfactual scenario

Investment by State



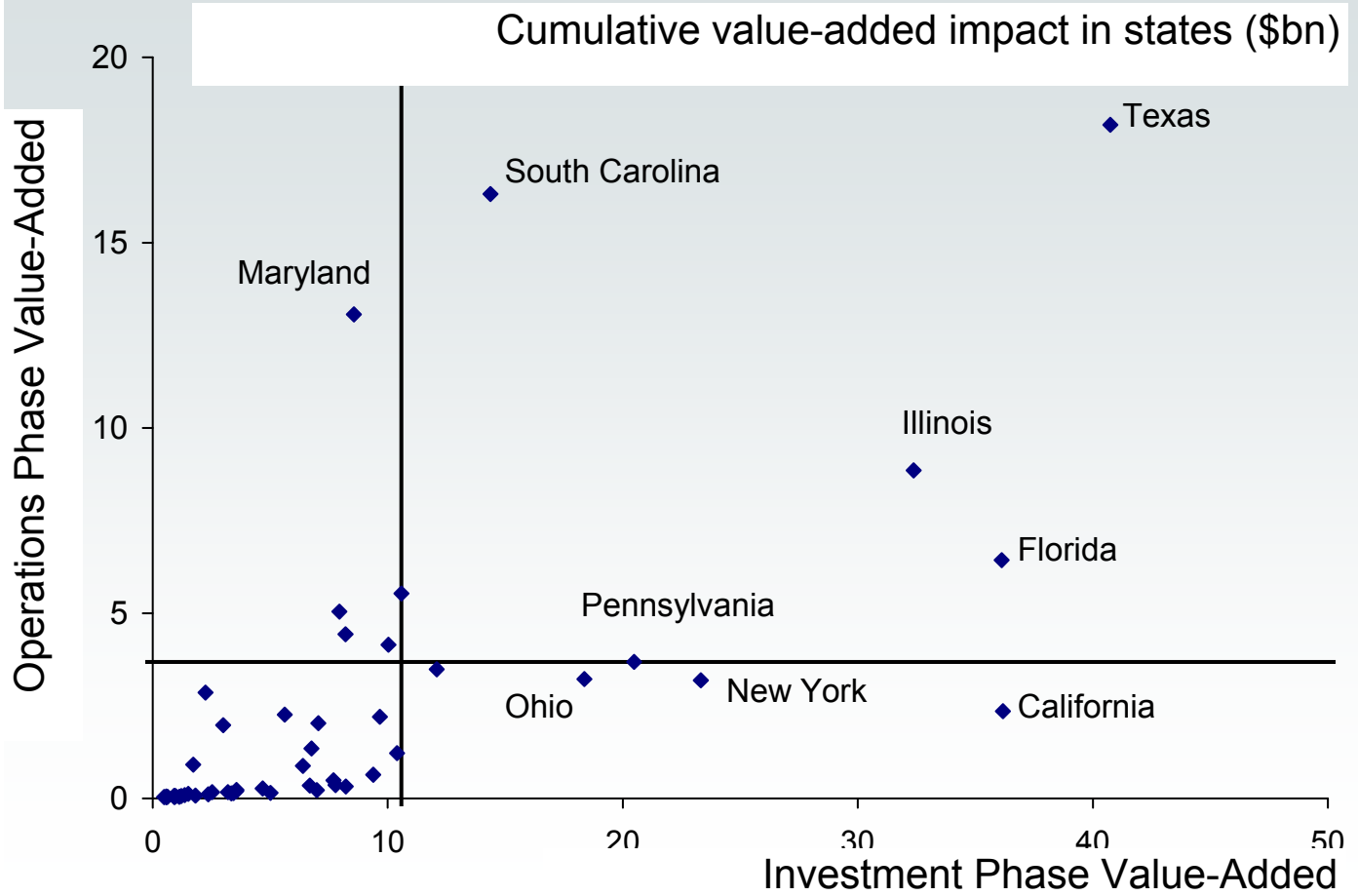
Source : Oxford Economics

Top 10 States – Value-Added Benefits

Value-Added Benefit by State (US$bn)			
	Investment Phase	Operations Phase	Total Combined Impact
Texas	4.3	2.1	6.4
Illinois	4.1	1.3	5.4
South Carolina	3.1	1.2	4.3
Florida	3.6	0.6	4.2
California	2.8	0.2	3.0
New York	2.2	0.5	2.8
Pennsylvania	2.1	0.5	2.6
Maryland	1.4	1.0	2.4
Ohio	1.7	0.4	2.1
Arizona	1.4	0.4	1.8

Value-Added Benefits

Cumulative Value-Added Impact by State



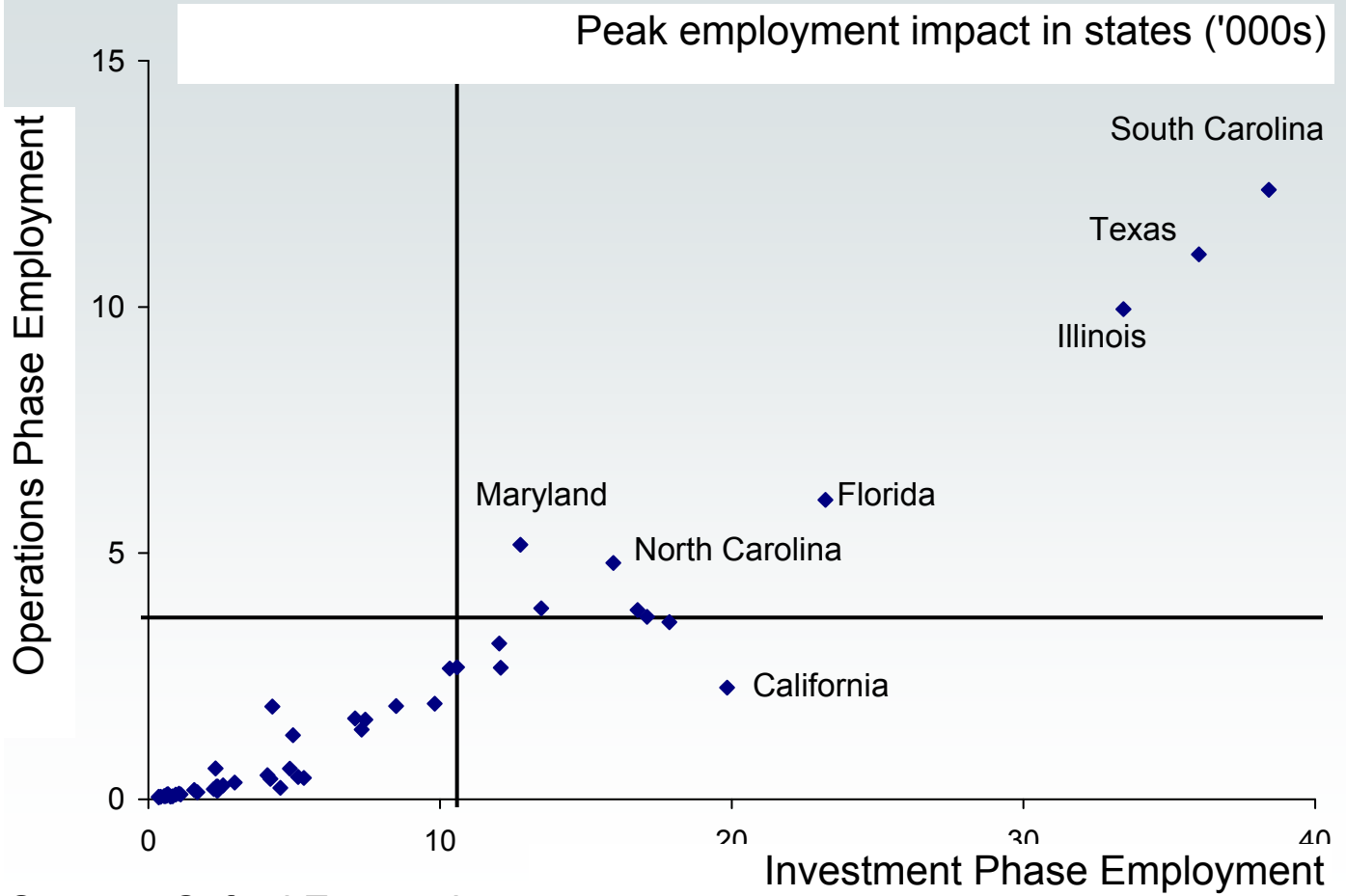
Source : Oxford Economics

Top 10 States – Employment Benefits

Employment Benefit by State ('000s)			
	Investment Phase	Operations Phase	Total Combined Impact
South Carolina	38.4	12.4	50.8
Texas	36.0	11.1	47.1
Illinois	33.4	10.0	43.4
Florida	23.2	6.1	29.3
California	19.8	2.3	22.1
Pennsylvania	17.9	3.6	21.5
New York	17.1	3.7	20.8
North Carolina	15.9	4.8	20.7
Ohio	16.8	3.8	20.6
Maryland	12.8	5.2	17.9

Employment Benefits

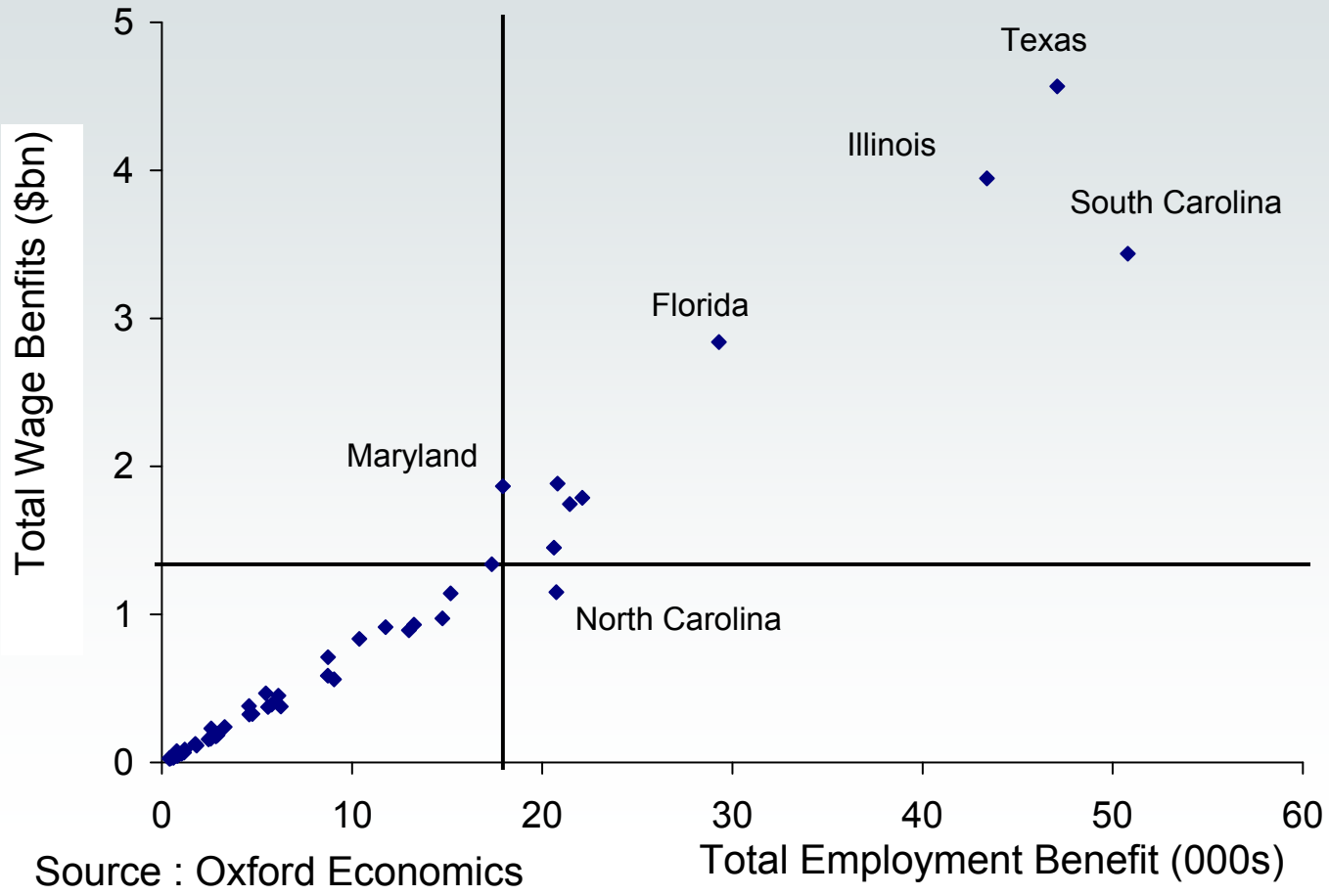
Peak Employment Impact by State



Source : Oxford Economics

Wage Benefits

Employment & Wage Impacts by State



Source : Oxford Economics

Energy and Trade Benefits

- Alternative to nuclear investment would be greater conventional generation capacity
- Jobs would be generated by this, but not the high-tech, high value-added manufacturing jobs generated by nuclear

- Greater nuclear generation capacity would directly reduce fossil fuel demand
- This would directly reduce import demand by $9bn a year
- Further import reductions could be realized from complimentary actions. For example, plug-in hybrids using nuclear generated power. Total trade balance benefit would reach $49 bn a year.

http://nuclear.prognoz.com

Energy and Carbon Savings

Counterfactual electricity generation

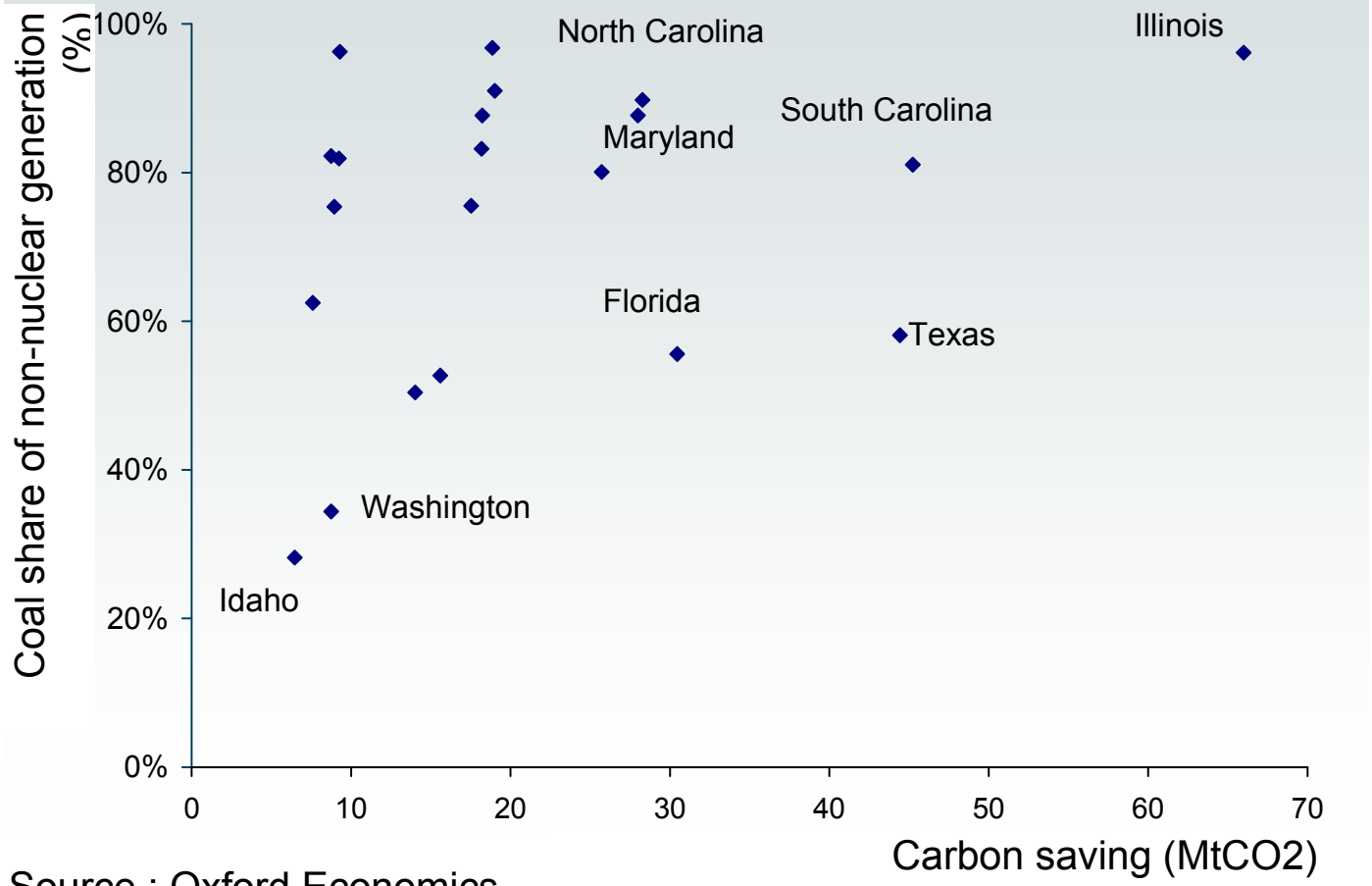
- We assume that generation demand in each state is met by growth in non-nuclear generation
- EIA projections of fuel use for generation are applied to the current generation fuel-mix for each state

Generation with nuclear investment

- It is assumed that nuclear capacity offsets any planned new fossil fuel capacity
- Carbon emissions savings are greatest in states which use a more carbon-intensive fuel mix for generation

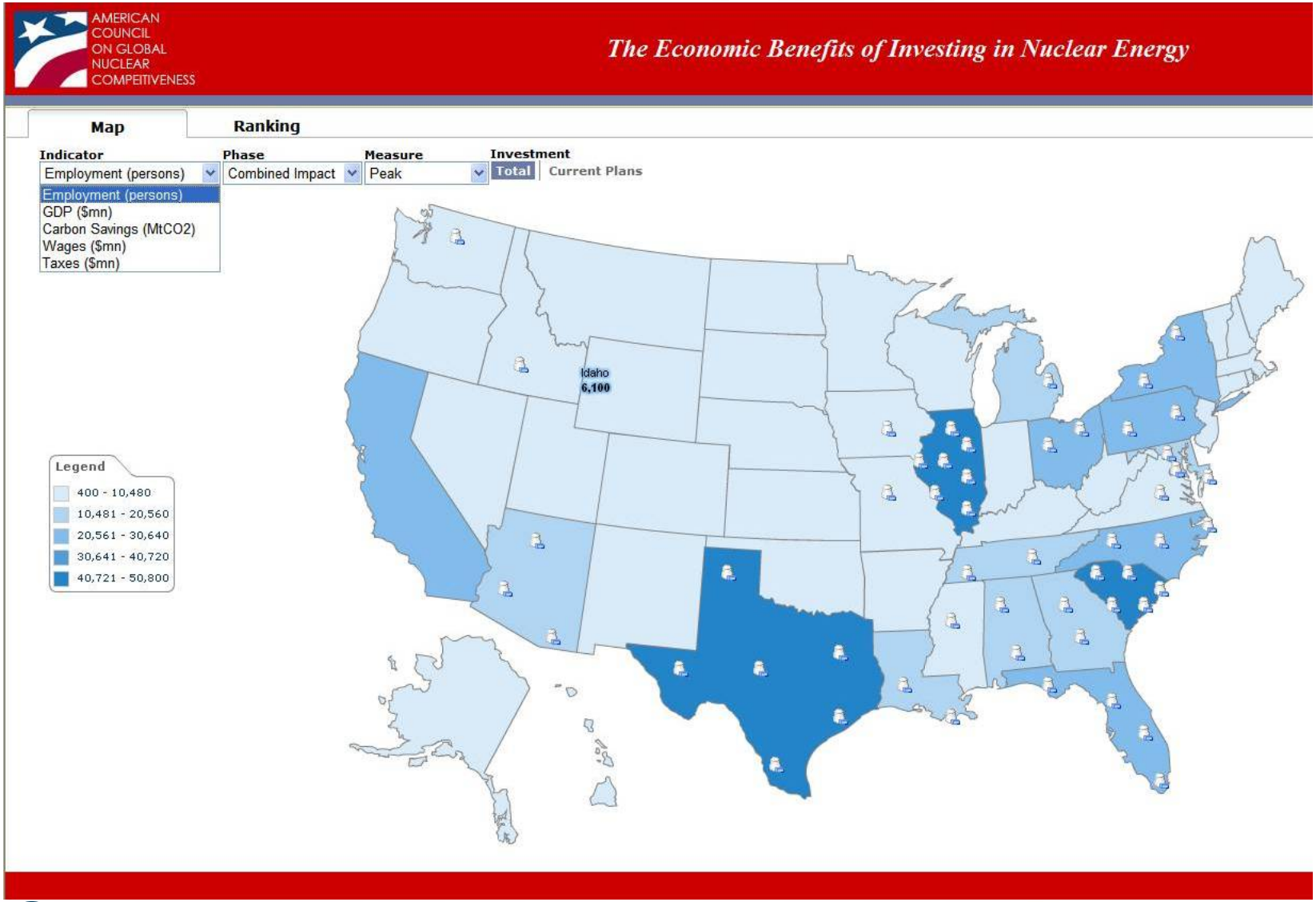
Carbon Savings

Carbon Saving by State (MtCO2)



Source : Oxford Economics

Online Nuclear Investment Benefits



Online Nuclear Investment Benefits

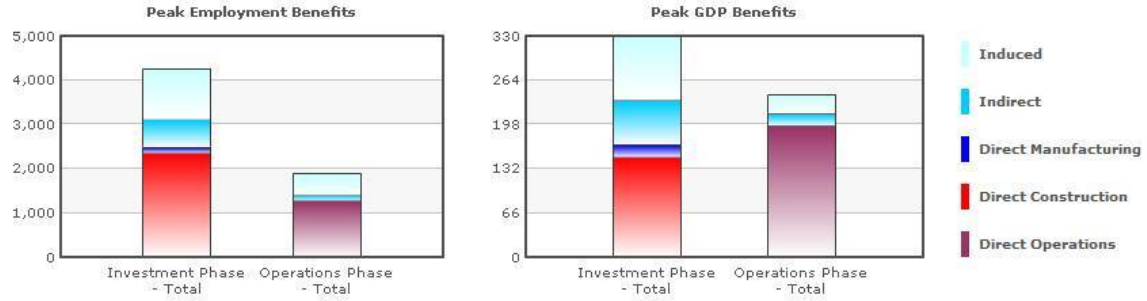
AMERICAN COUNCIL ON GLOBAL NUCLEAR COMPETITIVENESS

The Economic Benefits of Investing in Nuclear Energy

Map | Ranking | State information

Idaho

	Investment Phase	Operations Phase	Combined Impact
Employment (persons)	4,200	1,900	6,100
GDP ($mn)	300	200	600
Wages ($mn)	200	200	500
Taxes ($mn)	100	100	200
Carbon Savings (MtCO2)		0	0



Assumptions

	Value
Current number of active reactors	0
To be decommissioned by 2030	0
Currently planned reactors	1
Total assumed reactors to be built	1
Assumed first year of construction	2,018

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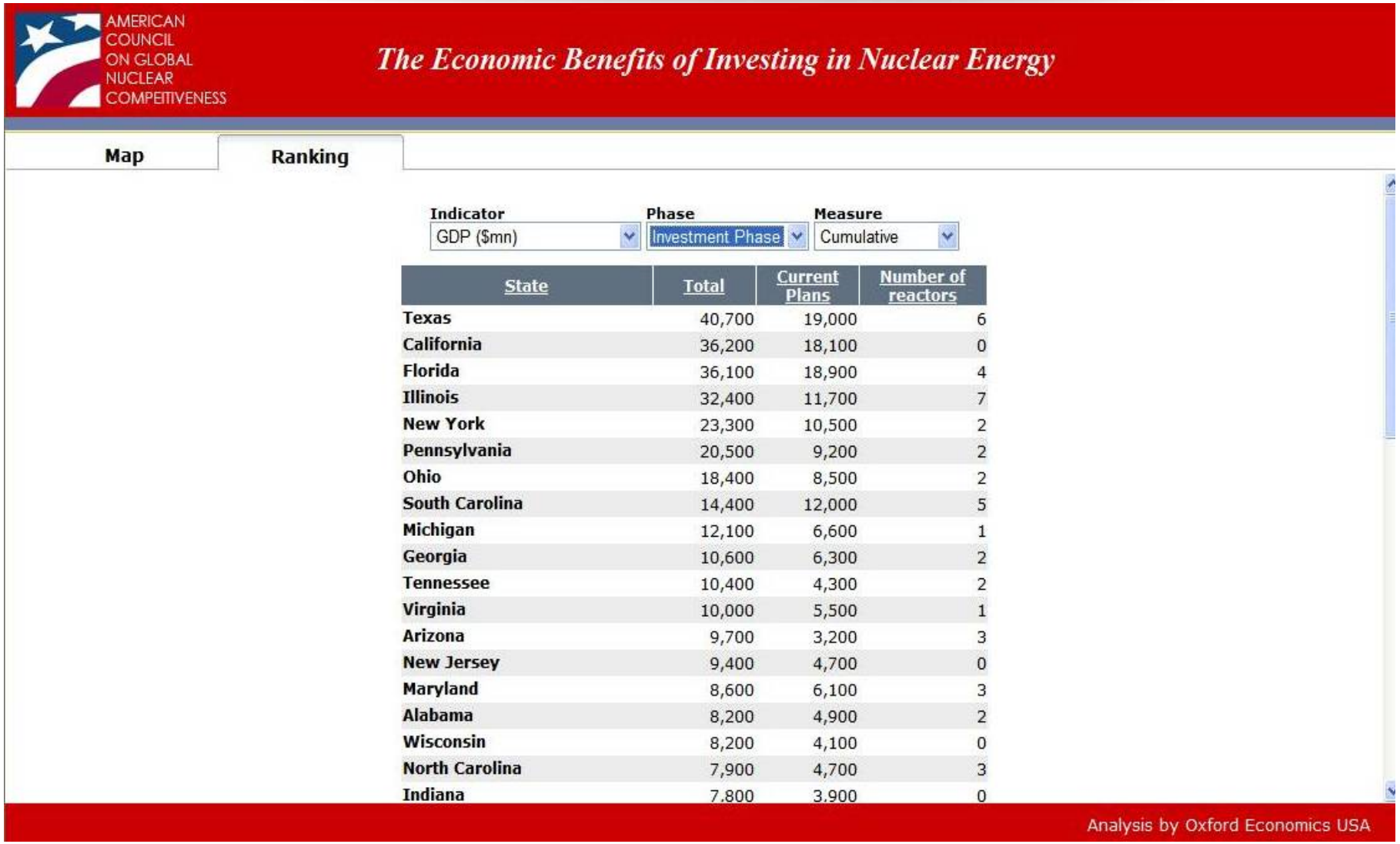
Online Nuclear Investment Benefits



AMERICAN COUNCIL ON GLOBAL NUCLEAR COMPETITIVENESS

The Economic Benefits of Investing in Nuclear Energy

Map | Ranking

Indicator: GDP ($mn) | Phase: Investment Phase | Measure: Cumulative

State	Total	Current Plans	Number of reactors
Texas	40,700	19,000	6
California	36,200	18,100	0
Florida	36,100	18,900	4
Illinois	32,400	11,700	7
New York	23,300	10,500	2
Pennsylvania	20,500	9,200	2
Ohio	18,400	8,500	2
South Carolina	14,400	12,000	5
Michigan	12,100	6,600	1
Georgia	10,600	6,300	2
Tennessee	10,400	4,300	2
Virginia	10,000	5,500	1
Arizona	9,700	3,200	3
New Jersey	9,400	4,700	0
Maryland	8,600	6,100	3
Alabama	8,200	4,900	2
Wisconsin	8,200	4,100	0
North Carolina	7,900	4,700	3
Indiana	7,800	3,900	0

Analysis by Oxford Economics USA