Potential impacts of the Bipartisan American Affordability and Jobs Act on United States energy systems

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Additional resources: kevinjkircher.com/BAAJA

My views do not necessarily represent the views of Purdue University.

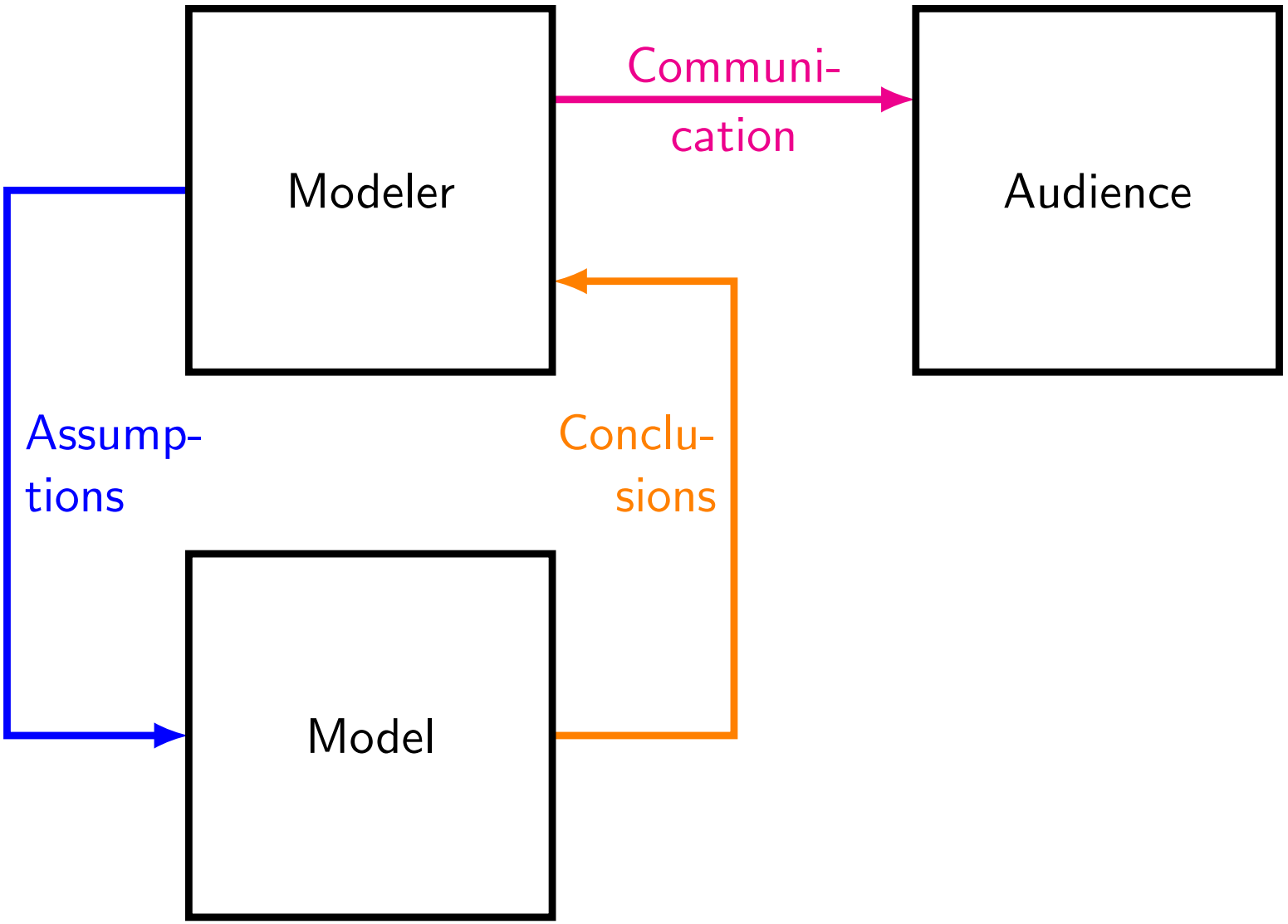
My students and I invent and model energy technologies

Credentials
Purdue prof 2022–
MIT postdoc 2019–22
Cornell PhD 2019
Grid of Tomorrow
  Consortium Member
Center for High
  Performance
  Buildings Member
IEEE Senior Member

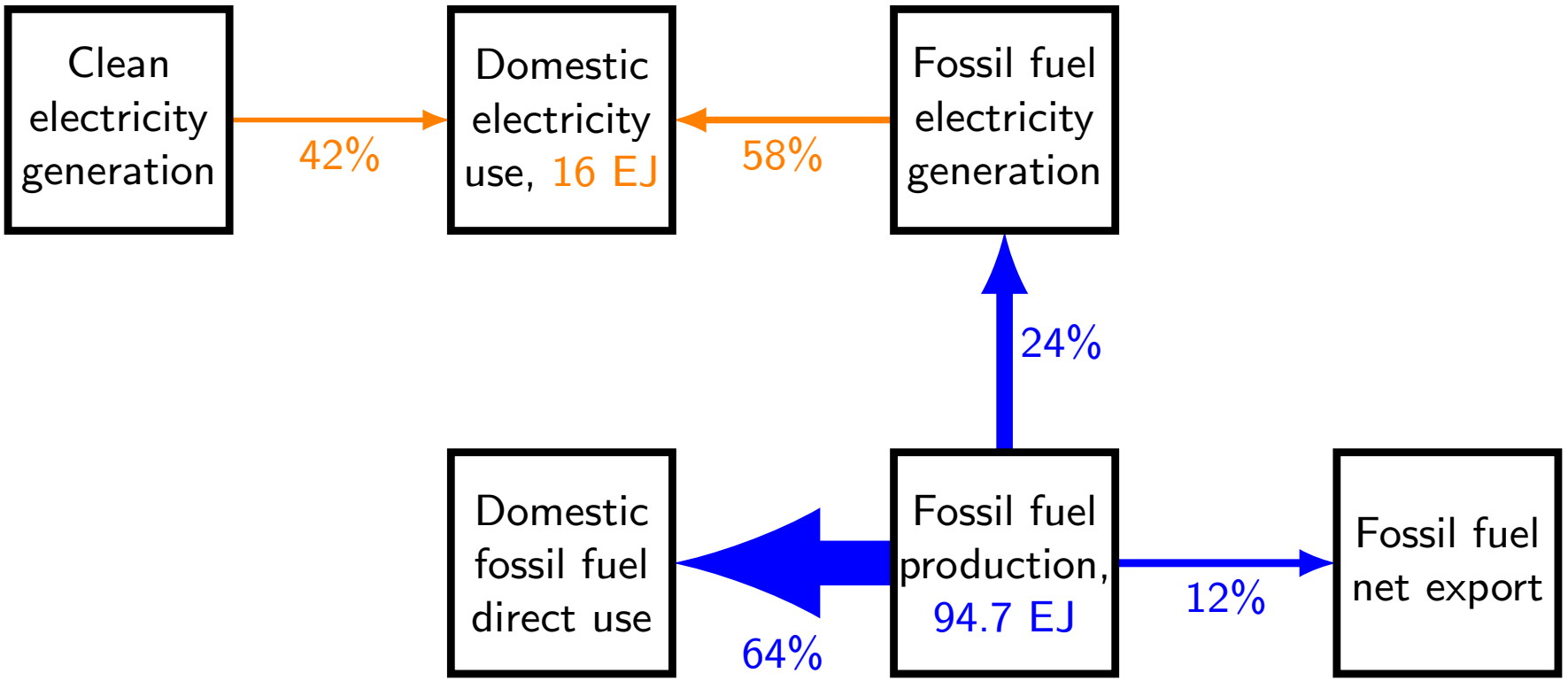
Research
Electrification
Energy management
Big energy modeling
~10 grad students
45+ peer-reviewed
  publications
1+3 patents

Teaching
Thermodynamics
Control systems
Energy systems
~170 students
  per year

All energy modeling has the form, 'If A, then C'



I strove for broad, transparent BAAJA modeling

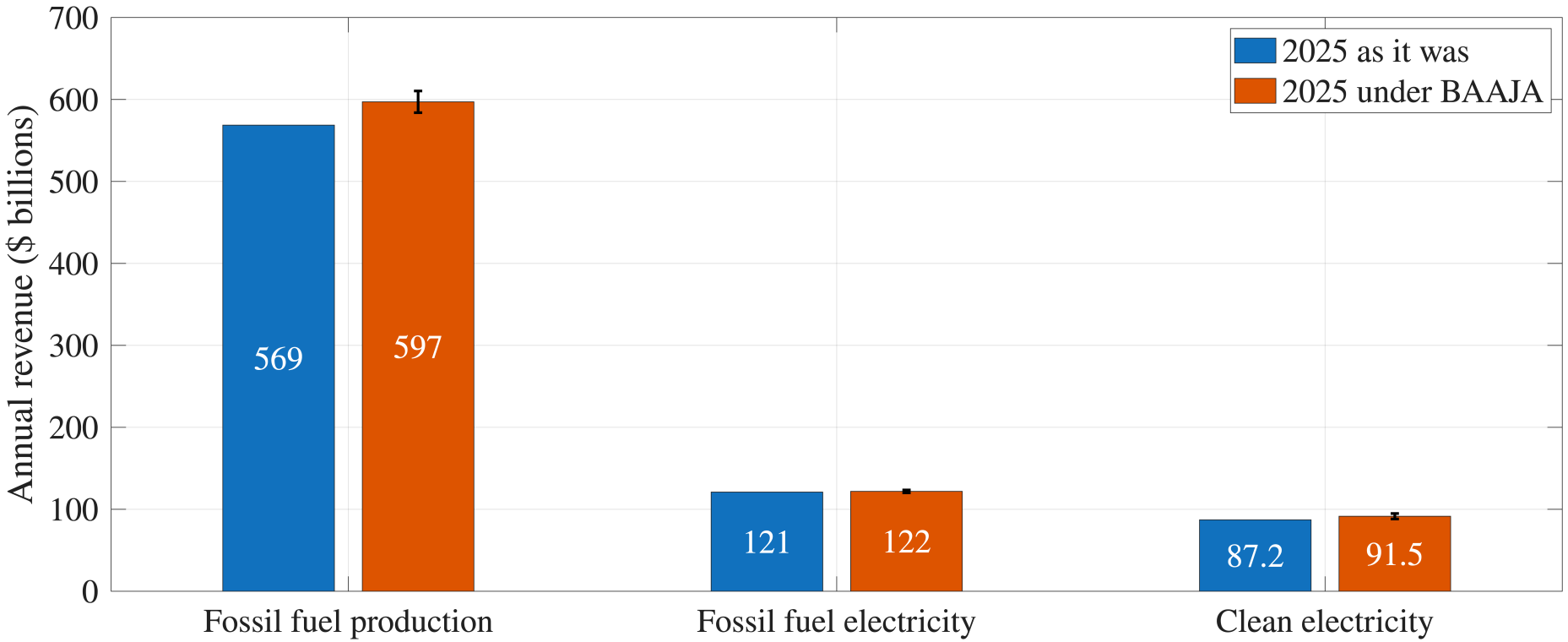


- covered 95% of primary energy
- explained all assumptions, equations, data
- made all code open source
- parsimonious $\implies$ easier to audit assumptions, reproduce results

I made two key assumptions

1. BAAJA increases electricity generation and load
   - ◇ easier power lines $\Longrightarrow$ easier generator/load interconnection
   - ◇ easier pipelines $\Longrightarrow$ easier behind-the-meter gas interconnection
2. BAAJA increases fossil fuel production and direct use
   - ◇ easier wells and pipelines $\Longrightarrow$ easier production
   - ◇ easier production and pipelines $\Longrightarrow$ lower prices, easier access

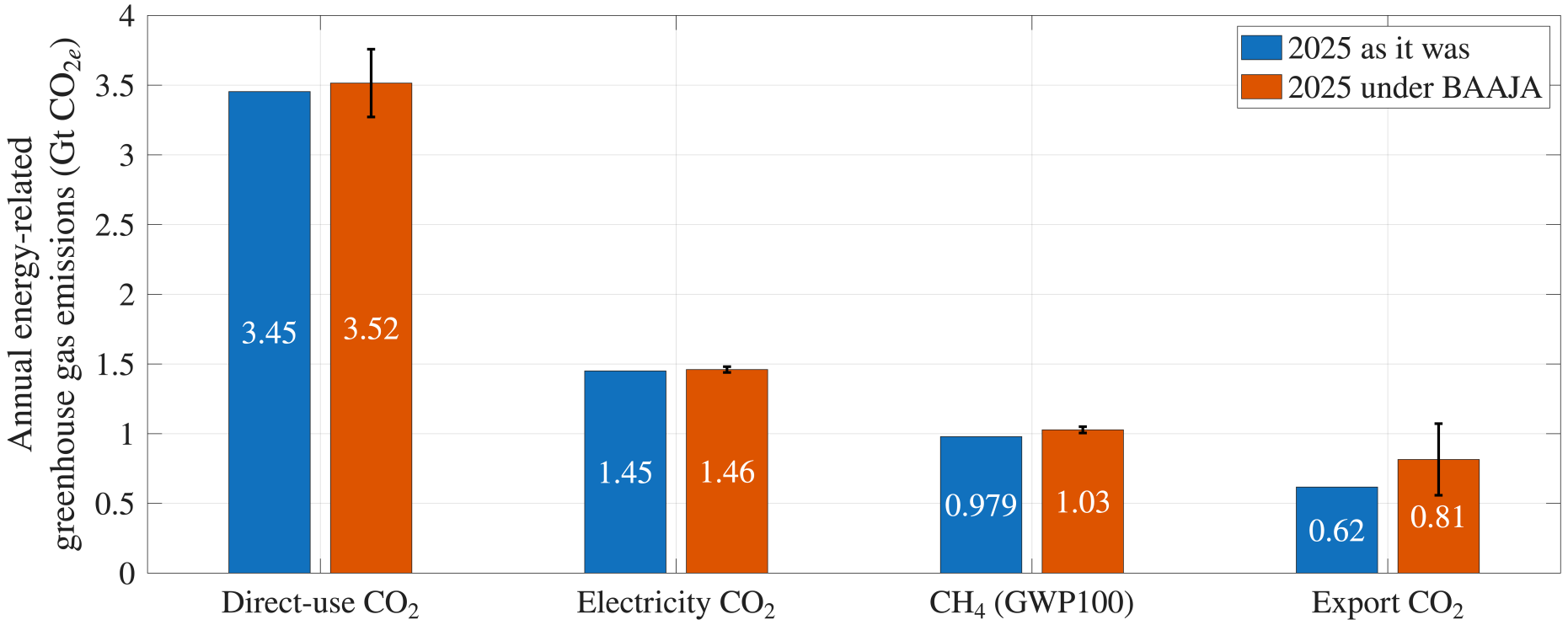
Energy revenues and jobs likely increase



on average over 10 million probabilistic simulations,

- annual energy revenues and jobs increase by **$34 billion** and **76k**
- fossil fuel $ increases **6.7x** more than clean electricity $
- fossil fuel jobs increase **1.4x** more than clean electricity jobs
- revenue/job losses in regulatory compliance not included

Domestic greenhouse gas emissions likely increase



- on average, clean electricity makes up **90%** of electricity growth
- on average, annual domestic emissions increase by **120 Mt CO_{2e}**
- exports not included

Domestic mortality from air pollution likely increases

- on average, annual domestic mortality increases by **1,200 deaths**
- non-fatal illnesses not included
- exports not included

How to make a model say BAAJA reduces emissions

1. assume it is impossible for BAAJA to increase electricity demand
2. assume it is impossible for BAAJA to increase fossil fuel production

Under these assumptions, my model shows annual emissions decreasing by ~100 Mt, consistent with think-tank modeling.

I believe BAAJA would not address the affordability crisis

The most optimistic modeling shows 2–4% electricity bill savings.

- would take years to materialize
- only exist by comparison to an imagined baseline
- likely indistinguishable from inflation- or weather-driven fluctuations

Savings estimates assume BAAJA can't increase power demand.

- supply up + demand constant $\Longrightarrow$ price down ✓✓✓
- supply up + demand up $\Longrightarrow$????

To increase revenues or protect communities?

In my assessment, BAAJA would likely be...

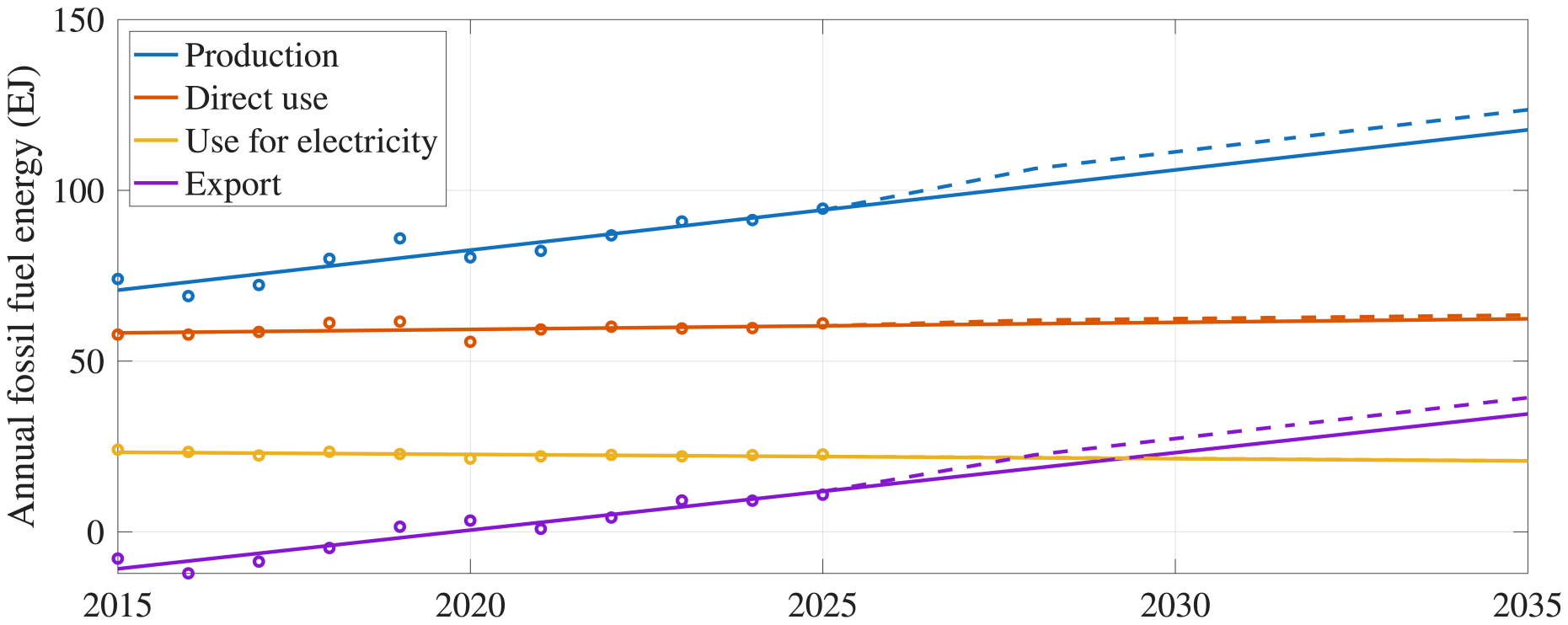
- good for revenues (energy, data centers, AI)
- neutral for jobs (+energy, −compliance)
- neutral for affordability
- bad for communities
  - ◇ more pollution
  - ◇ less agency in infrastructure siting decisions
- bad for the climate

I support reasonable compromises but think BAAJA is a bad deal.

- implied CO_2 intensity of new clean electricity: worse than coal
- implied value of a statistical life: 30% of EPA recommendation

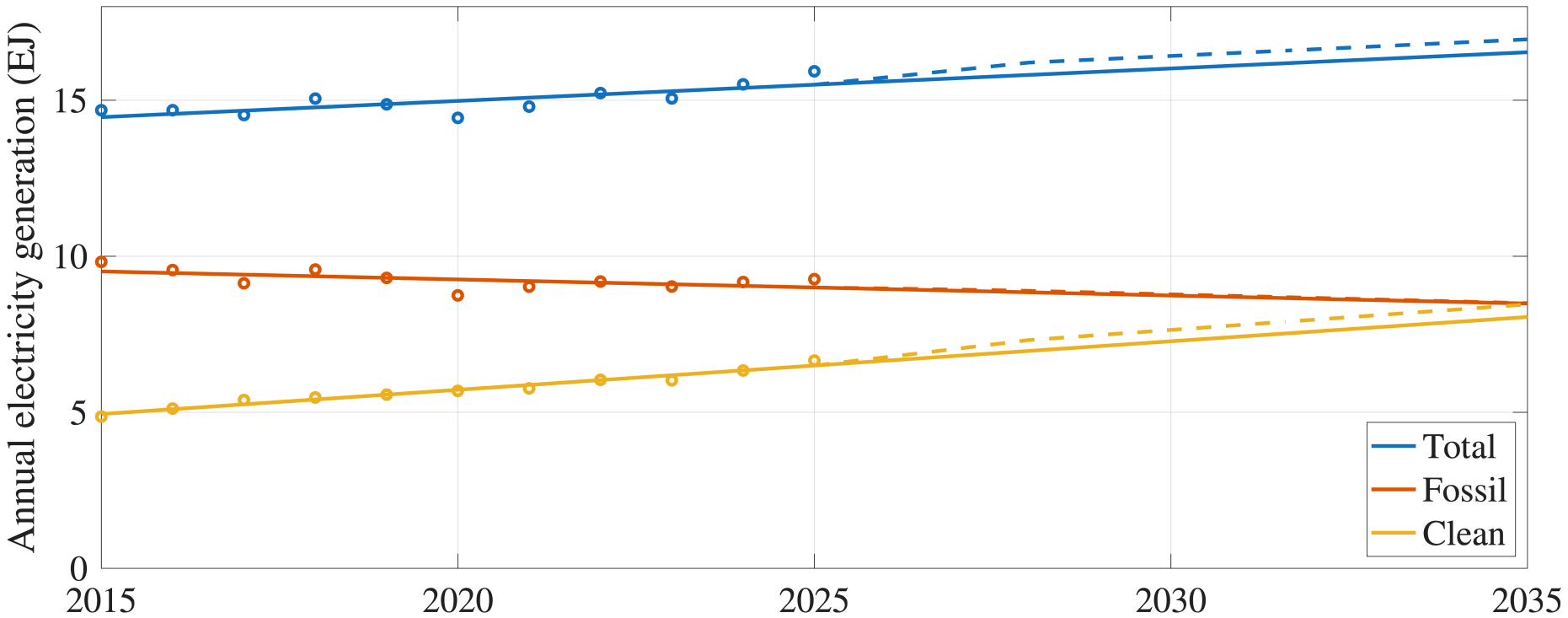
Backup slides

Fossil fuel projections through 2035

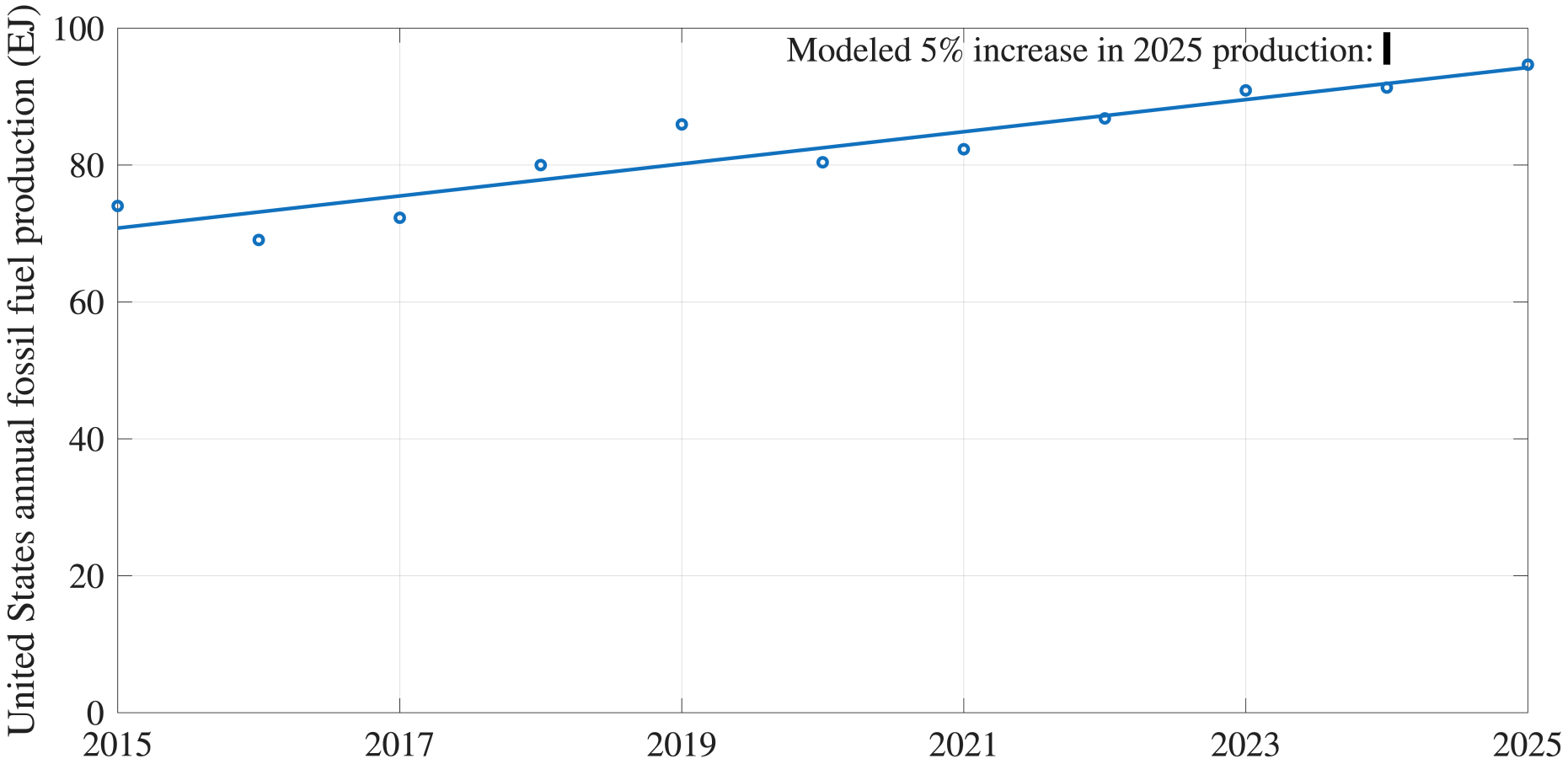


- circles are 2015–25 data
- solid lines are fit to circles, projected through 2035
- dashed lines are BAAJA trajectories
- model outputs match 2025 analysis within ∼15% error

Electricity projections through 2035



A 5% increase in production is not implausible



- 2015: trade renewable tax credits for lifting the oil export ban?
- modelers mostly missed the resulting fossil fuel production boom
- 5% may well be an underestimate