Transportation and Public Utilities Group

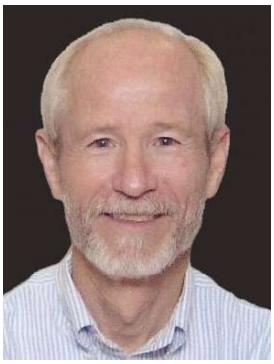
Part of the Allied Social Sciences Associations since 1946

Officers 2022

Ian Savage
President

Jonathan E. Hughes
President-Elect

James Peoples, Jr
Secretary



Patrick McCarthy
Treasurer

Organize sessions at

AMERICAN ECONOMIC ASSOCIATION

Accepting paper proposals until May 15 for New Orleans, January 2023

Portland, OR – June 2022

Distinguished Member Award

We will defer the next award until we can honor the recipient in person next January in New Orleans

Annual Dissertation Award

Nicola Rosaia

PhD, Harvard Univ, 2021

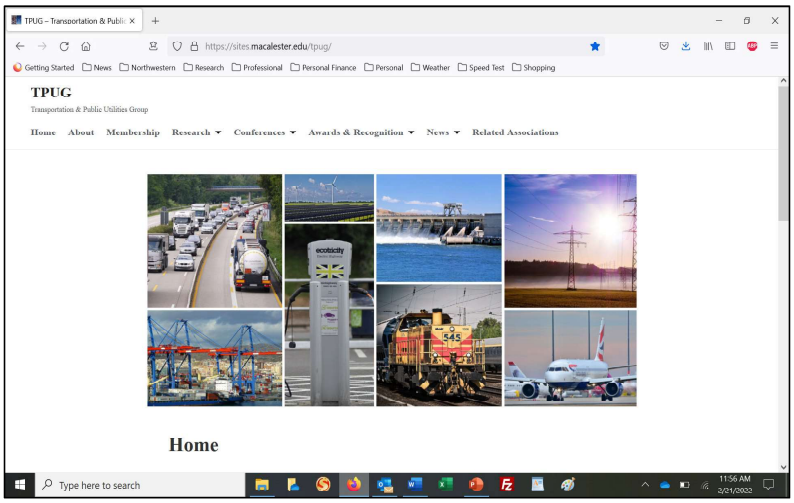
Post-doc, Princeton

Assistant Prof, Columbia University Business School, 2022

- Competing platforms and transport equilibrium: evidence from New York City
- Search frictions and efficiency in decentralized transport markets
- Duality and estimation of undiscounted Markov decision processes

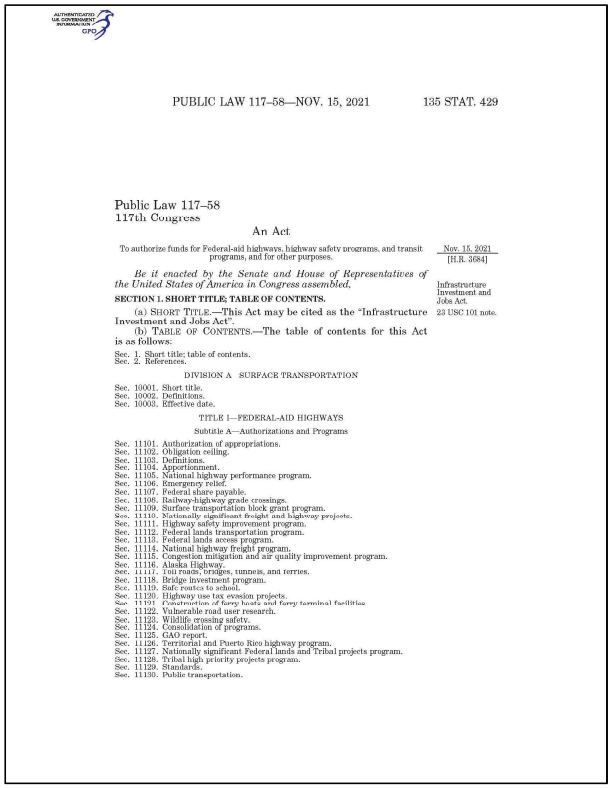
Membership

Annual (August – July) and lifetime memberships



https://sites.macalester.edu/tpug/

Infrastructure Investment and Jobs Act



PUBLIC LAW 117–58—NOV. 15, 2021 135 STAT. 429

Public Law 117–58
117th Congress

An Act

To authorize funds for Federal-aid highways, highway safety programs, and transit programs, and for other purposes.

Nov. 15, 2021
[H.R. 3684]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Infrastructure Investment and Jobs Act.

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

23 USC 101 note.

(a) SHORT TITLE.—This Act may be cited as the "Infrastructure Investment and Jobs Act".

(b) TABLE OF CONTENTS.—The table of contents for this Act is as follows:

Passed into law
November 15, 2021

a.k.a.

"Bipartisan Infrastructure Law"

a.k.a.

"The B.I.L."

All within 60 minutes

- Implications of the B.I.L. for transportation researchers – Ian Savage (10 minutes)

- Implications of the B.I.L. for public utilities researchers – Frank Wolak (10 minutes)

- The floor is open

Division A - Surface Transportation
- Title I – Federal-Aid Highways
- Tile II – TIFIA
- Title III – Research, Technology and Education
- Title IV – Indian Affairs

Division B – Surface Transportation Investment Act
- Title I – Multimodal and Freight Transportation
- Title II – Rail
- Title III – Motor Carrier Safety
- Title IV – Highway and Motor Vehicle Safety
- Title V – Research and Innovation
- Title VI – Hazardous Materials
- Title VII – General Provisions
- Title VIII – Sport Fish Replenishment and Recreational Boating Safety

Division C – Transit

Division D – Energy

Division E – Drinking Water and Wastewater Infrastructure

Division F – Broadband

Division G – Other Authorizations

Division H – Revenue Provisions

Division I – Other Matters

Division J – Appropriations

Division K – Minority Business Development

Division A - Surface Transportation
- Title I – Federal-Aid Highways
- Tile II – TIFIA
- Title III – Research, Technology and Education
- Title IV – Indian Affairs

Division B – Surface Transportation Investment Act
- Title I – Multimodal and Freight Transportation
- Title II – Rail
- Title III – Motor Carrier Safety
- Title IV – Highway and Motor Vehicle Safety
- Title V – Research and I
- Title VI – Hazardous Ma
- Title VII – General Provi
- Title VIII – Sport Fish Re

Division C – Transit
Division D – Energy
Division E – Drinking W
Division F – Broadband
Division G – Other Auth
Division H – Revenue P
Division I – Other Matte
Division J – Appropriati
Division K – Minority Business Development

$1.2 Trillion
- Includes the "regular" 5-year surface transportation funding
- Roughly half is "new money"

Highway Economics

- **11404** – Funding for integrated congestion relief management system that includes: “deployment and operation of a system that implements or enforces high occupancy vehicle toll lanes, cordon pricing, parking pricing, or congestion pricing”
- **11504** – Study of impacts on roads from self-driving vehicles
- **11511** – Report on alternative fueled vehicle and charging infrastructure

Mileage Taxes

- **11530** – Within 4 years “a highway cost allocation study to determine the direct costs of highway use by various types of users.” Most recent 1997.
- **13001** – Program “to test the feasibility of a road usage fee and other user-based alternative revenue mechanisms to help maintain the long-term solvency of the Highway Trust Fund, through pilot projects at the State, local, and regional level”
- **13002** – National motor vehicle per-mile user fee pilot

Travel Demand

- **11205** – Survey of demand forecasting methods used by MPOs
- **13010** – Transportation access pilot program – MPOs to measure accessibility

Safety Research

- **11122** – Research program on roadway design and safety countermeasures to minimize fatalities to vulnerable road users (pedestrians and cyclists)
- **22402** – Upgrade rail-highway grade crossing accident prediction and severity model
- **22422** – National Academies study on trains longer than 7,500 feet (roughly 120 cars)
- **23006** – Motor carrier crash causation study
- **24108** – eScooters to be identified in the FARS database

The Infrastructure Bill and Regulatory Economics Research

Frank A. Wolak
Director, Program on Energy and Sustainable Development
Professor, Department of Economics
Stanford University
wolak@zia.stanford.edu
http://www.stanford.edu/~wolak

1

1

Purpose of Talk

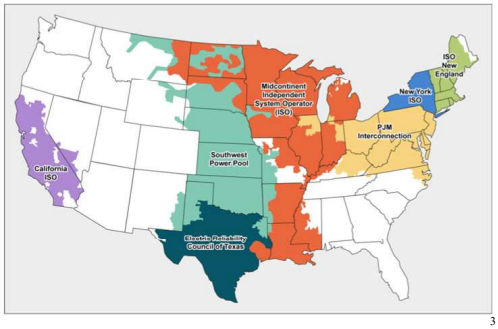
- Identify areas for regulatory economics research related to infrastructure bill
- Focus on energy sector
  - Bill is over 1,000 pages long
- Energy transition is a major focus of the bill
  - Reduce carbon content of electricity sector
  - Electrify sectors that traditionally use fossil fuels
    - Space heating
    - Transportation
  - Support technologies for short-term and long-term storage
    - Batteries
    - Hydrogen
  - Support alternative zero carbon technologies
    - Modular nuclear reactors

2

2

Background

Majority of electricity delivered to US consumers flows through a formal offer-based wholesale market

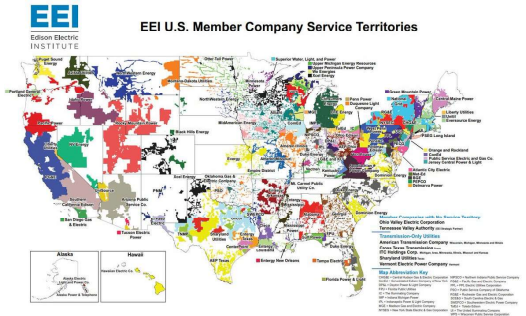


3

3

Background

Transmission planning and revenue recovery historically takes place at utility service territory level, but this is changing to ISO level



4

4

Regulatory Economics

- Benefits of transmission expansions in wholesale market regime different from benefits in vertically-integrated monopoly regime
  - Transmission expansion in vertically-integrated (VI) monopoly regime improves performance of *imperfectly regulated monopoly*
    - *Benefits = Reduction in cost to serve demand*
  - Transmission expansion in wholesale market (WM) regime improves performance of *imperfectly competitive wholesale market*
    - *Benefits = Reduction of wholesale energy costs to serve demand (includes market power rents)*
- Conclusion—Efficient amount of transmission capacity differs across the two regimes
  - See Wolak (2020) "Transmission Planning and Operation in the Wholesale Market Regime" (on web-site)

5

5

Planning Criteria in VI Monopoly Regime--Engineering Reliability

- Enough transmission capacity so that
  - Demand at all locations in network can be met with pre-specified probability
  - Assuming that vast majority of generation units in network are owned and operated by same entity
- Because of structure of regulatory process in VI monopoly regime, firm has strong incentive to operate its generation units to limit congestion
  - Utility interested in minimizing total cost of supplying all of retail load subject to transmission and generation unit operating constraints
  - No incentive to operate high cost units more intensively to increase locational price differences
    - This only increases total cost of VI utility, which reduces its profits
    - VI utility's revenue stream is independent of its actions once it output price is set by regulatory process

6

6

Planning Criteria in WM Regime Economic Reliability

- Sufficient transmission capacity so that all locations in the network face significant competition from enough independent suppliers to cause them to bid close to their marginal cost curve the vast majority of hours of the year
  - All suppliers face sufficiently elastic residual demand curves a large fraction of hours of the year
- Generation divestiture decisions can increase the economic reliability of a given transmission network
  - To the extent that significant generation divestiture cannot be implemented, more transmission investment or local market power mitigation mechanism (LMPM) may be needed to achieve economic reliability
- Transmission network facilitates commerce in same way that inter-state highway system facilitates commerce US economy
  - US Highway system built at a cost of 330 billion 1996 dollars
  - Net benefits from system vastly in excess of this magnitude

7

7

Renewable Energy is in our Future

- Wind and solar energy are considered major sources of low carbon energy
  - Intermittent—Energy can be produced only when wind and sunlight exists
  - Non-dispatchable—Can only obtain energy that is available
  - Location specific—Resource only exists at specific locations
  - Zero variable cost—No input fuel cost
- Dispatchable generation capacity still needed to serve demand during all hours of the year
  - Natural gas or hydrogen as input fuel
- Transmission network was not designed to provide major US load centers with access to least cost sources of renewable generation
  - Transmission network designed to deliver high capacity factor generation (primarily coal and natural gas-fired) to major load centers

8

8

Transmission Expansions

- Massive transmission network investments are required to deliver wind and solar to major load centers in US
  - Infrastructure bill provides significant support for transmission network investments—Sections 40101 to 40110
    - Designation of National Interest Electric Transmission Corridors
      - This has been tried before without much success
- Regulatory Economics Research Questions
  - How should the economic benefits of these transmission investments be assessed?
    - Measuring the Competitiveness Benefits of a Transmission Investment Policy: The Case of the Alberta Electricity Market (on web-site)
    - Using Market Simulations for Economic Assessment of Transmission Upgrades: Applications of the California ISO Approach (on web-site)
      - Compute distribution of expected competitiveness benefits due to improvements in market performance
  - How should costs of beneficial investments be recovered
  - How to get beneficial investments to approved
    - All transmission projects create winners and losers, transmission planning process must be designed to recognize this fact

9

9

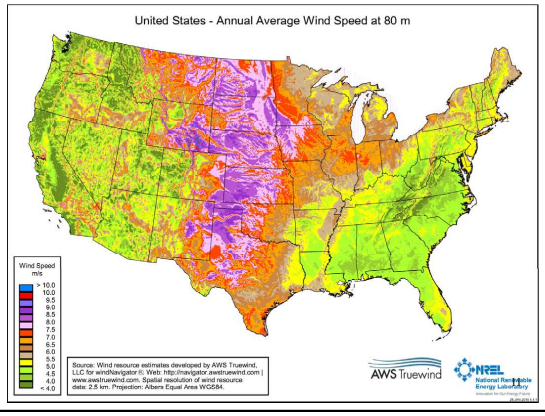
Storage Investments

- Both short-term and long-term energy storage facilities will be required to integrate large amounts of wind and solar resources
  - Infrastructure bill provides support for
    - Batteries (short-term storage)—Sections 40111, 40112 and 40207
    - Hydrogen (long-term storage)—Sections 40311 to 40315
- Regulatory Economics Research Questions
  - How should electricity transmission network and natural gas/hydrogen delivery network be planned
    - How should benefits of coordination of upgrades of networks be accounted for in the planning process
  - Long durations of low renewables output must be managed
    - Managing greater volatility in natural gas/hydrogen deliveries
    - Financing and pricing hydrogen and natural gas storage facilities
  - Can storage resources provide regulated services?
    - Storage as a substitute for a transmission upgrade
    - How should this service be priced?
    - How can storage sell competitively supplied products?

10

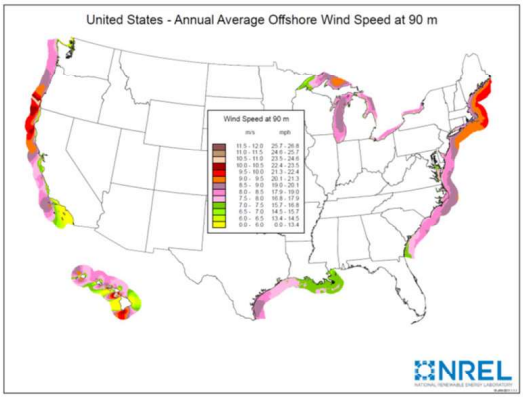
10

Land Wind Resources in US

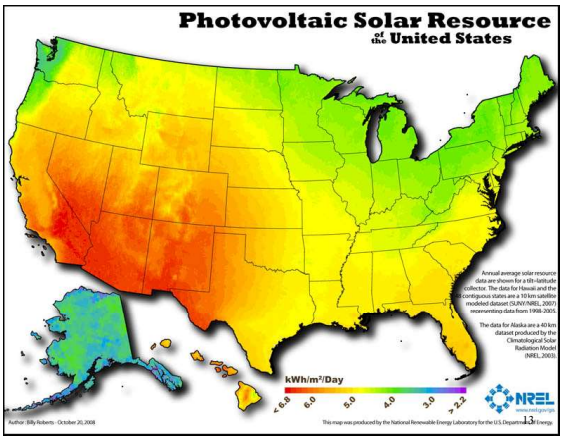


11

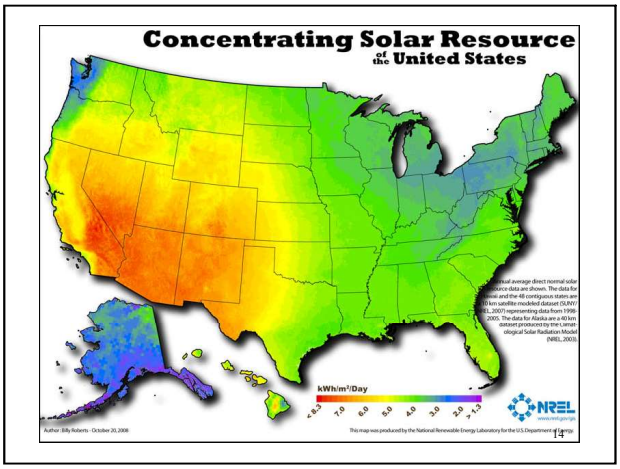
Off-Shore Wind Resources in US



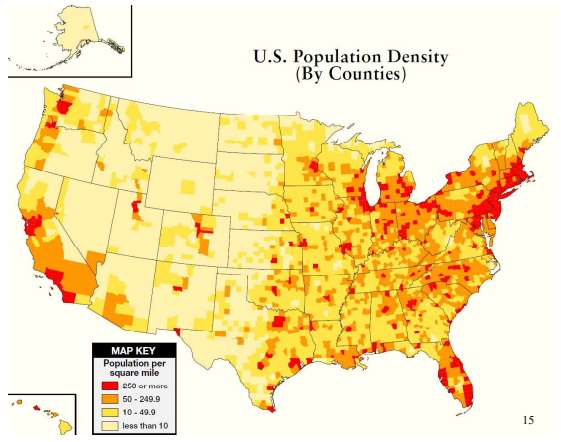
12



13



14



15

Nuclear Energy

- Nuclear energy is a dispatchable zero carbon source of electricity that can be sited close to load centers
- Recent advances in small modular reactors can reduce siting costs, construction costs, and licensing costs
  - Sections 40321 to 40323 provide support for nuclear energy infrastructure
- Regulatory Economics Questions
  - How can small modular reactors realize these potential savings?
  - What financial models are necessary to finance their construction?
  - How are costs of liability insurance for reactor safety shared?
  - How to integrate nuclear energy into existing low carbon support mechanisms
    - Zero carbon portfolio standard

16

16

Final Comments

- Infrastructure bill has the potential to significantly spur energy transition
  - Given the investment dollars needed for the energy transition, it is important to use public funds prudently
  - Easy to see how each program in bill could be used to distribute funds to politically favored groups
- Regulatory economics researchers can provide valuable input into the design of policies that achieve greatest carbon reductions per dollar of public funds spent

17

17

Questions/Comments

For more information

http://www.stanford.edu/~wolak

18

18