The Brattle Group

Easier Said Than Done: The Continuing Saga of Transmission Cost Allocation

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Presented to:
Harvard Electricity Policy Group

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Transmission Investments: Historic Trend

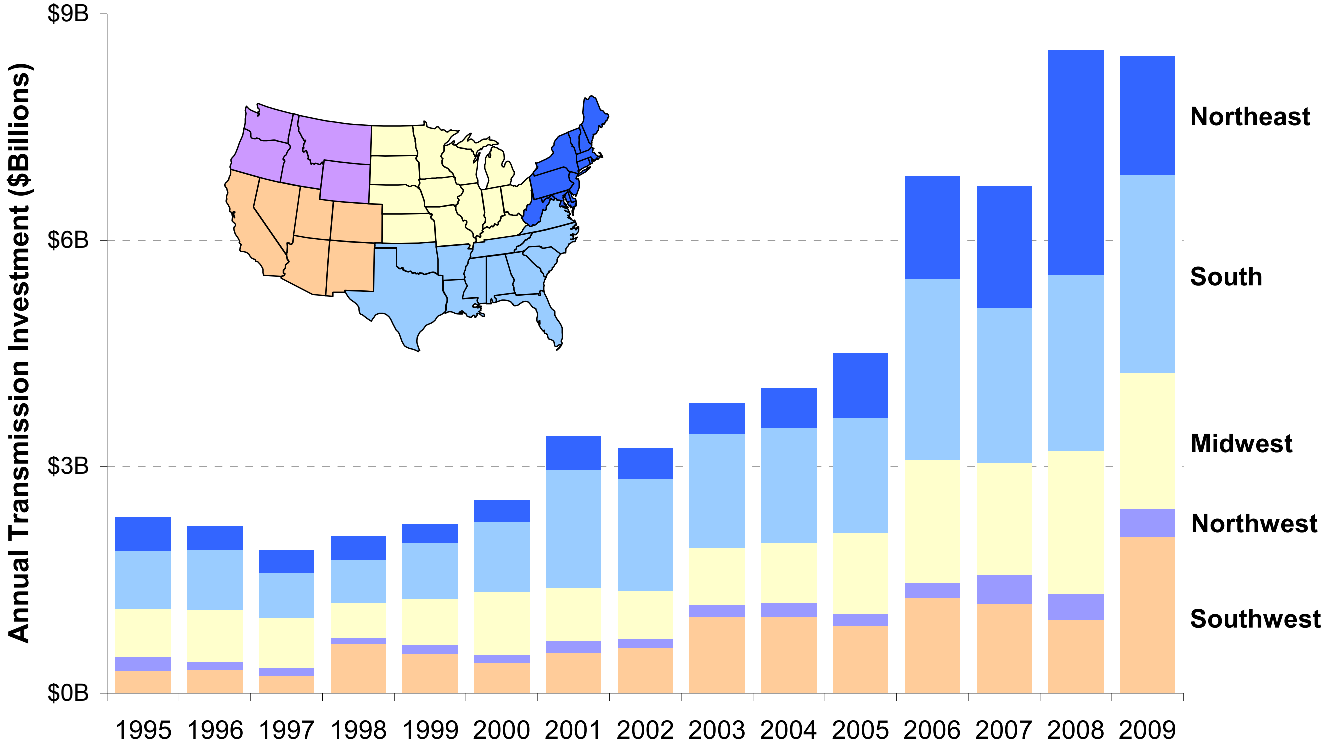
Significant increase in transmission investments:

- $2b/year by 1990s
- $8b/year in 2008-09

Both NERC and EEI predict investments to increase further over next 3-5 years

Drivers shifting from reliability needs to economic and RPS-related needs

Annual Transmission Investment of Investor-Owned Transmission Providers by FERC Subregion (Nominal Dollars)



Source: *The Brattle Group* based on FERC Form 1 data compiled by Global Energy Decisions, Inc., The Velocity Suite.

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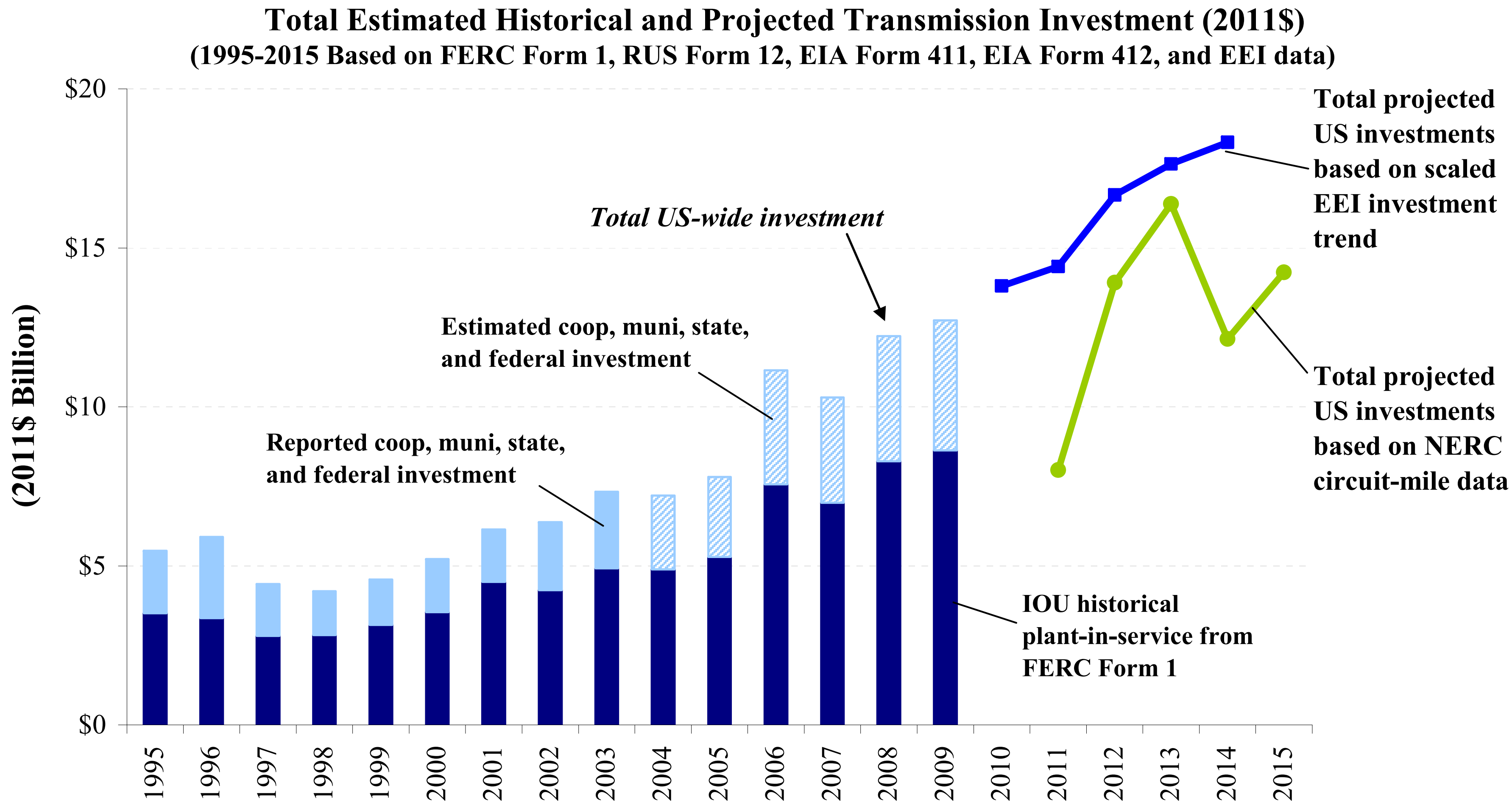
Transmission Investments: U.S. Total Through 2015



Notes: 1995-2009 historical additions to plant-in-service by IOUs (FERC Form 1 reporting entities); 1995-2003 historical plant additions by cooperative/municipal, federal/state power agencies, and other transmission owners based on RUS Form 12 and EIA Form 412 for overlapping years; 2004-2009 estimated plant additions by cooperative/municipal, federal/state power agencies, and other transmission owners based on share of projected circuit-miles in EIA Form 411; 2010-2015 FERC-based estimate of forecasted total plant additions (based on EEI projections); and 2011-2015 NERC-based estimate of forecasted plant additions ≥100kV (based on NERC/EIA Form 411 and EEI project survey cost estimates). The Brattle Group's analysis of FERC Form 1 data compiled in Ventyx's Velocity Suite. All nominal dollars restated in 2011$ based on the Handy-Whitman Index of Public Utility Construction Costs up through 2009 and the EIA's 2011 Annual Energy Outlook projected annual inflation thereafter.

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Transmission Investment: Longer-term Outlook

Likely $12-18 billion per year through 2015:

$65-85 billion … based on NERC and EEI projections

~70% by investor-owned companies

Brattle database for $180 billion of major projects

$30 billion … already in RTO-approved plans
$80 billion … additionally proposed (non-overlapping)

$50-100 billion in US-wide incremental transmission needed to integrate renewables through 2025:

- To satisfy **existing state-level RPS** requirements

$40-70 billion

- For **higher of existing state and 20% federal RPS**

$80-130 billion

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Cost Allocation: What Works and What Doesn't

Existing cost allocation and recovery processes have varying degrees of effectiveness

- **Works well:** cost recovery for traditional single-utility, single-state projects built to satisfy reliability needs
- **Mostly works:** cost allocation and recovery at the RTO level for reliability-driven regional projects and *conventional* generator interconnection requests
  - Some unintended consequences of existing RTO cost allocation framework
  - MISO's assignment of wind integration costs illustrates difficulties
- **Still mostly unresolved:** Cost allocation and recovery for all other types of regional projects, including "economic" projects, *renewable integration* projects, EHV overlay projects, and any multi-purpose projects
  - ERCOT and CAISO (two single-state ISOs) first resolved cost allocation for multi-utility, multi-purpose, and renewable integration projects
  - SPP and Midwest ISO now have cost allocation for regional projects (approved by FERC in July and December), though still untested
  - Other RTOs and regions have only started to address this issue
  - Court remand of PJM postage stamp tariff creates additional uncertainty
  - FERC NOPR: delegation of cost allocation to each "region"

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Cost Allocation: A Barrier for Regional Projects

Planning, permitting, and cost allocation process is "easier" (and more sequential) for single-state projects:

- Planning determines need (e.g., overall benefits in excess of total project costs)
- State permitting/regulatory process confirms need and approves project
- Approved projects receive cost recovery from customers within state
- Still, some challenges for in-state projects with regional benefits (e.g., Brookings line in MN)

Interaction between cost allocation and permitting creates barrier for many multi-TO, multi-state projects:

- Permitting processes primarily focused on costs and benefits to each individual state: share of benefit in excess of allocated share of costs
- "Beneficiary pays" framework creates incentives to dismiss difficult-to-quantify benefits to achieve lower cost allocation
- Result: projects that are beneficial to region often do not appear to be beneficial to individual states based on their shares of costs and benefits`

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Cost Allocation: The Fight Over “Measurable” Benefits

CAISO, SPP, MISO and ERCOT:

- Postage stamp allocation for policy-driven regional projects based on showing (or belief) that **benefits broadly accrue to region** as a whole

FERC NOPR:

- Allocation should be based on “cost causation” or “beneficiary” principles
- Should be “**at least roughly commensurate with estimated benefits**”; those that receive no benefit must not be allocated costs involuntarily
- Postage stamp may be appropriate if all customers tend to benefit from class or group of facilities or if distribution of benefits is likely to vary over long life of facilities
- FERC will use backstop cost-allocation authority if no agreement is reached amongst regional stakeholders

Proposed new legislation (Corker et al.)

- “…no rate…shall be considered just and reasonable unless…based on an allocation of costs…reasonably proportionate to **measurable economic or reliability benefits [to] 1 or more persons** that pay the rate…”

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Transmission Benefits: To Whom and When?

The benefits of regional transmission projects are:

▪ **Broad in scope**	• Renewables integration and environmental benefits • Economic development from G&T investments • Increased reliability and operational flexibility • Reduced congestion, dispatch costs, and losses • Lower capacity needs and generation costs • Increased competition and market liquidity • Insurance and risk mitigation benefits • Fuel diversification and fuel market benefits
▪ **Wide-spread geographically**	• Multiple transmissions service areas • **Multiple states** or regions
▪ **Diverse in their effects on market participants**	• **Customers**, **generators**, **transmission owners** in regulated and/or deregulated markets • Individual market participants may capture one set of benefits but not others
▪ **Occur and change over long periods of time**	• Several decades • Changing with system conditions and future generation and transmission additions • Individual market participants may capture different types of benefits at different times

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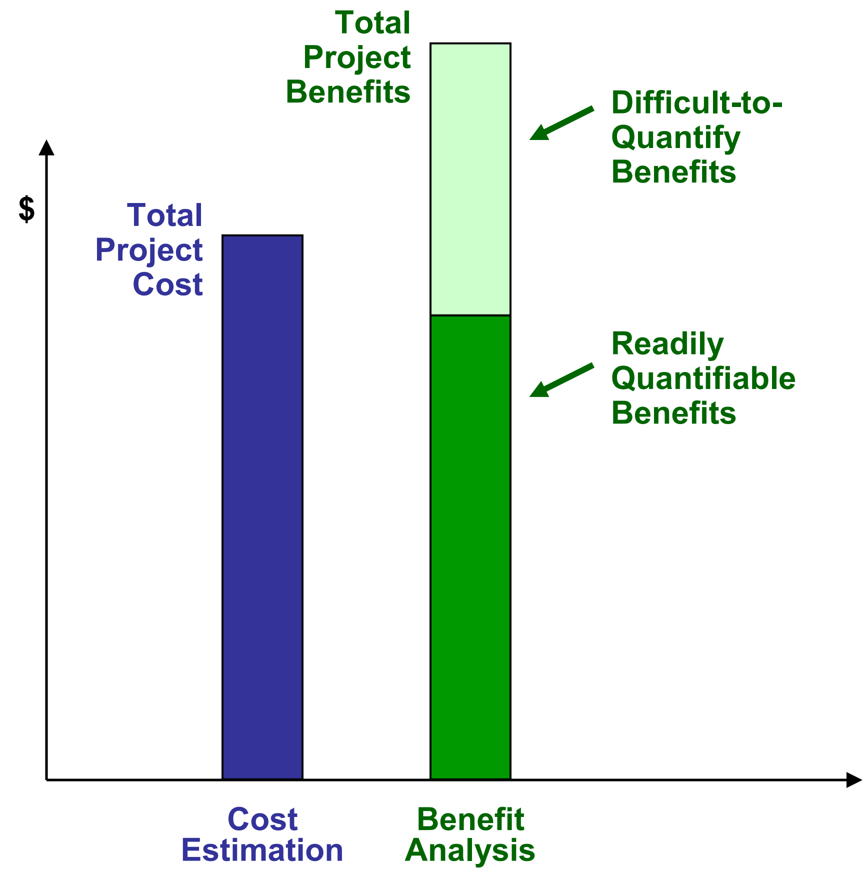
Implications of “Difficult to Quantify” Benefits

Planning processes need to recognize that many transmission benefits are difficult to quantify

- There are no “unquantifiable” or “intangible” benefits!
- Difficult-to-quantify benefits need to be explored and considered at least qualitatively
- Standard economic analysis tools (e.g., production cost models) capture only a portion of transmission-related benefits

Failure to consider difficult-to-quantify benefits can lead to rejection of desirable projects:

- Total benefits > Costs
- Quantified benefits < Costs



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Understated Benefits "Built Into" Many Models

Narrow focus on "production cost" simulation models understates transmission-related benefits

- Production cost models quantify short-term dispatch cost savings but cannot capture a wide range of transmission-related benefits:

  "The real societal benefit from adding transmission capacity comes in the form of enhanced reliability, reduced market power, decreases in system capital and variable operating costs and changes in total demand. The benefits associated with reliability, capital costs, market power and demand are not included in this [type of] analysis."

  (SSGWI Transmission Report for WECC, Oct 2003; emphasis added)

- Narrow or unrealistic modeling assumptions and simplistic benefit metrics fail to capture full impact of transmission buildout
- Process fails to capture important (but hard to quantify) benefits of regional transmission projects

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Important Transmission Benefits are Often Ignored

"Production cost" studies quantify dispatch cost and LMP impacts, without considering:

♦ Enhanced market competitiveness ♦ Enhanced market liquidity	Additional market benefits
♦ Economic value of reliability benefits ♦ Added operational and A/S benefits ♦ Insurance and risk mitigation benefits	Reliability/operational benefits
♦ Capacity benefits ♦ Long-term resource cost advantage ♦ Synergies with other transmission projects	Investment and resource cost benefits
♦ Impacts on fuel markets ♦ Environmental and renewable access benefits ♦ Economic benefits from construction and taxes	External benefits

These omitted transmission-related economic benefits, **often doubling the benefits from production cost studies**, make formulaic beneficiary-pays cost allocation approaches unworkable

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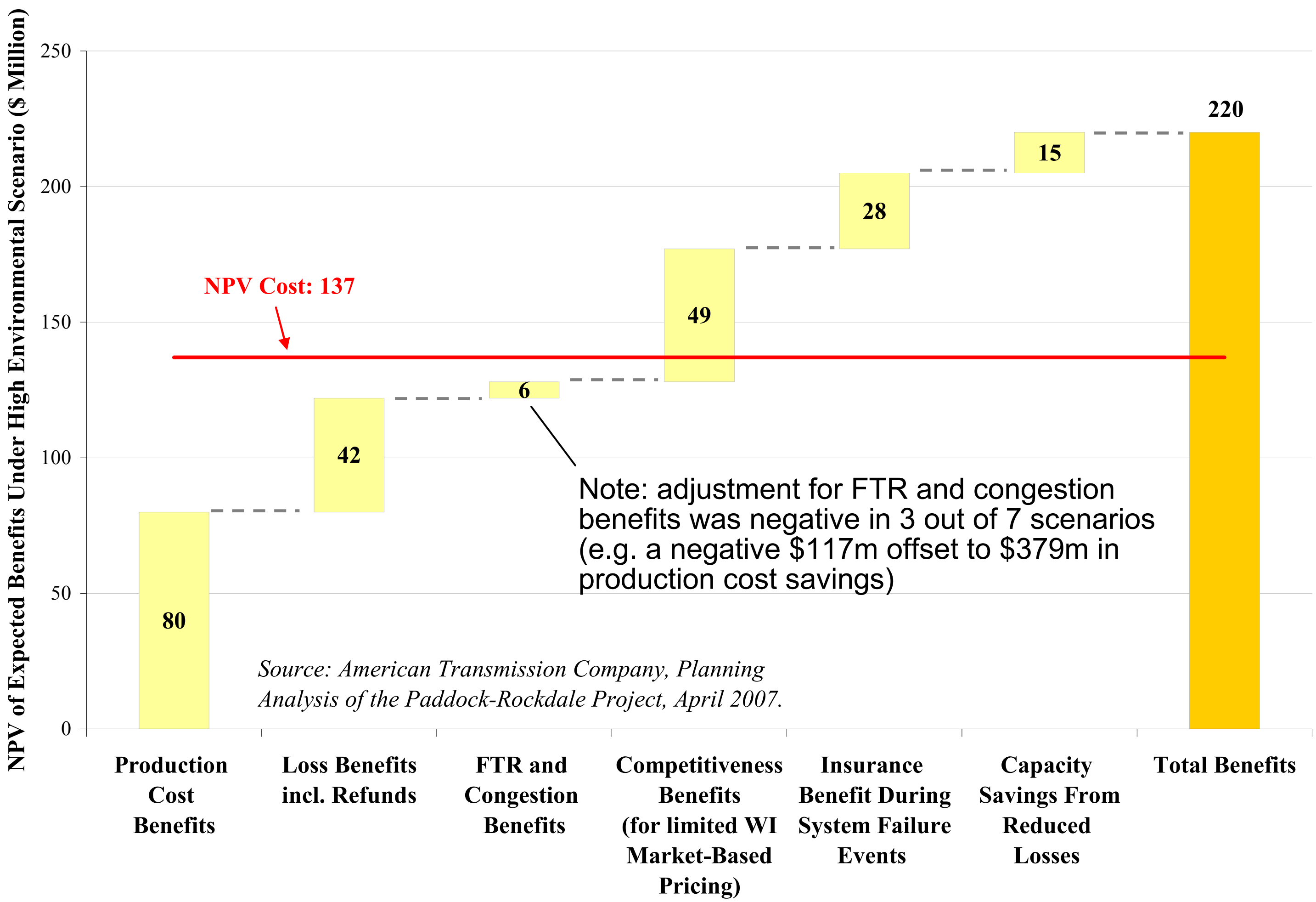
These “Other” Benefits Can Be Large

Example: Production cost savings were insufficient in some scenarios of ATC’s Paddock-Rockdale study



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Total Benefits vs. Benefits that Can be Allocated

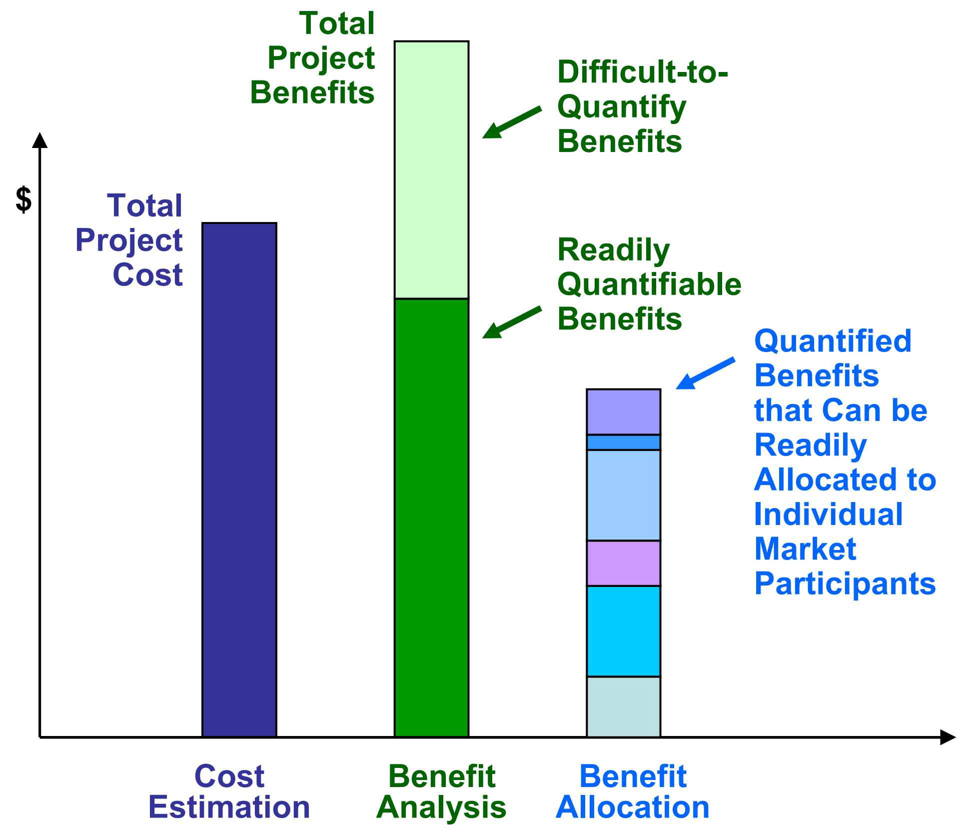
Analysis of overall project benefits should be done prior to and separate from analyses to determine how costs should be allocated

Recommend 2-step approach:

1. Determine whether a project is beneficial to the region
2. Evaluate how the cost of beneficial projects should be allocated

Because:

- Benefits that can be allocated readily or accurately tend to be only a subset of readily-quantifiable benefits
- Relying on allocated benefits to assess overall project economics would result in rejection of some desirable projects



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Cost Allocation for Projects vs. Regional Plans

- Cost allocation frequently unworkable or not even meaningful on a project-by-project basis
  - Sum of benefits of individual projects are often significantly less than the overall benefits of a comprehensive regional plan ➔ resulting in rejection of desirable projects
- Cost allocation less contentious for regional plans than individual projects
  - Estimated benefits will be more uniform across region for regional plan than for individual projects ➔ allocation that is "roughly commensurate with estimated benefits" will be more uniform
  - Portfolio of projects in regional plans allows consideration different types of benefits to different types of stakeholders ➔ makes it easier to achieve multi-state agreements
- More uniform distribution of benefits allows for less complex cost allocation methodologies

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Takeaways: Cost Allocation – The Status Quo

- Cost allocation mostly resolved for reliability projects, conventional generation interconnections, in-state economic projects
- Despite years of effort, cost allocation remains number one barrier for multi-state, multi-utility transmission projects
  - Current tariffs complicated, unworkable for most new projects
  - Undermines transmission development needed for large-scale renewable integration (in particular out-of-footprint and regional overlay projects)
- TX and CA have mostly resolved issue (but much easier in single states)
- Some regional efforts approved by FERC
  - SPP highway-byway allocation developed by State Committee
  - MISO postage stamp for "multi-value" projects (already litigated)
- Some options are available to bypass RTO cost recovery through merchant or regulated bilateral contracts

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Takeaways: Options and Recommendations

- Strong support from (or direct involvement by) state policy makers needed to achieve regional or sub-regional solutions
  - RTOs, transmission owners, and market unlikely to move beyond least-common denominator approaches without multi-state support
  - State commissions often lack “authority” to consider broader policy objectives and negotiate regional solutions without support from state policy makers
- The “perfect solution” to regional cost allocation is what state policy makers can support (i.e., economically perfect won’t be good enough)
- Aggregate and simplify!
  - Formulaic “beneficiary pays” concepts (an economist’s dream) unworkable due to broad range and wide-spread nature of transmission-related benefits
  - Aggregation of projects into regional or subregional plans simplifies and facilitates multi-state cost allocation
  - Regional or sub-regional postage stamp tariffs (including injection-withdrawal approaches) offer hope for workable “second-best” solutions
  - Similar postage-stamp rates from state-led efforts (CA, TX, SPP, MISO)
- Federal cost-allocation backstop to facilitate timely multi-state allocation agreements

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Appendix

Cost Allocation Approaches

Brattle Database: Planned and Proposed Projects

Additional Reading

About *The Brattle Group*

Basic Cost Allocation and Recovery Approaches

Five widely-used methodologies to allocate and recover costs from transmission customers

1) License plate (LP): each utility recovers the costs of its own transmission investments (usually located within its footprint).
2) Beneficiary pays: various formulas that allocate costs of transmission investments to individual Transmission Owners (TOs) that benefit from a project, even if the project is not owned by the beneficiaries. TOs then recover allocated costs in their LP tariffs from own customers.
3) Postage stamp (PS): transmission costs are recovered uniformly from all loads in a defined market area (e.g., RTO-wide in ERCOT and CAISO).
   - In some cases (e.g., SPP, MISO, PJM) cost of certain project types are allocated uniformly to TOs, who then recover these allocated costs in their LP tariffs.
4) Direct assignment: transmission costs associated with generation interconnection or other transmission service requests are fully or partially assigned to requesting entity.
5) Merchant cost recovery (M): the project sponsors recover the cost of the investment outside regulated tariffs (e.g., via negotiated rates with specific customers); largely applies to DC lines where transmission use can be controlled.

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Summary of Current Cost Allocation Methodologies

LP = License Plate Tariffs; PS = Postage Stamp Tariffs or Postage Stamp Allocation; M = Merchant Lines; GI = Generation Interconnection Tariffs;
· = workable approach; n/a = workable approach not yet available

RTO/ Region	General Tariff Methodology	Reliability	"Economic" Projects	Renewables	Regional/Overlay Projects
CAISO	PS 100% ≥200kV; otherwise LP or M	✓	✓	✓ GI and location-constrained resource tariff (Tehachapi)	✓ Not specifically discussed, but 100% PS of all network facilities
ERCOT	PS or M	✓	✓	✓ CREZ (100% PS)	✓ Not specifically discussed, but 100% PS of all network facilities
SPP	PS 33% ≥60kV reliability projects; PS allocation for balanced portfolio; otherwise LP or M	✓	✓ "Balanced Portfolio" allocation	✓ GI; Highway/Byway PS treatment (untested)	✓ Highway/Byway PS treatment (untested)
Southeast	LP (utility specific tariffs)	✓	n/a	n/a (GI only)	n/a
ISO-NE	PS 100% ≥115kV; otherwise LP or M	✓	too narrowly defined	n/a (GI only)	n/a
PJM	PS sharing 100% ≥500kV; otherwise LP allocation (beneficiary pays) or M	✓	too narrowly defined	n/a (GI only)	n/a
MISO	PS sharing 20% ≥345kV; rest LP allocation (beneficiary pays) or M; pending MVP approach	✓	too narrowly defined	✓ Multi Value Project ("MVP") PS treatment (untested)	✓ MVP PS treatment (untested)
PJM-MISO	Sharing of reliability project based on net flows/beneficiaries	✓	too narrowly defined	n/a	n/a
NYISO	LP allocation (based on beneficiary pays) or M	✓	too narrowly defined	n/a (GI only)	n/a
WECC (non-CA)	LP; often with cost allocation based on co-ownership	✓	✓ (differs across WECC subregions)	✓ GI (*e.g.*, BPA open season); under discussion in WREZ	n/a – under discussion in WREZ

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New Tariff-Based Cost Recovery Approaches

New OATT-based approaches:

- CAISO:
  - Postage stamp for all network upgrades ≥200kV
  - *Tehachapi LCRI* approach: up-front postage stamp funding of project, later charged back to interconnecting generators, thereby solving chicken-egg problem
- ERCOT:
  - Postage stamp for all *CREZ* transmission being built to integrate 18,000 MW of new wind; build-out awarded to a diverse set of 7 transmission companies
- SPP:
  - $1.1 billion Priority Projects under FERC-approved postage stamp ("highway/byway") recovery
- MISO:
  - FERC approval of the "Multi Value Project" postage stamp recovery
- WECC:
  - Co-ownership of lines (within and out of footprint) based on contractual allocations of point-to-point capability to resolve cost allocation issue
  - BPA open season approach for >5,500 MW renewable generator interconnections
  - Northern Tier's multi-state cost allocation committee

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Non-Tariff-Based Cost Recovery Options

New cost recovery options that bypass the RTO's OATTs:

- Long-term merchant PPAs:
  - HVDC cable from PJM to LIPA financed with long-term PPA for capacity
  - Example: Neptune (independent transmission LLC)
- Merchant anchor tenant with open season:
  - Anchor tenant signs up for large portion of capacity, open season for rest
  - Standard model used for new pipelines
  - Example: Zephyr and Chinook HVDC lines (TransCanada)
- Regulated PPA with ISO operational control:
  - Utilities own transmission, sold bilaterally to generator at state regulated rates, buy bundled long-term PPA
  - Project under RTO operational control but bypasses RTO cost recovery
  - Example: NU-NSTAR-HQ HVDC link
- Participant funding with cost-based rates for transmission service:
  - Stand-alone transmission company to construct and own AC collector system and charge cost-based rates for long-term transmission, balancing, and firming service
- Mostly used for HVDC lines because (by being "controllable" like pipelines) they allow owners/customers to capture more of the benefits than from AC projects

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FERC NOPR: Cost Allocation Provisions

- **Regional cost allocation principles**
  - Allocation should be based on "cost causation" or "beneficiary" principles (should be "at least roughly commensurate with estimated benefits")
  - Costs can only be allocated to regions in which the facility is located
  - Those that receive no benefit must not be involuntarily allocated costs
  - Facilities located entirely within one transmission owner's service area do not require (but can be granted) regional allocation
  - Postage stamp may be appropriate:
    - If all customers tend to benefit from class or group of facilities
    - If distribution of benefits likely to vary over long life of facilities
  - FERC will use backstop cost-allocation authority if no agreement is reached amongst regional stakeholders
- **Interregional planning and cost allocation**
  - Regions need to share plans and coordinate planning processes
  - Requires cost allocation methodology for projects spanning both regions
  - Cost of facilities located solely in one region cannot be allocated to neighboring region (unless voluntarily/with agreement)

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Brattle Database: Planned and Proposed Projects

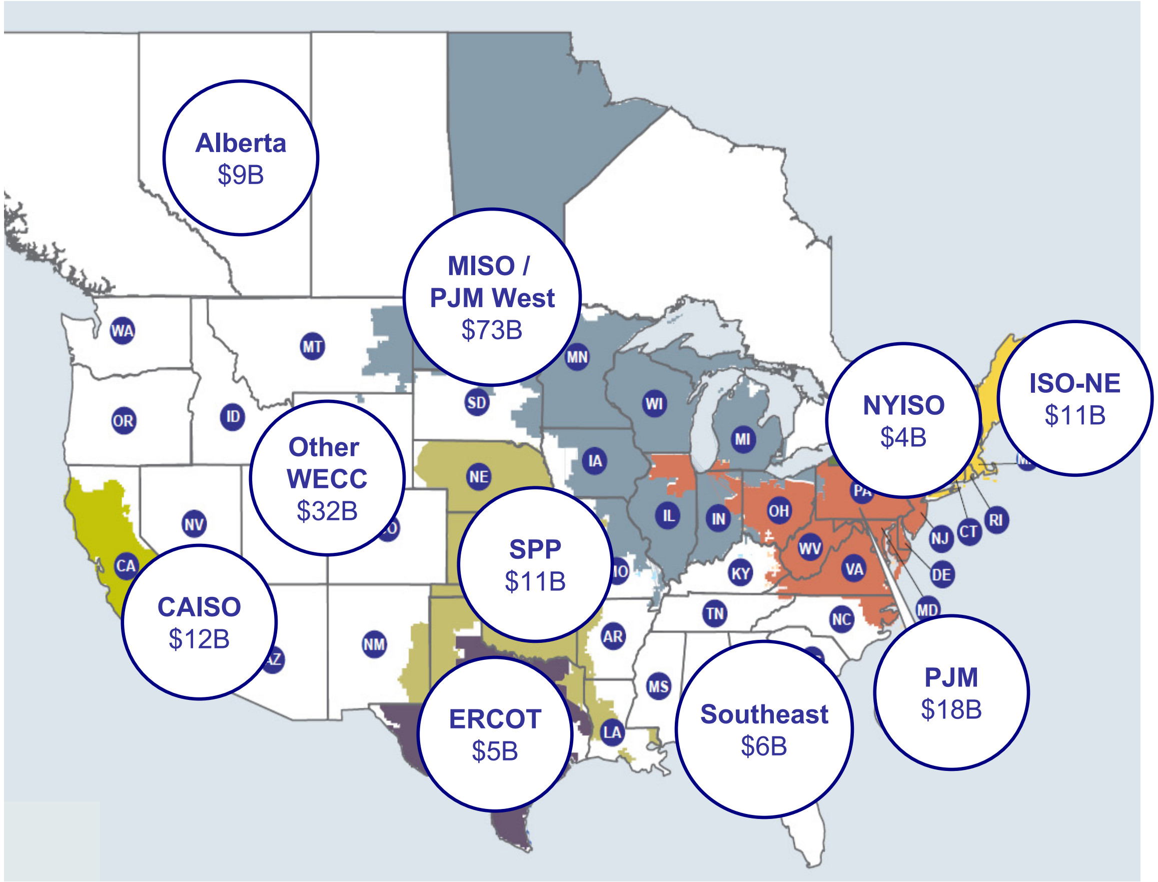
We identified approx.130 mostly conceptual and often overlapping projects (>$100 million each) for a total of over $180 billion

1/3 to 1/2 of these regional projects will not get realized due to:

- Overlaps with competing projects
- Planning and cost allocation challenge
- High costs

Large portion of these proposed projects are driven by large-scale renewables integration

$180 Billion of Planned and Conceptual Transmission Projects as of 9/10



Source: Map from FERC. Project data collected by *The Brattle Group* from multiple sources and aggregated to the regional level.

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Additional Reading

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The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governmental agencies around the world.

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- Mergers and Acquisitions
- Transmission

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