

Transmission Cost Allocation

Harvard Electricity Policy Group

September 30, 2010

William W. Hogan

Mossavar-Rahmani Center for Business and Government

John F. Kennedy School of Government

Harvard University

Cambridge, Massachusetts 02138

New Conventional Wisdom

- Put a Price on Carbon.
- Promote Energy Efficiency and Renewable Supply.
- Provide Bigger and Smarter Grids.

Old Controversial Wisdom

- Expand Regional Transmission Organizations (RTOs).
 - Open Access
 - Bid-Based, Security-Constrained, Economic Dispatch
- Adopt Smarter Pricing for Smarter Grids.
 - Dynamic Pricing
 - Reliability Pricing Impacts
- Develop Hybrid Transmission Expansion and Cost Allocation Framework.
 - Regional Scope
 - Beneficiaries Pay

Transmission Expansion

- **What to Build?** Smart grid, its complements and its substitutes. Reliability expansion, economic investments, and green strategies.
- **Where to Build?** Large scale remote connections or incremental expansions of the network. State and federal siting authority.
- **Who Pays?** Socialize the costs or emphasize the principle that beneficiaries pay.
- **Who Decides?** Congress, regulators, system operators, load serving entities, and merchant investors. Central planning or a hybrid system.

Transmission Uncertainty

What to Build, Where to Build, Who Pays, and Who Decides?

- “We know where the wind blows. We know where the loads are going to go. We know absolutely beyond the shadow of a doubt what the RPS standards are. Yet we want to design these [lines] one at a time and build a spaghetti network that’s both inefficient and ineffective, where we could just make the calculation.” Joseph Welch, ITC, in PUF, March 2009, p. 24.
- “In May 2007, the Arizona Corporation Commission unanimously rejected SoCal Ed’s proposed [line] between Arizona’s Palo Verde hub and Southern California. ... ACC commissioners, in part, were concerned that California would reap the benefits of Arizona’s generating capacity, while Arizona ratepayers would be stuck with higher costs.” “Southern California Edison officials said Friday that the utility will ... cease efforts to develop ... the project has become uneconomic. ... Changes in the economic picture include an increase in expected renewable resources, reduced differences between Arizona and California fuel supplies, and a drop in California electricity demand, due to the economic downturn, [Pedro] Pizarro said.” Megawatt Daily, May 18, 2009, p. 7.

Transmission Beneficiaries

What to Build, Where to Build, Who Pays, and Who Decides?

Identifying Beneficiaries

Change in Zonal Load Payments & FTR Credits
associated with 502 Junction-Loudoun Line



Zone	2007 Base Simulation w/o 502Junc-Loudoun line		2007 Base Simulation w/ 502Junc-Loudoun line		Delta Load Payment		Delta FTR Credit	Delta Load Payment minus Delta FTR Credit	
	Load Payment (\$)	\$/MWh	Load Payment (\$)	\$/MWh	(\$)	\$/MWh	(\$)	(\$)	\$/MWh
ACEC	618,618,364	51.82	603,210,345	50.53	-15,408,019	-1.29	-1,545,577	-13,862,443	-1.16
AEP	5,371,261,726	38.64	5,595,666,290	40.26	224,404,564	1.61	62,015,390	162,389,174	1.17
APS	2,339,348,764	45.29	2,382,018,354	46.11	42,669,590	0.83	-410,427,673	453,097,263	8.77
BG&E	1,978,166,180	56.11	1,760,499,769	49.94	-217,666,411	-6.17	-36,804,827	-180,861,584	-5.13
COED	4,164,080,516	39.18	4,310,488,946	40.56	146,408,430	1.38	-5,349,609	151,758,039	1.43
DOM	5,183,001,308	54.51	4,627,398,244	48.67	-555,603,064	-5.84	-358,988,286	-196,614,778	-2.07
DP&L	724,908,697	38.66	752,371,800	40.12	27,463,104	1.46	-5,745,651	33,208,754	1.77
DPLC	1,027,352,040	51.93	997,157,085	50.40	-30,194,955	-1.53	-5,172,447	-25,022,508	-1.26
DQE	558,563,943	38.06	617,669,745	42.09	59,105,802	4.03	16,292,179	42,813,622	2.92
JC	1,306,051,858	52.09	1,282,434,900	51.15	-23,616,958	-0.94	-10,442,764	-13,174,194	-0.53
ME	793,076,158	50.33	770,322,760	48.89	-22,753,399	-1.44	-16,144,623	-6,608,776	-0.42
PECO	2,139,352,180	51.56	2,096,785,257	50.29	-52,566,923	-1.27	-4,894,038	-47,672,885	-1.15
PEPCO	1,933,019,895	57.97	1,676,834,934	50.29	-256,184,961	-7.68	-17,042,605	-239,142,356	-7.17
PN	771,591,700	42.62	810,742,112	44.79	39,150,412	2.16	-9,748,947	48,899,359	2.70
PPL	2,091,095,307	49.06	2,052,912,311	48.16	-38,182,996	-0.90	-28,820,188	-9,362,808	-0.22
PSEG	2,501,069,258	51.53	2,454,367,529	50.57	-46,731,729	-0.96	-5,518,397	-41,213,332	-0.85
RECO	79,706,373	52.27	78,395,461	51.41	-1,310,912	-0.86	-71,899	-1,239,013	-0.81
Neptune	283,516,438	47.25	278,529,398	46.42	-4,987,040	-0.83	-108,482	-4,878,558	-0.81
Total	33,863,810,704	46.72	33,137,805,238	45.72	-726,005,466	-1.00	-838,518,441	112,512,976	0.16

Market Efficiency Analysis Progress Report, PJM Planning Committee Transmission Expansion Advisory Committee, April 18, 2007.

Hybrid Transmission Framework

What to Build, Where to Build, Who Pays, and Who Decides?

- Some of the requirements of a hybrid system seem clear. Property rights must be defined for the transmission investor. Cost allocation must follow the beneficiary pays principle. Decisions should defer to market choices when there is no compelling evidence of a market failure. There must be a mechanism to separate cases where regulated investments mandates would be appropriate from those where market choices should prevail.
- “The proposed cost allocation mechanism is based on a ‘beneficiaries pay’ approach, consistent with the Commission's longstanding cost causation principles. ... Beneficiaries will be those entities that economically benefit from the project, and the cost allocation among them will be based upon their relative economic benefit. ... The proposed cost allocation mechanism will apply only if a super-majority of a project's beneficiaries agree that an economic project should proceed. The super-majority required to proceed equals 80 percent of the weighted vote of the beneficiaries associated with the project that are present at the time of the vote.” New York Independent System Operator, Inc Docket No. OA08-13-000, “Order No. 890 Transmission Planning Compliance Filing,” Cover Letter Submitted to Federal Energy Regulatory Commission, December 7, 2007, pp. 14-15.

Expansion Cost Allocation

What to Build, Where to Build, Who Pays, and Who Decides?

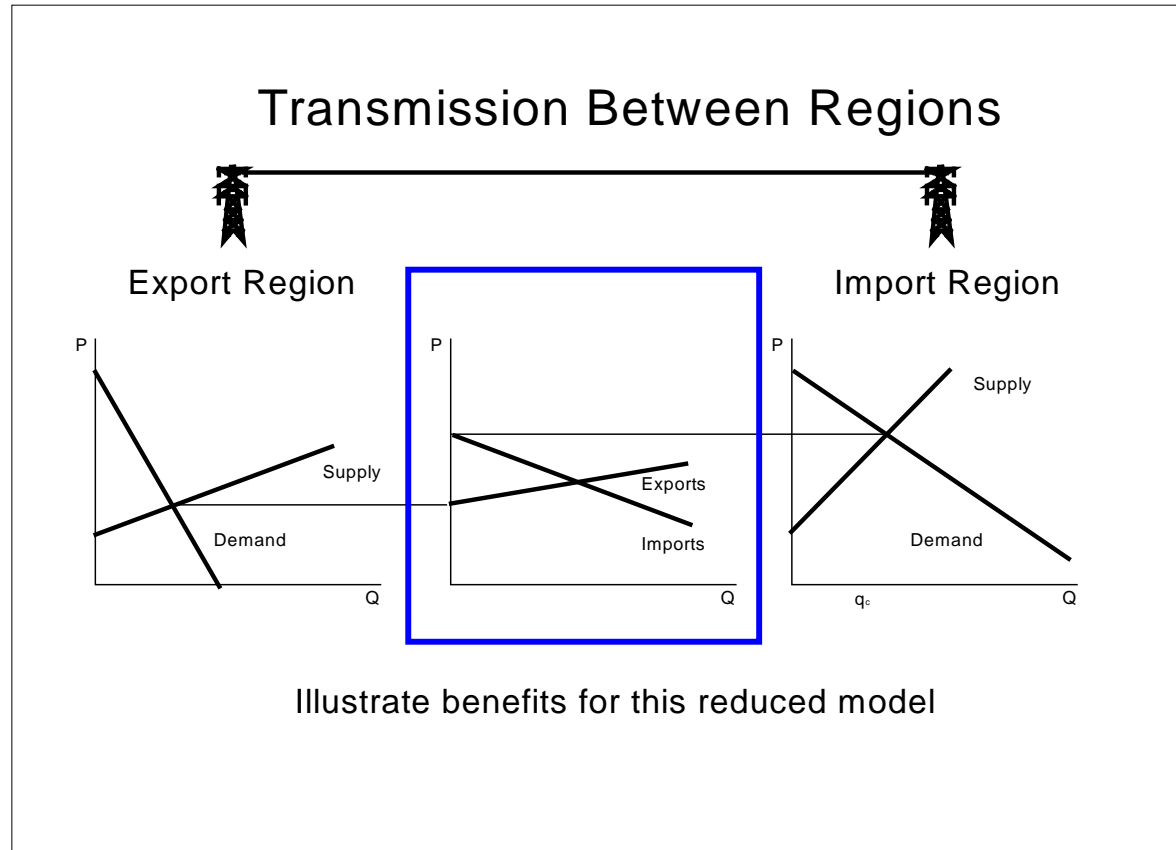
- Beneficiary Pays
 - Gold Standard: Net Benefits > Total Cost
 - Cost Sharing: Commensurable with Benefits
 - Compatible with Larger Market Design
- Ex ante
- Net Benefits = Change in Expected Social Welfare
 - Counterfactual
 - Uncertainty
- Approximations
 - Reliability
 - Economic
 - Policy

Transmission Cost Allocation

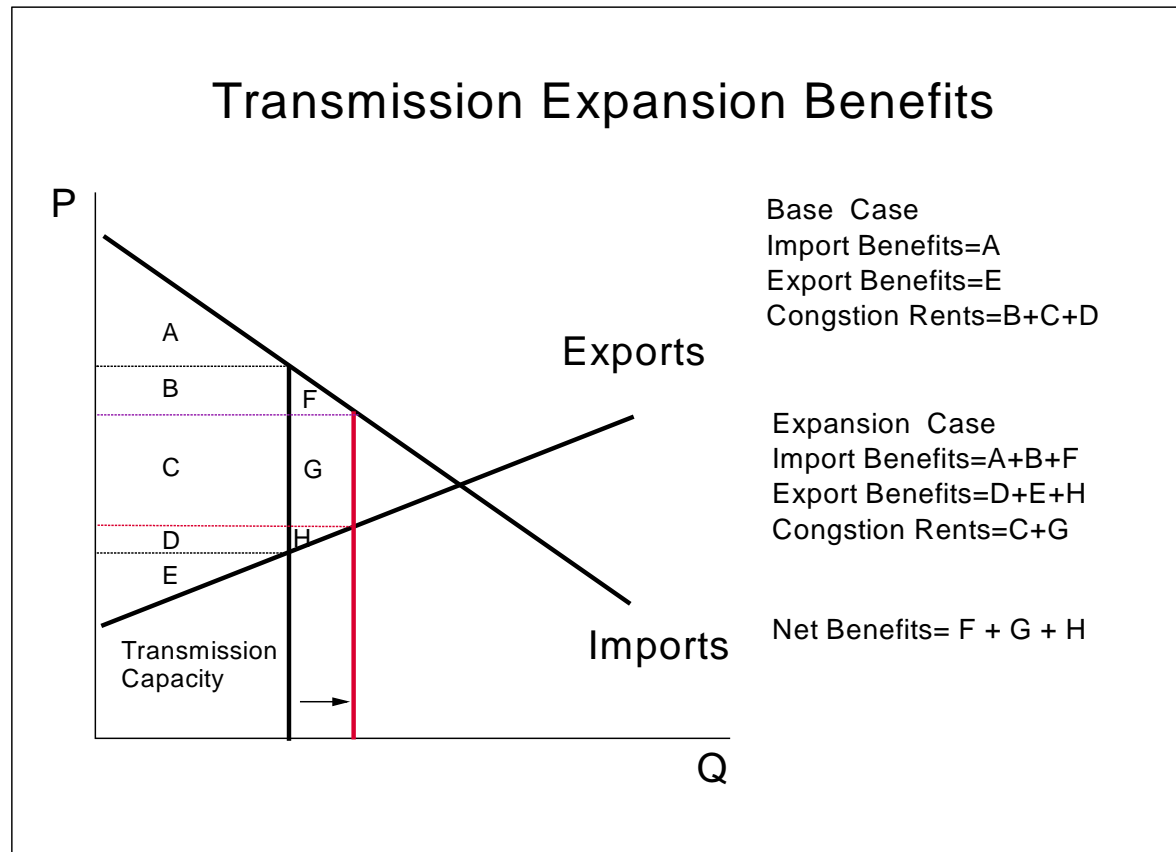
What to Build, Where to Build, Who Pays, and Who Decides?

- Beneficiary Pays
 - “The cost of transmission facilities must be allocated to those within the transmission planning region that benefit from those facilities in a manner that is at least roughly commensurate with estimated benefits.” (NOPR, p. 91)
- Ex ante evaluation of benefits and beneficiaries
 - “Those that receive no benefit from transmission facilities, either at present or in a likely future scenario, must not be involuntarily allocated the costs of those facilities.” (NOPR, p. 91)
 - “For example, a postage stamp cost allocation method may be appropriate where all customers within a specified transmission planning region are found to benefit from the use or availability of a facility or class or group of facilities (e.g., all transmission facilities at 345 kV or higher), *especially if the distribution of benefits associated with a class or group of facilities is likely to vary considerably over the long depreciation life of the facilities amid changing power flows, fuel prices, population patterns, and local economic developments.*” (NOPR, p. 94, emphasis added)
- Implementation Challenge
 - Determine if benefits exceed costs
 - Estimate shares of benefits for cost allocation

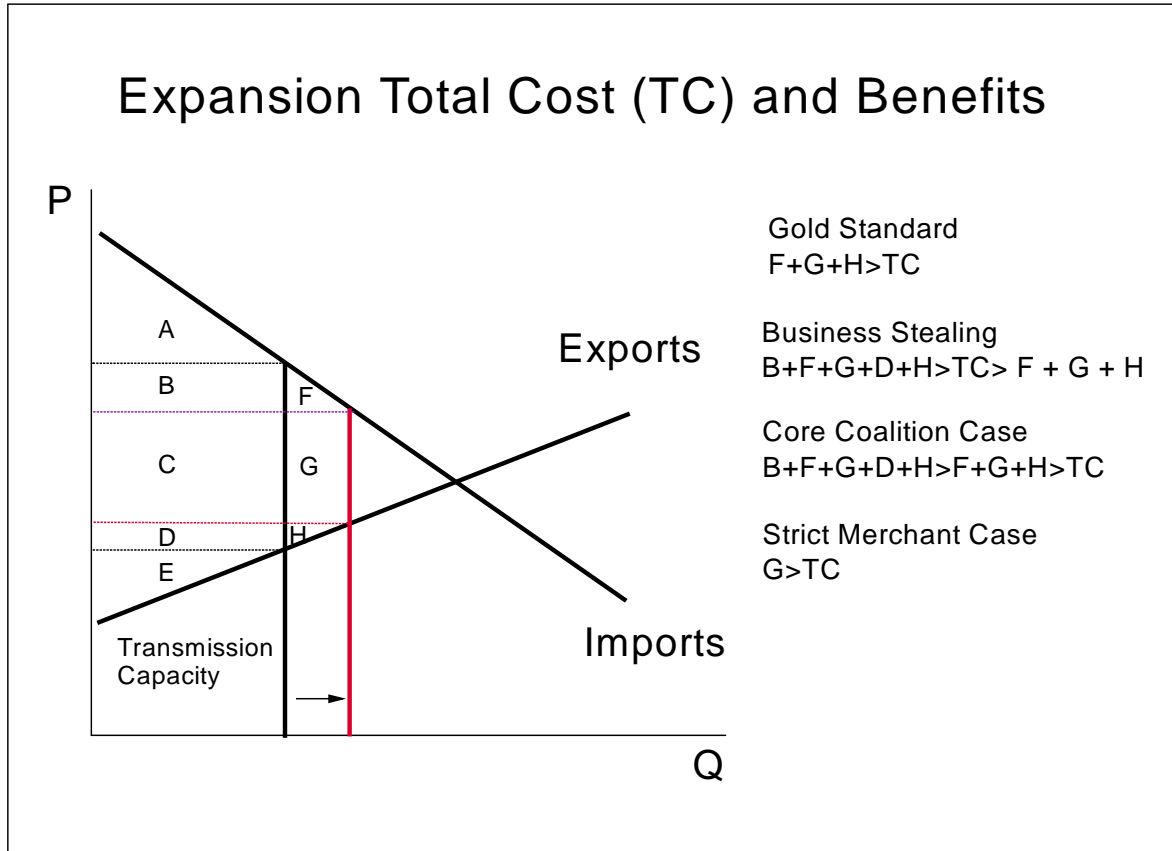
A Stylized Investment Case



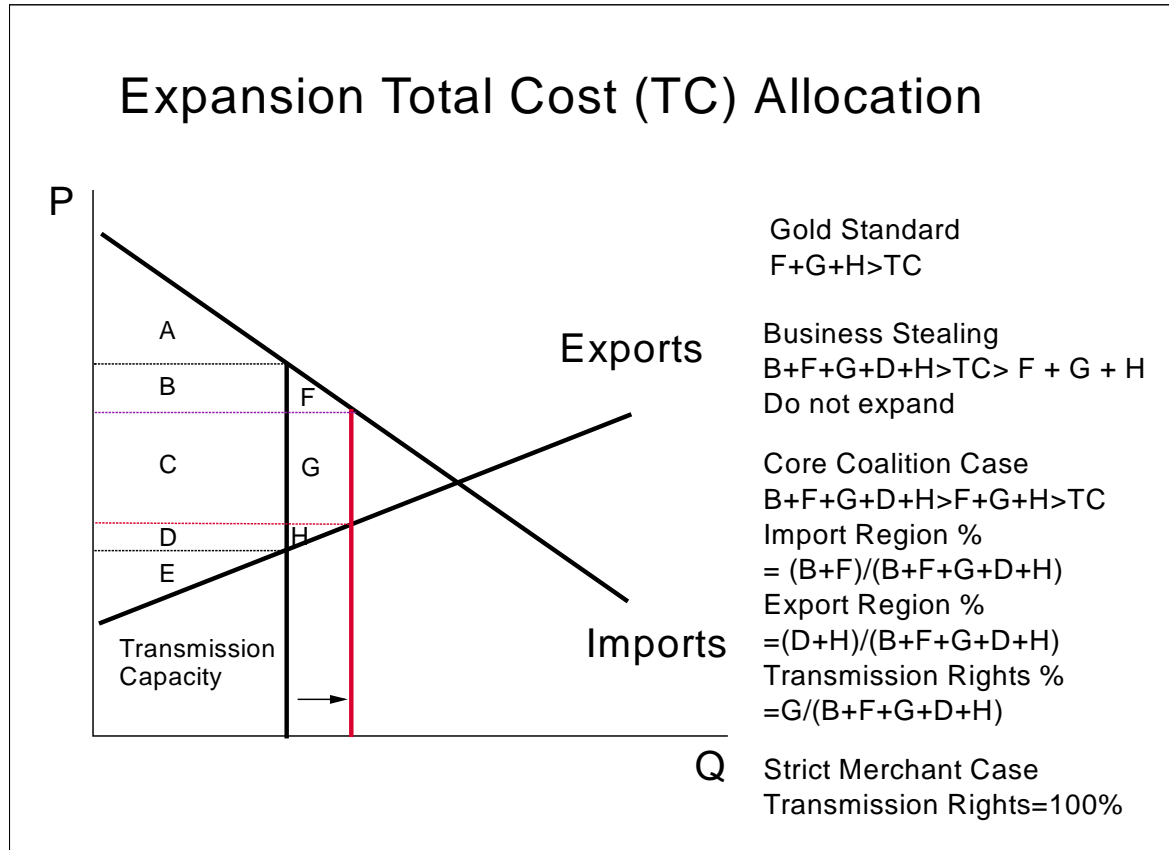
Parsing the Expansion Benefits



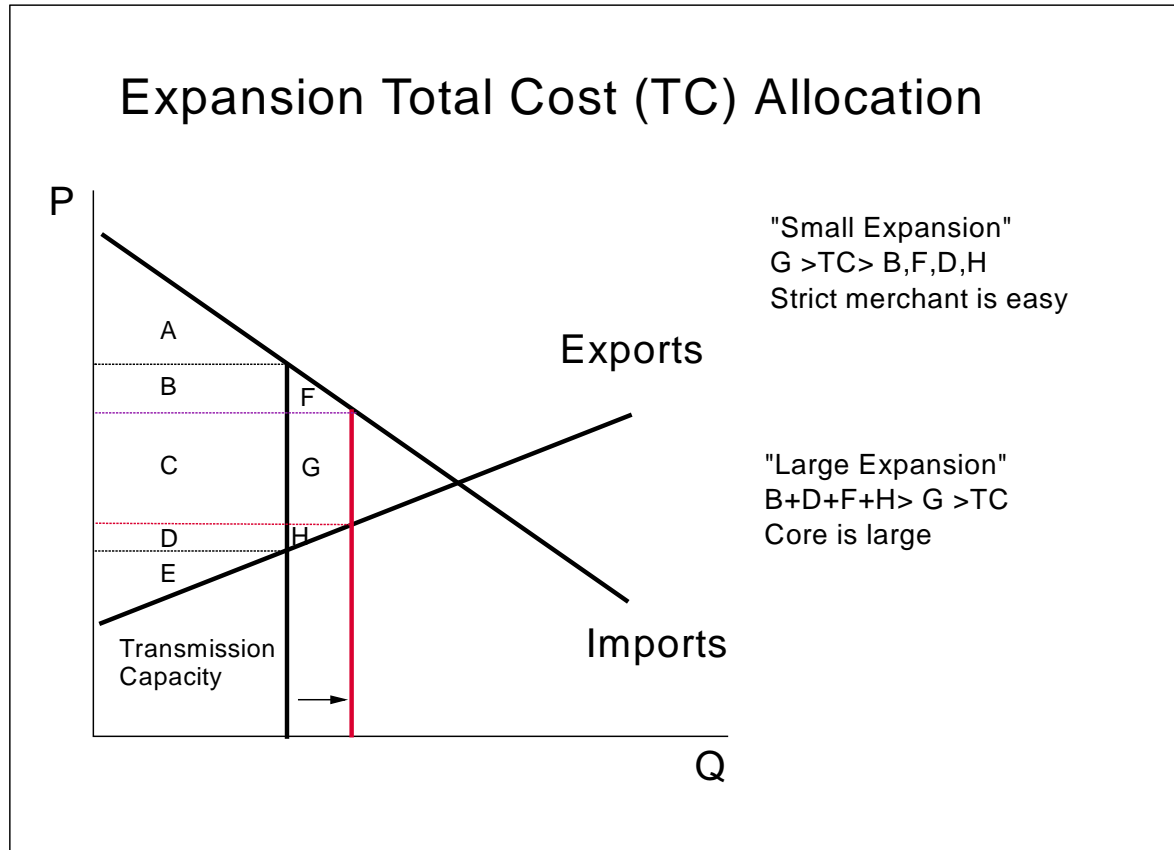
Cost Benefit Test



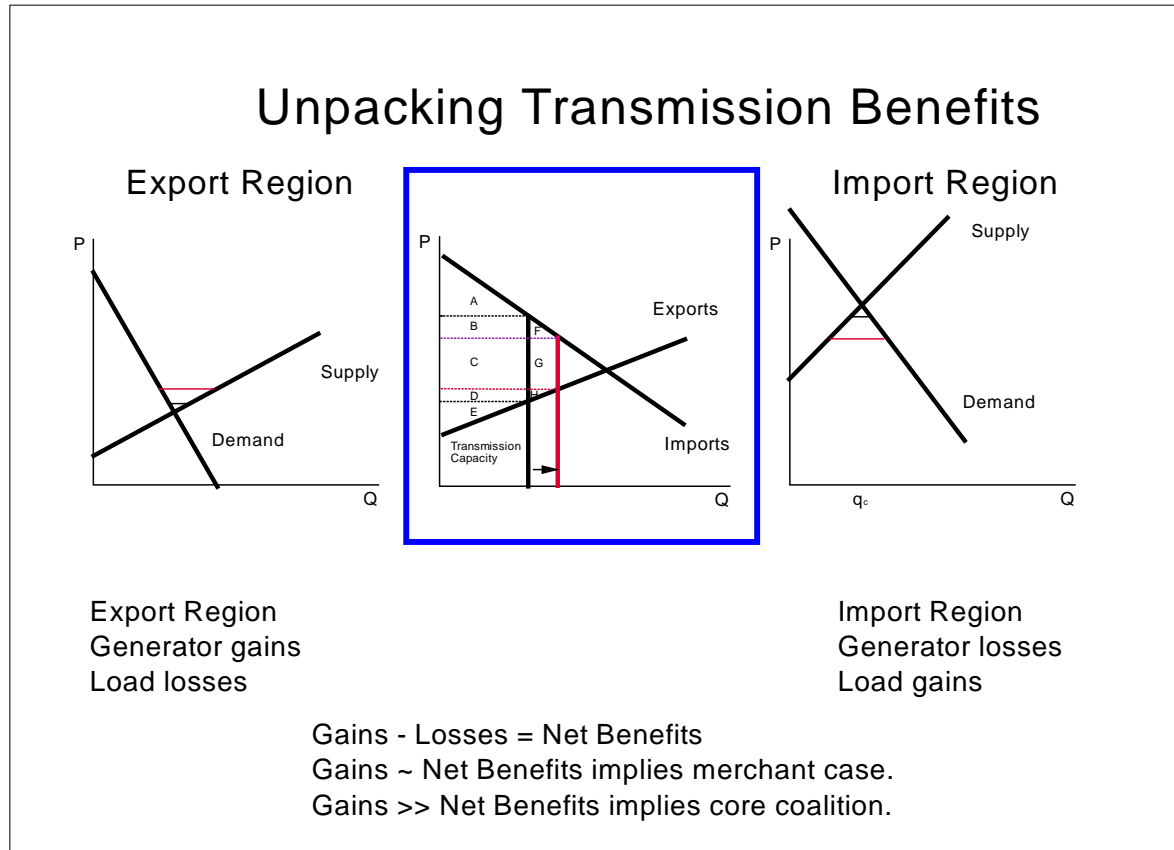
Benefit Shares and Cost Allocation



Typical Cases: Natural Advantages



Unpacking Reinforces Natural Advantages



Transmission Cost Allocation

What to Build, Where to Build, Who Pays, and Who Decides?

- Challenge
 - Determine if benefits exceed costs
 - Precision not required
 - Standard methods provide a good approximation
 - Regulators apply gold standard
 - Estimate shares of benefits for cost allocation
 - Expected shares ex ante
 - Shares of benefits easier to estimate than exact benefits

William W. Hogan is the Raymond Plank Professor of Global Energy Policy, John F. Kennedy School of Government, Harvard University and a Director of LECG, LLC. This paper draws on work for the Harvard Electricity Policy Group and the Harvard-Japan Project on Energy and the Environment. The author is or has been a consultant on electric market reform and transmission issues for Allegheny Electric Global Market, American Electric Power, American National Power, Aquila, Australian Gas Light Company, Avista Energy, Barclays, Brazil Power Exchange Administrator (ASMAE), British National Grid Company, California Independent Energy Producers Association, California Independent System Operator, Calpine Corporation, Canadian Imperial Bank of Commerce, Centerpoint Energy, Central Maine Power Company, Chubu Electric Power Company, Citigroup, Comision Reguladora De Energia (CRE, Mexico), Commonwealth Edison Company, COMPETE Coalition, Conectiv, Constellation Power Source, Coral Power, Credit First Suisse Boston, DC Energy, Detroit Edison Company, Deutsche Bank, Duquesne Light Company, Dynegy, Edison Electric Institute, Edison Mission Energy, Electricity Corporation of New Zealand, Electric Power Supply Association, El Paso Electric, GPU Inc. (and the Supporting Companies of PJM), Exelon, GPU PowerNet Pty Ltd., GWF Energy, Independent Energy Producers Assn, ISO New England, Luz del Sur, Maine Public Advocate, Maine Public Utilities Commission, Merrill Lynch, Midwest ISO, Mirant Corporation, JP Morgan, Morgan Stanley Capital Group, National Independent Energy Producers, New England Power Company, New York Independent System Operator, New York Power Pool, New York Utilities Collaborative, Niagara Mohawk Corporation, NRG Energy, Inc., Ontario IMO, Pepco, Pinpoint Power, PJM Office of Interconnection, PPL Corporation, Public Service Electric & Gas Company, Public Service New Mexico, PSEG Companies, Reliant Energy, Rhode Island Public Utilities Commission, San Diego Gas & Electric Corporation, Sempra Energy, SPP, Texas Genco, Texas Utilities Co, Tokyo Electric Power Company, Toronto Dominion Bank, Transalta, Transcanada, TransEnergie, Transpower of New Zealand, Tucson Electric Power, Westbrook Power, Western Power Trading Forum, Williams Energy Group, and Wisconsin Electric Power Company. The views presented here are not necessarily attributable to any of those mentioned, and any remaining errors are solely the responsibility of the author. (Related papers can be found on the web at www.whogan.com).