USAID/NARUC East Africa Regional Regulatory Partnership Exchange:

Cost Allocation for Transmission Infrastructure

Andrew Greene
Massachusetts Dept. of Public Utilities
Energy Facilities Siting Board

Dar es Salaam, Tanzania
October 22, 2014

Transmission Cost Allocation - Overview

- The Central Question: Who Pays? Why it Matters.
- Objectives of Cost Allocation – Guiding Principles
- Building Blocks for Allocating Transmission Costs
- Cost Allocation Methods – An Overview
- Examples of Cost Allocation Approaches Used
- The EKT Proposed Wheeling/Allocation Principles
- Implementation Issues for Cost Allocation

USAID
FROM THE AMERICAN PEOPLE

National Association of Regulatory Utility Commissioners

The Central Question: Who Pays? Why it Matters.

- Cost allocation is all about determining **"who pays"**
- The willingness <u>and</u> ability to pay for transmission must exist for transmission plans to become a reality
- Cost allocation decisions have profound effects on:
  - Rates paid by customers and access, affordability, efficiency
  - The location and type of generation that is built and operates
  - Economic development, growth and regional trade/linkages
  - Environmental outcomes: carbon emissions, land use impacts, natural resource impacts, and human health

USAID FROM THE AMERICAN PEOPLE

National Association of Regulatory Utility Commissioners

Objectives of Cost Allocation – Guiding Principles

- Rates should be reflective of “cost causation”
- Cost causation considers both burdens and benefits
- Practical considerations for cost allocation methods
  - Degree of precision (location, type of service, time period)
  - Administrative ease: data requirements and procedures
  - Understandability and public acceptance as “fair”
  - Resilience: ability to reflect system changes over time
  - Stability of rates and predictability for customer decisions
  - Consistency with energy market policies, incentives, and planning

“Beneficiary Pays” vs. “Socialization”

- Beneficiary Pays – only the parties that benefit from transmission projects should pay for them (“benefit” also means reducing the risk of unreliable service).

- Socialization – transmission benefits are inherently widespread and not easily assigned to local areas; therefore costs should be spread broadly across the system.

“Beneficiary Pays” vs.“Socialization” (con’t)

The terms convey opposing cost allocation views:

Beneficiary Pays advocates: “We can determine who causes costs/experiences benefits, and should assign the costs to them – not to others”

Socialization advocates: “Transmission produces broad benefits for everyone, even if they are difficult to measure”

Building Blocks for Allocating Transmission Costs

- Total cost of service (revenue requirements)
- Customer load data (energy used, peak loads)
- Transmission planning outputs (if beneficiary pays methods are use)
  - Market simulation tool (production cost model) to examine changes in in production costs, congestion, prices, and reliability
  - Power flow models provide a basis for identifying the location of uses of the transmission system that can cause problems (thermal and voltage violations) that require solutions or new investment

Cost Allocation Methods – An Overview of Choices

- Allocating costs to load or generation, or both?
- Allocating costs based on megawatt-hours (MWh) or MWs? (both socialization methods)
- Allocating costs using location-based or flow-based methods (beneficiary pays method)
- Allocating costs using monetary benefits and the parties that obtain them from transmission projects (beneficiary pays method)

USAID FROM THE AMERICAN PEOPLE

National Association of Regulatory Utility Commissioners

Cost Allocation Example: ISO-New England

- “Socialized Cost”: 100% of reliability and economic efficiency upgrades are allocated to all load based on monthly zonal coincident peak loads
- Existing transmission assets that serve regional network are allocated in the same manner
- Costs that go beyond requirements (e.g. undergrounding) – are localized not socialized
- Generators pay 100% of direct interconnection costs and other upgrade costs not otherwise incurred

ISO-New England – Costing “Wheel Through Rates”

- “Wheel Through or Out” service allows generators and load outside of ISO-NE to wheel power through ISO-NE (similar to the EKT situation for Kenya)
- If capcity is available, a firm reservation is made for a specified period of time (hourly daily, weekly, monthly, yearly); customer pays for any new facilities needed for the service
- Hourly rate for service is the prorated Annual Transmission Rate ($/MW-yr) divided by 8760
- New York ISO and ISO-NE have special mutual provisions to waive charges for wheel though service

Cost Allocation Example: Southwest Power Pool (SPP)

- “Mixed Allocation”:
  - 33% of costs allocated over all load based on monthly non-coincident zonal peaks;
  - 67% of costs allocated to zones using a flow-based model that determines each zone’s share of incremental flows over the new assets; then costs allocated within zone based on monthly coincident peak
  - Economic upgrades above 345 kV are allocated 100% to load across all SPP based on non-coincident zonal peak
- Generator-associated transmission upgrade costs over $180,000 per MW assigned to generator

Cost Allocation Example: PJM

- Mixed Approach:
  - Upgrades 500 kV and above: allocated to load based on each zone's share of zonal non-coincident peak (socialized)
  - Upgrades below 500 kV (over $5 million) are 100% allocated to load zones and merchant lines based on contribution to flows on constrained facilities (benefiicary pays)
- Economic upgrades must achieve a 1.25 benefit/cost ratio; allocation follows reliability upgrade approach
- Generators are responsible for 100% of upgrades necessary for interconnection

EKT Cost Allocation Principles/Assumptions

- Long-term wheeling should reflect transmission asset-related costs. It should not subsidize the transmission service provider or the transmission service customer
- Assets include transmission lines along the most direct route between receipt and delivery points, but actual flows may justify including other paths/circuits
- Includes losses, capital cost recovery, O&M, and administrative/control costs
- Long-term wheeling capacity can be a reliable service

EKT Proposed Cost Allocation Formula

The total transmission revenue requirement (C_{total}) used in calculating the wheeling rate:

$C_{Total} = C_{capital} + C_{O\&M} + C_{C\&A}$ where:

$C_{capital}$ = capital-related costs associated with transmission assets used to provide wheeling service

$C_{O\&M}$ = operation and maintenance costs

$C_{C\&A}$ = control, management, administrative costs

EKT Proposed Cost Allocation Formula

The allocation of the total transmission costs to the wheeling service ($C_{Wheeling}$):

$$CWheeling = CTotal \times \frac{Available\ Capacity}{Total\ Capacity}\ x\ \frac{Wheeling\ Capacity}{Available\ Capacity} \quad +$$

$$CTotal \times \frac{Reliability\ Capacity}{Total\ Capacity}\ x\ \frac{Wheeling\ Capacity}{Total\ Reserved\ Capacity + Nat'l\ Peak\ Dem}$$

EKT Proposed Cost Allocation Illustration

Assume the following values:

C_{total} = \$1,000,000 USD

Available Capacity = 100 MW

Total Capacity = 150 MW

Wheeling Capacity = 25 MW (reserved)

Reliability Capacity = 50 MW

Total Reserved Capacity = 30 MW

National Peak Demand = 70 MW

EKT Proposed Cost Allocation Illustration

$$CWheeling = 1{,}000{,}000 \times \frac{100\ MW}{150\ MW}\ x\ \frac{25\ MW}{100\ MW} \quad +$$

$$1{,}000000 \times \frac{50\ MW}{150\ MW}\ x\ \frac{25\ MW}{30\ MW + 70\ MW}$$

Wheeling Cost = $250,000 total per year or
$10,000/MW-Yr or $ 833/MW-month

Implementation of EKT Cost Allocation Principles

- Continued testing of the principles with some real-world examples (mine is not very realistic)
- Do regulators, transmission providers, and transmission customers understand and support the principles?
- Will it work to facilitate the EKT transaction and the desired wheeling service?
- Other issues?

USAID FROM THE AMERICAN PEOPLE

National Association of Regulatory Utility Commissioners

Questions ?