Regulatory Policy Options for DER

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Cheryl Harrington
The Regulatory Assistance Project

16 State Street
Montpelier, Vermont 05602
Tel: 802.223.8199
Fax: 802.223.8172

www.rapmaine.org

177 Water St.
Gardiner, Maine 04345
Tel: 207.582.1135
Fax: 207.582.1176

Technical Details

- Subcontract No. 30605-03
- Awarded Under the NREL/DOE Distributed Power Program
- Distributed Power System Integration Research and Development
- Letter of interest Solicitation
- NREL Technical Monitor: Tom Basso
- Principal Investigator: RAP Principals,Gardiner, Maine

Objectives of RAP's Work

- Identify impediments to DR posed by existing regulatory practices.
- Develop policy options to remove the institutional barriers posed by utility regulation.
- Inform regulatory community of policy options that work to eliminate the barriers.

Regulators' Policy Checklist

Interconnection Rules	*Creates opportunity for demand response *Provides system protection *Standardized (plug and play) *Simple, inexpensive and timely
Rate Design	*Usage based pricing for distribution services *Reasonable standby and exit tariffs *Customer credits for high cost distribution areas *Net metering for small systems
Performance Based Regulation (PBR)	*Distribution company will not lose revenue when DR Installed (revenue caps)
Environmental Emissions Rules	*Installation of DG will not degrade air quality *Distinguishes emergency operation from other uses
Periodic Reviews	*Distribution and Transmission Expansion Plan (2-3 years) *IRP plan for vertically integrated utility (includes generation *DR deployment and operational experience

Theme of RAP's DR Work

- Reveal the economic value of DER to:
  - Customers
  - Distribution Companies
  - DR vendors
  - Wholesale Market Participants
  - Regulators

Reveal the Value

- Getting Cost and Price signals right
- Getting regulatory incentives right - DR value must realizable by the parties that can do something about it.
- Getting market rules/ structure right
- Restructuring is making matters worse for small DR

RAP's 3 Tasks

1. Write and publish four studies for regulatory community on identifying and removing barriers to DR.

2. Hold two workshops for regulators to learn their thoughts on DR and to educate them on the barriers and policy options.

3. Organize a national stakeholder working group to develop a model rule for environmental emissions from DR.

Topics of the Four Study Papers

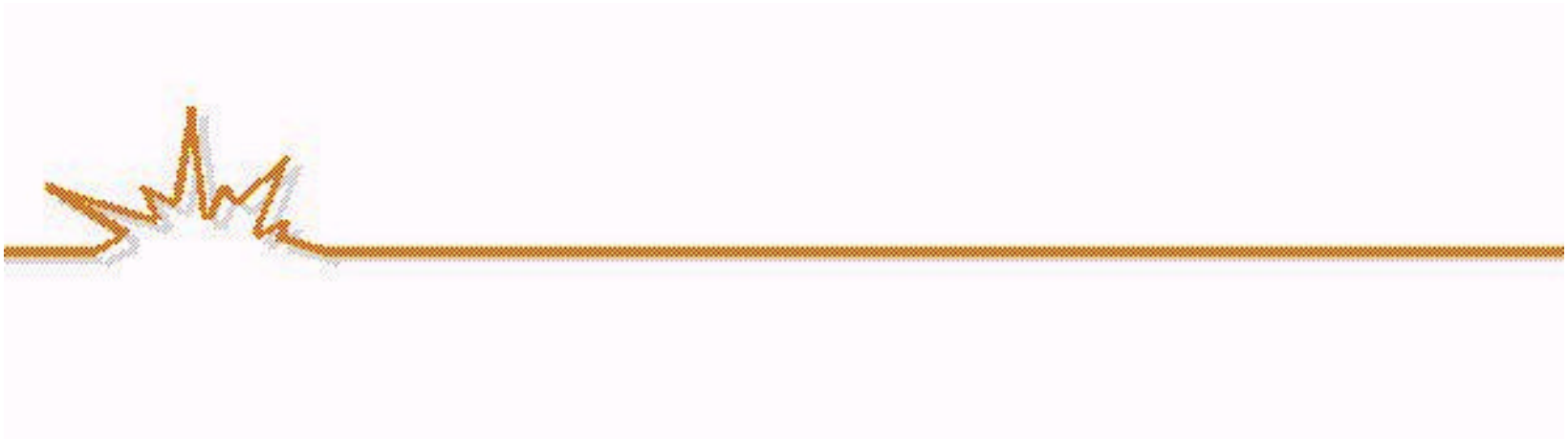
1. Simplified distribution system costing methods for identifying where DR should be deployed.
2. De-averaged distribution credits for customers who install DR.
3. Case studies documenting use of DR to enhance reliability.
4. Incorporating DR into wholesale markets.

Outcomes:
Four Study Papers

- Papers distributed to 800 key regulatory players: each state utility regulator, senior electricity policy advisors and, many, many interested parties.

- Strong positive response from state utility regulatory community.

- Papers are available on RAP's website: www.raponline.org



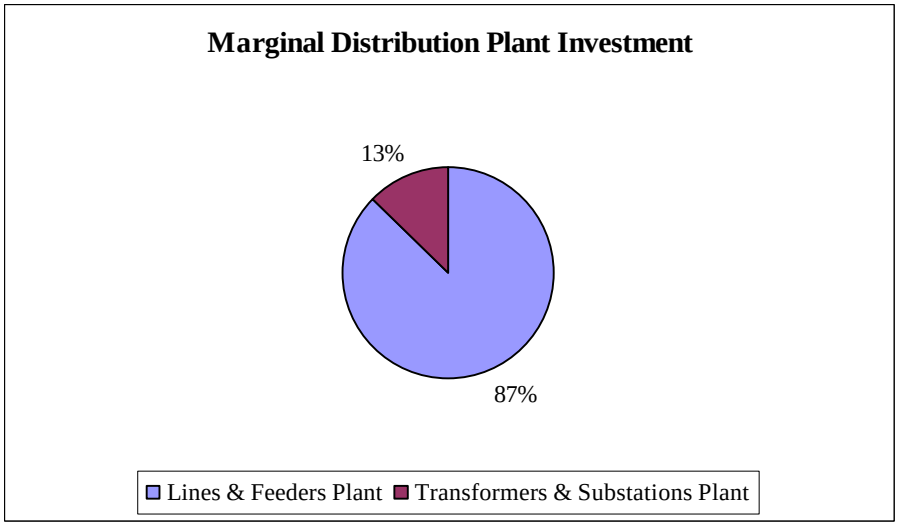
Distribution System Cost Methodologies for Distributed Generation

What We Looked At

- Distribution Plant
  - Lines & Feeders
    - Plant Invesment
    - O&M
  - Transformers & Substations
    - Plant Investment
    - O&M
- Embedded and Marginal
- FERC Form 1 Database 1994-1999

General Observations

- On Average Marginal Costs Are 2.4X of Embedded Costs
- Average Annual Investment of 124 Utilities
  - Lines & Feeders -- >$5.6 billion
  - Transformers & Substation -- >$800 million
- Costs Highly Dependent on Geographic Location Within Each Utility



Summary

- High Variability of Costs Among Utilities
- High Variability of Costs Within Utilities
- Most New Investment is in Lines & Feeders
- Significant Dollars At Stake
  - For 124 Utilities over $6.4 Billion Invested Per Year
  - Equals Approximately $1.2 Billion in Revenue Requirements *Increase* Per Year
- Significant Opportunities for DR Options

Costing Study Conclusions

- Distribution costs are a substantial annual expense for most IOU's
- State regulators should require annual filings of multi-year distribution investment plans.
- Distribution utilities should be required to analyze DR options as part of filed plans
- Distribution utilities should invest in DR, including providing incentives for customer investment, where it is cost- effective.

Distribution Credit Pilot Programs

Distribution Prices/Costs

- Distribution Prices typically system average
- Distribution costs vary greatly
  - Marginal costs range from 0 to 20 cents per kWh
- High cost areas can be urban or rural
- Approximately 5% of a distribution system is "high cost" at any time

Distribution Credits

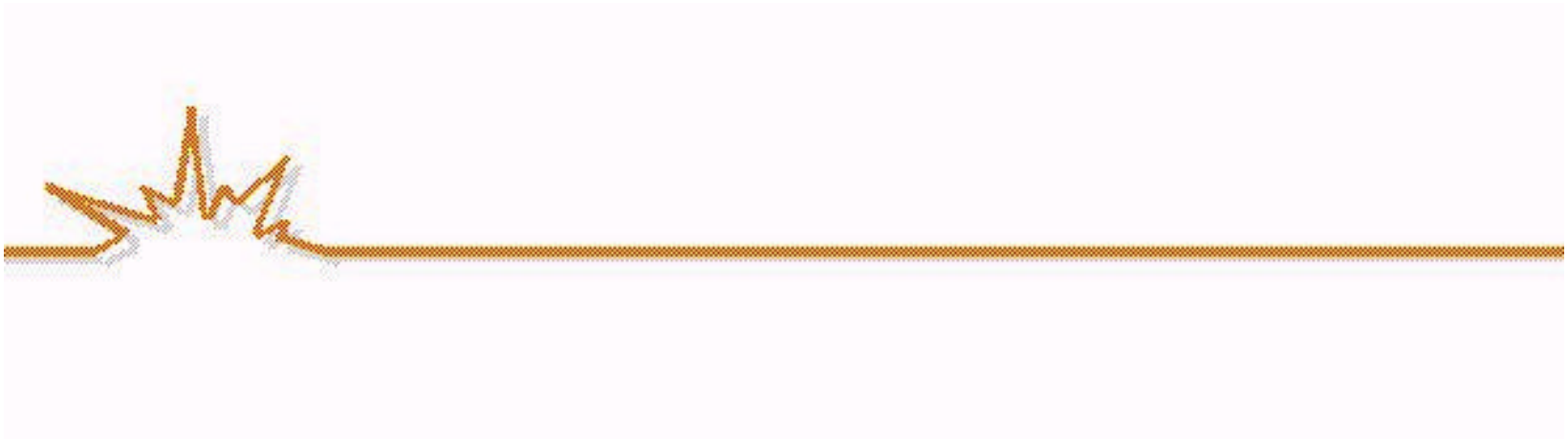
- Offering distribution credits in high cost areas can send the same price signals with much less risk
- Credits can focus on customer and vendor actions
- Credits can be limited to "qualifying DR"
- Can use standard payments and/or bidding

Qualifying DR for Rate Credits

- Types
- Operating and performance standards
- Installation time and milestones
- Min/Max amounts
- Duration

De-averaged-Credits Conclusions

- Customer DR investments can offer substantial investment savings to utilities' distribution system.
- Customer distribution rate credits can induce customers to make desirable DR investments.
- The credits should be based upon the savings caused by the customers' DR investment.
- The credits should to be limited in time.
- State regulators should have utilities undertake pilot projects.

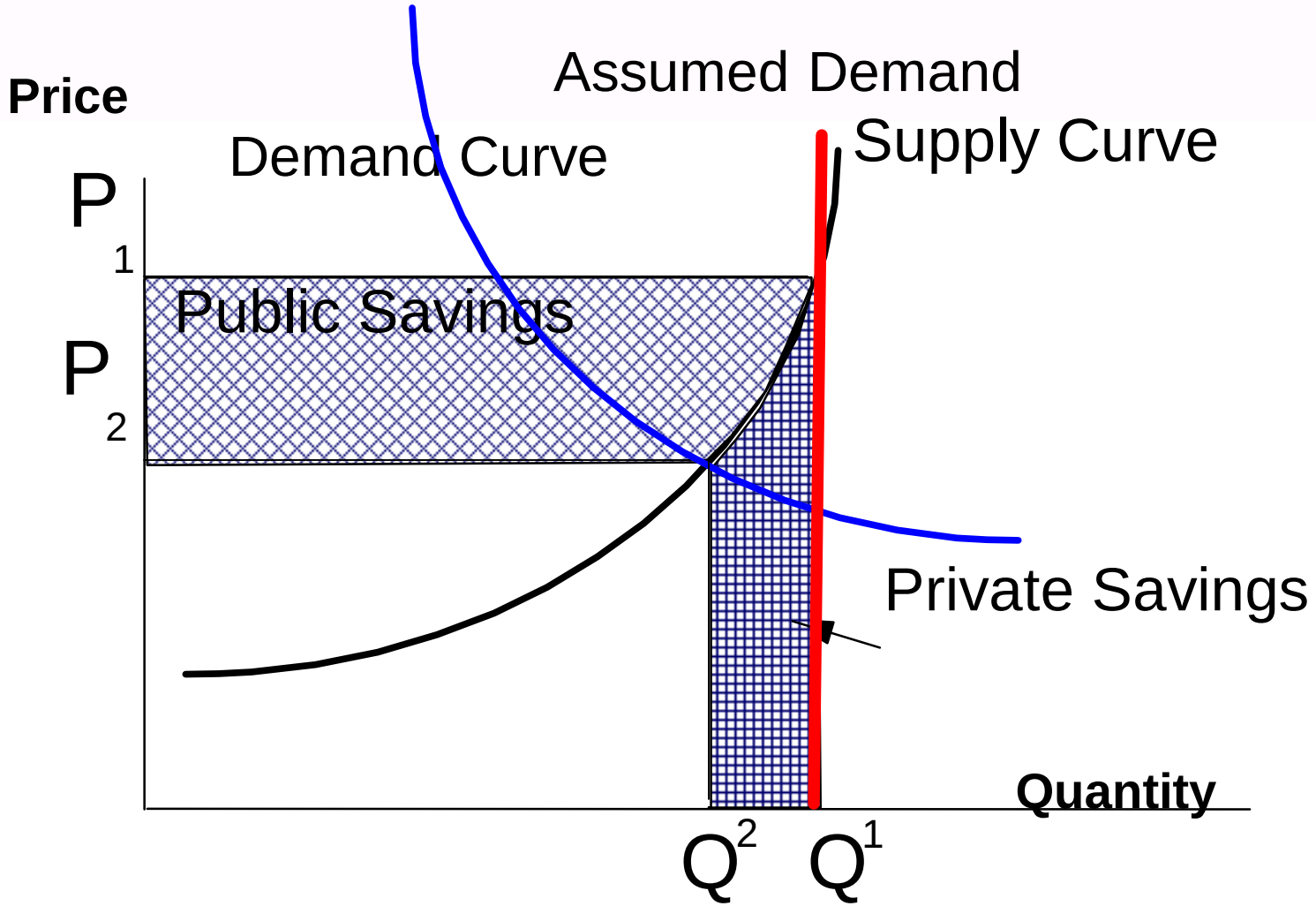


Distributed Resources and Electric System Reliability

How Demand Response Works

- Traditional Approaches
  - -time of use rates, seasonal pricing
  - -isolate from the grid with local gen.
- Real-time Market Approaches
  - -programmed appliances
  - -Internet-based bidding
  - -demand reduction though DG
- Reveals The Real Electricity Demand Curve

Demand Response Saves Everyone Money

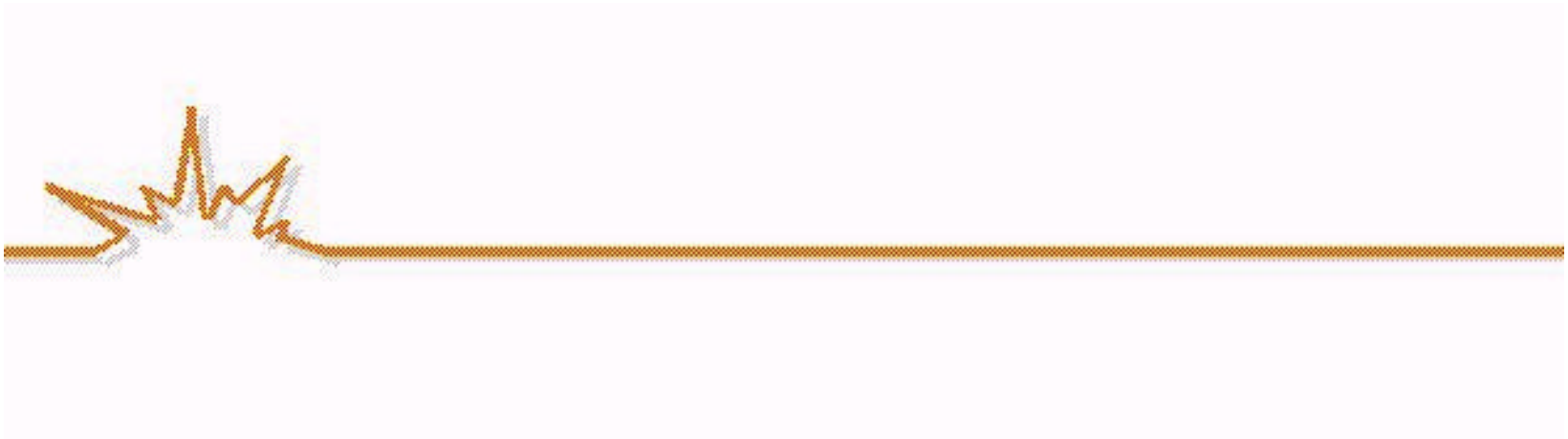


Modest Participation
Big Impact

- EPRI: 10% participation of demand response would have reduced peak prices 33 - 66% in Midwest in 1998.
- NYMEX: 5% would have reduced prices 80-90%
- EPRI: In California in 2000, 1% reduction in load >> 10% reduction in peak prices, 5% reduces peak prices 19%

DR and Reliability Conclusions

- Case studies show that DR can effectively be used to:
  - improve power quality
  - relieve congestion
  - meet generation adequacy requirements
  - provide ancillary services to system



Accommodating Distributed Resources in Wholesale Markets

DR role in Wholesale Markets Conclusions

- Potential value of DR in wholesale markets
  - Peak load management, ancillary services
  - Downward pressure on wholesale prices
  - market power mitigation
- What needs to be done to use DR in wholesale markets?
  - Evaluate existing ISOs and market rules
  - Suggests model rules and approaches

Regulators' Workshops

- Two regional workshops: East/West
- Designed to educate and interest regulators in DR as well as get input into four study papers
- Outcome:
  - Strong general interest among regulators
  - But, DG not yet high enough on regulator's "to do" list, requires more attention.
  - Reliability potential of DR resonates.