

DR Cost Impacts on T&D Systems

EPRI's VIIth DR Conference and
Exhibition
March 21, 2002
Dallas, TX USA



Presented by N. Richard Friedman and E.J. Honton
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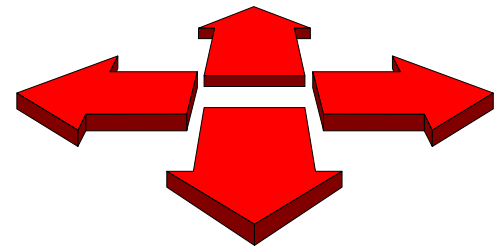
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What is Distributed Resources Generation (DR)?



- Small power generating units that are close to load, under 50 MW, and most of output used by host facility
- Includes
 - Combined Heat and Power (CHP)
 - Backup power
 - Niche applications such as premium power, peak shaving, and green power
- About 30-60 GW of DR in U.S. (4-8 percent of all electrical generating capacity)



The Dominant Myths of Distributed Resources Generation

- Myth 1 – Lots of money is being made in the DR market
- Myth 2 – DR can be installed for less than \$500/kW
- Myth 3 – DR will replace central station generation

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The “Grid” is No Longer Assumed to Be the Only Power Supply Option

- Transition to competitive energy marketplace underway
- National concerns over grid reliability and security are well established
- Facilities seeking more control over power supply
- A diverse set of DR solutions is emerging
 - Fuel cells
 - Microturbines
 - Renewables
 - Reciprocating engines and combustion turbines

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What's the DR Market Opportunity?

- Facilities use DR to generate power on-site in lieu of grid purchases
- Cutting energy costs is a primary motivation, but boosting reliability and quality of power is also a driver
- Getting closer examination – **DR as an alternative to T&D construction**

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T&D Asset Management: An Opportunity to Reduce Costs



● Stakeholders

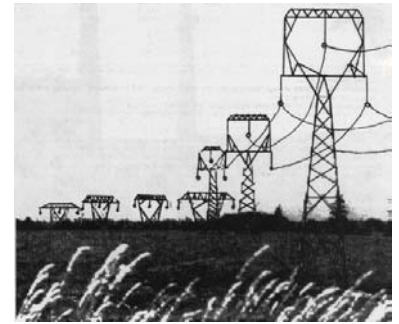
- Integrated utilities
 - Investor owned utilities
 - Cooperative utilities
 - Munis
 - State/federal authorities
- Distcos, Transcos, Regional Transmission Authorities

● Challenges

- Meet increased customer load
- Select most cost effective option between traditional T&D investment and DR alternative

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Traditional T&D Upgrade

- Equipment, towers, wires and land
 - Line construction
 - Substation upgrades
- Non-asset related costs
 - Regulatory fees
 - Right-of-way-perfection

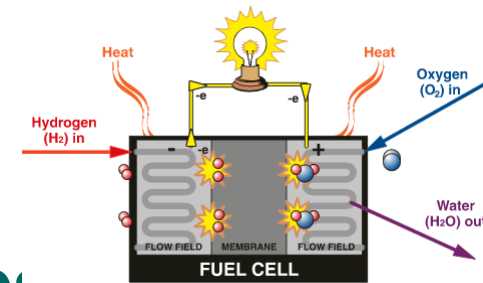
DR Alternative

- Allows T&D investment deferral
- Can provide ancillary services
 - Reactive power support and voltage control
 - Correction of energy imbalance
 - Operating reserves
 - Real power support
- Reduces T&D loading while meeting customer needs

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DR Application Characteristics



- DR costs
 - Capital (\$/kW, financing)
 - Maintenance (fixed and variable)
 - Fuel
- DR benefits
 - T&D deferral
 - Displaced electricity purchase
 - Reduces T&D losses
 - Can provide ancillary services

Cost Structure/Performance Characteristics Of DR



- Important DR performance characteristics
 - Availability
 - Hours of operation
 - Efficiency
 - Modularity/staged deployment
- DR siting options
 - At the customer
 - At the substation

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Model to Evaluate DR and T&D Alternatives

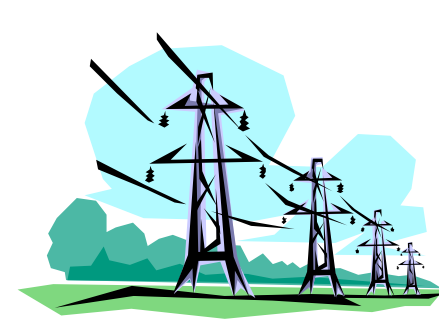


- Purpose:
 - Compare economics of using DR solution versus traditional T&D upgrade
- Method:
 - Evaluates the NPVs of competing DR and T&D alternatives

Model Inputs



- Existing T&D system capacity
- Load characteristics
 - Peak load
 - Load factor (annual hours of operation)
 - Load growth rate
- Equipment cost and performance data
- Financial assumptions



Key Advantages of the Model

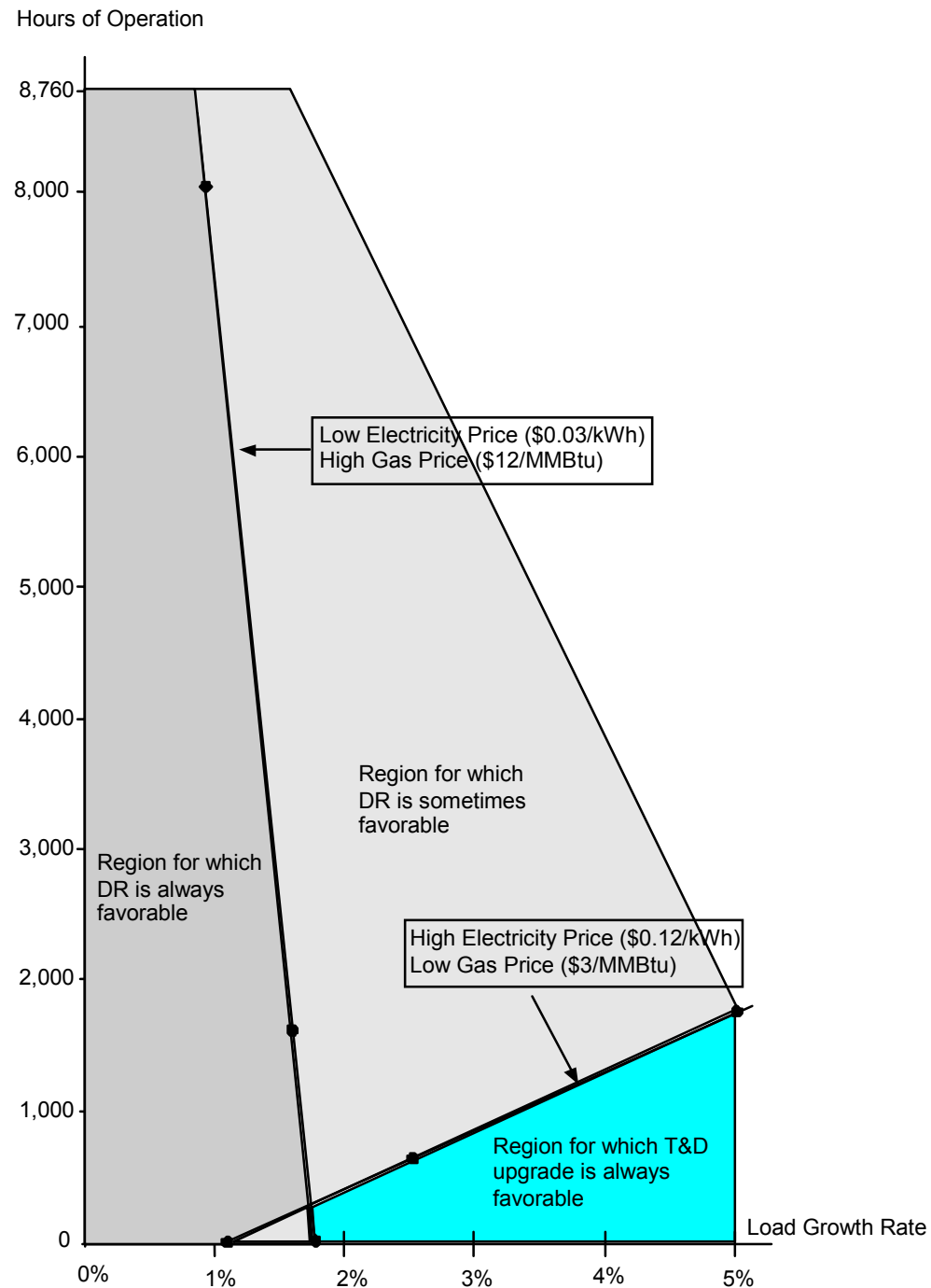
- Can help identify alternative solutions to T&D problems
- Assesses the economic impacts of various project parameters
- Quickly and effectively tests a range of potential DR solutions to a T&D problem
- Improves effectiveness of due diligence efforts, supports prudency review

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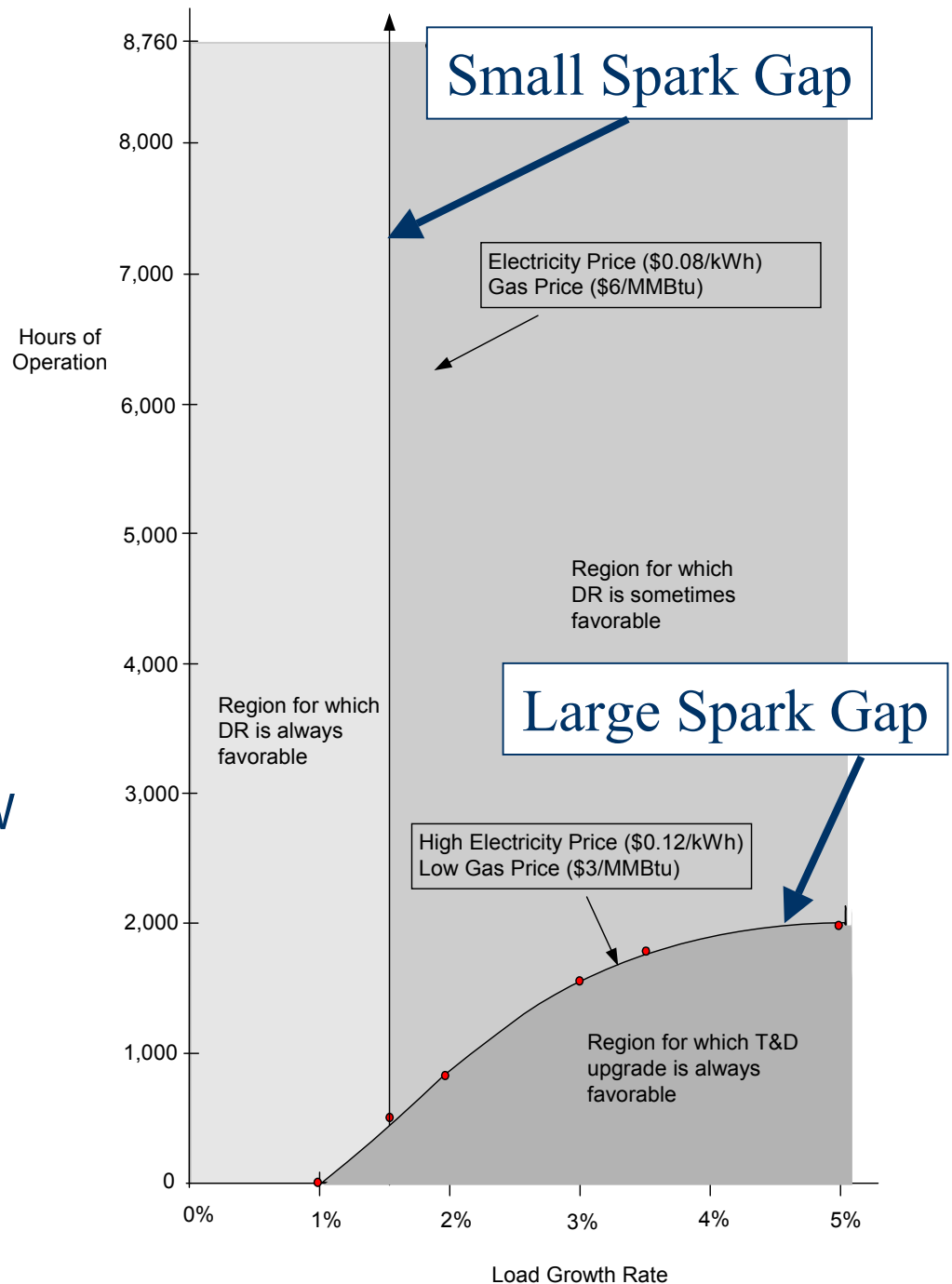
Sample Model Results

- 50 MW T&D peak capacity
- 46.5 peak load
- T&D expansion cost \$1.4M
- Incremental DR upgrade 2 MW

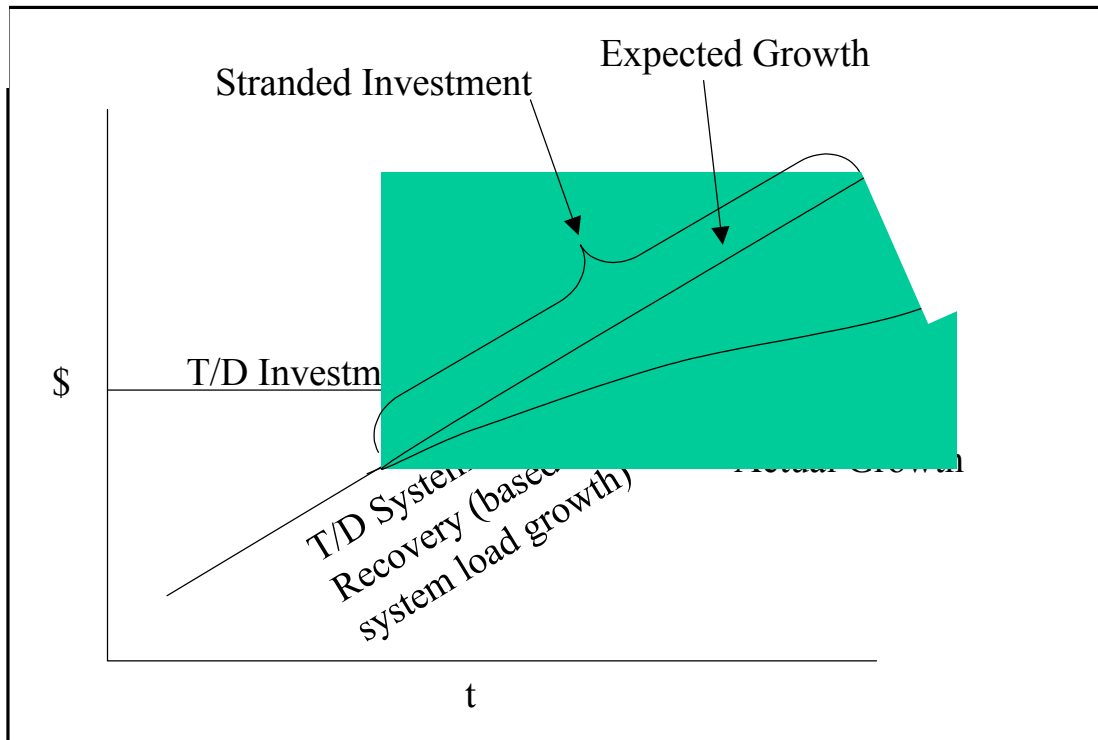


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Potential for DR to Strand T&D Investment



Scenario	Impact
Load growth happens as planned	Supports full T&D system cost recovery
Load growth stagnates	T&D system assets partially stranded
Load growth served by DR	T&D system assets partially stranded
T&D Approval Delayed	DR becomes near-term viable option

Challenges to Expanded DR Deployment for T&D



- Emerging technologies must mature and proven options need improvement
- Grid needs to be DR ready
- Transmission and distribution system deferral value
- Market should value non-energy benefits of DR

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Recommended Next Steps

- Consider Development of “User-Friendly” Model for Expanded Use
- Begin to Value Soft Costs (e.g., right-of-way perfection)
- Refine database of T&D costs

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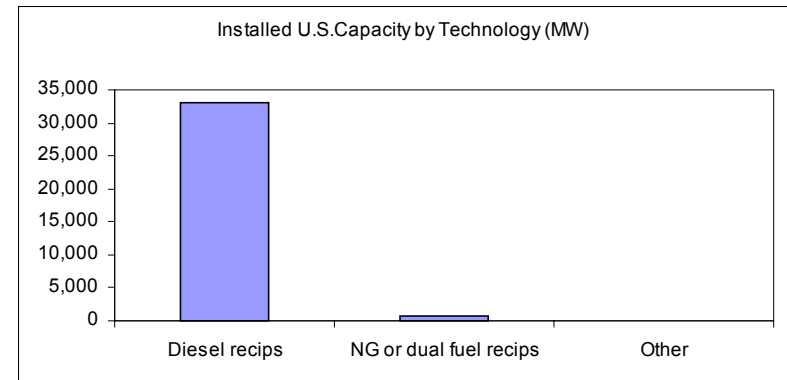
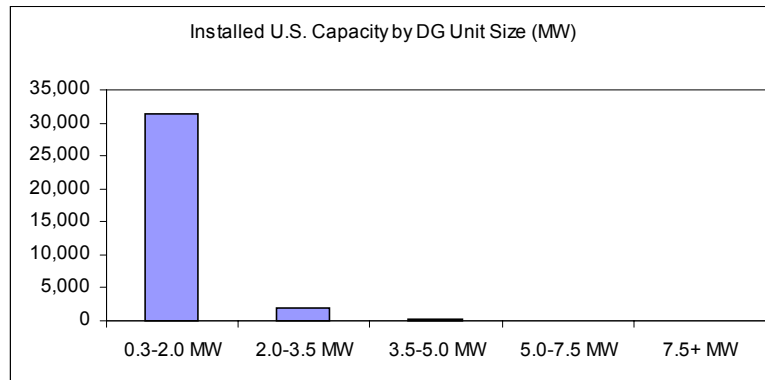
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Installed DR base



- RDC estimates based on a 2001 inventory of installed California DR units (>300 kW) suggest there is at least 34 GW of installed U.S. DR capacity.
- The Gas Research Institute estimates installed DR capacity in the U.S. (of all unit sizes) as 75 GW (2000).



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