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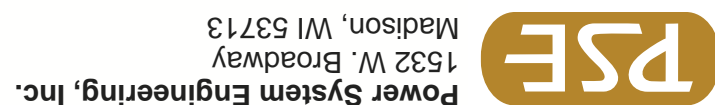
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PSE provides a full range of engineering, economic, and planning services to utilities nationwide. Some of our services include:

- Communications (Fixed and Mobile)
- Technology Work Plans & Strategic Plans
- Transmission & Distribution Studies and Planning
- Transmission & Distribution Line Design
- Daily Operations & Engineering Support
- Rates and Cost of Service Studies
- Time of Use and Dynamic Pricing
- DG Rates and Contracts
- Energy Efficiency & Demand Response Evaluation
- Load Forecasting with & without Demand Side Management
- Substation Engineering & Design
- Consulting on AMI, SCADA, IVR, OMS, GIS, CIS, etc.

Please be sure to give the PSE team the opportunity to present our ideas on how we can work together. We are confident that our full range of services can meet your needs. Visit our website for a full list of services and additional contacts.

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# The Utility Edge



Summer 2010

the power to help you succeed.

## Trends in Distribution Automation

As part of the NRECA's DOE Demonstration Grant Deployment and Study Teams, PSE is in a good position to observe the distribution automation (DA) projects being deployed by co-ops across the nation. Here's a brief review of what we are seeing:

- **Smart Feeders.** With the focus shifting toward improved reliability, faster service restoration after outages, and reduction of sustained outages, many utilities are deploying smart feeder switching programs in their distribution systems. Sustained interruptions are known to cause loss of production, time, and labor, and in some cases spoiled or damaged products for C&I customers. Because smart feeder programs help minimize sustained interruptions, the benefits extend far beyond basic reliability improvements.
- **Fault Detection and Location.** A wide range of technology solutions assist distribution utilities in detecting and locating faults on a distribution line. They range from the sophisticated High Impedance Fault (HIF) devices that detect fault locations by recognizing impedance changes to simple fault indicators which provide visual indication of the fault. This allows utility restoration crews to quickly locate the fault on long feeders. These solutions benefit utilities by minimizing the fault location time, assisting in early restoration, and thereby boosting performance indices.
- **Conservation Voltage Reduction.** Conservation Voltage Reduction (CVR) is the practice of lowering voltage on a distribution system with the objective of decreasing coincident peak demand (MW). Considering the potential of peak demand cost savings CVR programs can deliver, utilities are showing keen interest in these programs as part of the Smart Grid initiative. In many cases, CVR programs can be implemented on existing SCADA platforms, or customized solutions may be created.

Because of advancements in distribution automation technology, the lower cost of distribution automation equipment, and a wide choice of products, PSE is seeing an accelerated adoption of distribution automation by cooperatives nationwide. We recommend that you investigate the programs we've described above to see if there is a fit for your co-op.

## What's New at PSE

Power System Engineering is pleased to unveil our newly designed website. Visit us online at [www.powersystem.org](http://www.powersystem.org) to browse our services, news and events, and even download PSE-authored articles on various industry developments.



**Upcoming Events:**



September 8 - 10, 2010

PSE's Steve Fenrick and Erik Sonju will overview performance benchmarking as a management tool at the Minnesota Rural Electric Managers Association CEO's Conference.



October 5 - 6, 2010

PSE will host the "Demand Response Symposium: Emerging Opportunities" in Madison, WI. This two-day workshop will present a state of the industry overview, including valuation of DSM programs; business drivers for new demand response programs; impacts on power supply; new time sensitive rate structure opportunities; new AMI, home automation, and energy efficiency technologies impacting demand response; and overall vendor maturity/readiness.

We will also present real-world strategies relevant to electric utilities today, including how to create a business case, how to enhance an existing DR program, and others.

This class will be led by PSE subject matter experts and other outside industry leaders. Please stay tuned to PSE's website for more details.

Email [studnec@powersystem.org](mailto:studnec@powersystem.org) with questions, comments, or for more information.

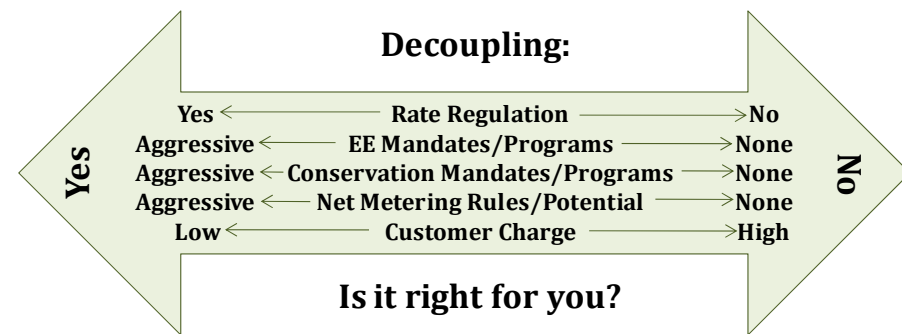
## Ask PSE a Question: Revenue Decoupling

**What is revenue decoupling?** Simply stated, revenue decoupling breaks the link between net income (or margins) and sales volumes. Decoupling in the electric industry is generally introduced as a way to “protect” revenue or margins in light of Conservation and Energy Efficiency (C&EE) programs, not as a way to mitigate the impacts of the economy or weather.

**Why is decoupling more important today than in the past?** Historically, electric utilities have enjoyed steady sales growth as a result of adding new customers and increasing usage per customer. Now, legislators and regulators in many parts of the country are mandating reduced energy consumption and “greenhouse” emissions through C&EE programs. To the extent that these programs are effective and fixed costs are recovered through consumption charges (e.g., kWh based charges), the utility will face declining net income or margins.

**How is decoupling accomplished?** Decoupling can be accomplished by modifying rate structures to recover fixed costs in fixed monthly charges and/or through rate adjustment mechanisms that adjust charges to compensate for reduced sales volumes related to C&EE programs. It appears that some regulators are recognizing that decoupling is necessary before utilities will enthusiastically support C&EE initiatives.

**Should my utility consider or be concerned about decoupling?** There are several factors to consider and no single answer will address every situation. To evaluate whether decoupling may be valuable for your co-op, consider the presence and aggressiveness of rate regulations and energy efficiency mandates, as well as other circumstances such as those shown in the diagram below.



## System Impact Studies Play a Vital Role in Evaluating DG Interconnections

Utilities appear to be receiving more requests for the interconnection of distributed generation (DG) resources to their distribution systems. When a request comes in, one of the first orders of business is to determine whether a System Impact Study is needed to review the potential impact of the proposed DG interconnection on the distribution system. Your utility should have interconnection standards in place that include specific criteria that define when a System Impact Study is required. These criteria commonly include the following “rules of thumb”:

1. Interconnection to a non-radial distribution system.
2. Utility construction required.
3. Aggregate generator capacity > 15% of protection zone peak load.
4. Aggregate generator contribution to fault current:
  - On primary distribution system, > 10% of feeder’s maximum available short-circuit current.
  - Causes protective devices to exceed 85% of short-circuit interrupting capability.
5. Generator facility and/or interconnection equipment not certified by a Nationally Recognized Testing Laboratory (NRTL) to meet IEEE Std. 1547 (*note that inverters with a UL 1741 listing are typically considered in compliance with IEEE Std. 1547.*)
6. Three-phase, four-wire distribution system interconnections that are not effectively grounded three-phase or connected line-to-neutral.

...continued on page 3

## Continued from page 2— System Impact Studies Play a Vital Role in Evaluating DG Interconnections

Once it is determined that a System Impact Study should be completed, the following items are typically studied:

1. Protection and voltage regulation schemes at utility substation(s).
2. Steady state and transient analysis of distribution system with DG operating in parallel: Voltage, Power flows (real and reactive), Harmonics and flicker.
3. Distribution system protection schemes: Increased fault current, reduced sensitivity of phase and/or ground overcurrent protection, interference with fuse saving schemes, reverse power flow, out-of-synch reclosing, coordination with DG protective devices.
4. Interconnection protection and step-up transformer connection.
5. The need for monitoring (SCADA) and the items to be monitored.
6. Metering.
7. Communications for metering, monitoring, and transfer-trip schemes.

The System Impact Study is vital to determine any concerns related to a proposed interconnection and measures to mitigate those concerns *before* the interconnecting customer moves forward with the interconnection. This will help to ensure that the most cost effective solution is implemented to maintain required levels of safety, power quality and reliability. Once the study is completed, the ball is back in the interconnecting customer’s court to complete the installation of the DG and interconnection facilities per the utility’s study findings.

## Making Optimal Undergrounding Decisions

What is the best balance between low rates and high reliability? This is a central question that most electric utility managers struggle with. Although higher reliability increases homeowners’ satisfaction and reduces business owners’ economic losses due to power outages, it usually requires capital investments and increased operations and maintenance (O&M) spending that eventually require funding from increased rates.

Given this challenge, distribution utilities looking to increase reliability often consider whether to bury a power line underground. Construction costs associated with undergrounding are typically higher than those of constructing an overhead line. However, the increase in reliability, O&M cost savings, and aesthetics of underground lines should be considered.

PSE’s Performance Benchmarking and Statistical Research Group has shown significant reliability improvements and O&M cost savings for underground lines relative to overhead lines. These benefits can be quantified into a dollar value. For example, by examining the consumer composition and demographics by feeder, the value of reliability to consumers can be estimated. The benefits can then be weighed against construction costs to assist with the undergrounding decision.

The table to the right provides a recommendation based on the costs and benefits of an underground versus an overhead line mile. As can be seen, the value of the undergrounding decision varies by feeder due to geographical and consumer compositions served by each feeder. For example, an outage that strikes a feeder serving primarily Commercial and Industrial loads will typically have a greater economic

Undergrounding Decision by Feeder

Feeder	Present Value of Estimated O&M Savings of Underground Line Mile (\$S)	Present Value of Estimated Reliability Value of the Underground Line Mile (\$R)	Present Value of Other Considerations (\$C)	Construction Cost of Underground Line Mile (\$U)	Construction Cost of Overhead Line Mile (\$O)	Net Present Value of Undergrounding Decision (S+R+C) - (U-O)	Recommendation based on Value-based planning principles
A	\$1,500	\$5,000	\$2,000	\$95,000	\$75,000	(\$11,500)	Overhead
B	\$4,500	\$43,000	\$2,000	\$95,000	\$75,000	\$29,500	Underground
C	\$2,500	\$48,500	\$2,000	\$95,000	\$75,000	\$33,000	Underground
D	\$2,000	\$14,000	\$2,000	\$95,000	\$75,000	(\$2,000)	Overhead
E	\$3,500	\$20,500	\$2,000	\$95,000	\$75,000	\$6,000	Underground
F	\$2,500	\$7,500	\$2,000	\$95,000	\$75,000	(\$8,000)	Overhead
G	\$2,000	\$31,000	\$2,000	\$95,000	\$75,000	\$15,000	Underground

impact than an outage that strikes a feeder serving only residential consumers. With this analysis in hand, utilities can make educated undergrounding decisions, or decisions on other investments that impact reliability, using value-based planning principles.

PSE is currently putting together a white paper on the evaluation process of undergrounding for our benchmarking clients. If you are interested in obtaining a white paper on the evaluation process for undergrounding or in learning more about how PSE can help your utility properly balance rates with reliability, please contact us.