PUBLISHED ARTICLE

Looking Beyond the Initial Price Tag:
The Importance of Lifetime Value

Planning and budgeting are critical for the sustained success of any business by providing a roadmap for effectively allocating resources. By anticipating future operational challenges and purchase needs, companies can reduce waste, enhance overall efficiency and prioritize investments that give them long-term returns. Utility companies, like all companies, plan and budget for key purchases—and by reviewing product specifications and comparing the best solutions, they can find the greatest overall value.

But focusing solely on the initial purchase cost doesn't always reflect the best lifetime value and may not be the most cost-effective approach. Companies need to look beyond "low-cost" solutions and focus on reliability, safety, operation and maintenance costs, and automation capabilities over the equipment's entire lifespan.

G&W Electric

Comparing air insulated distribution switchgear to solid dielectric technology

Let's examine, for example, evaluating a switch from air insulated distribution switchgear to solid dielectric technology. Air insulated distribution switchgear historically has been widely accepted for distribution voltages ranging from 4kV to 27kV—but today, more utilities are discontinuing the use of air insulated switchgear in favor of solid dielectric technology. Companies can take steps to ensure that they're properly considering all aspects of this decision, and four core considerations to keep in mind.

Step 1: Conduct a life cycle cost analysis

Life cycle cost (LCC) analyses are increasingly becoming a vital tool for utility stakeholders and procurement managers when acquiring a new asset or retrofitting or refurbishing existing systems. This process involves evaluating multiple solutions that meet project requirements and achieve acceptable performance, each with varying costs, maintenance needs and useful life cycles.

As a first step in the purchase process, using an LCC analysis not only considers the asset's initial cost (acquisition and installation cost), but also factors in long-term costs tied to maintenance, renewal cost, re-tooling, repair and failure.

With an LCC analysis, companies can assess the total cost of ownership for air and solid dielectric switchgear. Algorithms and data aggregation methods create a reliable LCC analysis to identify the most cost-effective solution. With a fully developed LCC model, informed decisions can be made about deploying new assets, exploring innovative switchgear technologies, or refurbishing existing equipment.

Step 2: Decide whether to purchase or upgrade

Next, evaluate whether to purchase new equipment or upgrade current equipment. This will depend on the budget, the age and condition of the current equipment and the timeline.

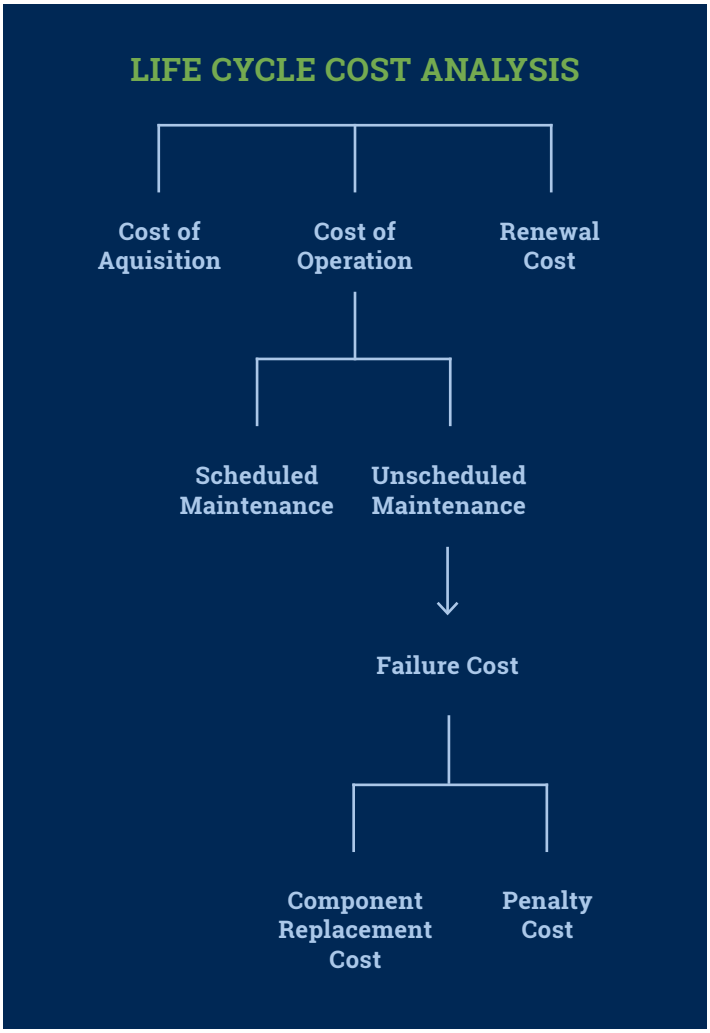
When comparing product specifications, it is vital to ensure that the ratings are the same and meet the long-term requirements of the application. Comparing ratings such as load operations, salt fog testing or creepage can determine which product best fits the application and provide reliable service over the product's useful life. Companies can also contact the manufacturer to have a service team review the product in the field for a more comprehensive understanding of how it works.

Step 3: Consider system and environmental factors

The overall environment plays an important role when determining whether to replace or upgrade equipment. For example, severe weather events can affect the conditions that outdoor equipment must tolerate, and history doesn't always predict future events.

There are many aspects of purchasing power equipment that need to be reviewed, such as:

- Are you connecting to a new or existing system?
- Is the system underground or overhead?
- Are you connecting to renewables?
- Is the environmental terrain flat, mountainous or subject to flooding?
- What are the weather conditions of the area and how do they change?
- Are there animals and birds in the area that might seek warmth or protection?



The deciding factors: air insulated distribution switchgear versus solid dielectric technology

Factor #1: Maintenance

Ongoing maintenance can be costly due to the regular need for inspections, repairs and part replacements—these can disrupt operations and lead to lost productivity. Investing in low-maintenance solutions can help mitigate these costs, ensuring more predictable and manageable long-term expenditures.

Dead-front solid dielectric switchgear and reclosers offer many advantages over traditional air and gas insulated products such as the use of environmentally friendly epoxy encapsulation that is maintenance-free over its lifetime. This eliminates regular maintenance and associated costs. By contrast, live-front air insulated switchgear is susceptible to failures by flooding, animal ingress, moisture build-up, and debris.

Solid dielectric switchgear's dead-front and sealed design functionality continues even when submersed. The sealed design prevents animal and debris-related faults and reduces unexpected maintenance and repair costs. When a fault occurs in traditional switchgear, a fuse replacement often requires taking the entire assembly out of service, increasing renewal costs. But the right solid dielectric switchgear solution utilizes resettable vacuum interrupters, allowing for easy manual or electronic resetting, eliminating the safety hazards and costs of fuse replacement.

Look for switchgear that allows operators to reset a fault interrupter or reconfigure a circuit without leaving their SCADA terminal to eliminate renewal costs and further improve overall operator safety.

Factor #2: Safety

Safety is of paramount importance when deciding on switchgear technology. While live-front designs can expose personnel to energized parts and the risk of arc flash, solid dielectric switchgear is at zero ground potential—providing a much higher degree of safety and reliability than its counterparts. Dead-tank and enclosed designs eliminate exposure to live circuits and wildlife protectors improve operator safety.

Solid dielectric switchgear utilizes a vacuum interrupter and a visible break mechanism which are mechanically interlocked externally and internally and resettable vacuum fault interrupters, eliminating the need to close fuses into live circuits. And, most solid dielectric switchgear does not use a gas or oil to insulate any of the visible break components, eliminating a failure mode due to loss of dielectric.

Factor #3: Automation

Being able to connect switchgear and reclosers to current SCADA or other monitoring systems can be a deciding purchasing factor. Utilizing real-time voltage and current data allows the system to respond to events, providing various modes of automatic system operations. Automation increases reliability by detecting and locating faults—ultimately reducing labor costs and possibly outage times. This improved service quality also leads to increased revenue and a decrease in operational costs.

It's best to install equipment that offers automation and remote monitoring solutions for reduced maintenance and operation costs. solid dielectric switchgear products designed with automated solutions in mind include options such as motors, magnetic actuators, auxiliary contacts and flexibility; with many different automation relays allow the end user to deploy switchgear on a network for manual switching and control with the option to easily retrofit automation capabilities in the future. These automation capabilities will help to lower costs by limiting the need to deploy crews for manual switching and reconfiguration.

Factor #4: Overall Value

The initial cost of air-insulated switchgear doesn't account for the whole picture. Many costs over the switch's lifetime must be considered to determine if it's the best possible value.

Solid dielectric switchgear is designed to be a direct replacement for legacy insulation types, so most common pad footprints can be maintained. It eliminates the need for fuse and barrier replacement, lowering consumable costs, and can reduce penalties and losses incurred for service interruptions.

Automation packages are available for air insulated switchgear. However, options such as in air auto-transfer, voltage/current monitoring, bus fault detection and fault targeting are not available. Without confirmation that the switchgear enclosure is free of debris or moisture, an air insulated switchgear that automates remote operation can lead to catastrophic failure. In fact, there is no solution available that can automate the outdated power fuses used for overcurrent protection.

Price comparison: air insulated distribution switchgear versus solid dielectric technology

The information in the below table is sourced from public utility and municipality budgeting and construction plans that publish costs related to purchase, installation, and repair of distribution switchgear and sampling large and small Investor-Owned Utilities.

	Air Insulated	Solid Dielectric
Initial Purchase Price	$20,000 - $29,000	$57,000 - $67,000
Installation Price *	$18,000	$18,000
Maintenance Visit x 2 (every 15 years)	$15,000	---
Renewal Cost (Fuses, barriers, etc.)	$3,600	---
Repair Due to Flash-over (Component replacement cost)	$9,000	---
Cost of Service Interruption† (penalty cost)	$10,500	---
Totals	**$76,100 - $85,100**	**$75,000 - $85,000**

** Variable depending on site conditions*
† U.S. Department of Energy Interruption Cost Estimator

Solid dielectric switches have multiple advantages over air insulated switches—including the ability to reduce outages and the cost of consumables over the product's lifecycle. Solid dielectric is a comparable economic solution that offers higher quality and reliability that can lower the total cost of ownership.

Ultimately, utilities are leaning toward installing emerging technology such as deadfront, automation ready solid dielectric switchgear, which is environmentally friendly and well suited to meet the future needs of their customers.

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