



Jussi Vanhanen,
Director, Sales and Marketing

We believe strongly in the future of new energy. But the only way to succeed is to ensure that the costs of producing high quality electricity are as low as possible.

Lowering the cost of energy made simple

As wind and solar compete as serious contenders in generating more energy for the world, the energy produced must be as cheap, if not cheaper, than that of fossil-based sources, and the quality of energy equally as high.

The formula for lowering the cost of energy from any source is ultimately very simple: Lower overall capital investment costs, equipment lifetime operation and maintenance (O&M) costs and fuel costs while boosting the amount of energy generated. This formula becomes even more attractive with wind and solar – as the cost of fuel is already free!

The Switch has taken a closer look at 4 ways to lower the costs of energy that affect the remaining variables. Here's how:

All adds up: goal is lowest cost of energy

The race is on to lower the cost of energy. Although this applies to all kinds of energy, it is even more crucial with new energy sources. To help renewables pick up speed in being accepted, The Switch has carefully considered the key variables that lower the cost of energy production with wind and solar. And we intend to continue fighting to lower the costs of energy.

1. Raise annual energy production

High availability and great efficiency curves make for a winning combination to boost annual energy production (AEP).

Availability

The simplest way to increase AEP is to keep turbines or solar plants up and running. Though the wind and sun may come and go, the equipment must continue to operate and produce a constant stream of high quality energy.

“The Switch PMG drive trains typically average 97% availability or higher in all operating conditions.”



Five years ago, The Switch made a strategic decision to pioneer permanent magnet generator (PMG) technology for wind turbines as its contribution to raising AEP. PMGs are known for their use of permanent magnets, requiring no external power source to initiate a magnetic field. Today, PMG technology is preferred by the market majority because it ensures fewer failures, due to the fact that there are no wearing parts, and it requires less maintenance.

Since 2007, The Switch has had field-proven experience in offshore wind conditions from its 4.25 MW direct-drive PMG deliveries to ScanWind. These wind turbines have also set truly remarkable records in availability. The Switch PMG drive trains typically average 97% availability or higher in all operating conditions.

By minimizing the downtime of the equipment and scheduling regular maintenance and tune-ups for low wind or solar periods, it is possible to keep renewable energy producing equipment operating at its highest availability. The Switch products all feature a highly serviceable design to minimize the need for maintenance and increase production time.

Efficiency

When it comes to efficiency curves, PMGs also excel. Operating at peak efficiency or power does not account for better AEP rates. Rather, improved AEP comes from the amount of time a wind turbine spends generating electricity over all wind speeds.

PMGs demonstrate higher efficiency at partial loads where they spend the greatest number of their operating hours, resulting in a proven higher efficiency curve. Moreover, PMGs start producing power at lower wind speeds, enabling them to add more power to AEP rates.

Each of The Switch PMG-based drive trains delivers superior efficiency curves over the entire wind speed range. In an independent study by NextWind's Rain Byars, the advantage of using PMG becomes clearer at lower wind speeds due to the PMG's performance capability at partial loads. The use of PMGs result in 1.4 – 6.9% more energy on a consistent basis per year, depending on the wind class.¹

2. Minimize total life cycle costs

Cutting back on total life cycle costs (TLC) means scrutinizing the expenses associated with both the initial capital investment as well as the O&M costs over the lifetime of the equipment. These two essential expenses must be optimized to bring about the best long-term results.

Capital investment

Going for a low-cost initial equipment investment may not always be the wisest. In fact, it may even lead to higher hidden expenses when it comes to O&M costs throughout the equipment's lifetime of 20 years or more.

A double-fed induction generator (DFIG) solution has been estimated to cost about 30% less in initial investment costs because it uses a partial converter rather than a full-power converter. However, it is important to factor in all additional costs of getting the DFIG connected to the grid according to the latest international grid code requirements, as this may entail much more costly connectivity solutions and lost production time.

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At The Switch, we begin each project with a view to minimize TLC. We start by optimizing the design for each wind and solar customer through our unique design process that involves close collaboration with our customers. Every solution is purpose-built for the specific environment in which it will operate. By placing more focus up front on selecting the right, rugged design, we can significantly lower O&M costs over the equipment's lifetime.

Some of our solutions to lower costs have included carefully calculated magnet placement in the generator to minimize their use, special high-humidity systems to avoid disturbances, and optimized weight-efficiency ratios to best match the desired turbine design.

Operation and maintenance

All solutions from The Switch require minimal maintenance and feature a highly serviceable design to speed up maintenance routines. When maintenance is scheduled for low seasons in wind and solar, it is cheaper and faster. Moreover, when a recommended maintenance program is followed, it is possible to minimize breakdowns and ensure smooth operation.

Our remote equipment monitoring system and 24/7 technical support allow our customers easily to implement a proactive service plan, avoiding unexpected downtime and costly failures. Moreover, PMG technology allows us to optimize the entire drive train and offer our customers the greatest possible flexibility to find a solution that reduces O&M costs.

One example of this is our FusionDrive™ concept, which improves the entire drive train design by removing all high-speed components that are more prone to failure. The lightweight product also saves in tower costs. Another example is The Switch direct-drive PMG, which eliminates the entire gearbox, and with it, the slip rings and speed measurements.

When comparing the maintenance costs of a PMG turbine with a DFIG turbine, the potential savings are considerable. The estimated maintenance time between failures (MTBF) for a PMG and full-power converter is 8,000 hours compared to only 1,500 hours for a DFIG.¹ In practice, this means servicing once per year for a PMG turbine versus 5 times per year for a DFIG turbine. Not only does the downtime during a maintenance day account for thousands of euros in lost energy, associated labor and maintenance equipment costs also have a substantial impact on the overall costs.

3. Extend the lifetime of equipment

Typical renewable energy generating units, like wind turbines or solar panels, have an estimated operating lifetime of 20 years with today's technology. By lengthening this time with an additional three to five years, the cost of energy can be lowered dramatically. In fact, current designs from The Switch have already been calculated to last longer than 20 years.

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A good purpose-built design, well-selected materials and components, and a carefully planned maintenance program can lengthen the lifetime of the equipment substantially. For example, a well-designed drive train minimizes cogging torque, reducing the amount of vibration and lengthening the lifetime of all components.

The Switch has implemented its unique Model Factory concept, which enables low-cost volume production. This systematic approach allows the consistent, industrialized production of each renewable energy module.



Our proprietary Model Factory concept begins with an optimized supply chain that is specified by the precise needs of each customer. This guarantees the best possible component quality. It even includes continuous access to critical components, such as the rare earth magnets used in PMG units. Model Factory locations can be flexibly placed wherever desired, even close to the energy generation site. This allows the production of standardized serial products with local expertise and assures the lowest landed cost for each customer.

Another way to extend the lifetime of equipment and increase its production efficiency is through upgrades, retrofitting and recycling of components. The Switch offers several simple plug-and-play solutions to retrofit older DFIG turbines into modern PMG versions that meet the challenging international grid code requirements.

4. Boost the quality of electricity

In the end, the success of renewable energy depends on the quality of electricity it feeds into the grid. News from recent incidents of wind turbines not connected to the grid has overshadowed some of the earlier favorable progress. Now the industry and governments alike are responding – with stricter and more uniform grid code regulations.

The Switch renewable energy solutions have always demonstrated superior grid connection behavior. Our full-power converters support fault ride-through and fulfill the world's strictest grid code requirements, including the German BDEW 2008. Our 3 MW units have been tested on site and passed all grid code requirements, even for the latest Chinese regulations. Low flicker, electrical noise emission and THD of <1.5%, the lowest of any in the entire industry, also support the final quality of electricity fed to the grid.

Join us on our mission!

The Switch believes strongly in the future of new energy as a major contributor to the world's growing energy needs. But the only way to succeed is to make sure that the costs of producing high quality electricity are as low as they can possibly be.

We have built our company and way of working around the idea of lowering the cost of wind and solar energy. And we continue to look for ways to improve AEP while minimizing overall TLC as well as O&M expenses.

Why not join us in lowering the costs of energy?

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¹ Byars, Rain. NextWind, Inc., 2011. Power System Architecture: What is the Best Generator Type for a 5MW Wind Turbine? A Comparison of Doubly Fed and Permanent Magnet Generators for Wind Turbines. Presented at AWEA Offshore Windpower Conference. Baltimore, MD. October 12, 2011.