



AC or DC POWER – WHICH is BEST for TODAY'S USAGE?

HISTORICAL FACTS; AC/DC DEBATE, EDISON vs. TESLA, circa 1900

Nicola Tesla; "Alternating Current will allow the transmission of electrical power to any point on the planet, either through wires or through the air, as I have demonstrated."

Thomas Edison; "Transmission of AC over long distances requires lethally high voltages, and should be outlawed. To allow Tesla and Westinghouse to proceed with their proposals is to risk untold deaths by electricide."

Tesla; "How will DC power a 1,000 horsepower electric motor as well as a single light bulb? With AC, the largest as well as the smallest load may be driven from the same line."

Edison; "The most efficient and proper electrical supply for every type of device from the light bulb to the phonograph is Direct Current at low voltage."

Tesla; "A few large AC generating plants, such as my hydroelectric station at Niagara Falls, are all you need: from these, power can be distributed easily wherever it is required."

Edison; "Small DC generating plants, as many as are required, should be built according to local needs, after the model of my power station in New York City."

EARLY AC DOMINANCE

After Edison introduced his DC power stations, the first of their kind in the world, the demand for electricity became overwhelming. Soon, the need to send power over long distances in rural and suburban America was paramount. How did the two power systems compare in meeting this need?

AC - Alternating current could be carried over long distances via a relatively small line given an extremely high transmission voltage of 50,000 volts or above. The high voltage could then be transformed down to lower levels for residential, office and industrial use.

DC - While higher in quality and more efficient than alternating current, DC power could not be transformed or transmitted over distances via small cables without suffering significant losses through resistance.

The Result - AC power became the standard of all public utilities, overshadowing issues of safety and efficiency and forcing manufacturers to produce appliances and motors compatible with the national grid.

The 100 YEAR OLD POWER SCHEME

With AC power the only option available from power utilities, the world came to rely almost exclusively on AC-based motors and other appliances, and the efficiencies and disadvantages of AC power became accepted as unavoidable. Nicola Tesla's development of the polyphase induction AC motor was a key step in the evolution of AC power applications. His discoveries contributed greatly to the development of dynamos, vacuum bulbs and transformers, strengthening the existing AC power scheme 100 years ago. Compared to DC and Edison's findings, AC power is inefficient because of the energy lost with the rapid reversals of the current's polarity. We often hear these reversals as the familiar 60 cycles per second (60 hertz) hum of the appliance. AC power is also prone to harmonic distortion, which occurs when there is a disruption in the ideal AC sinusoidal power wave shape. Since most of today's technological advances of on-site power devices are DC, there is a need use inverters to produce AC through the system and then back to DC into the end source of power. These inverters are inefficient; energy is lost (up to 50%) when these devices are used. This characteristic is evident in many of today's electronic devices that have internal converters, such as fluorescent lighting.

AC/DC 1950 to 2000

The discovery of semiconductors and the invention of the transistor, along with the growth of the American economy, triggered a quiet but profound revolution in how we use electricity. Changes over the last half-century have brought the world into the era of electronics with more and more machines and appliances operating internally on DC power and requiring more and more expensive solutions for the conversion and regulation of incoming AC supply:

<u>AC DEVICES — 1950</u>	<u>DC DEVICES — 2000</u>
Electric Typewriters	Computers, Printers, CRT's, Scanners,
Adding Machines	CD-ROMs, Photocopiers
Wired, Rotary Telephones	Wired, Cordless & Touch Tone Phones
Teleprinter	Answering Machines, Modems, Faxes, Videoconferencing, Internet, Intranet
Early Fluorescent Lighting	Advanced Fluorescent Lighting with Electronic Ballast, Gas Discharge Lighting
Radios, Early TV's	HDTV's, CD Players, Videocassette Recorders
Record Players	Cable & Satellite Decoders, Game Consoles
Electric Range	Microwave Ovens
Fans, Furnaces	Electronically Controlled HVAC Systems

A WORLD OUT of PHASE

Over the last 50 years, we have moved steadily from an electro-mechanical to an electronic world--a world where most of our electrical devices are driven by Direct Current, and where most of our non-fossil fuel energy sources (such as photovoltaic cells and batteries) deliver their power as a DC supply.

The Problem - Despite these changes, the vast majority of today's electricity is still generated, transported and delivered as Alternating Current. Converting AC to DC, and integrating alternative DC sources with the mainstream AC supply, are inefficient and expensive activities that add significantly to capital costs and lock us all into archaic and uncompetitive utility pricing structures.

The Solution - Nextek's AC/DC integration technology represents a breakthrough in on-site electrical management, combining the availability of AC power with the quality and efficiency of a DC supply.

NEXTEK BENEFITS

- Easy conversion of AC lighting fixtures to DC-powered units
- Easy conversion of AC grid power into DC power into lighting systems
- Highly efficient management of peak loads
- Complete continuity of supply through the seamless integration of rechargeable batteries
- Complete continuity of alternative energy sources such as PV, micro turbines and fuel cells
- **Future-proof** lighting and other systems to be developed
- A world which Thomas Edison envisioned which is clean, efficient and less costly

The CYCLE of 100 YEARS NEEDS to be ADDRESSED for a SUSTAINABLE POWER FUTURE

- The computer industry alone accounts for 15% of the total power capacity in America
- Fossil Fuel needs to be slowed to prevent global warming concerns
- On-site power using DC to the end-source is the most efficient use of power
- No conversion losses using DC power for the full potential of alternative energy