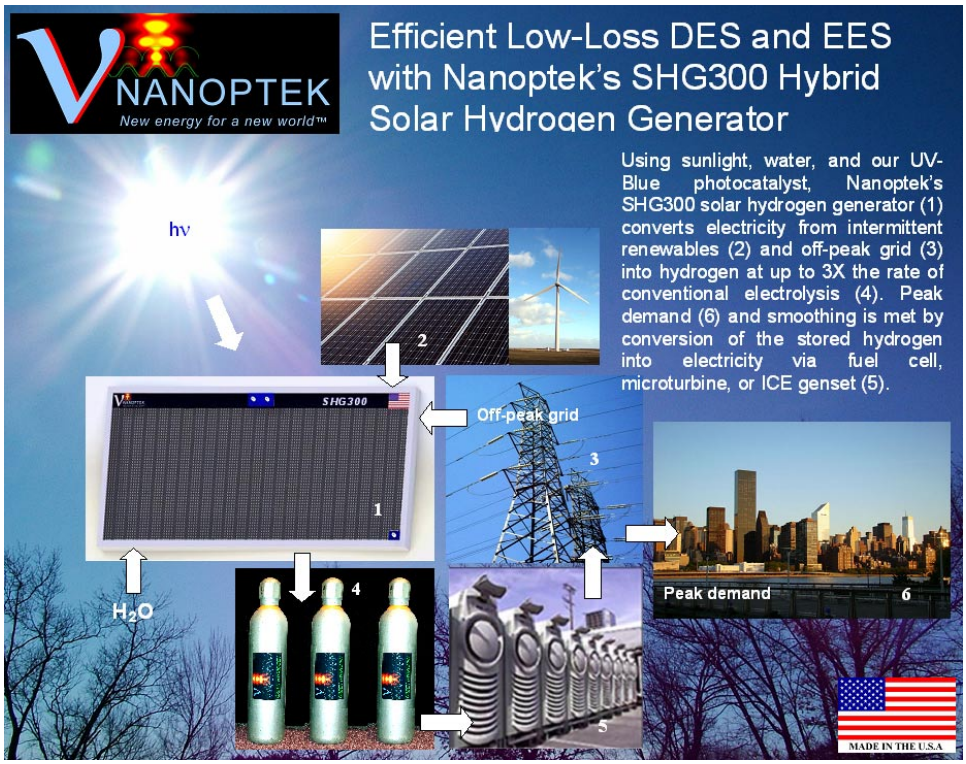
NEW PRODUCT FOR UTILITY DES AND EES:

NANOPTEK SHG300 HYBRID SOLAR HYDROGEN GENERATOR™

Produce Up To 3X More Hydrogen per KWh for Low-Loss Utility Peak-Shaving; Harvest and Buffer Solar, Wind, and Other Renewable Power, Remote Back-up

The Nanoptek SHG300 is a hydrogen generator panel that uses sunlight and Nanoptek's patented engineered band-gap photocatalyst to reduce the electrical power needed to split hydrogen from water to as little as 1/3 of that required by PEM or ½ of alkaline electrolyzers, for an electrolysis efficiency of *up to 150% on an electrical-energy basis.**

By providing efficient chemical storage of electrical energy, the SHG300, in combination with hydrogen storage and fuel cell components from other manufacturers, enables more efficient electrical energy storage (EES) and distributed electricity storage (DES). Utilities can save low-cost off-peak power to replace expensive peak-load capacity. Intermittent solar and wind power can be efficiently converted into hydrogen to provide a stable buffer to the grid, converting such clean sources into reliable "on demand" power to utilities.



When the sun is not shining, the SHG300 can continue to produce hydrogen with its integral MMO (mixed metal oxide) anode, chemically converting off-peak power from windfarms or the grid for later use, and with conversion efficiency as good as or better than many PEM electrolyzers.

Of course, no carbon is produced with renewable power input. But even with fossil-fueled grid power input, the sunlit panels reduce carbon up 50% to 66% per unit of hydrogen produced compared to other electrolyzers.

The SHG300's highly efficient use of the shorter UV and blue wavelengths in sunlight means that it can continue to generate hydrogen at up to 1/3 or more of its peak capacity on most overcast days, because these energetic wavelengths penetrate cloud cover more effectively than the rest of sunlight.

The modular 2.0m^2 panel form-factor is easily interconnected to scale up to utility-size multi-acre MW installations, or down to off-grid backup and commercial installations. It stacks flat for economical warehousing and shipping. Optimum shallow-angle mounting means the panels can be packed more densely in fields or on roofs.

Utility and Renewable Value Proposition: Up to 3X More H_2 per KWh In

	H_2 Generator *All percent efficiencies are based on higher heating value (HHV) of H_2: 39.4 kWh/kg of H_2	Energy Content of H_2 Produced	KWh OUT (Fuel cell @ 50%)	Turn-around Yield Gain
100 KWh IN	PEM Electrolyzer @ 52%	52 kWh	26 kWh	—
	Nanoptek SHG300 @ 103%	103 kWh	52 kWh	**2X**
	Nanoptek SHG300 @ 148%	148 kWh	74 kWh	**3X**

Key Benefits:

- Hybrid design operates 24/7
- 2X to 3X more H_2 produced per kWh in
- No carbon by-product in all-solar or renewable-to-MMO modes
- Up to 1/3 of peak capacity on cloudy days
- Lower capital cost than electrolyzers of equal H_2 production rate
- Almost no operating cost in all-solar mode
- Minimal maintenance
- Impurities: Easily removed O_2 and H_2O
- Silent operation
- Use of diffuse light eliminates need to track
- Passive auto-fill
- Rapid start-up, steady flow in about 10 min.

Acre Installation SHG300 75% packing 24/7 Operation Boston 820 W/m^2 direct solar (Thorlabs S302C)	Electrical Energy Consumed Producing KG of H_2	Electrolysis Electrical Efficiency (HHV) $\frac{39.4 kWh/kg_{H2}}{kWh_{in}/kg_{H2}}$	DC Volts at Anode	Power Storage Capacity of H_2 Produced Per Acre Per Hour (HHV)	Annual Energy Content of H_2 Produced Per Acre (HHV)
TiO_2 Photo-Anode Only	26.7 kWh	148%	1.0V	49 kW	426 MW-h
TiO_2 and MMO Anodes	38.3 kWh	103%	1.0V / 2.3V	98 kW	852 MW-h
MMO Anode Only	67.9 kWh	58%	2.6V	98 kW	852 MW-h

SHG300 Panel Physical	Weight (empty)	Weight (filled)	Weight/area (filled)	Height	Width	Thickness	Electrolyte Volume	Total Area
English	103 lbs	140 lbs	6.7 lbs/ft^2	43 in.	83 in.	2.5 in	4.5 gal.	21 ft^2
Metric	46.7 kgs	63.5 kgs	30.2kgs/m^2	1 m nom.	2 m nom.	6.4 cm	17 liters	2.0 m^2

Safety and Environmental Features:

- Reduces/eliminates carbon from H2 production
- Leak-resistant solvent-welded acrylic chamber
- Dual-sealed Ti and SS electrode pass-throughs
- Potassium carbonate (potash) electrolyte (pH<12) is safer than KOH
- Auto-shutoff valves for leak-free disconnection
- Safety shut-off switch
- Low-pressure, low temperature operation
- Non-asbestos gas separation barrier
- Recyclable and/or low energy materials
- No exhaust plume
- Higher tolerance of water feed quality than most electrolyzers; water need not be distilled

Design Highlights:

- Nanoptek patented shifted-bandgap UV-Blue™ titania (TiO_2) photoanode
- MMO (Mixed Metal Oxide) auxiliary anode
- 316 stainless steel cathode
- High transmission S-UVT acrylic™ window
- Rugged acrylic body
- 6063-T5 Al frame, anodized and acrylic overcoated
- High packing density for field and roof installations
- Flat stacking for economical shipping
- Thermal signature less than 35°C above ambient
- Minimum temperature: -7°C operating, -40°C storage

- Each kWh in produces 2X to 3X more hydrogen than electrolyzers during sunny hours
- Convert off-peak power into hydrogen for use during peak load demand
- Buffer intermittent solar and wind power for stable enhanced-value supply to utility and grid
- Provide back-up power for telecomm towers and other remote equipment — no diesel fuel
- Increase reliability and continuity of grid power where it is now intermittent
- Use oxygen co-produced with hydrogen (8X by weight) for cleaner electricity generation

NANOPTEK
New energy for a new world™

NANOPTEK CORPORATION
63 Great Road
Maynard, MA 01754
www.nanoptek.com

For more information, or to explore business opportunities:
John M. Guerra, P.E
President and CEO
Phone: (978) 461-0472
jguerra@nanoptek.com

Now accepting pre-orders for limited production beginning Q1, 2012

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