



BLACKLIGHT POWER
BLACKLIGHT POWER

clean, renewable, sustainable energy

Business Presentation

Safe Harbor Statement

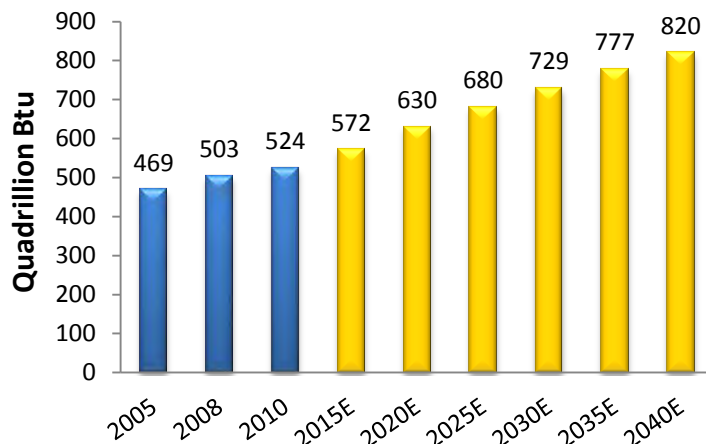
This presentation contains forward-looking statements, including statements regarding the company's plans and expectations regarding the development and commercialization of our technology. All forward-looking statements are subject to risks and uncertainties that could cause actual results to differ materially from those projected. The forward-looking statements speak only as of the date of this presentation. The company expressly disclaims any obligation or undertaking to release publicly any updates or revisions to any such statements to reflect any change in the company's expectations or any change in events, conditions or circumstances on which any such statements are based.



The Opportunity

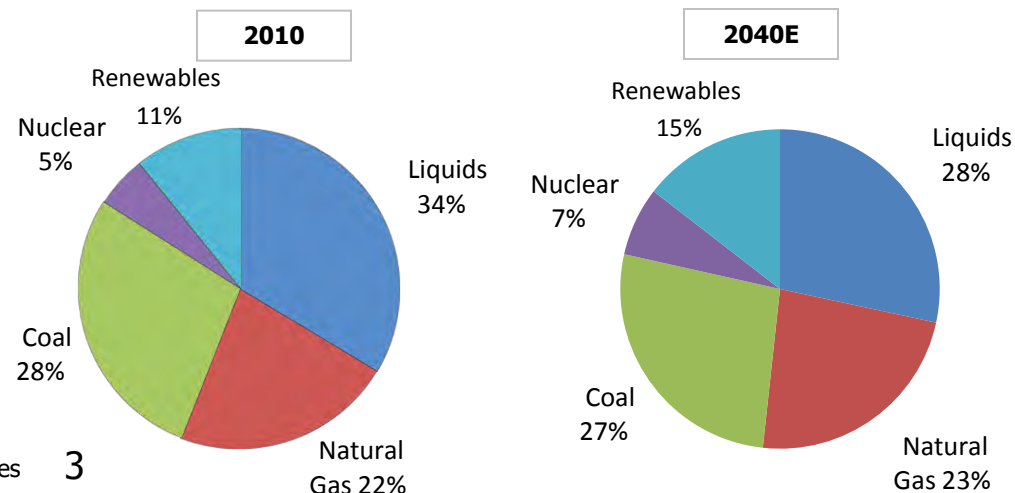
- Established energy sources are expensive, polluting and unsustainable
 - ~\$8 trillion currently spent globally on fossil fuels; ~\$2 trillion in the U.S.
 - Each year, tens of billions are spent on energy R&D in search of alternative solutions
- Over \$1 trillion annually expected to be spent on global energy infrastructure through 2030
- Global energy demand has nearly doubled over the past 20 years, and is projected to increase 56% between 2010 and 2040
- Existing sources of renewable energy are expected to satisfy only a small portion (~15%) of 2040 demand
 - Wind and solar are relatively poor sources of baseload power
 - The remainder will be supported primarily by fossil fuel consumption, which is expected to increase nearly 46% over the same time period

Global Energy Consumption



Sources: EIA IEO 2013, International Energy Agency and management estimates

Global Energy Use by Fuel Type



The Solution - BlackLight Power

- BlackLight Power has developed a new, sustainable nonpolluting energy technology.
- BLP's technology and science have been validated by independent third parties in their own laboratories.
- "SunCell" has been validated.
- "SunCell" appears very competitive with a clear path to market.
- Additionally, advanced thermal power source with Licenses in place with seven firms to offer up to 8,250 MW of power.

*The BlackLight Process could be the most important
energy technology of our generation*

Unit Costs: BLP vs. Competitors

Table 1. Capital and Generation Costs Comparisons of BlackLight Power Sources Versus Other Primary Energy Sources or Power Converters.

	Average Generating Capacity (MW)	Installed Cost (\$/kW)	Levelized Cost of Electricity (\$/kWh)	CO ₂ Emission (lb per MWh)
CENTRAL GENERATION				
BLP Thermal	1+	1,000	<0.01	0
Natural Gas Combined Cycle	550	1,000	0.06	800
Coal	600	3,000	0.065	2,500
Nuclear	1,100	5,400	0.12	
DISTRIBUTED GENERATION APPLICATIONS				
BLP SunCell™	<10	<100	<0.01	0
Solid Oxide Fuel Cell	2.4	5,000	0.21	850
Wind	100	2,000	0.10	
Photovoltaic	10	3,000	0.20	

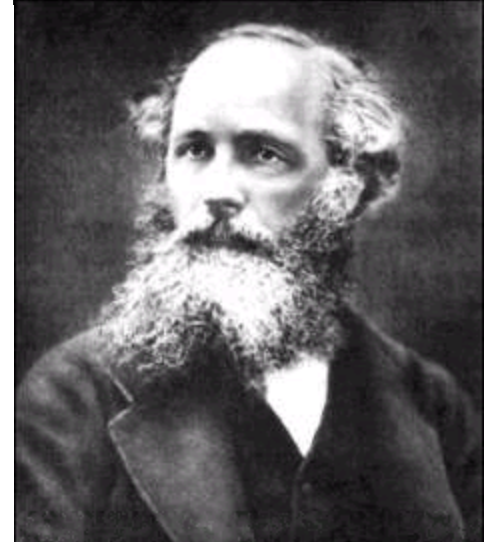
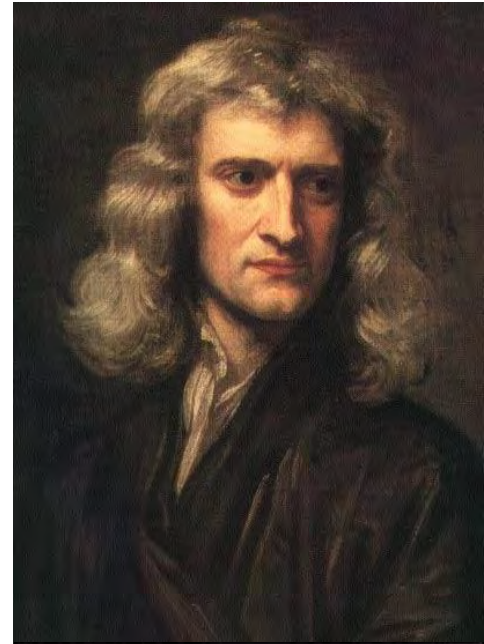
Sources: EIA, Lazard 7.0 and Management estimates

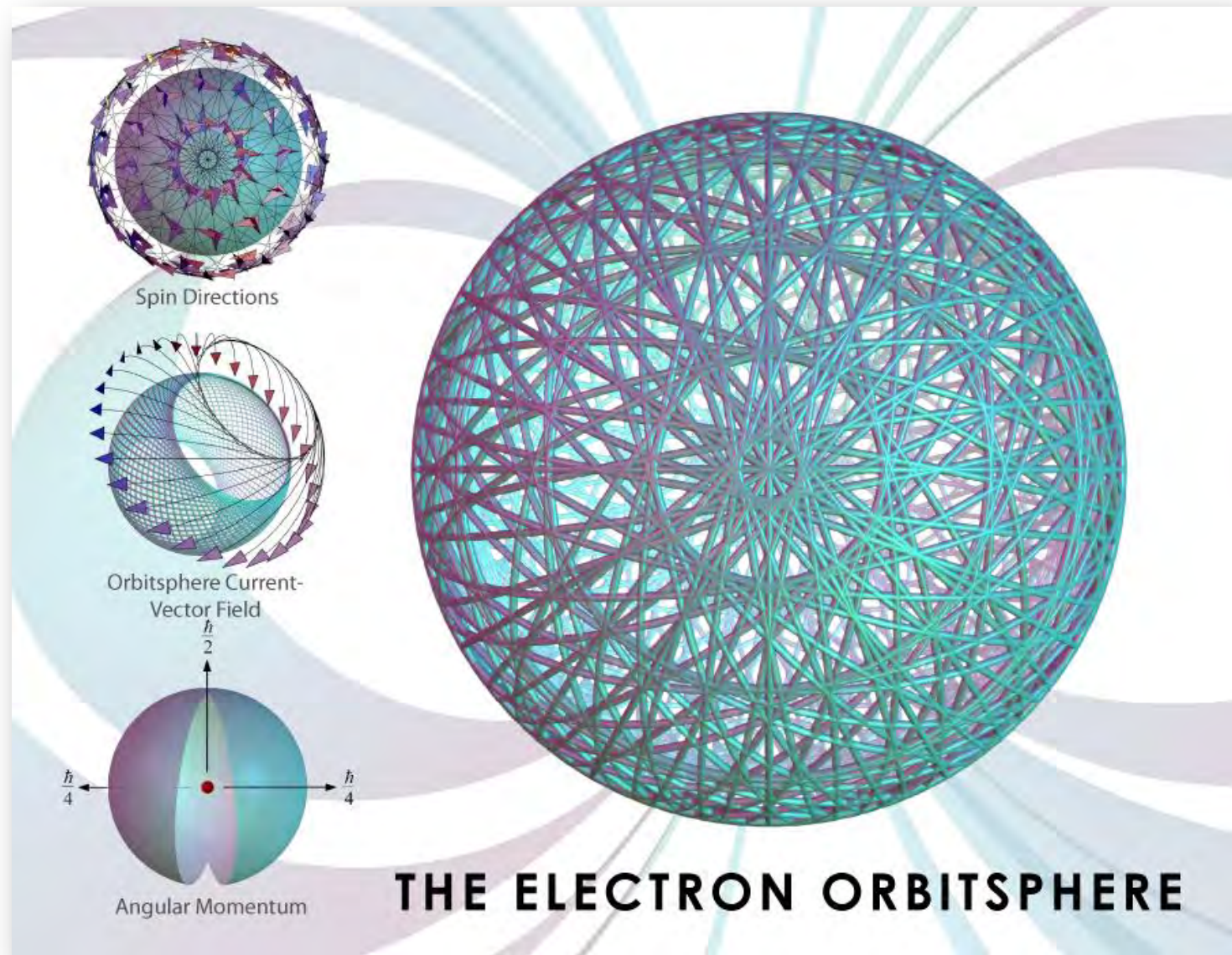
Background



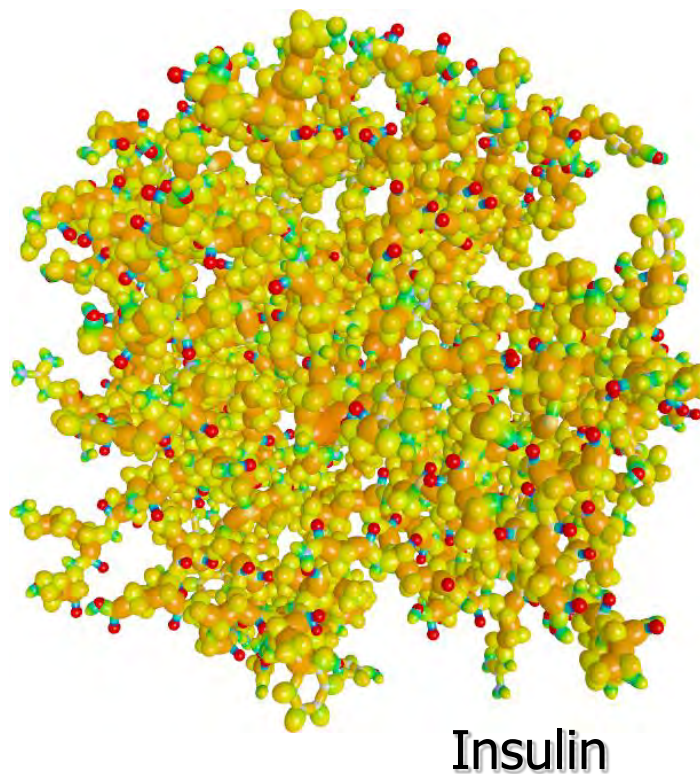
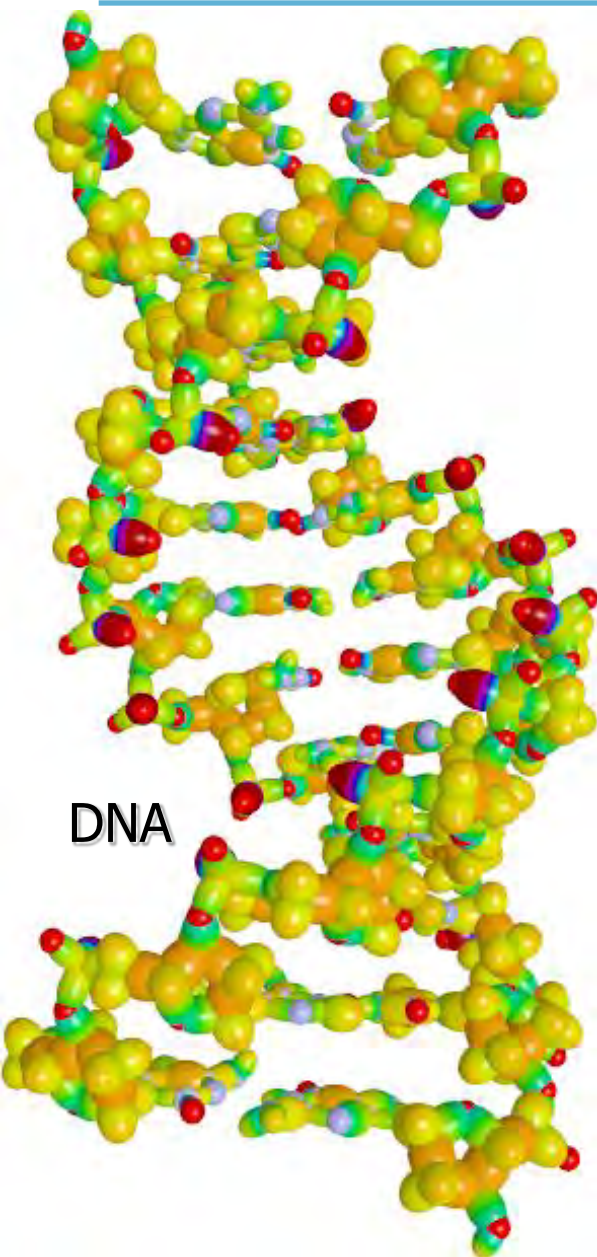
Review of Theory

- Founder, Dr. Randell Mills, proposed a new model of the electron that was used to predict our novel energy technology
- Assume physical laws apply on all scales including the atomic scale
- Start with first principles
 - Conservation of mass-energy
 - Conservation of linear and angular momentum
 - Maxwell's Equations
 - Newton's Laws
 - Special Relativity
- **Highly predictive**— application of Maxwell's equations precisely predicts hundreds of fundamental spectral observations in exact equations with no adjustable parameters (fundamental constants only). Correctly predicts the fundamental observations of chemistry and physics in exact equations over a scale (largest to smallest) of 1 followed by 85 zeros.

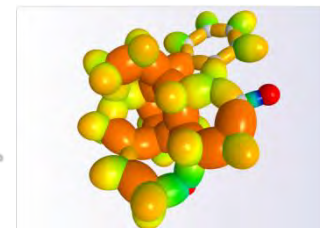




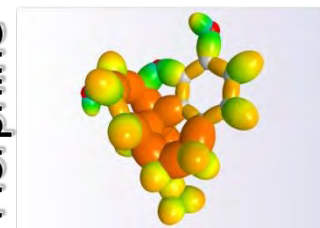
Millsian 2.0: Modeling Molecules



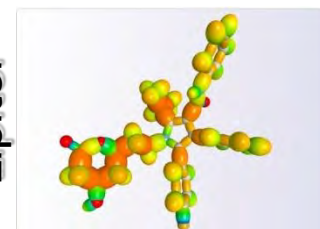
Strychnine



Morphine



Lipitor



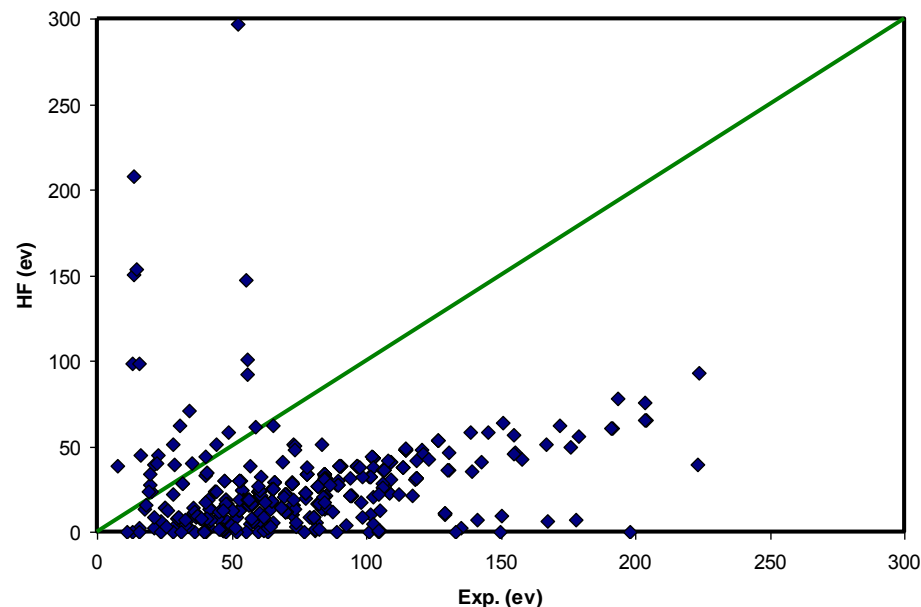
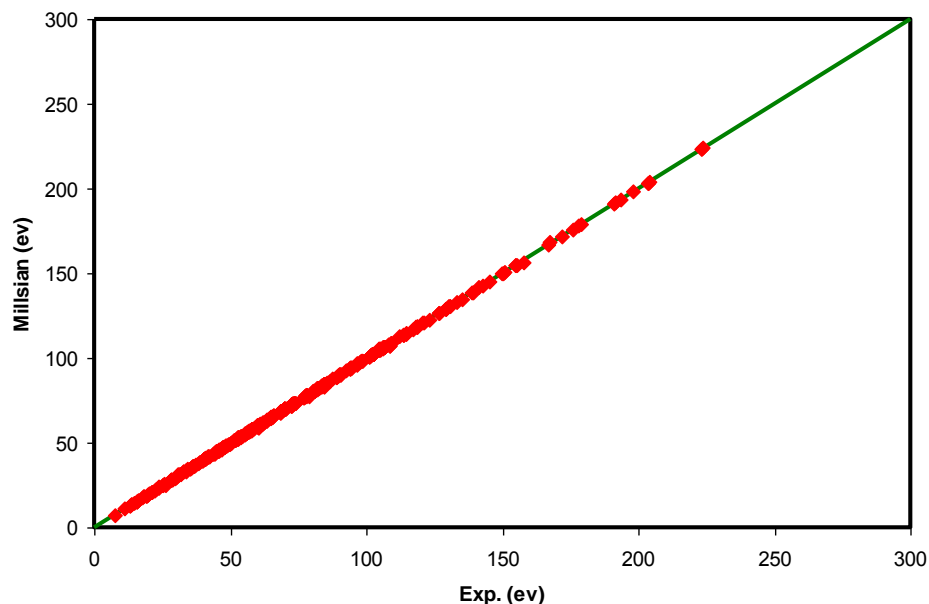
RNA



Comparison of Classical to Quantum Mechanical Performance

The total bond energies of exact classical solutions of 415 molecules generated by Millsian 1.0 and those from a modern quantum mechanics-based program, Spartan's pre-computed database using 6-31G* basis set at the Hartree-Fock level of theory, were compared to experimental values.

Millsian vs. 6-31G*

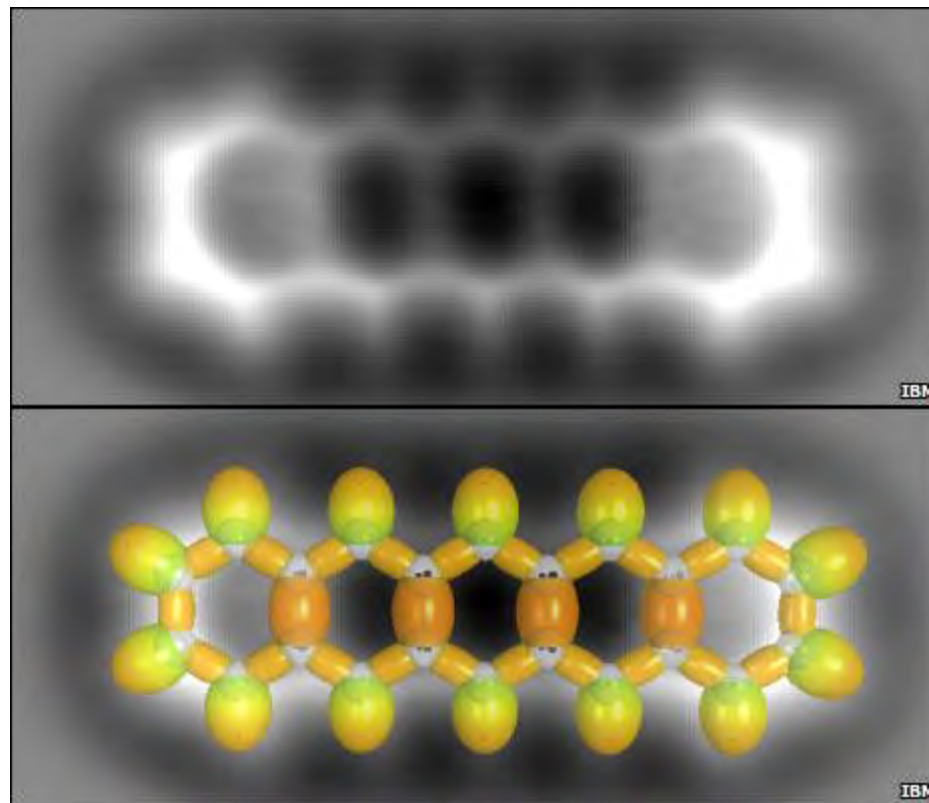


R. L. Mills, B. Holverstott, W. Good, A. Makwana, J. Paulus, "Total Bond Energies of Exact Classical Solutions of Molecules Generated by Millsian 1.0 Compared to Those Computed Using Modern 3-21G and 6-31G* Basis Sets," Phys. Essays 23, 153 (2010); doi: 10.4006/1.3310832

Physical Image Compared to Physical Solution

The polycyclic aromatic hydrocarbon pentacene was imaged by atomic force microscopy using a single CO molecule as the probe. The resulting breakthrough in resolution revealed that in contrast to the fuzzy images touted by quantum theoreticians as proof of the cloud model of the electron, the images showed localized bonding MOs and AOs in agreement with the classical solution.

Top, atomic force microscopy image of pentacene by Gross et al. Bottom, the superimposed analytical classical solution that matches the physical structure.

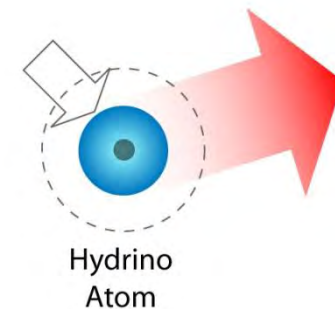
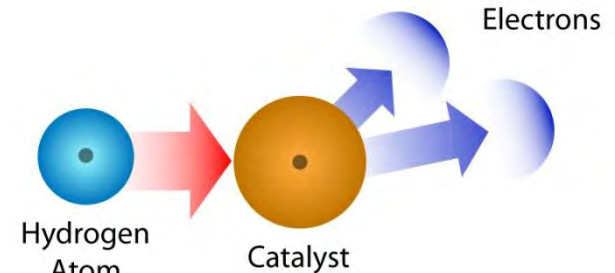


[L. Gross, F. Mohn, N. Moll, P. Liljeroth, G. Meyer, "The chemical structure of a molecule resolved by atomic force microscopy", Science, Vol. 325, (2009), pp. 1110-1114.]

The BlackLight Energy Process

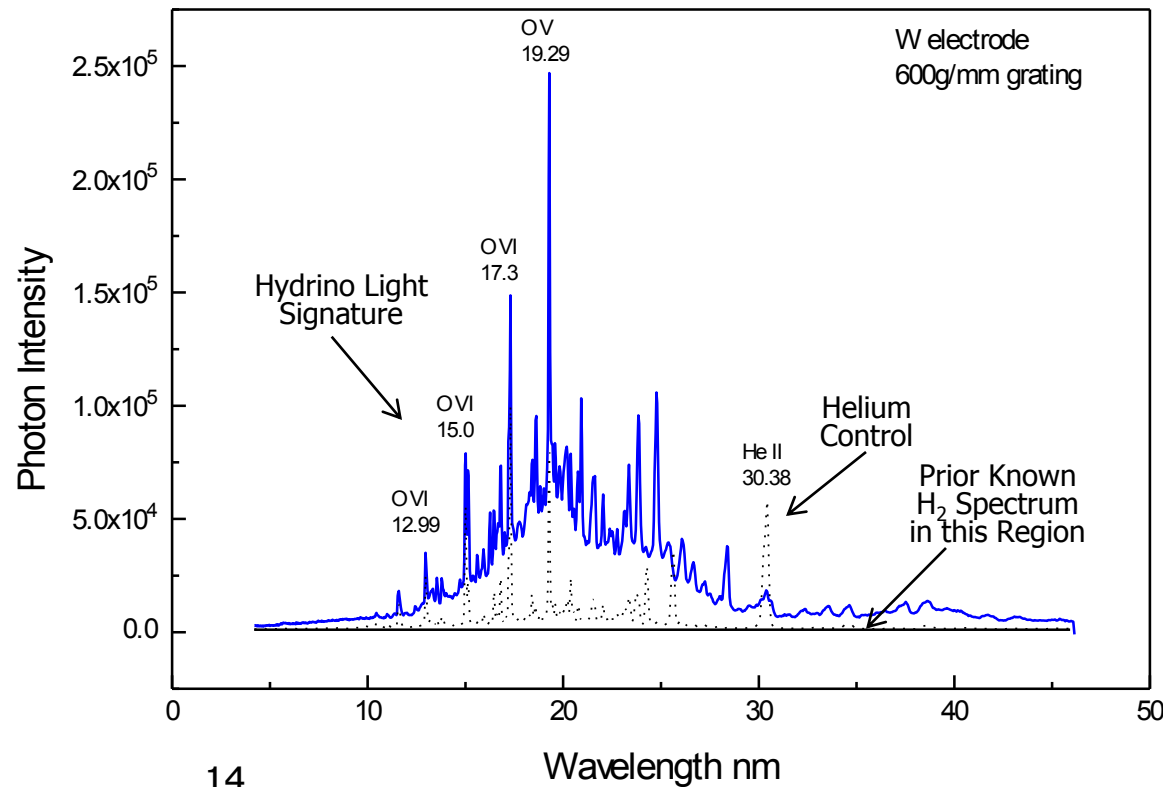
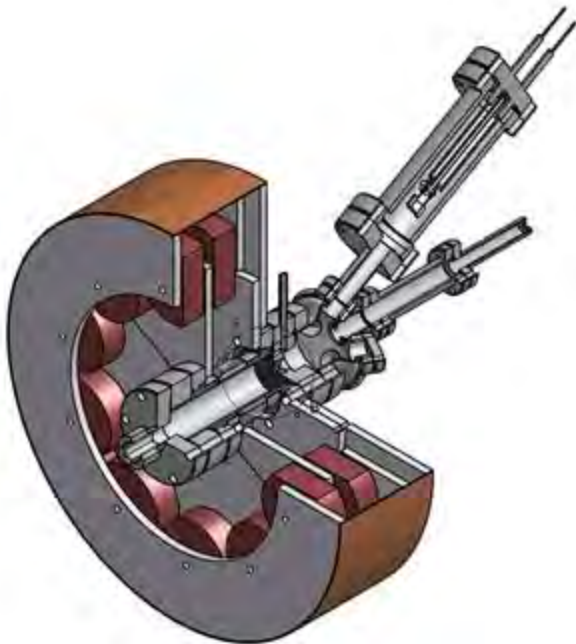
Hydrino Reaction ("BlackLight Process")

1. Atomic hydrogen reacts with an energy acceptor called a catalyst wherein energy is transferred from atomic hydrogen to the catalyst which forms an ion due to accepting the energy
2. Then, the negative electron drops to a lower shell closer to the positive proton to form a smaller hydrogen atom called a "hydrino" releasing energy that ultimately is in the form of heat
3. The catalyst ion regains its lost electrons to reform the catalyst for another cycle with the release of the initial energy accepted from hydrogen. With the imposition of an arc current condition, the limiting space charge of the ionized electrons is eliminated and the rate becomes massively high.



Hydrino Light Signature

- Experimental Setup for the Observation of the Hydrino Light Signature
 - Light signature from pure hydrogen at much higher energy than deemed possible for this element in any known form
 - Continuum radiation showing H going below the level previously thought to be the “Ground State”



Dark Matter Ring in Galaxy Cluster

This Hubble Space Telescope composite image shows a ghostly “ring” of dark matter in the galaxy cluster Cl 0024+17. The ring is one of the strongest pieces of evidence to date for the existence of dark matter, a prior unknown substance that pervades the universe.

Characteristic EUV continua of hydrino transitions following radiationless energy transfer with

cutoffs at $\lambda_{\left(H \rightarrow H \left[\frac{a_H}{p=m+1} \right] \right)} = \frac{91.2}{m^2} \text{ nm}$

are observed from hydrogen plasmas in the laboratory that match significant celestial observations and further confirm hydrino as the identity of dark matter.



- M. J. Jee et al., Discovery of a ringlike dark matter structure in the core of the galaxy cluster Cl 0024+17, *Astrophysical Journal*, 661, (2007) 728–749.
- R. L. Mills, Y. Lu, K. Akhar, Spectroscopic observation of helium-ion- and hydrogen-catalyzed hydrino transitions, *Cent. Eur. J. Phys.*, 8, (2010) 318–339, DOI: 10.2478/s11534-009-0106
- R. L. Mills, Y. Lu, “Time-Resolved Hydrino Continuum Transitions with Cutoffs at 22.8 nm and 10.1 nm,” *Eur. Phys. J. D*, 64, (2011), pp. 65, DOI: 10.1140/epjd/e2011-20246-5.
- R. L. Mills, Y. Lu, Hydrino Continuum transitions with cutoffs at 22.8 nm and 10.1 nm, *Int. J. Hydrogen Energy*, 35 (2010) 8446–8456, doi: 10.1016/j.ijhydene.2010.05.098.
- F. Bornauid et al., Missing mass in collisional debris from galaxies, *Science*, 316, (2007) 1166–1169.



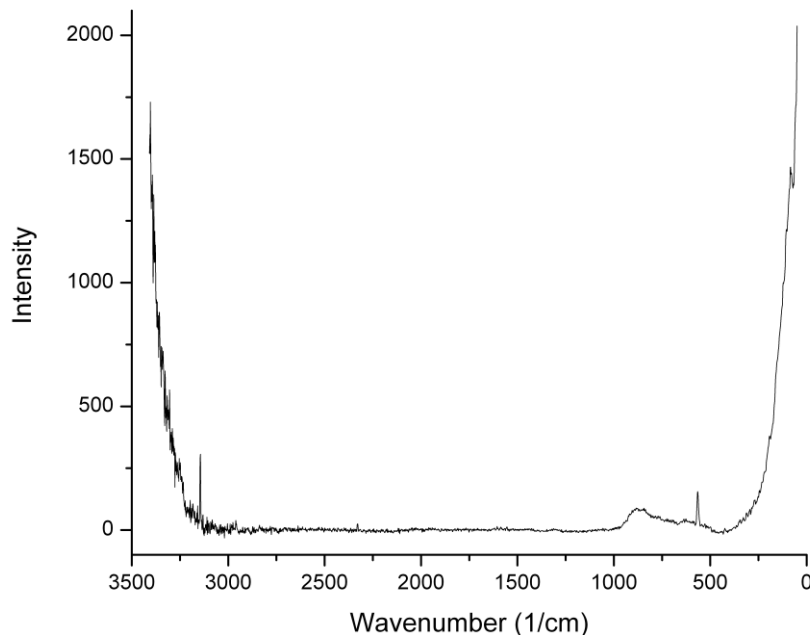
Hydrino Identification

- GUT
- Molecular modeling
- $H(1/2)$ and $H(1/4)$ hydrino transitions observed by continuum radiation
- Astronomy data verifying hydrinos such as $H(1/2)$, $H(1/3)$, and $H(1/4)$ hydrino transitions
- $H(1/2)$ hyperfine structure
- $H_2(1/4)$ XPS binding energy
- $H_2(1/4)$ ro-vib spectrum in crystals by e-beam excitation
- $H_2(1/4)$ FTIR
- $H_2(1/4)$ Raman
- $H_2(1/4)$ Photoluminescence spectroscopy
- Fast H in plasma including microwave and rt-plasmas
- Rt-plasma with filament and discharge
- Afterglow
- Highly pumped states
- H inversion
- Power with multiple solid fuels chemistries
- SunCell energetic plasma
- ToF-SIMS and ESI-ToF identification of hydrino hydride compounds
- Solid H NMR
- $H(1/4)$ spin-nuclear hyperfine transition
- Electricity gain over theoretical in CIHT cells

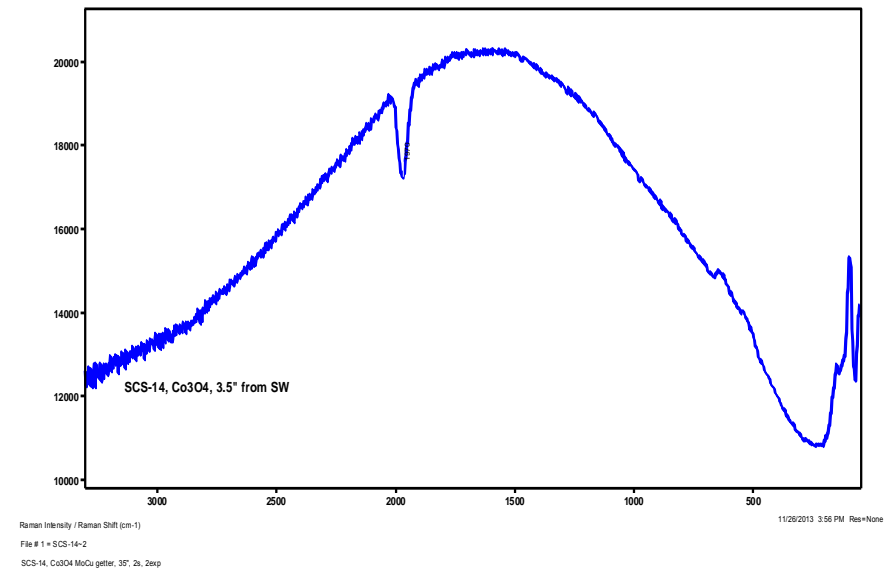


Raman Spectrum of $H_2(1/4)$

The Raman spectra obtained on MoCu witness foils using a Thermo Scientific DXR SmartRaman spectrometer and the 780 nm laser showing a new inverse Raman effect absorption peak starting at 1950 cm^{-1} that matches the free rotor energy of $H_2(1/4)$ (0.2414 eV) to four significant figures.

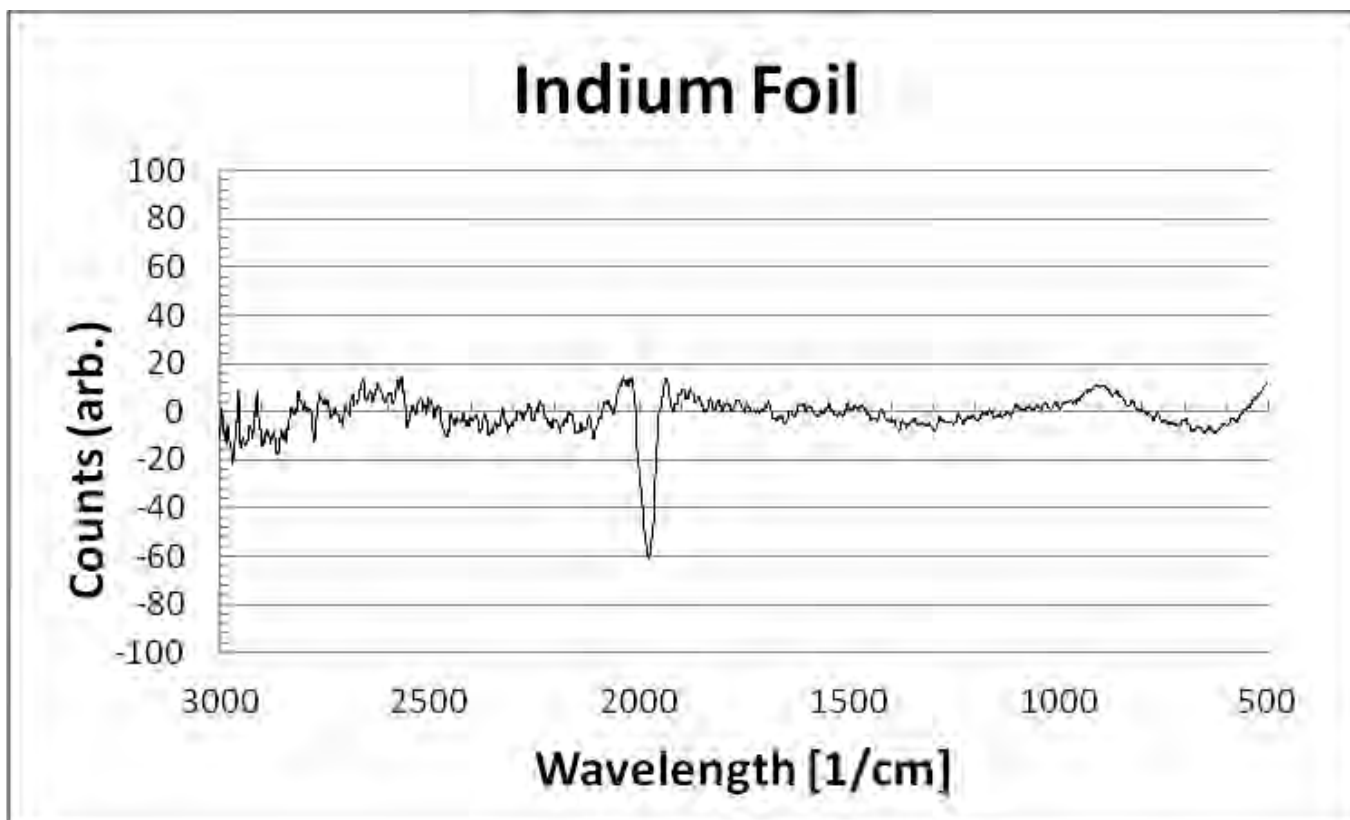


MoCu starting material showing no peak



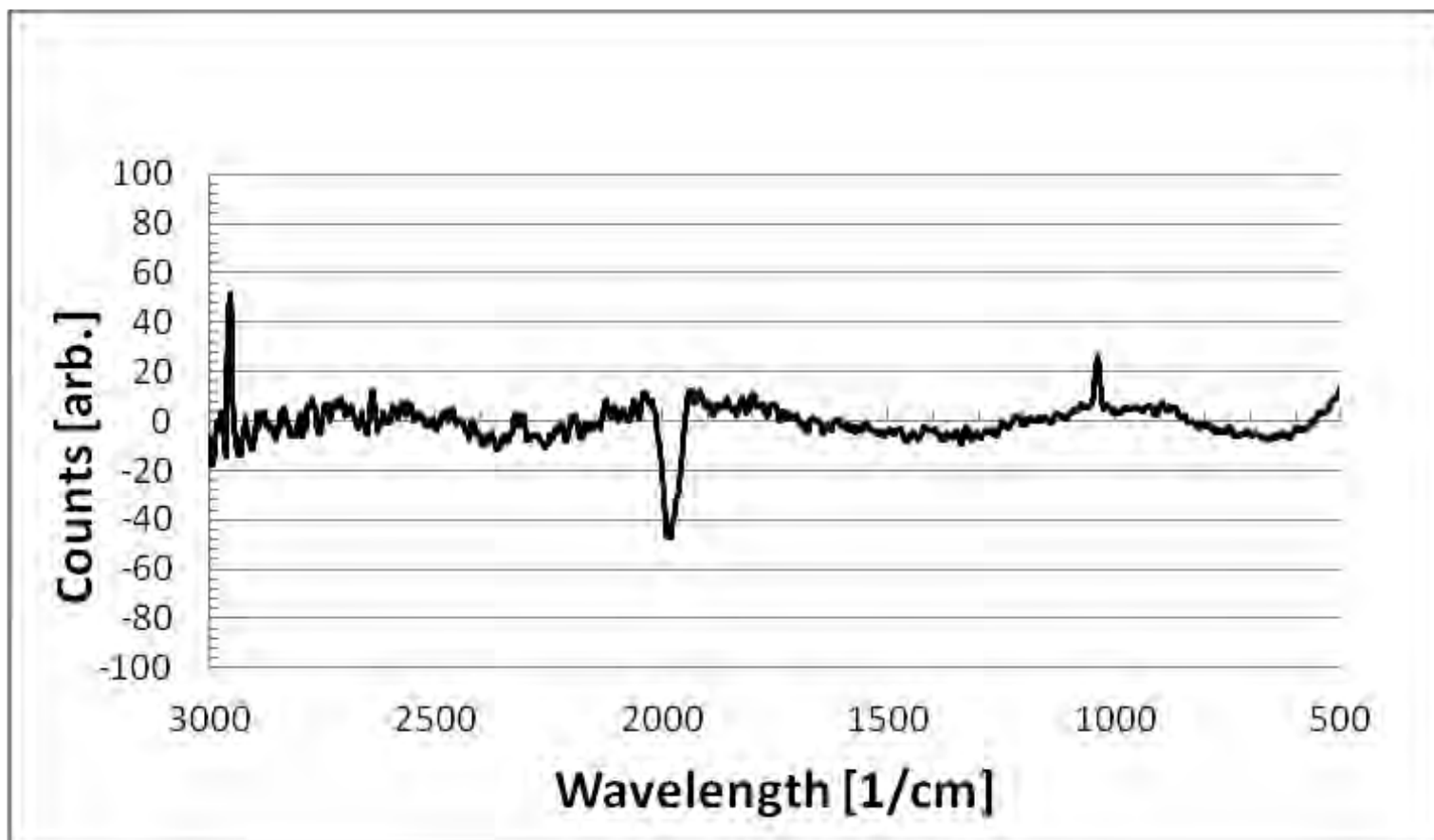
MoCu witness foil exposed to solid fuel plasma.

Raman Spectrum



The Raman spectrum obtained on a In metal foil exposed to the product gas from a series of solid fuel ignitions under argon, each comprising 100 mg of Cu mixed with 30 mg of deionized water. Using the Thermo Scientific DXR SmartRaman spectrometer and the 780 nm laser, the spectrum showed an inverse Raman effect peak at 1982 cm^{-1} that matches the free rotor energy of $\text{H}_2(1/4)$ (0.2414 eV) to four significant figures.

Raman Spectrum



The Raman spectrum recorded on the In metal foil exposed to the product gas from the argon-atmosphere ignition of 50 mg of NH_4NO_3 sealed in the DSC pan. Using the Thermo Scientific DXR SmartRaman spectrometer and the 780 nm laser the spectrum showed the $\text{H}_2(1/4)$ inverse Raman effect peak at 1988 cm^{-1} .

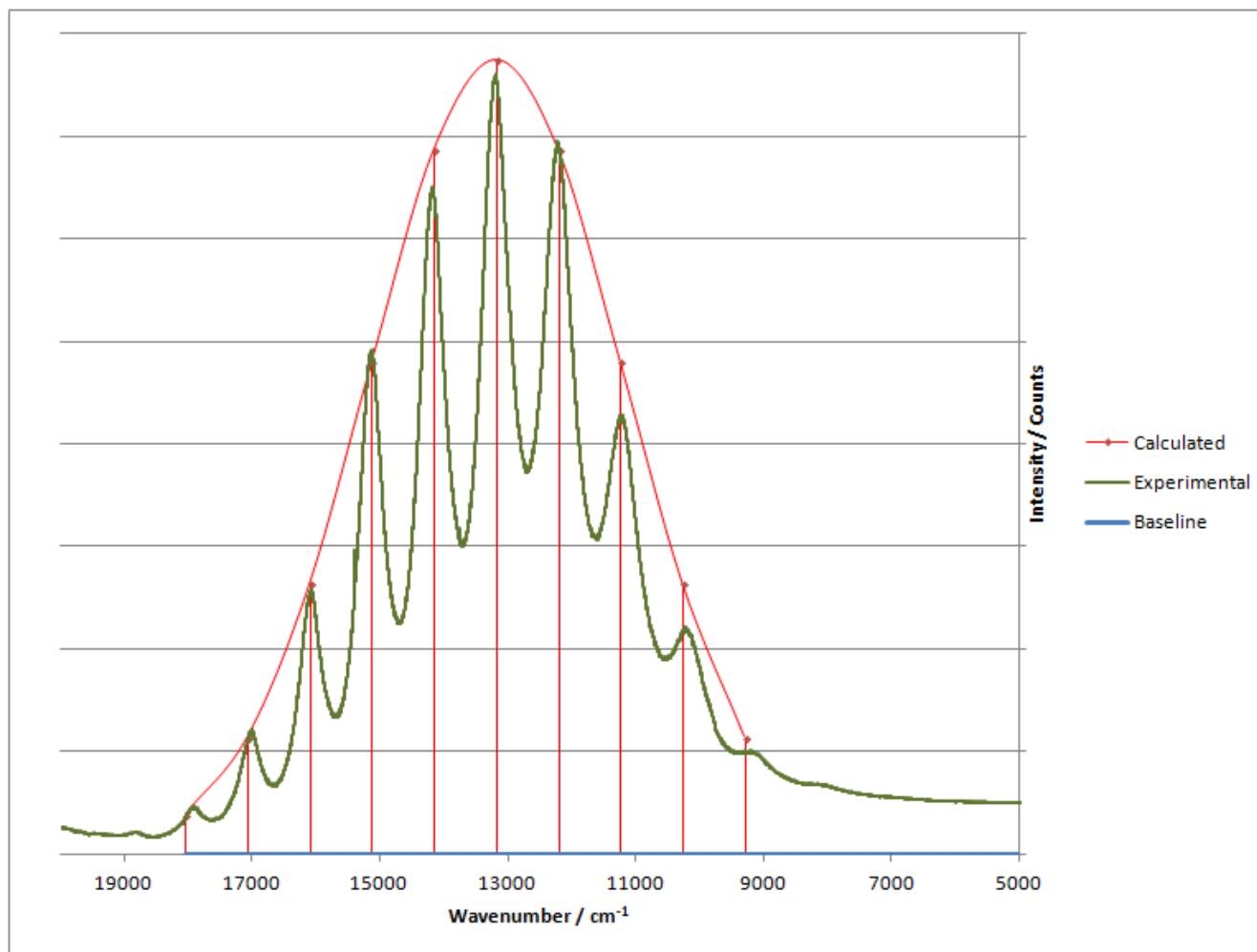
Data Comparison

Comparison of the theoretical transition energies and transition assignments with the observed Raman peaks.

Assignment	Calculated (cm ⁻¹)	Experimental (cm ⁻¹)	Difference (%)
P(5)	18,055	17,892	0.91
P(4)	17,081	16,993	0.52
P(3)	16,107	16,064	0.27
P(2)	15,134	15,121	0.08
P(1)	14,160	14,168	-0.06
Q(0)	13,186	13,183	0.02
R(0)	12,212	12,199	0.11
R(1)	11,239	11,207	0.28
R(2)	10,265	10,191	0.73
R(3)	9,291	9,141	1.65
R(4)	8,318	8,100	2.69

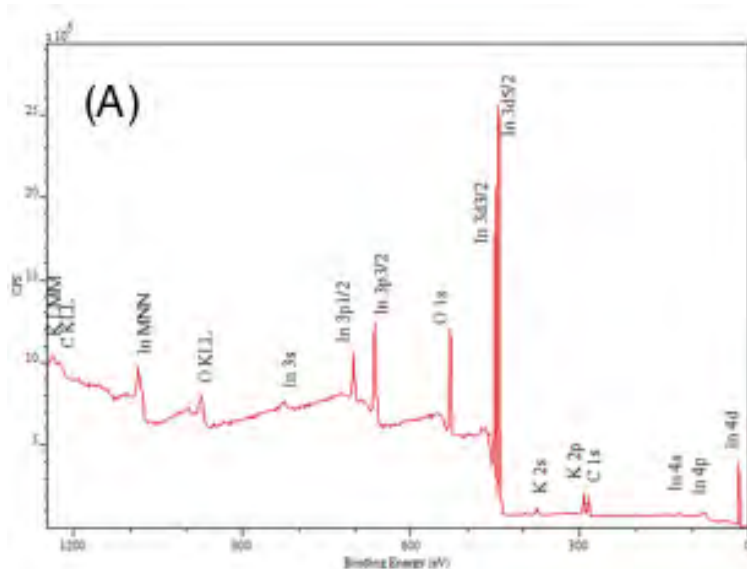
Data Comparison

A plot comparison between the theoretical energies and assignments given on the previous slide with the observed Raman spectrum.

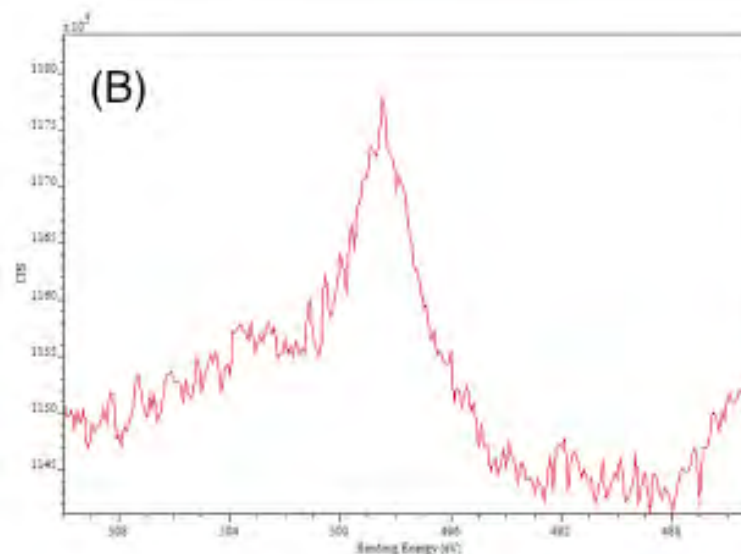


XPS Spectra

XPS spectra recorded on the indium metal foil exposed to gases from sequential argon-atmosphere ignitions of the solid fuel 100 mg Cu + 30 mg deionized water sealed in the DSC pan.



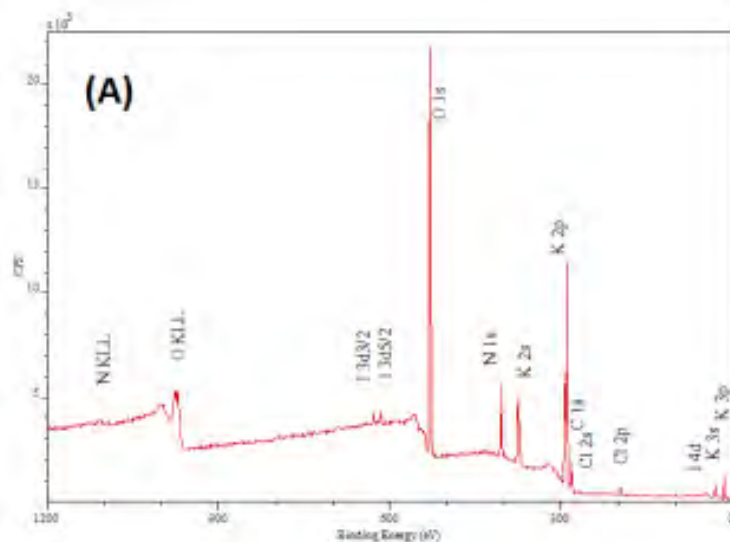
(A) A survey spectrum showing only the elements In, C, O, and trace K peaks were present.



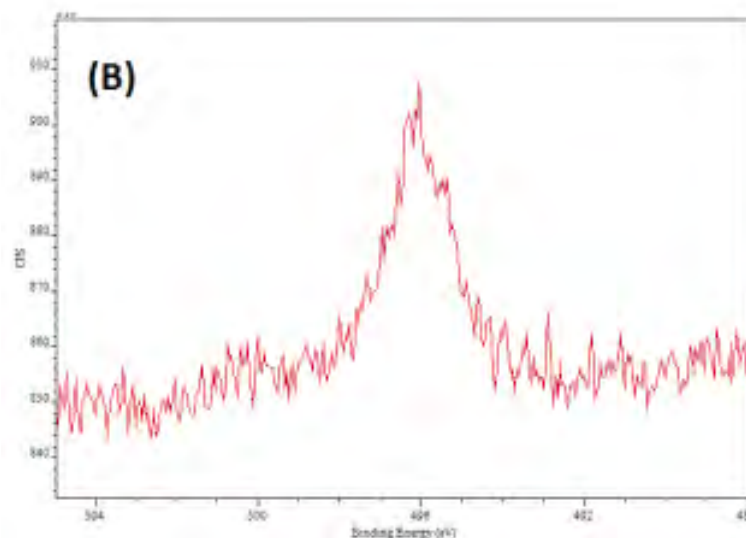
(B) High-resolution spectrum showing a peak at 498.5 eV assigned to H₂(1/4) wherein other possibilities were eliminated based on the absence of any other corresponding primary element peaks.

XPS Spectra

XPS spectra recorded on KOH-KCl (1:1 wt%) getter exposed to gases from sequential argon-atmosphere ignitions of the solid fuel 85 mg of Ti mixed with 30 mg of deionized water sealed in the DSC pan.

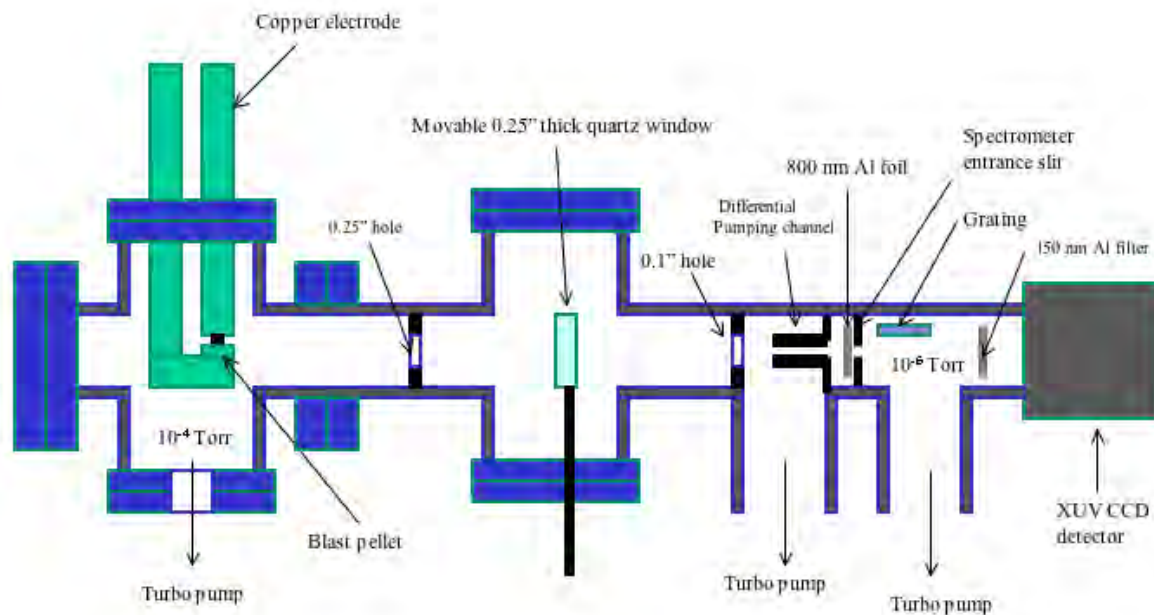


(A) A survey spectrum showing only the elements K, C, O, N, and trace I peaks were present.



(B) High-resolution spectrum showing a peak at 496 eV assigned to $H_2(1/4)$ wherein other possibilities were eliminated based on the absence of any other corresponding primary element peaks.

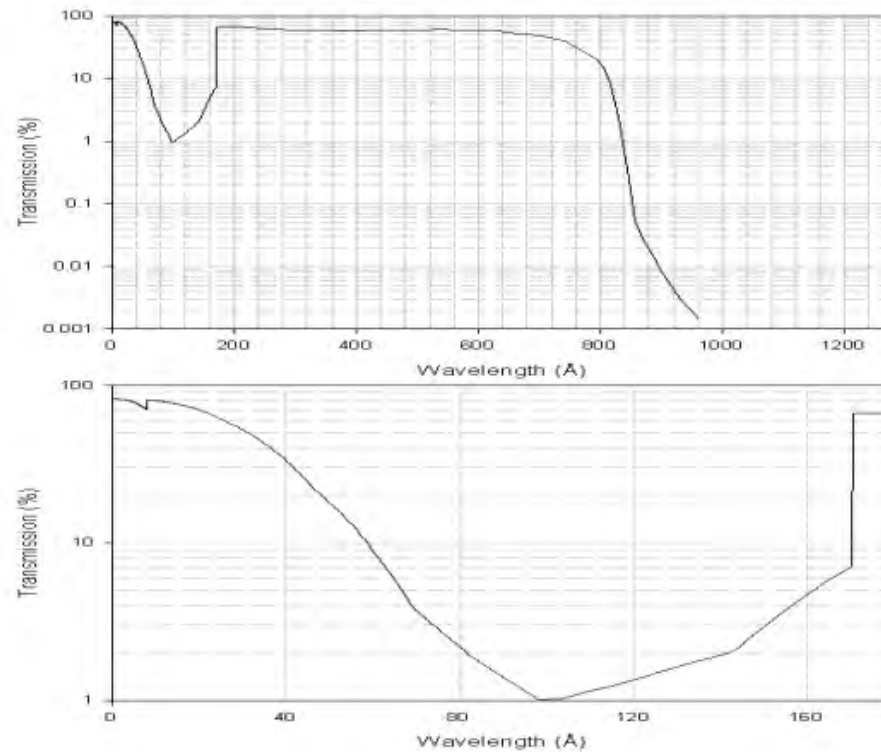
Hydrino Transition Continuum Soft X-Ray Emission



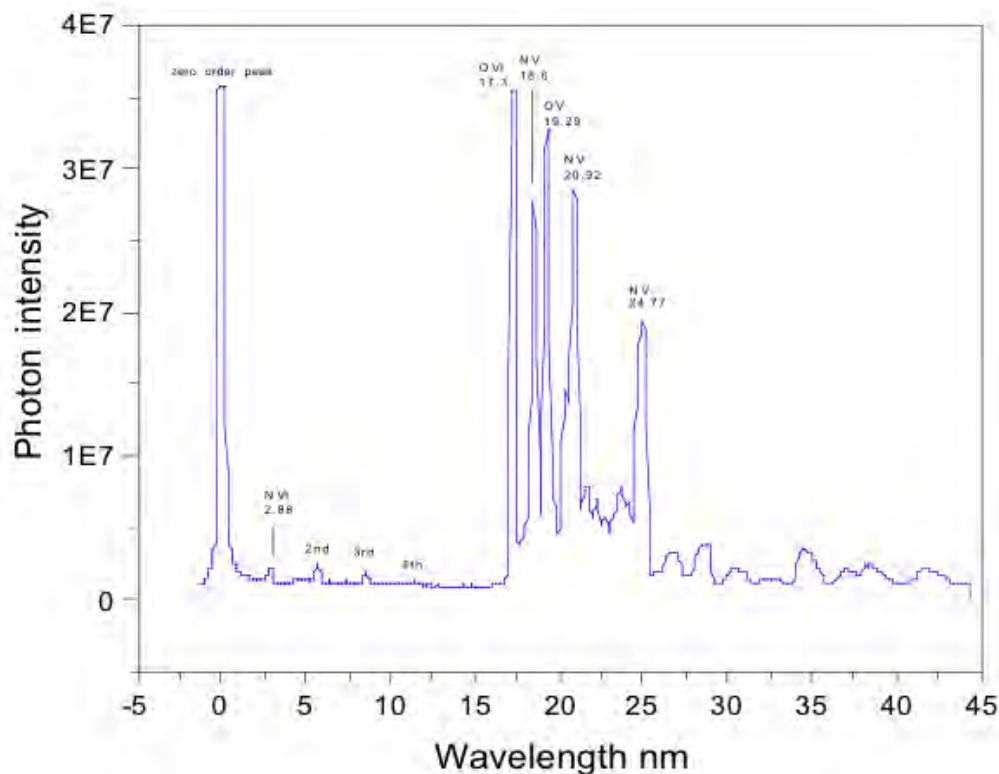
Experimental setup for the ignition of a conductive NiOOH solid fuel pellet and the recording of the intense plasma emission. The plasma expands into a vacuum chamber such that it becomes optically thin. The source emits its light spectra through an entrance aperture passing through a slit, with the spectra dispersed off a grazing-incidence grating onto a CCD detection system.



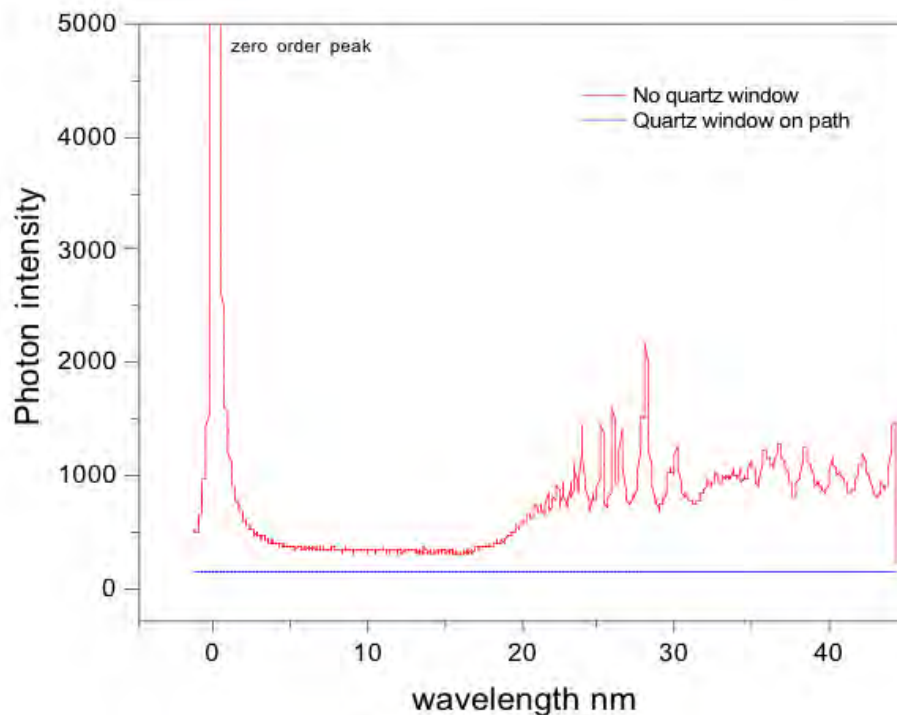
Aluminum
1500Å with mesh



Transmission curve of the Al filter (150 nm thickness) having a cutoff to short wavelengths at ~ 17 nm.



Calibration emission spectrum (0-45 nm) of a high-voltage pulsed discharge in air (100 mTorr) with W electrodes recorded using the EUV grazing incidence spectrometer with the 600 lines/mm grating showing that only known oxygen and nitrogen lines were observed in the absence of a continuum.



Emission spectra (0-45 nm) of the plasma emission of the conductive NiOOH pellet ignited with a high-current source having an AC peak voltage of less than 15 V recorded with an Al filter alone and additionally with a quartz filter. Only EUV passes the Al filter and the EUV light is blocked by the quartz filter. A strong EUV continuum with secondary ion emission was observed in the region 17 to 45 nm with a characteristic Al filter notch at 10 to 17 nm as shown in Figure 3. The EUV spectrum (0-45 nm) and zero order peak was completely cut by the quartz filter confirming that the solid fuel plasma emission was EUV.

Solid Fuel Plasma

Solid Fuel produces plasma power at billions of watts per liter from the formation of hydrinos using H_2O as the only source of fuel.

(Recorded Ignition Plasma at 6500 frames per second)

BLP 10 MW Plasma



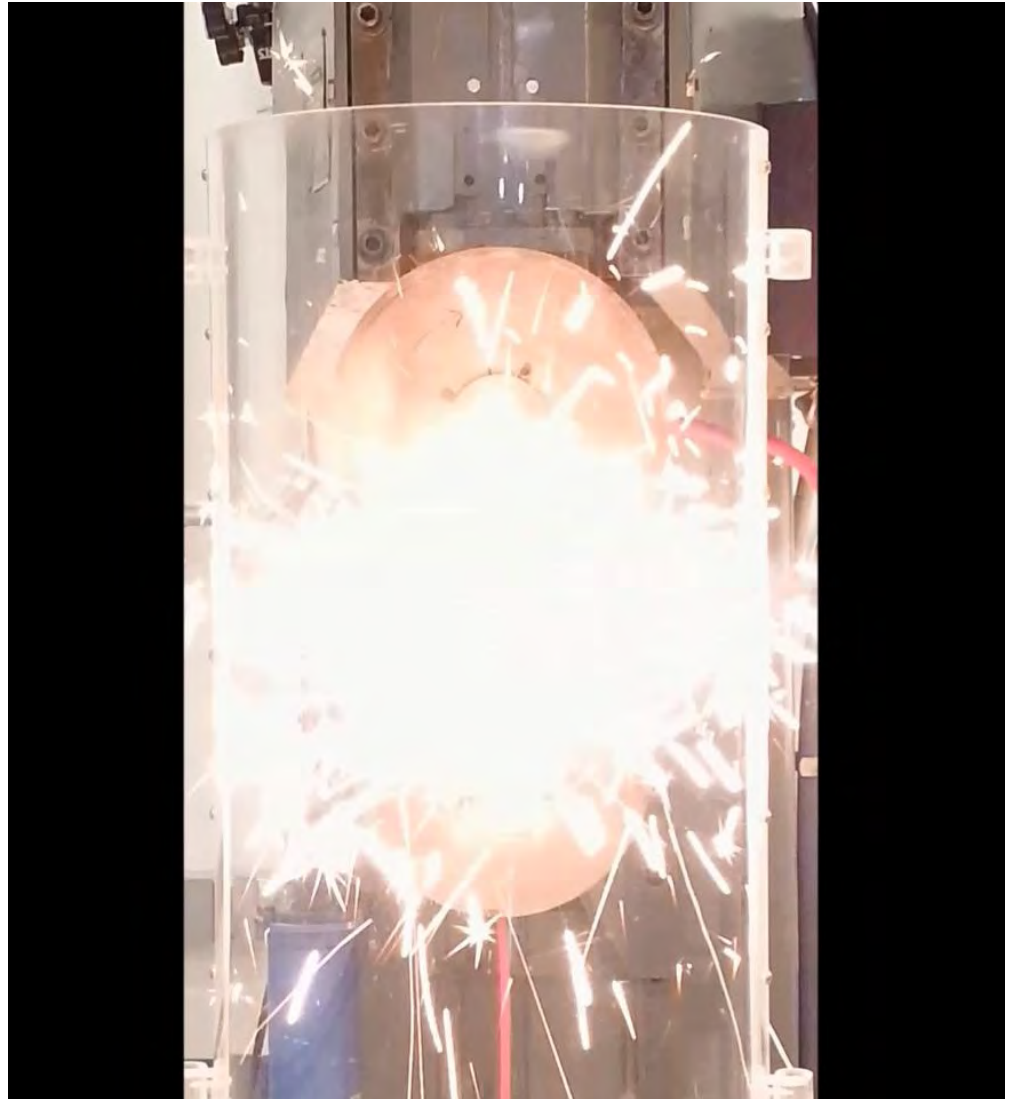
Please visit www.BlackLightPower.com to view full video

Brilliant-Light Emitting Plasma Demo

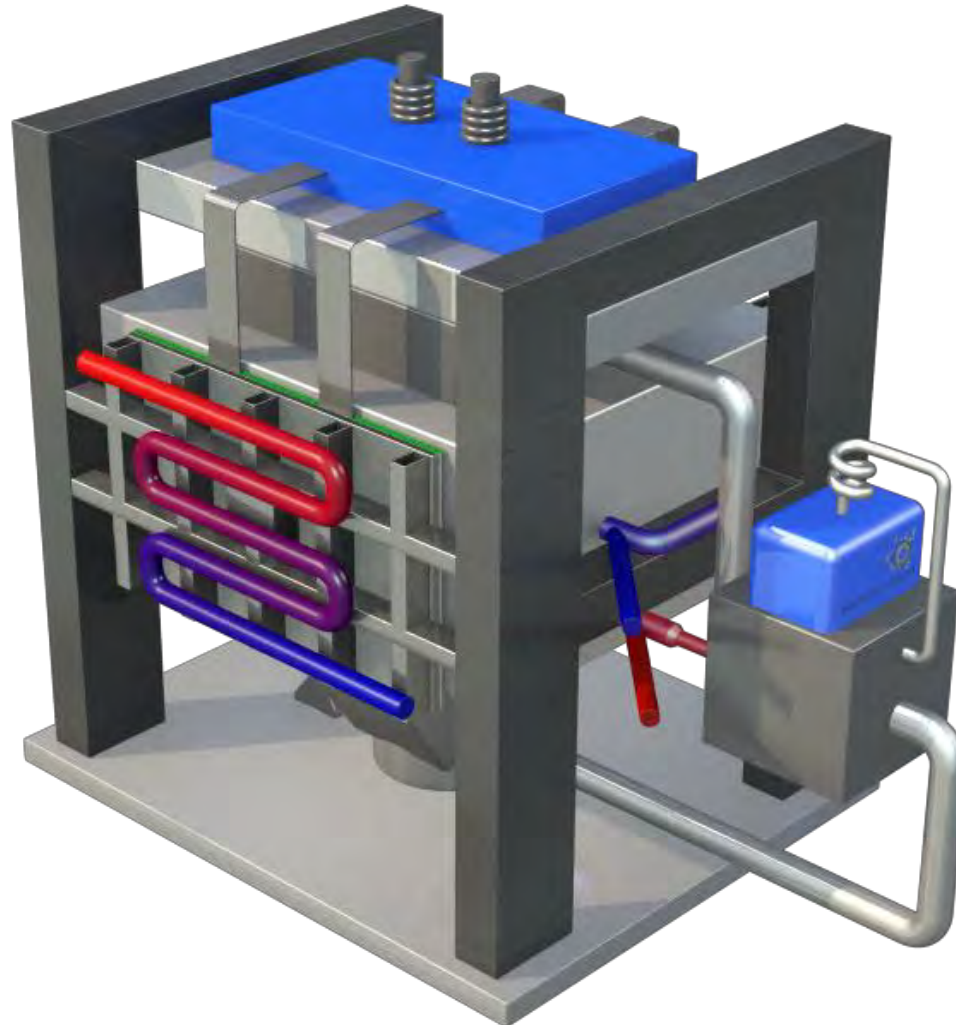
The detonations occur on a microsecond time scale, and the brilliant flashes of light are being converted into electricity on a second time scale. The millions of watts of optical power is being converted into electricity over a second time scale due to slow response time and limited maximum power of the solar cells that were used.

Fast, high power solar concentrator cells will be used subsequently. Thus, the energy of each detonation event is being spread out in time to give a near continuous illumination from a LED lighting array.

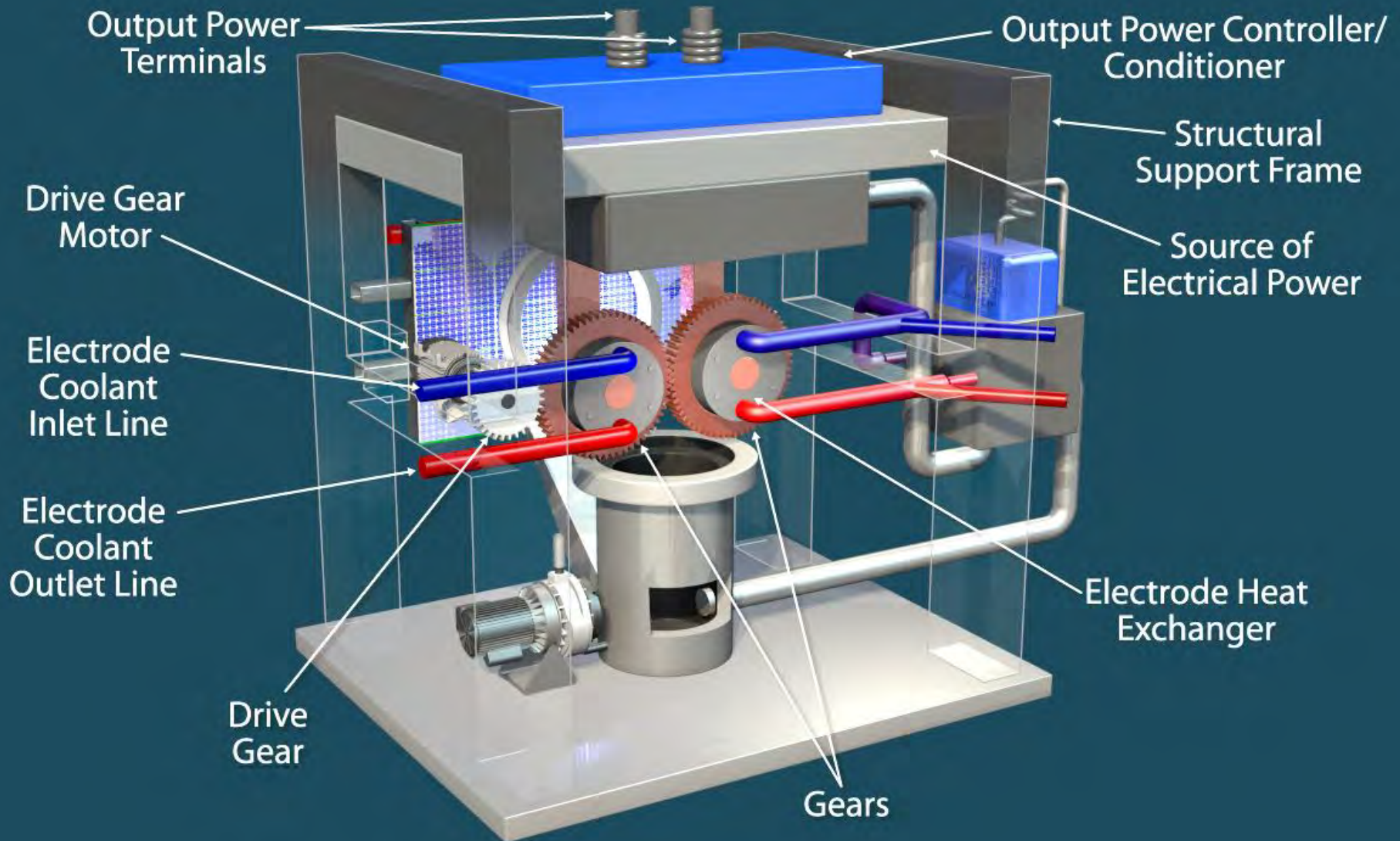
Please visit
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full video



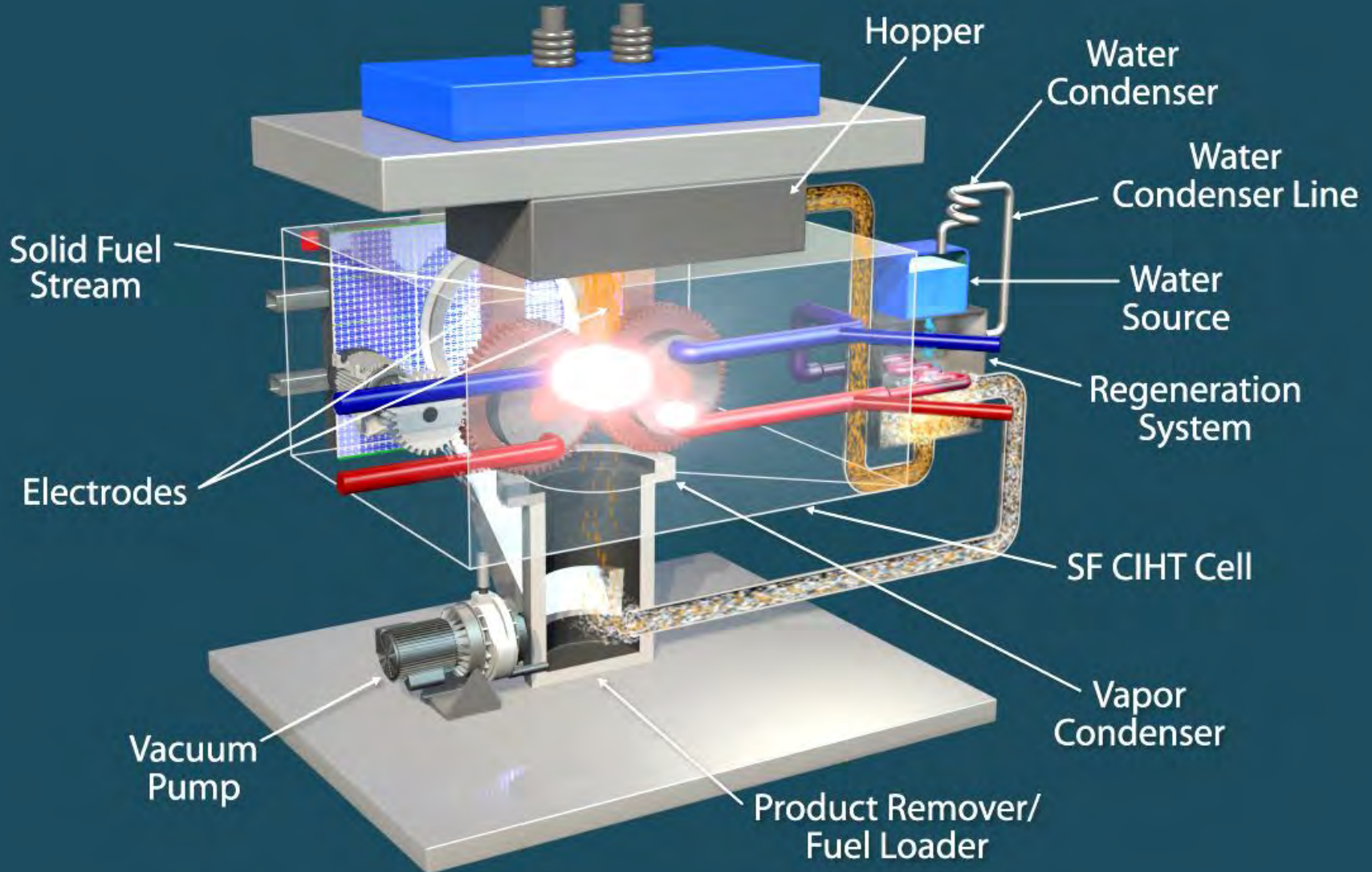
SunCell Power System



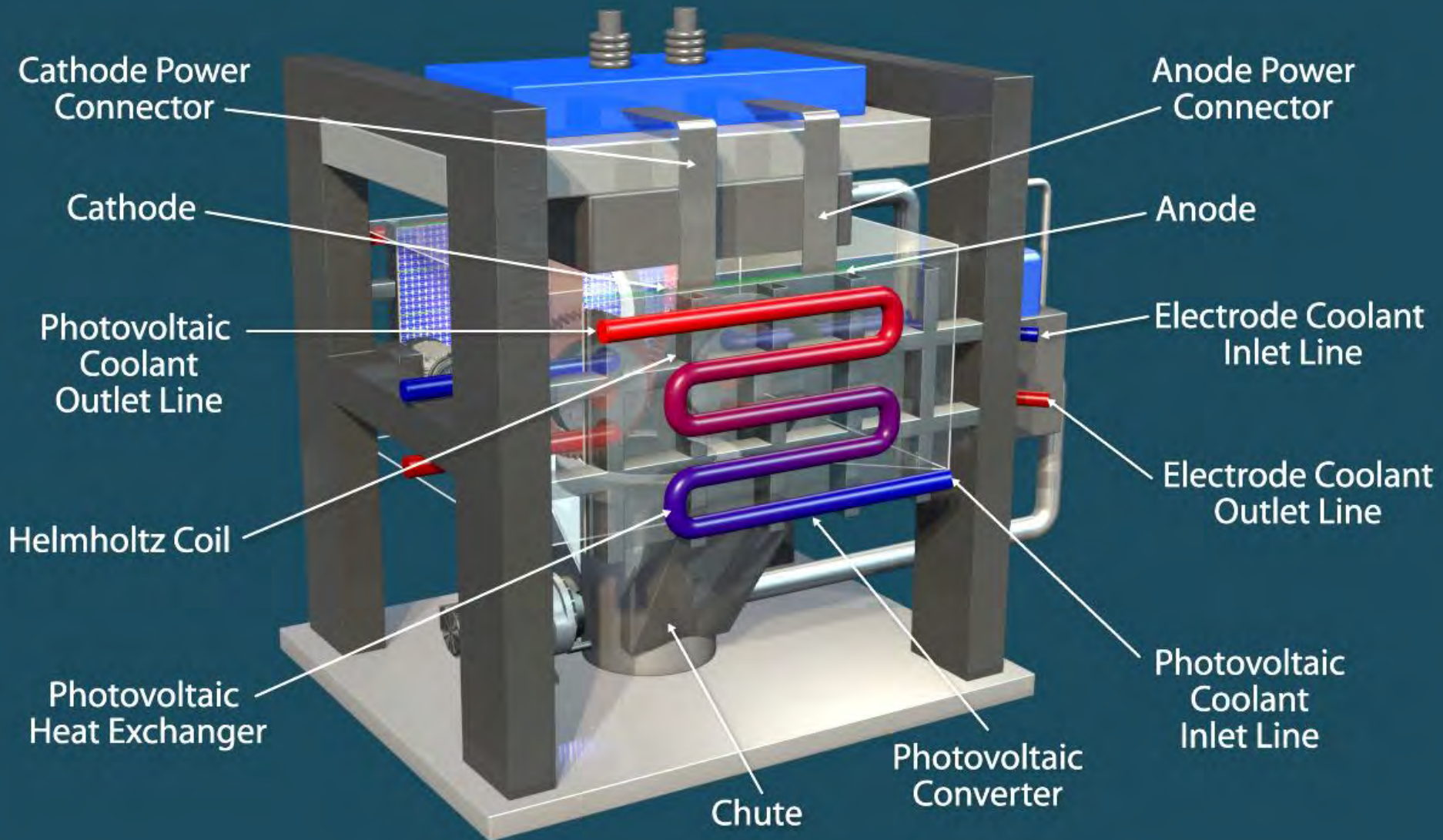
SunCell Power System



SunCell Power System

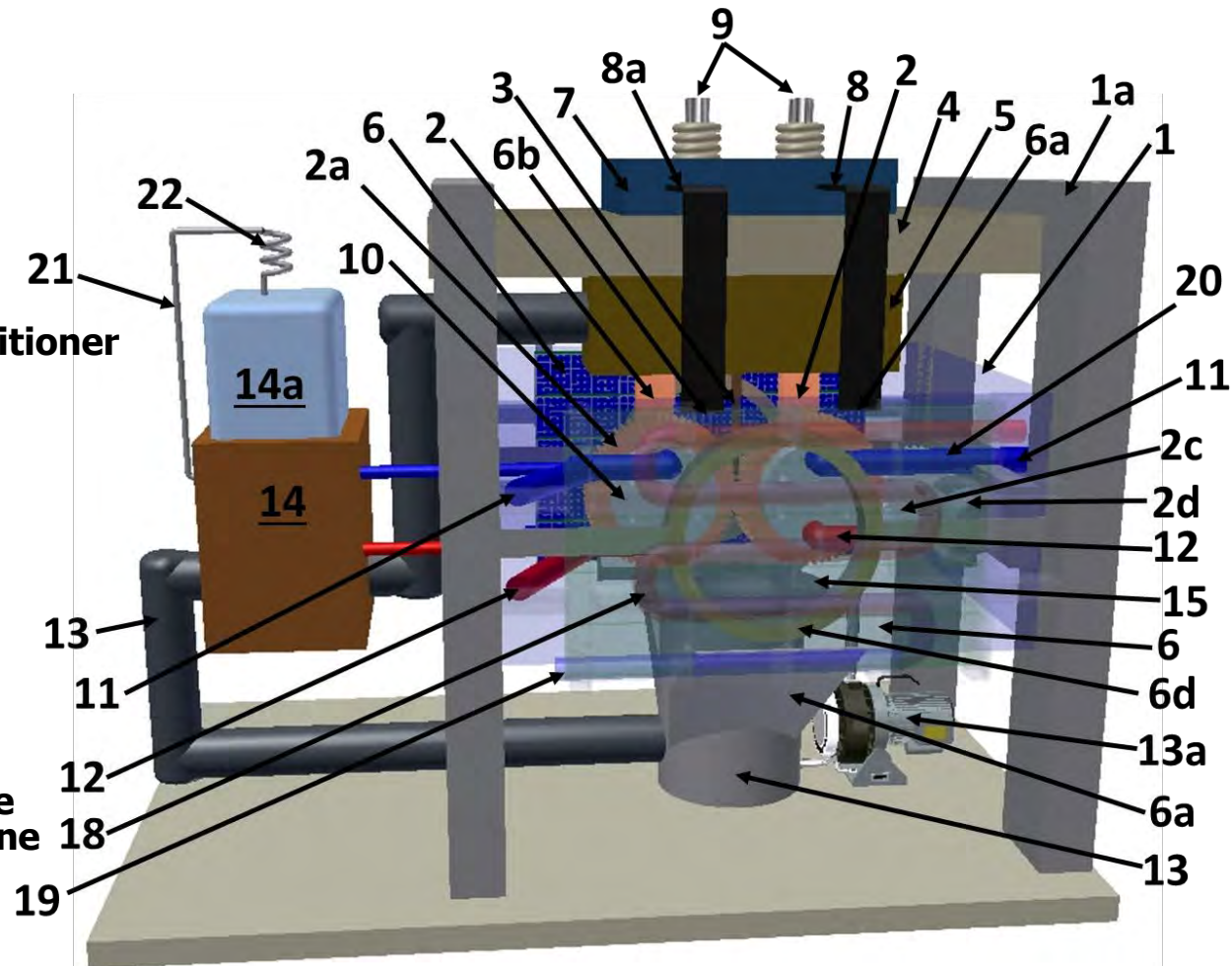


SunCell Power System

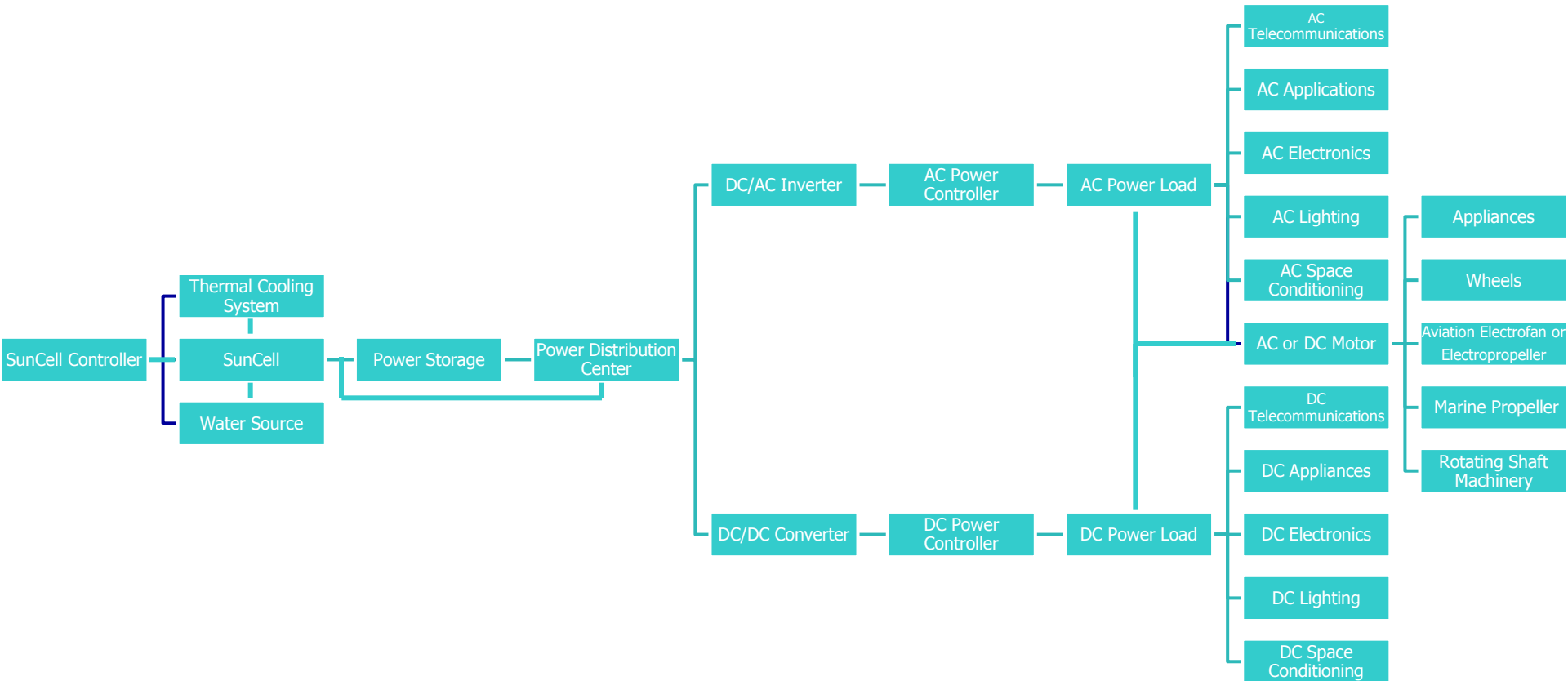


SunCell Power System

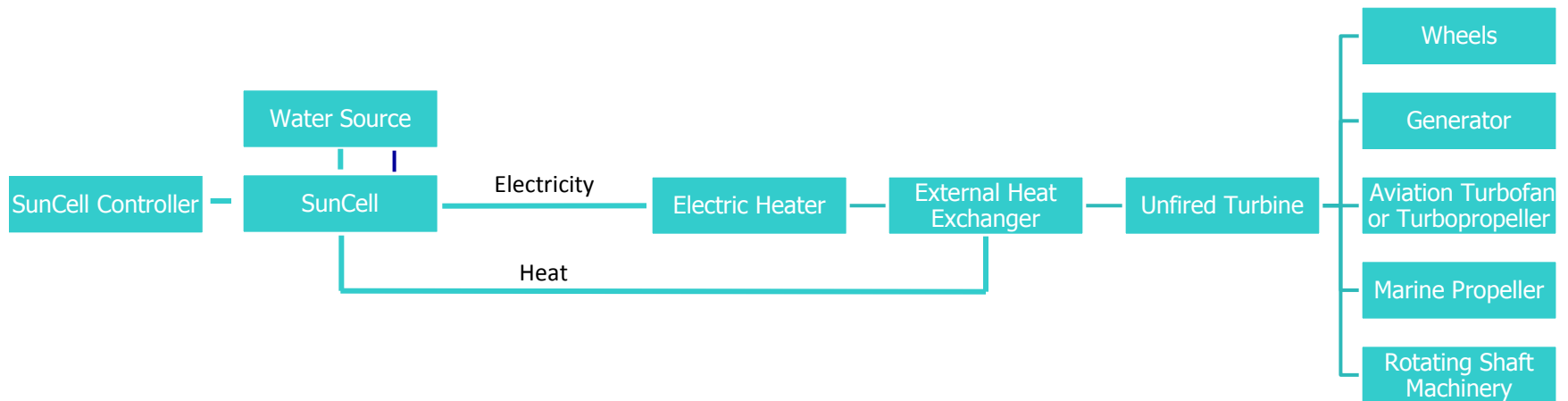
1. SunCell
- 1a. Structural Support Frame
2. Electrode
- 2a. Gears
- 2c. Drive Gear
- 2d. Drive Gear Motor
3. Solid Fuel Stream
4. Source of Electrical Power
5. Hopper
6. Photovoltaic Converter
- 6a. Chute
- 6b. Anode
- 6c. Cathode
- 6d. Helmholtz Coil
7. Output Power Controller/ Conditioner
8. Anode Power Connector
- 8a. Cathode Power Connector
9. Output Power Connector
10. Electrode Heat Exchanger
11. Electrode Coolant Inlet Line
12. Electrode Coolant Outlet Line
13. Product remover/Fuel Loader
- 13a. Vacuum Pump
14. Regeneration System
- 14a. Water Source
15. Vapor Condenser
18. Photovoltaic Heat Exchanger
19. Photovoltaic Coolant Inlet Line
20. Photovoltaic Coolant Outlet Line
21. Water Condenser Line
22. Water Condenser



Applications Flow Chart



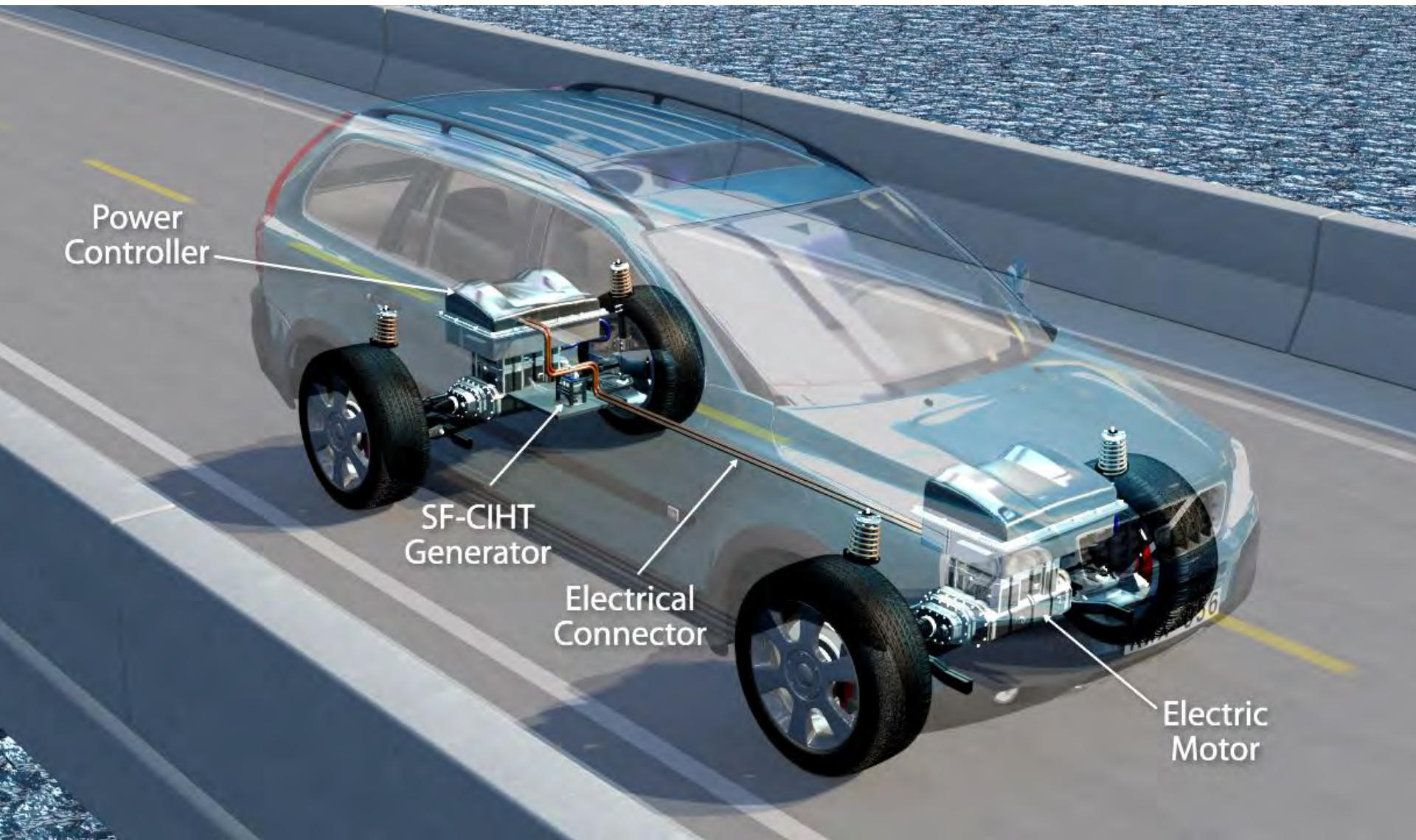
Applications Flow Chart



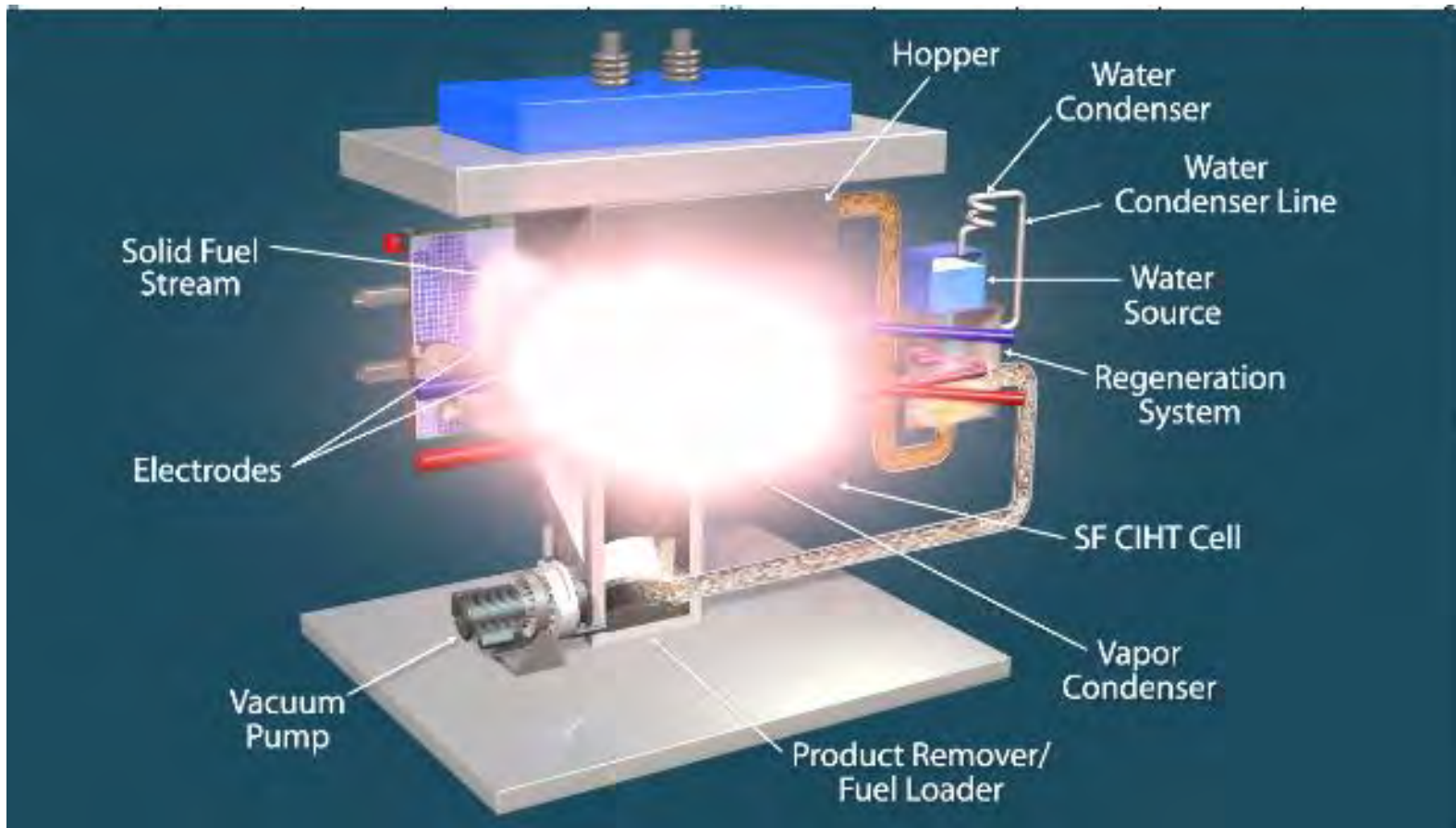
SunCell



SunCell Power System



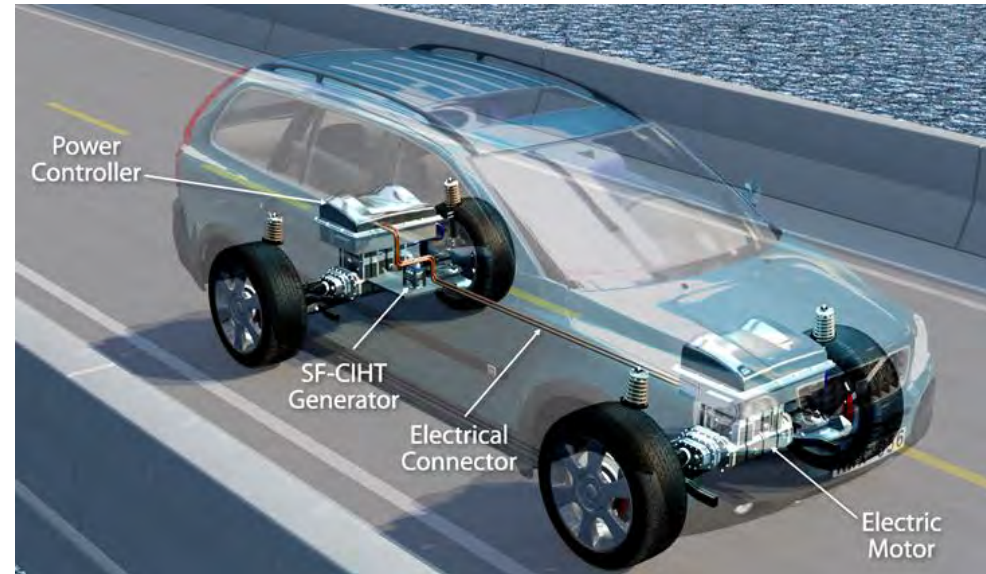
Continuous Power SunCell



Please visit www.BlackLightPower.com to view full video

SunCell Power System

- 3,000 miles per liter of water.*
- Projected cost of less than \$100 per kW electric.
- One third the weight of an internal combustion engine (ICE).
- Projected 200kW (267 HP) SunCell and electric drive system is less than that of a comparable combustion system.
- Has the potential of unsurpassed capability in terms of range, capital cost, power, logistics, and pollution abatement to zero including zero carbon dioxide emission.



***Calculations:** H_2O to $\text{H}_2(1/4) + 1/2\text{O}_2$ (50MJ/mole or 2.78 GJ/kg, 2.78 GJ/liter)

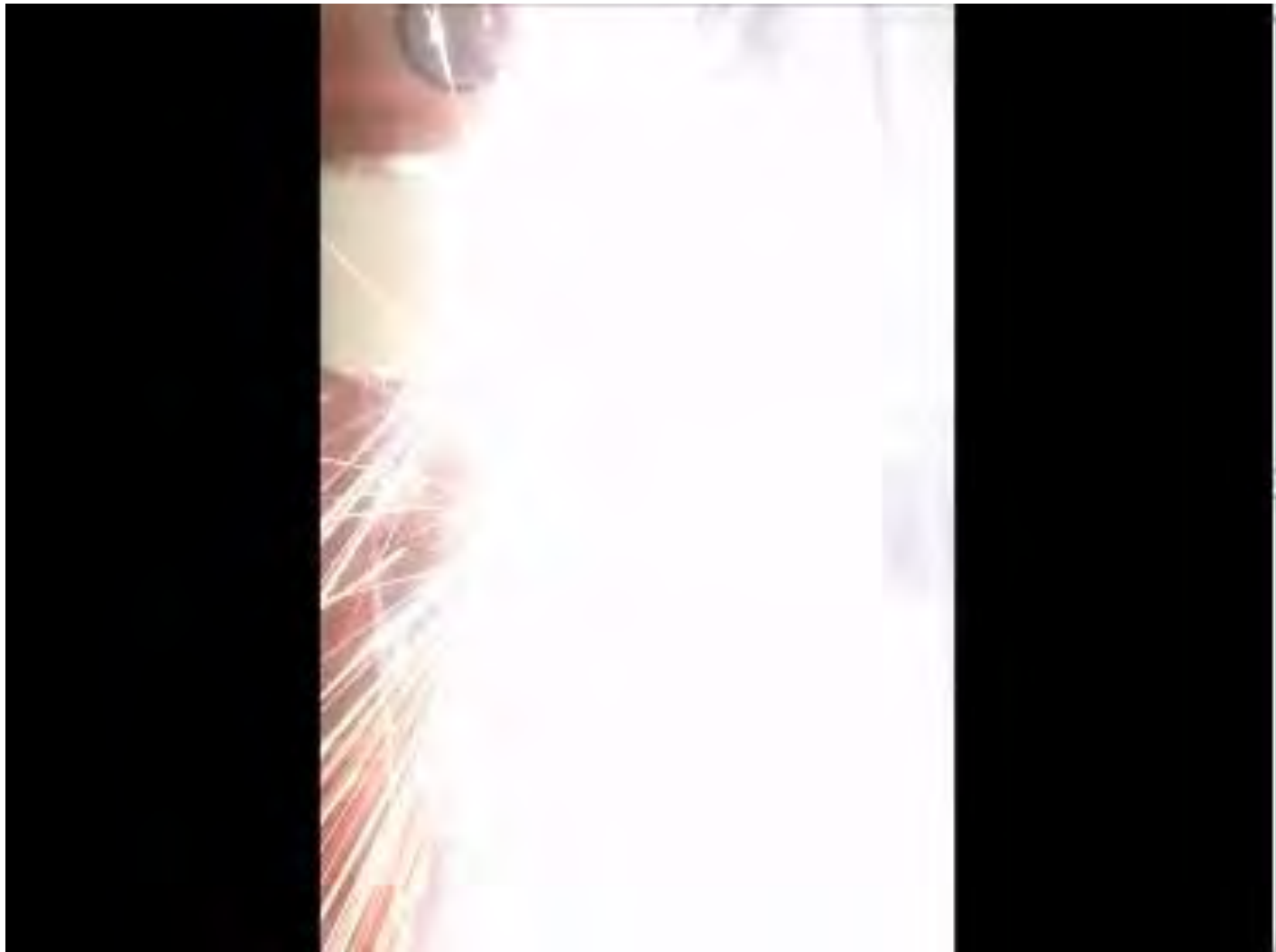
Model S energy consumption rate of 291 Wh/mile
(<http://www.teslamotors.com/goelectric#savings>)

1 Whr = 3600 J

Model S energy consumption rate of 1 MJ/mile

2780 MJ/liter / (1 MJ/mile) = 2780 miles/liter

BLP Test of Automated Ignition System with Trace-Flow of H₂O-based Solid Fuel Powder



Please visit www.BlackLightPower.com to view full video

BLP Test of Automated Ignition System with Trace-Flow of H₂O-based Solid Fuel Powder



Please visit www.BlackLightPower.com to view full video

SunCell Electrical Power

SunCell produces plasma power at billions of watts per liter from the formation of hydrinos using H_2O as the only source of fuel. The plasma power is directly converted to electrical power by a photovoltaic power converter.

Photovoltaic Conversion of Optical Power Into Electricity



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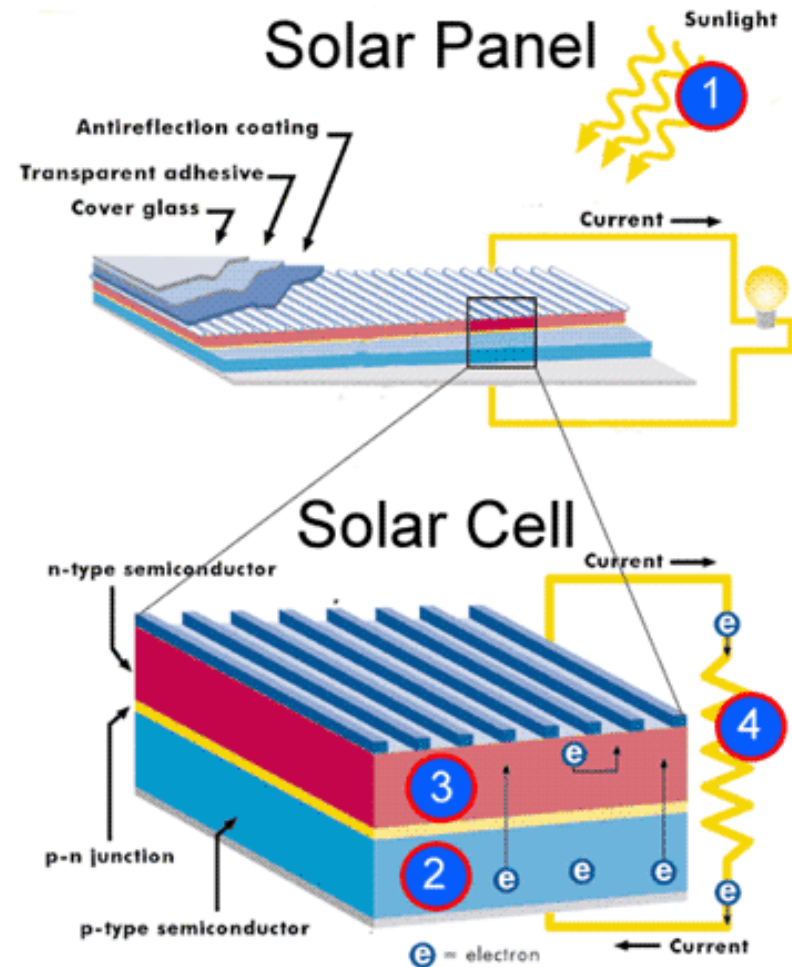
A solar cell comprises at least two wafer layers of differentially doped semiconductor material that exhibits the photovoltaic effect, the production of electrical power when irradiated with light of the solar spectrum.

Certain materials such as silicon are doped with trace amounts of atoms that exchange electrons between at least two bands that have different dopants, one electron acceptor or p-type and one electron donor or n-type, to cause a gradient between them at their interface called a p-n junction.

When the cell is struck by light **1**, electrons reverse the natural diffusion gradient and are transferred between the layer of p-type semiconductor material having excess electrons **2** to the layer of n-type semiconductor material having a deficiency of electrons **3** to create electrical power **4** delivered to an external load.

All photovoltaic have metal added at the bottom and top of the flat panel to collect and deliver electrons to allow the current flow through an external circuit to harness this power. An antireflective coating is also added to make the silicon better absorb photons.

Concentrator solar cells that typically comprise triple junctions responsive to different regions of the solar spectrum convert incident radiation of high intensity such as 2000 Sun equivalent to electricity at high efficiency such as >40%.



The Light Power Spectrum of the SunCell Plasma is Equivalent to that of the Sun at 50,000 Times the Intensity

Intensity-normalized, superposition of visible spectra of the SunCell plasma and Sun's radiation at the Earth's surface demonstrating that they both emit blackbody radiation of about 5800-6000K.

From the blackbody curves, the SunCell plasma has the same temperature as the Sun emitting the same solar spectrum of light but at extraordinary power equivalent to 50,000 times the Sun's intensity at the Earth's surface.

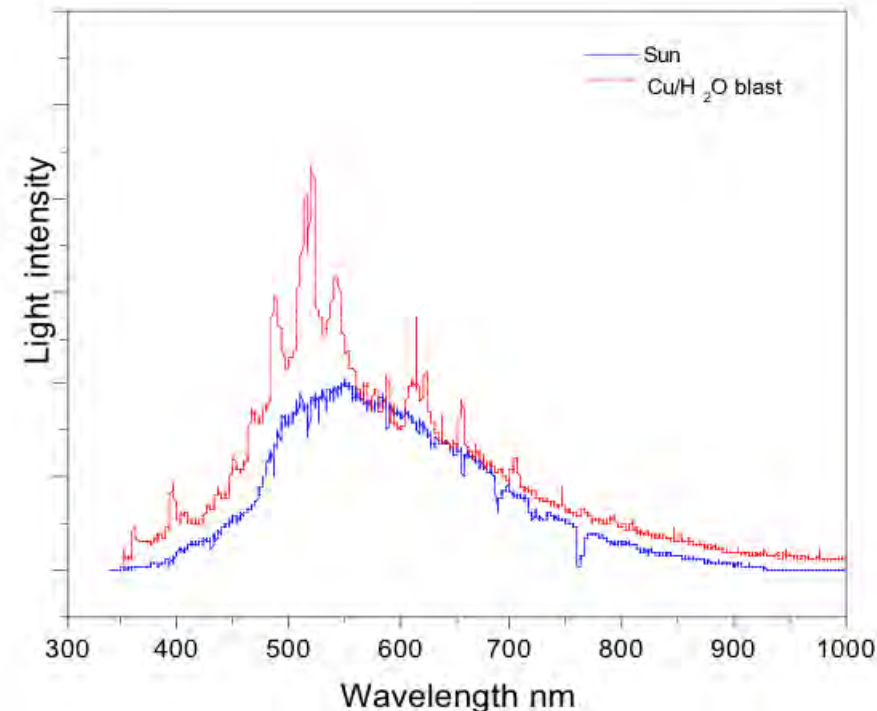
The implications are extraordinary.

The SunCell plasma has an essentially perfect spectral match to the Sun. An estimate of over \$1T has been spent on R&D and manufacturing capacity since inception and the first solar cell by Bell Labs in 1954.

Solar PV R&D: Who is Footing the Bill?

A photovoltaic converter can be engineered to be mass-produced for the SunCell using existing technology and manufacturing capacity.

The 50,000 Sun intensity of the SunCell can be distributed across a compacted stacked array of photovoltaics using a light distribution system comprising lenses, mirrors, and fiber optic cables.



Electricity Demo

BlackLight Power, Inc. Announces Sustained Production of Electricity Using Photovoltaic Conversion of the Millions of Watts of Brilliant Plasma Formed by the Reaction of Water to a More Stable Form of Hydrogen

Electricity Demo



We are sequentially igniting H₂O-based solid fuel pellets of one hundred thousandth of a liter volume that each releases millions of watts of power at billions of watts per liter power density from the conversion of hydrogen to hydrinos, a more stable form of hydrogen. The power is in the form of light that is being converted into electricity by solar cells. The fuel detonations are concealed by an opaque structural enclosure upon which the photovoltaics (solar cells) are mounted. The unscreened, non-converted flashes of power can be seen here.

Please visit
www.BlackLightPower.com to view
full video

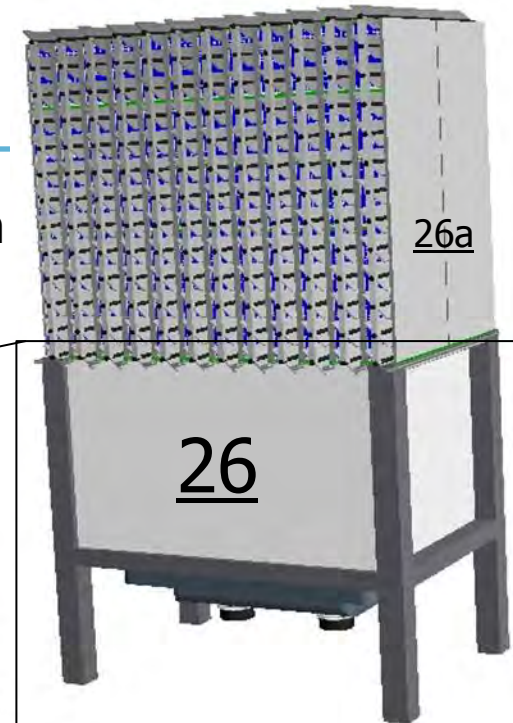
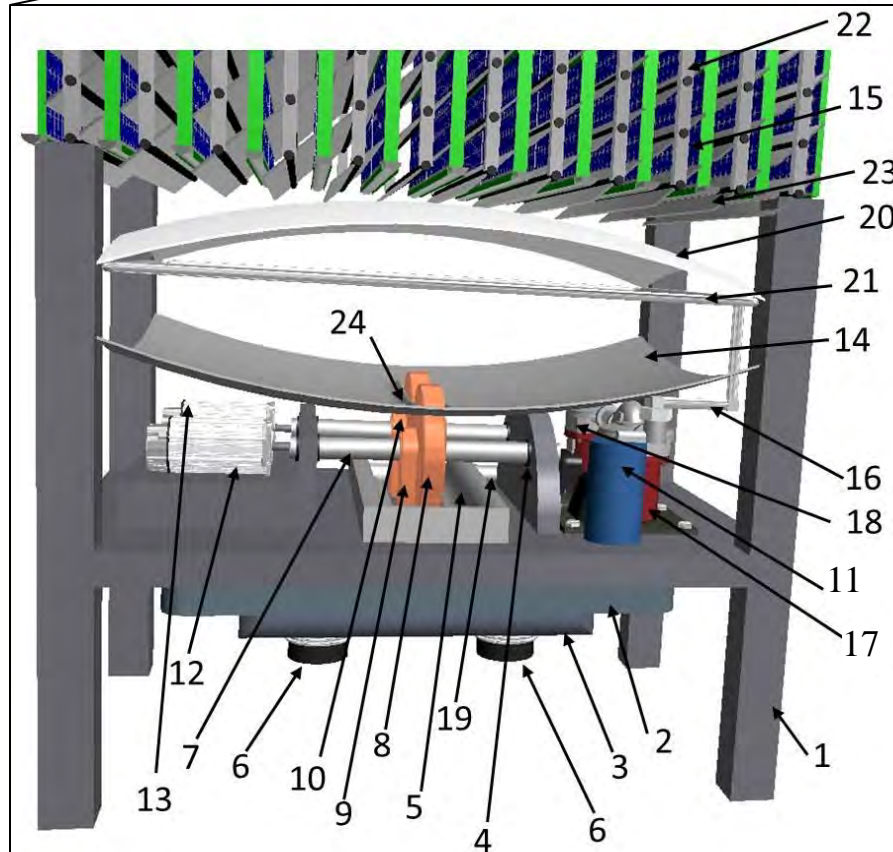
SunCell

with Rotary Ignition-Regeneration
System and Optical Distribution and
Photovoltaic Conversion System

SunCell

SunCell with Rotary Ignition-Regeneration System and Optical Distribution and Photovoltaic Conversion System

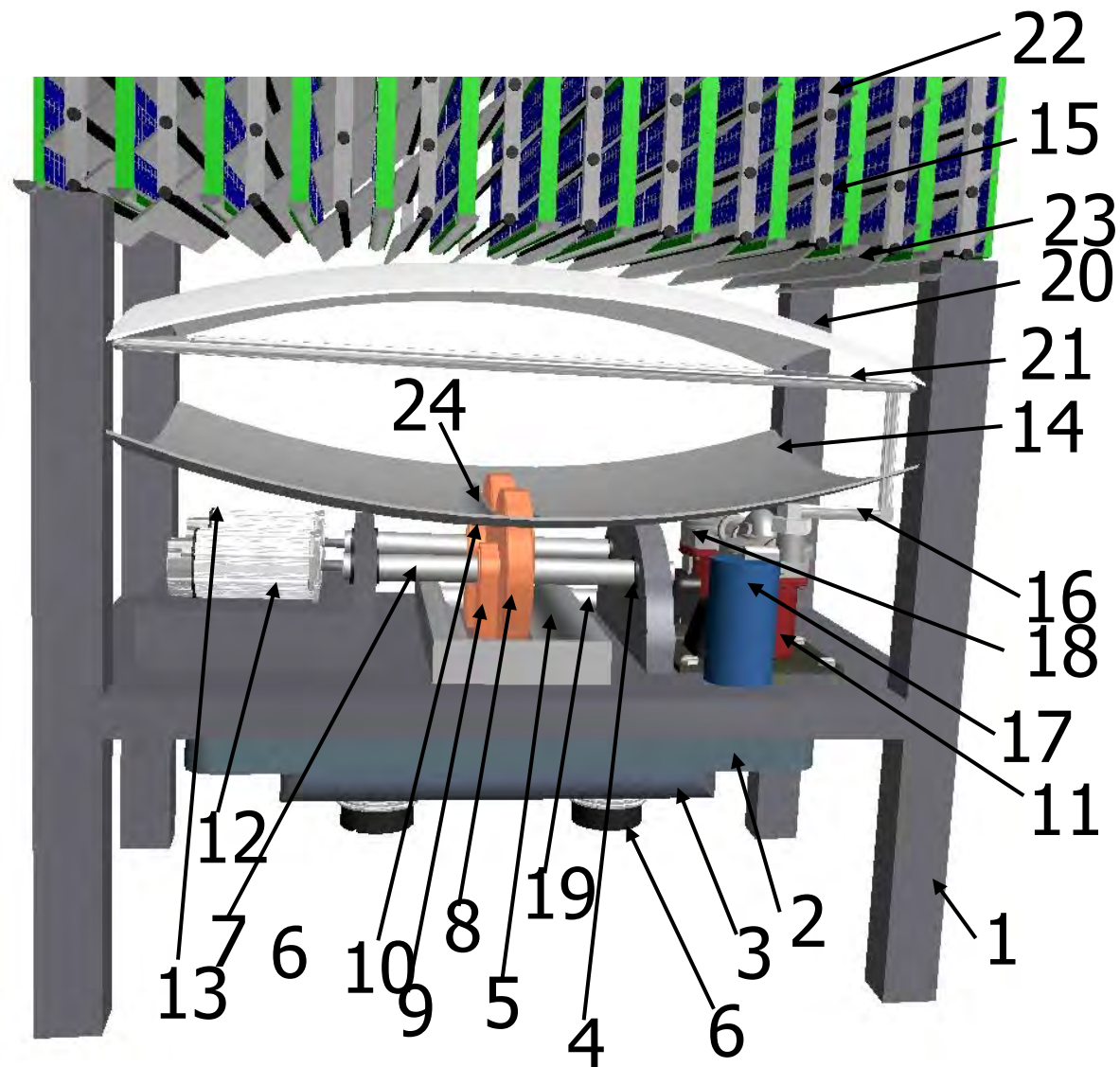
1. Structural Support
2. Source of Electrical Power
3. Output Power Controller/Conditioner
4. Bearing Support for Roller Shaft
5. Trough
6. Output Power Terminal
7. Roller Shaft
8. Roller Electrode
9. Negative Electrode Bus Bar
10. Positive Electrode Bus Bar
11. Water Reservoir
12. Roller Motor 1
13. Roller Motor 2
14. Parabolic Mirror
15. Photovoltaic Panel
16. Window Water Line
17. Ejection Water Pump
18. Water Sucking Pump
19. Water Sucking Line
20. Window
21. Rinsing Line with Jets
22. Mirror Fastener
23. Semi-Transparent Mirror
24. Scraper and Collection Area
26. Cell
- 26a. Optical Distribution and Photovoltaic Conversion System
- 26b. PV Bus Bar



Base of SunCell



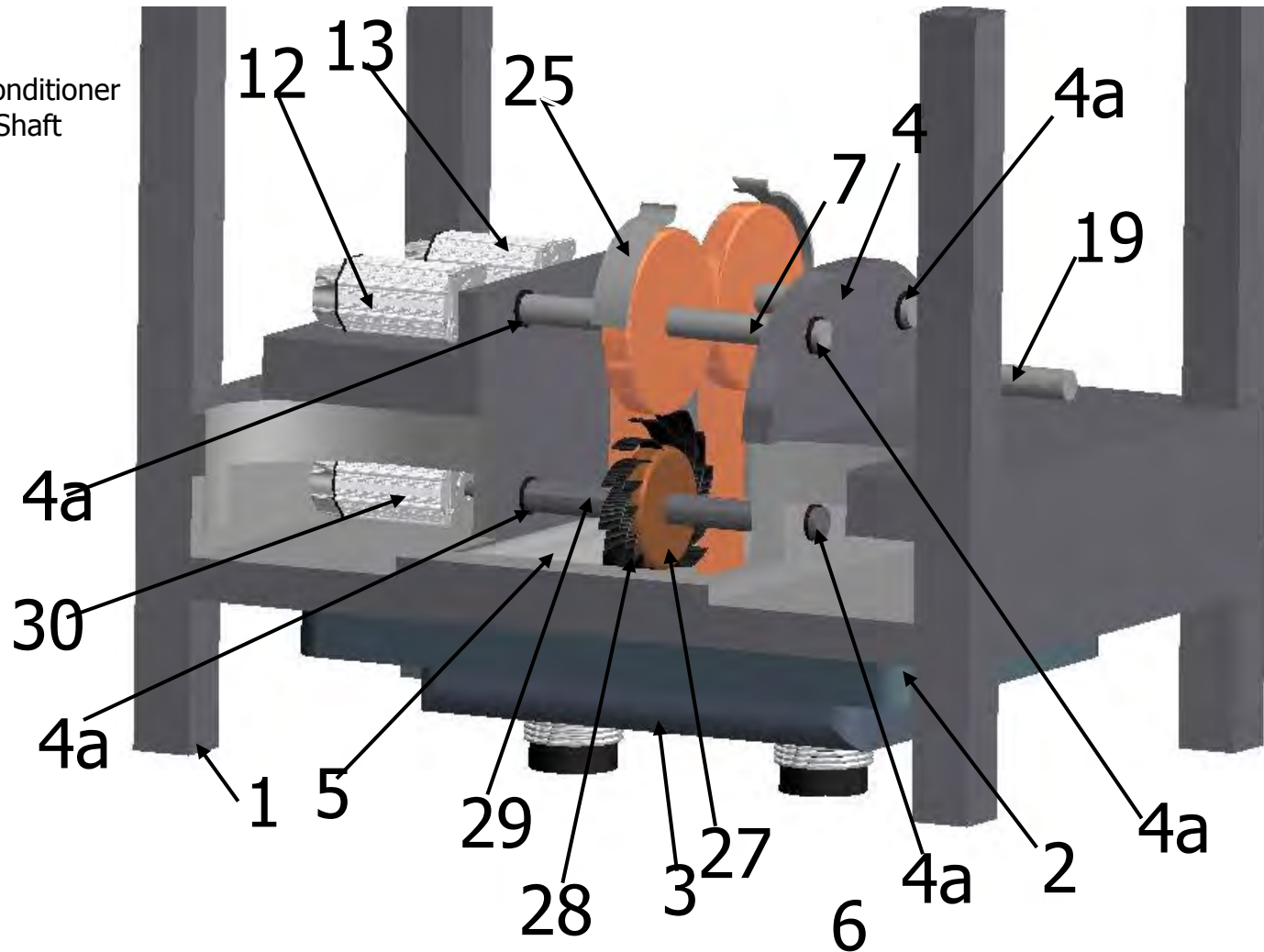
BLACKLIGHT POWER
BLACKLIGHT POWER





Ignition System of SunCell

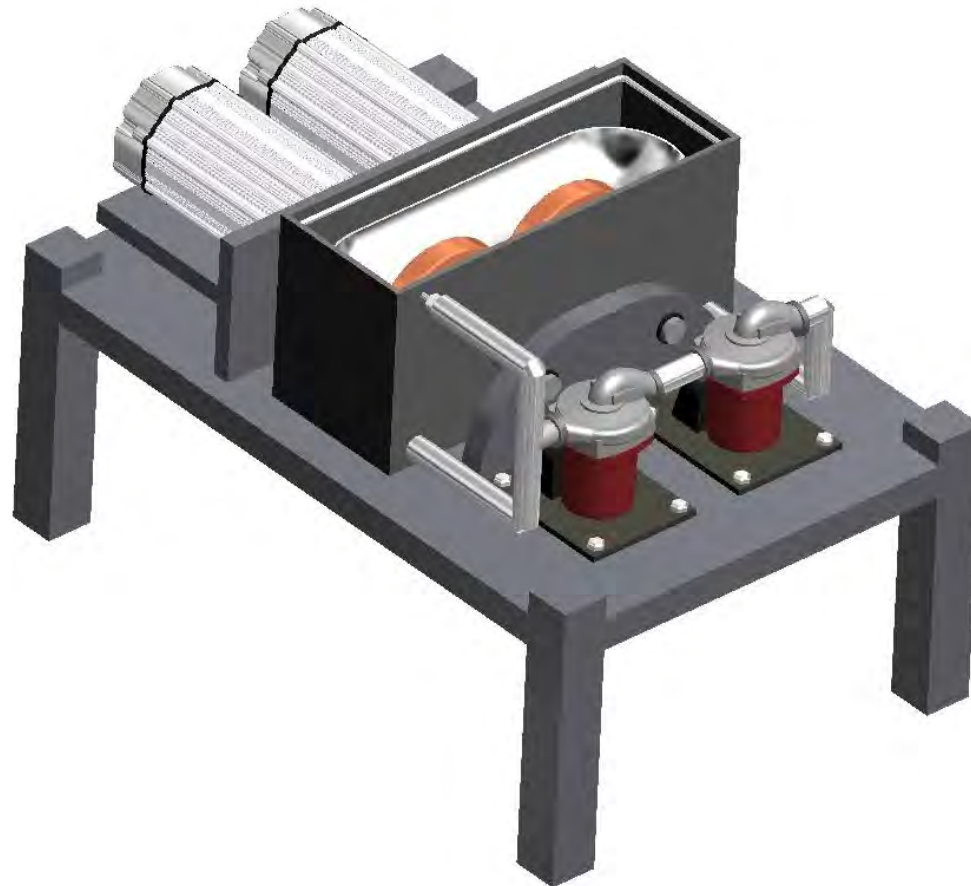
1. Structural Support
2. Source of Electrical Power
3. Output Power Controller/Conditioner
4. Bearing Support for Roller Shaft
- 4a. Bearing
5. Trough
7. Roller Shaft
12. Roller Motor 1
13. Roller Motor 2
19. Water Sucking Line
25. Chute
27. Applicator Wheel
28. Applicator Flaps
29. Applicator Shaft
30. Applicator Wheel Motor



Placement of Motors, Pumps, and Other Components Outside of the Region Housing the Rollers



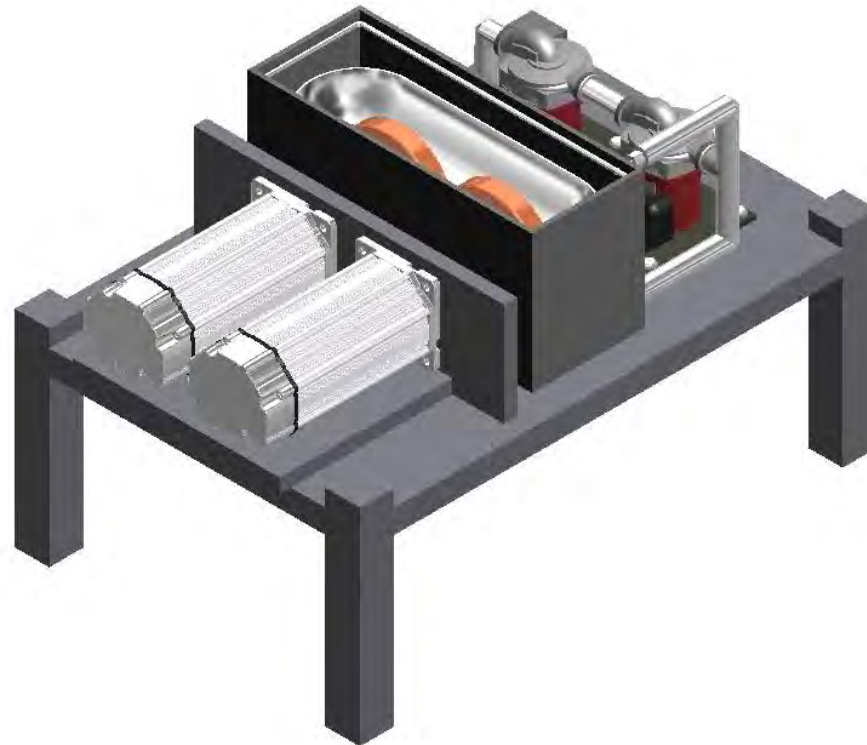
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BLACKLIGHT POWER



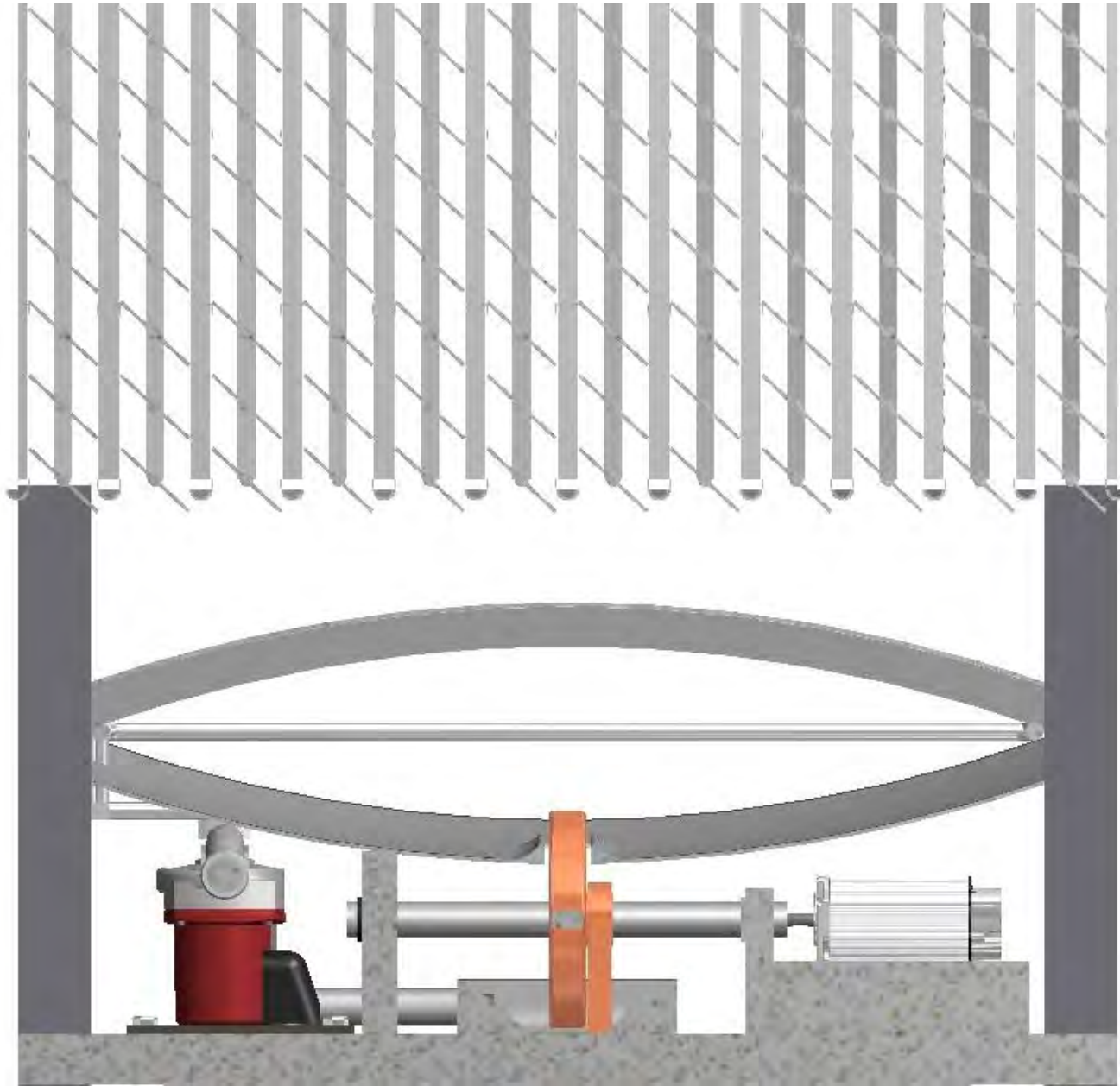
Placement of Motors, Pumps, and Other Components Outside of the Region Housing the Rollers



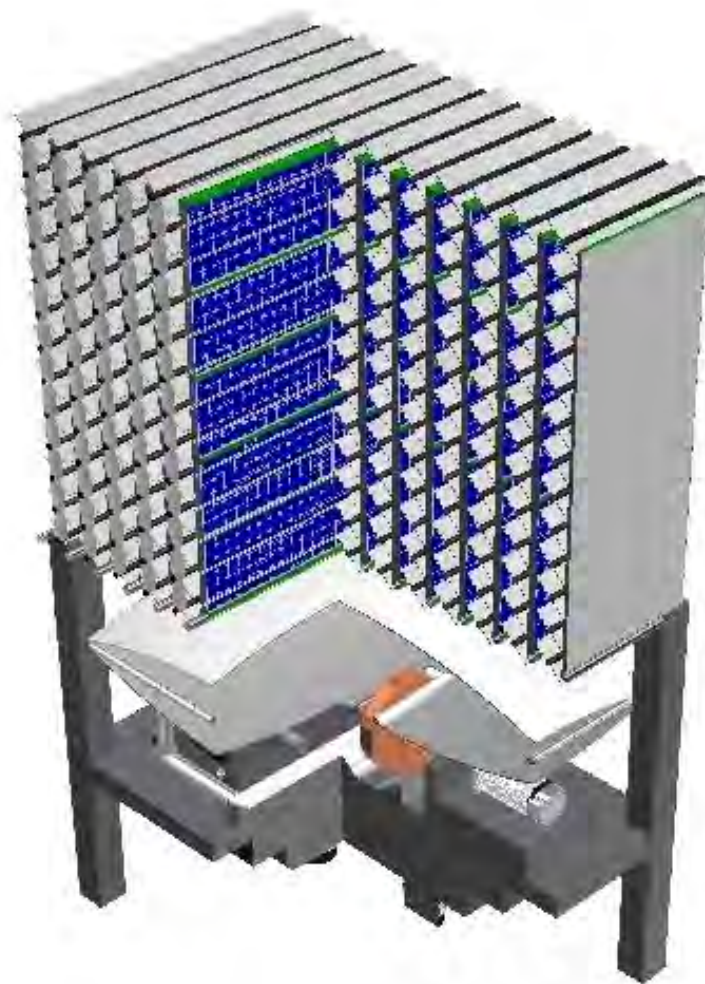
BLACKLIGHT POWER
BLACKLIGHT POWER

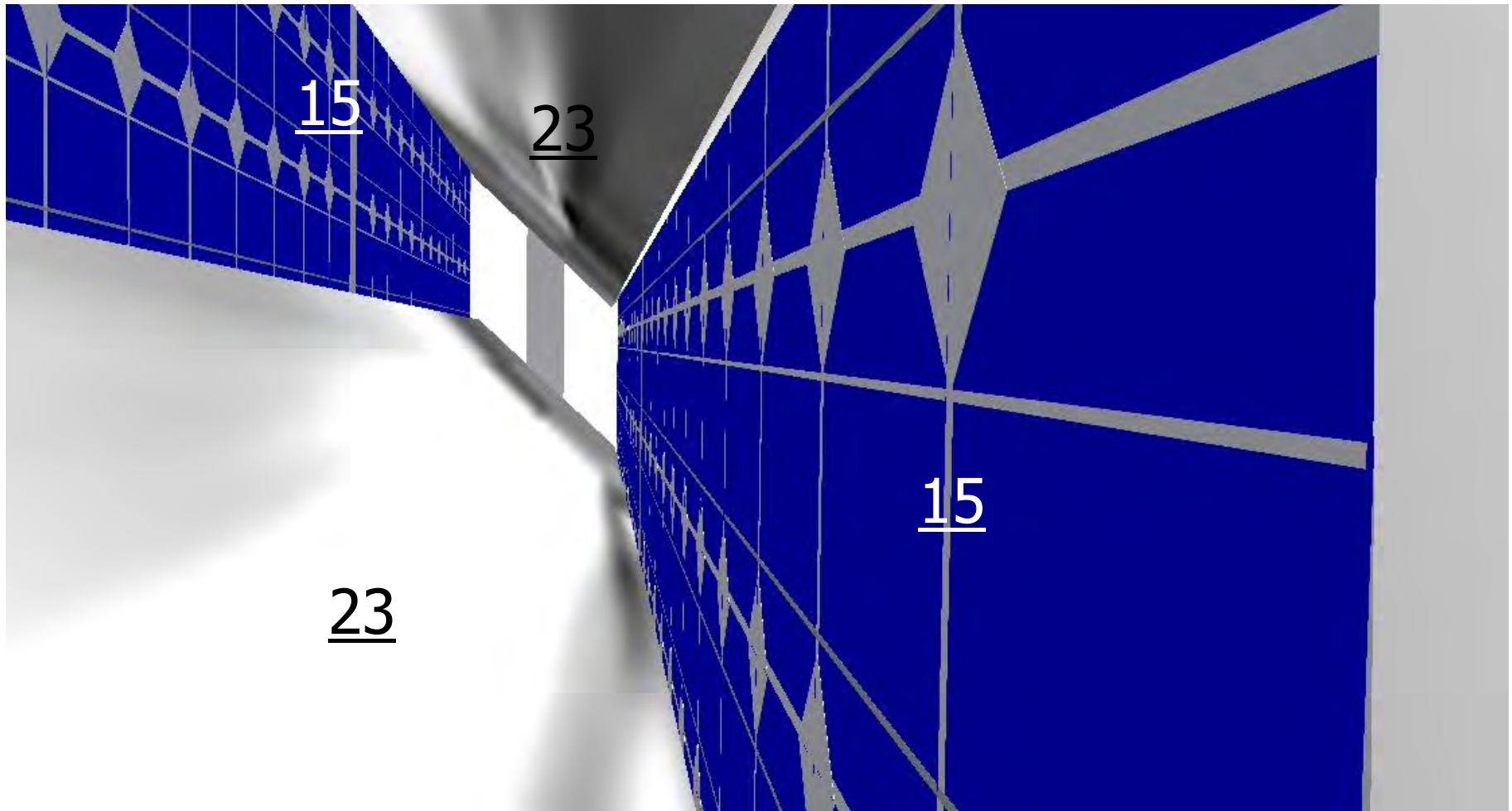


SunCell Cross-Section



SunCell Cross-Section





Inside View of Optical Distribution and Photovoltaic Converter System
Comprising Semitransparent Mirrors and Photovoltaic Cells

Operating Specifications

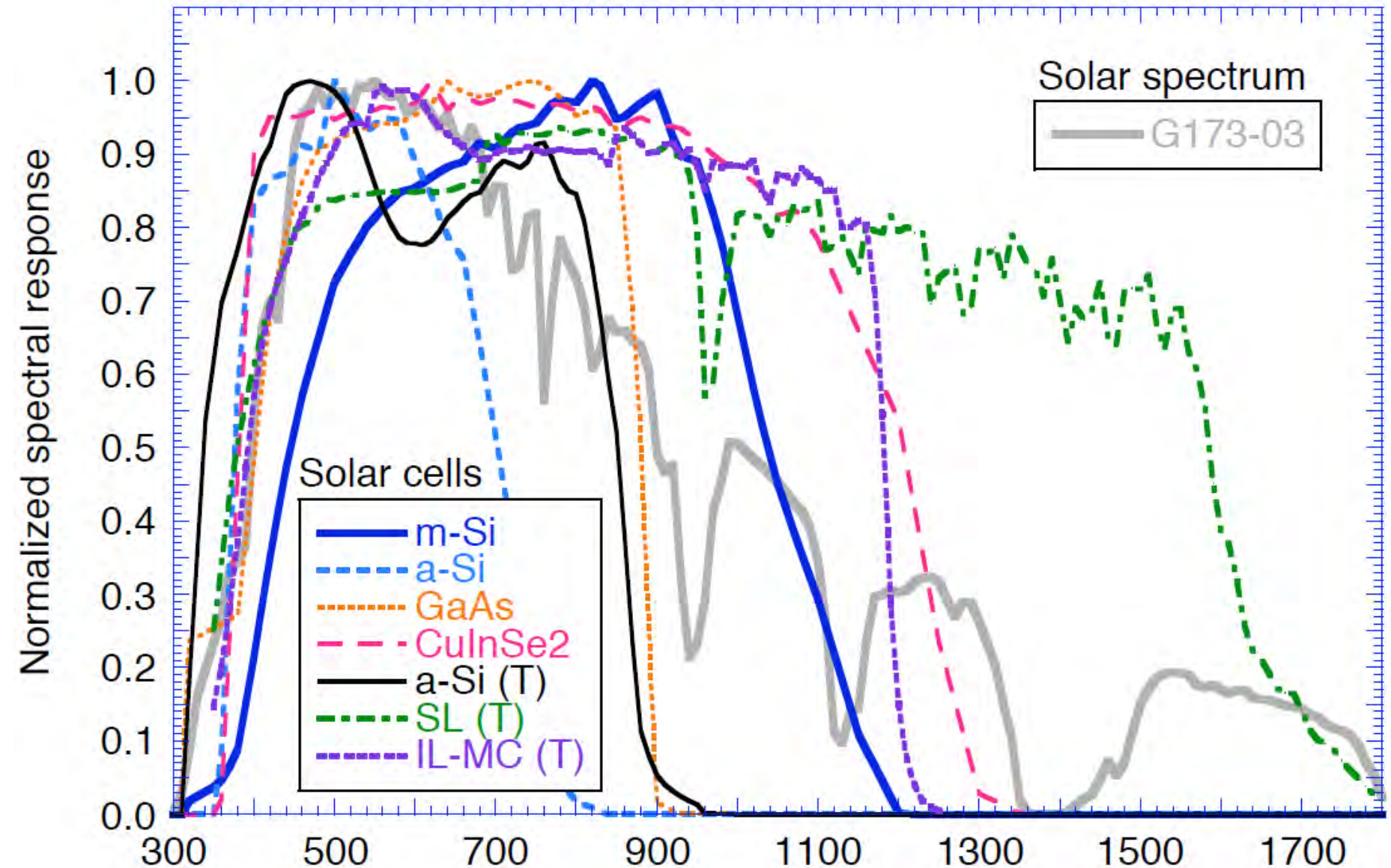
Fuel Composition	Ti, Cu, or Ag + ZnCl ₂ or MgCl ₂ hydrate powder
Load applied to the fuel	180-200 lb total pressure per 7 mm diameter, adjustable +/- 30%
Cycle frequency	2000 Hz adjustable to control power output
Mass Flow	Aliquot mass X ignition frequency = 200 mg X 2000 Hz = 400 g/s
Optical Power	Energy/aliquot X ignition frequency = 1000 J X 2000 Hz = 2 MW optical
Spectrum	3500 to 5500 K blackbody depending on fuel composition and ignition parameters
Ignition current	10,000 A to 30,000A
Ignition voltage	4.5 V-15 V
System Peak Input Power	45 kW to 450 kW
System Time Average Power	Ignition input energy X ignition frequency = 5 J X 2000 Hz = 10 kW
System output power	0.25 to 10 MW
Power Source Duty Cycle	System time average power/ system peak input power = 10 kW/180 kW =5.6%
Pulse Time	Ignition energy/system peak input power = 5 J/180,000 = 28 us
Fuel mass	(Match with power requirements) 200 mg per 1000 J multiply each by frequency such as 2000 Hz to get power and mass flow rate
Reaction product analysis	Perform online analysis/monitoring such as IR for fuel water content
Operating temperature	< 600 °C at electrodes < 100 °C at electrodes with slurry
Operating pressure	Expected range < 2 PSIG
Radiation	Emission from plasma blackbody at 3500 to 5500 K depending on the fuel

Operating Specifications of a 10 MW Electric SunCell Generator with a Rotary Ignition-Regeneration and an Optical Distribution and Photovoltaic Converter System.



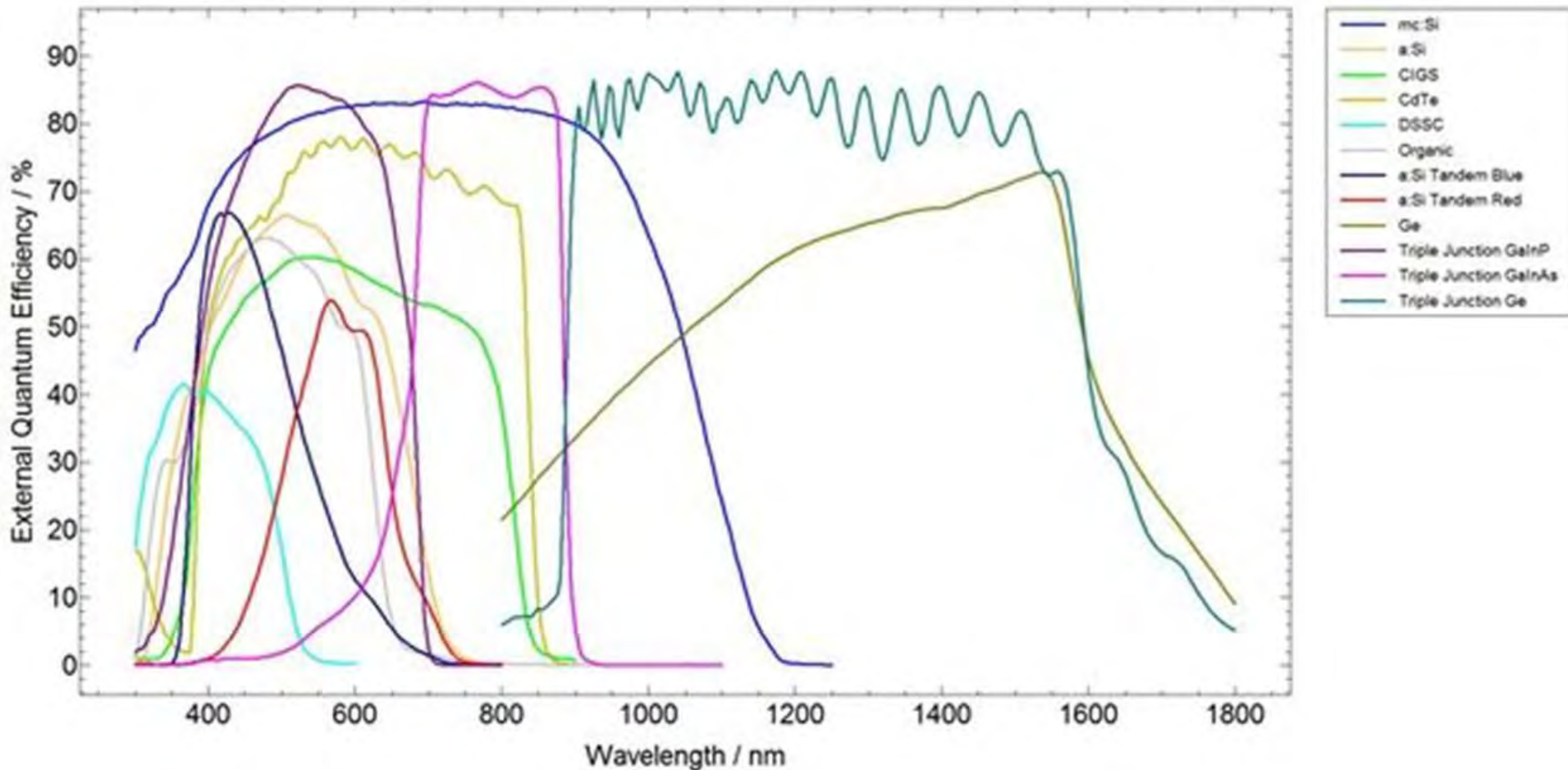
Optical/Electrical Power	25 MW optical 10 MW electrical
Fuel Composition	Ti, Cu, or Ag + ZnCl ₂ or MgCl ₂ hydrate powder
Load applied to the fuel	180-200 lb total pressure per 1 cm ² , adjustable +/- 30%
Energy per Mass	5 MJ/kg
Fuel Mass Flow	optical power/energy per mass = 25 MW/5 MJ/kg = 5 kg/s
Fuel Volume Flow	Fuel mass flow/fuel density = 5 kg/s/0.005 kg/cm ³ = 1000 cm³/s
H₂O Fuel Consumption (Volume Flow)	25 MW/50 MJ/mole (H ₂ O to H ₂ (1/4)/55 moles H ₂ O/liter = 9 ml/s (33 l/h)
Cycle frequency (based on pulse duration of 0.5 ms)	2000 Hz
Roller Diameter	10 cm
Roller Rotational Speed	10 cm diameter roller X 2000 RPM = 1050 cm/s
Fuel dimensions	H: 0.3 cm L: roller rotation speed/cycle frequency = 1050 cm/s/2000 Hz = 0.525 cm W: Fuel volume flow/cycle frequency/H/L = 1000 cm ³ /s/2000 Hz/0.3 cm/0.525 cm = 3.17 cm (Roller electrode width)
Ignition current	20,000 A to 30,000A
Ignition voltage	4.5 V-8 V
System Peak Input Power	90 kW to 240 kW
System Time Average Power	Ignition input energy X ignition frequency = 5 J X 2000 Hz = 10 kW
Power Source Duty Cycle	System time average power/ system peak input power = 10 kW/165 kW = 6%
Pulse Time	Ignition energy/system peak input power = 5 J/165,000 = 30 us Pulse duration X duty cycle = 0.5 ms X 6% = 30 us
Reaction product analysis	Perform online analysis/monitoring such as IR for fuel water content
Operating temperature	< 100 °C at electrodes with slurry
Operating pressure	Expected range < 2 PSIG
Spectrum	Emission from plasma blackbody at 3500 to 5500 K blackbody depending on fuel composition and ignition parameters
Area of Concentrator PV (1000 suns Illumination, 40% efficiency)	Optical power/illumination/efficiency = 25 MW/1 MW/m ² /40% = 62.5 m²
Width of Optical Distribution and Photovoltaic Conversion System	1 m
Length of Optical Distribution and Photovoltaic Conversion System	1 m
Spacing of Centers of PV Panels	2 cm
Number of PV Panels	Width of PD & PVC system/spacing of PV panels = 100 cm/2 cm = 50 panels
Height of Optical Distribution and Photovoltaic Conversion System	Area of Concentrator PV/ Number of PV Panels/ Width of PD & PVC system = 62.5 m ² /50 panels/1 m = 1.25 m

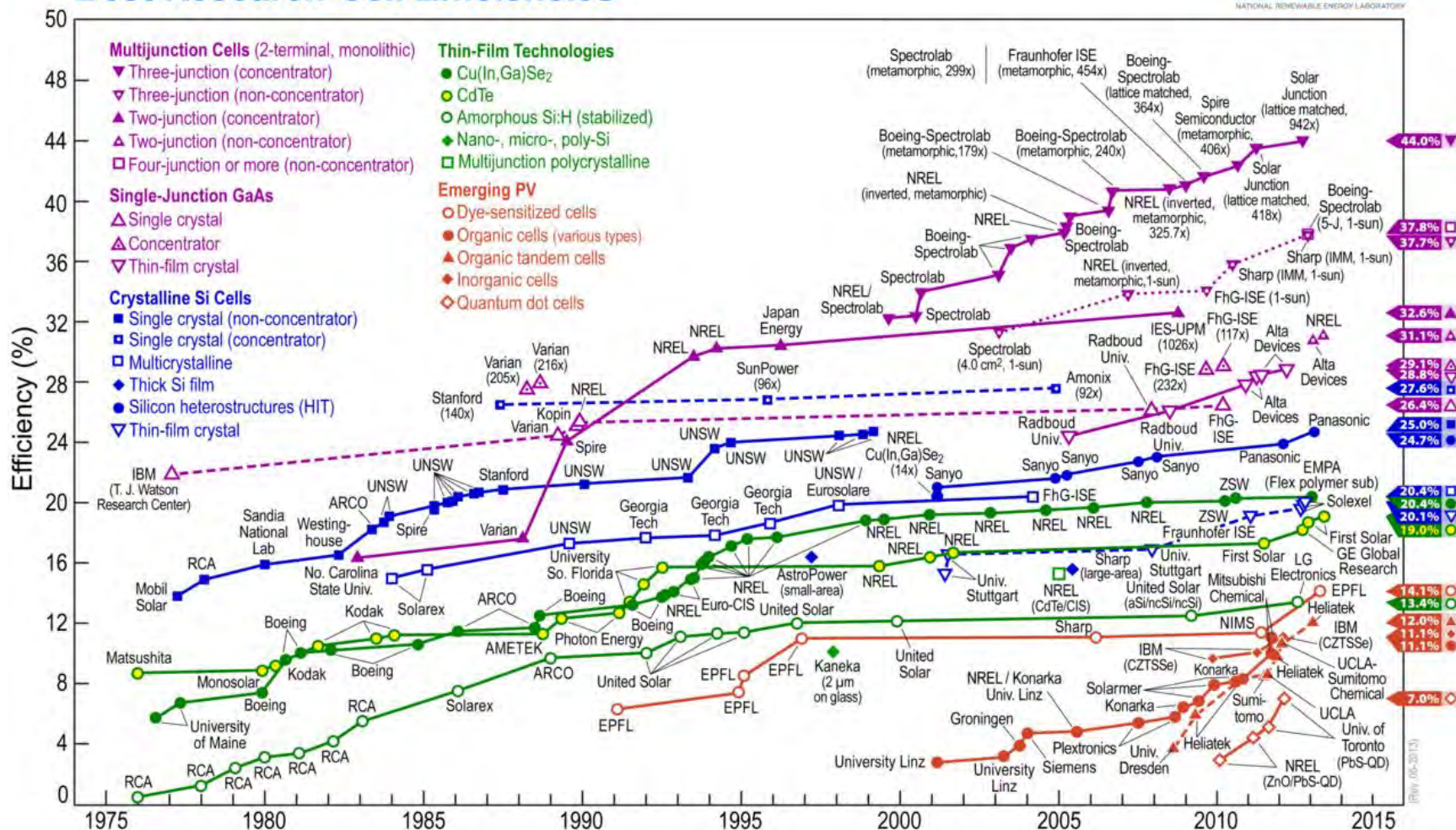
Wavelength Region Selectivity of PV Cell Types



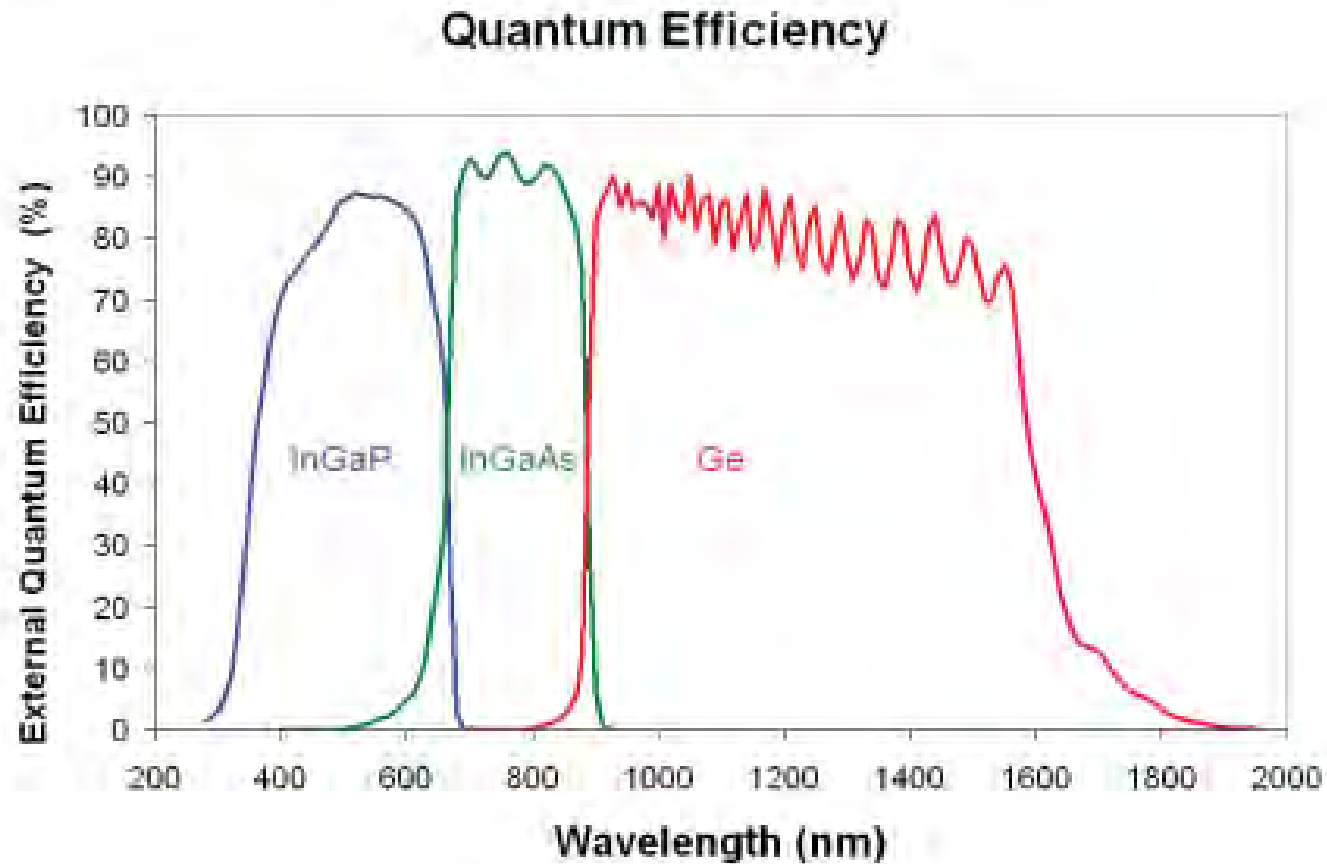


Wavelength Region Selectivity of PV Cell Types

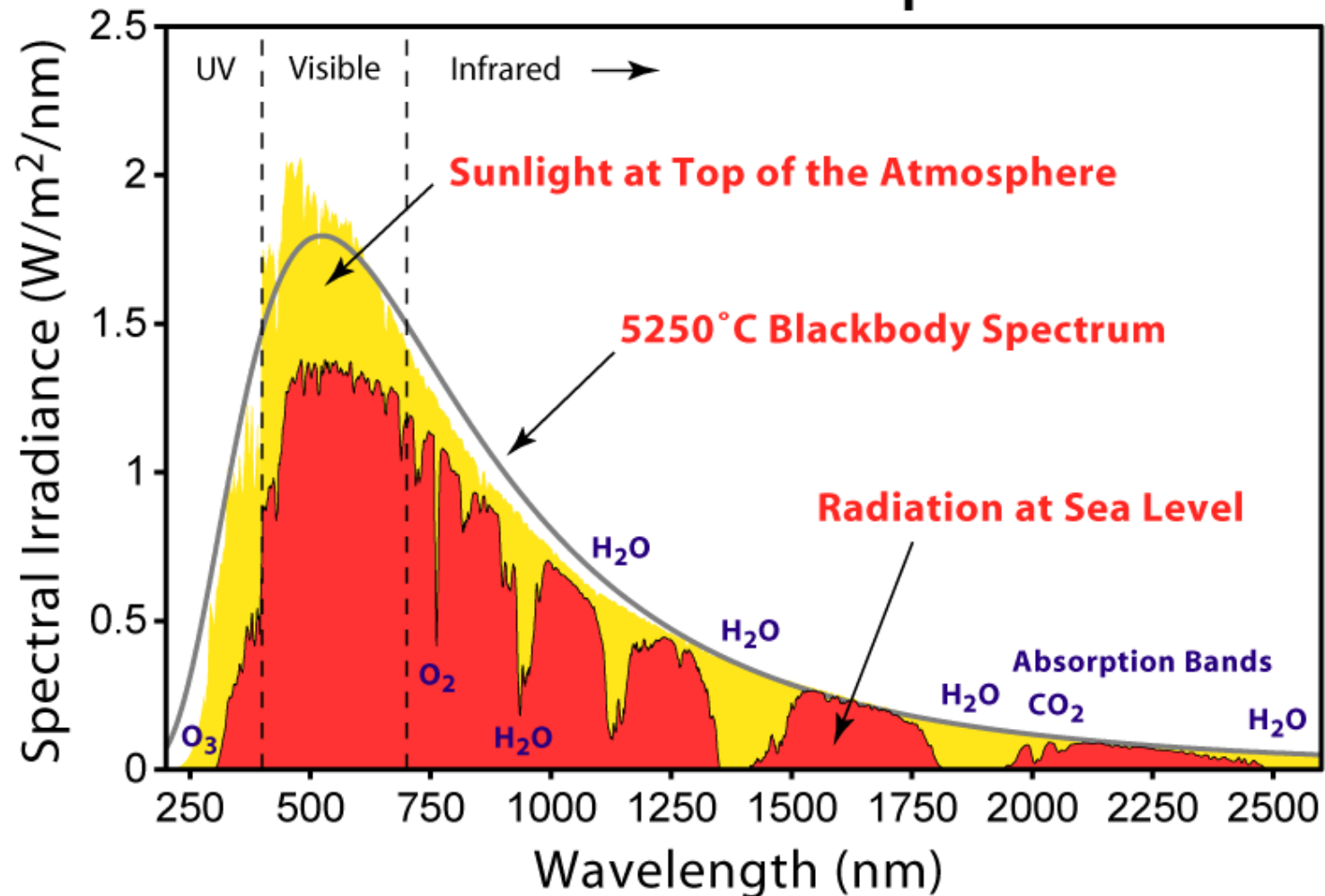




Wavelength Region Selectivity of PV Cell Types



Solar Radiation Spectrum



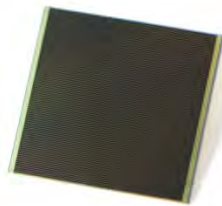
Triple Junction CPV Cell



DRAFT - NOT FOR RELEASE
Solar Junction

DATA SHEET SJ3 CPV CELL

SOLAR JUNCTION High Performance CPV Cells with 42.0% Mean Production Efficiency provide the highest efficiency solution for CPV systems. Solar Junction's single crystal structure, made with our proprietary material technology, ensures reliable superior performance throughout the lifetime of the CPV system. Specific system needs can be addressed on request through custom modifications designed by Solar Junction's in-house engineering and manufacturing teams.



SJ3-55 AVERAGE VALUES

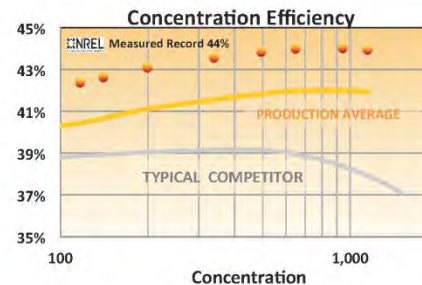
100W/cm², 25° C, ASTM G173-03
AM1.5D DNI + Circumsolar Spectrum

Parameter	Typical Value
Eff.	42.0 %
Eff. Sigma	0.5%
P _{max}	13.1 W
I _{sc}	4.35 A
V _{oc}	3.50V
FF	86 %

Parameter	Thermal Coefficient
Eff.	-0.055% abs./°C
V _{oc}	-4.5mV/°C

FEATURES AND CHARACTERISTICS

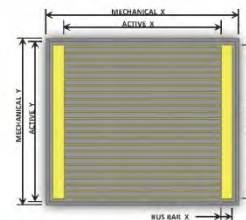
- Sustained efficiency at very high concentrations
- Fully lattice matched single crystal structure for reliable operation
- Silver metallization with gold finish front and back contacts
- Anti-reflective coating (ARC) matched to glass
- Rapid custom design available to meet your needs - all engineering in-house
- 100% flash testing available



FORM FACTORS

Standard Prod. Type	Aperture (mm)	Active Area (mm ²)	Mechanical (mm)	Busbar (mm)
SJ3-55	5.5 x 5.5	30.25	6.17 x 5.62	0.25 x 5.46

Other sizes available on request



Triple Junction CPV Dense Array



Advanced Dense Array Module (ADAM)

Product Type: Concentrator Triple Junction Solar Cell
Module – 3C30M

Application: Concentrating Photovoltaic (CPV) System for Dish Application



General

AZUR SPACE's Advanced Dense Array Module (ADAM) is intended to be used in HCPV receivers with reflective optics, e.g. parabolic mirrors. It consists of a two-dimensional array of high efficiency solar cells mounted on a cooling element. Electrical protection of solar cells against reverse voltage is provided by bypass diodes. The solar cells and diodes within ADAM are completely interconnected and only electrical connection to the external circuitry and connection to cooling system shall be provided by system integrator. For requested thermal management of the module, an active liquid cooling system is necessary. The ADAM module has to be protected against all environmental influences (e.g. water, humidity, dust, pollution, etc.).



Design and Mechanical Data

Base Solar Cell Material	GaInP/GaAs/Ge on Ge substrate
Base Cooler Material	Copper and AlN Ceramic
AR Coating Solar Cell	TiO ₂ /Al ₂ O ₃
Module Size	17,8 cm x 12,7 cm
Module Active Area	11,77 cm x 12,1 cm = 142,417 cm ²
Cooler Thickness without fittings	ca. 0,9 cm
Cooler Thickness with fittings	ca. 2,9 cm
Total module thickness	ca. 3,4 cm
Electrical plus contact	suitable for clamp process
Electrical minus contact	suitable for clamp process



Typical Electrical Data

(Measurement condition: 1.5 AMd – 1000 W/m² (ASTM G 173-03), T = 25° C)

Sun concentration	I _{sc} [A]	V _{oc} [V]	I _{MPP} [A]	V _{MPP} [V]	P _{MPP} [kW/MPP]	FF [%]	η [%]
x 700	53	76	50	64	3,20	79,5	32,0

Values are valid for homogeneous illumination only!

Bypass diode protection is provided for each segment.
Inhomogeneous illumination, a lower light intensity or higher temperatures will reduce the power output.



Typical Temperature Coefficients of Solar Cell (@ 500 suns)

Temperature range (25 – 80° C)

Parameter	(Δ I _{sc} / I _{sc(25°C)}) / ΔT	(Δ V _{oc} / V _{oc(25°C)}) / ΔT	(Δ P _{MPP} / P _{MPP(25°C)}) / ΔT
value	0,074 %/°K	- 0,137 %/°K	- 0,106 %/°K

3C30M

Triple Junction CPV Dense Array Cont'd



Recommended Cooling Unit

Wafer connection: 2 inlet and 2 outlet fittings on the rear side
 Wafer flow rate: 14 – 18 l/min
 Pressure drop: 0,3 bar @ 15 l/min
 Max. water inlet temperature: 60° C
 Max. system peak preasure: 3 bar

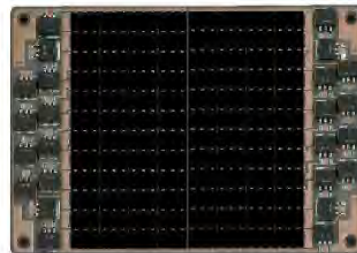
Failure of cooling unit or interruption of cooling flow has to be avoided; otherwise damage will result within seconds.

Thermal Power Output

At 700 sun concentration approximately ~ 6 kW



Picture of Front Side




Picture of Rear Side



Water Inlets

Water Outlets

Order information

ADAM fittings	picture	SAP-Material number for order
with thread connector outer thread: M20 inner thread: G 1/4 height: 2 cm		80563
with hose connector (20 mm outer tube diameter)		80420

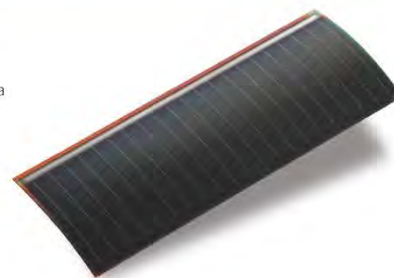
3C30M

ALTA DEVICES

TECHNOLOGY BRIEF Single Solar Cell

Alta Devices produces the highest performance single junction solar cells available on the market.

- The gallium arsenide based cells are thin, flexible, and lightweight, enabling a broad range of mobile power applications
- World-record cell and module efficiencies
- Low temperature coefficients and high sensitivity to low light generate unsurpassed real world performance



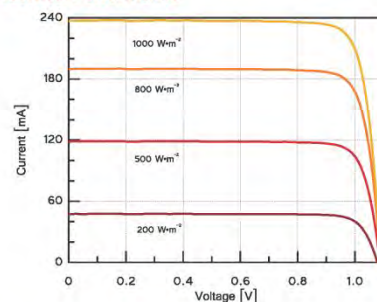
Mechanical Data and Design

Format	[mm]	50 x 19.6 ± 0.5
Thickness	[μm]	110 ± 10
Weight	[mg]	180
Front	[-]	1.0 mm bus bar, AR coating
Back	[+]	Polymer carrier film, vias for electrical contact

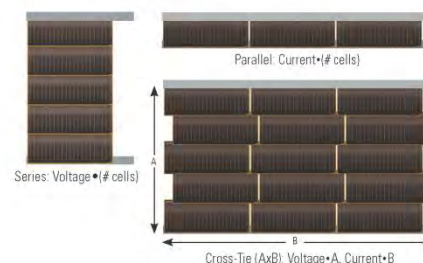
Temperature Coefficients

Voltage	[%/ °C]	-0.187
Current	[%/ °C]	+0.084
Power	[%/ °C]	-0.095

Electrical Performance



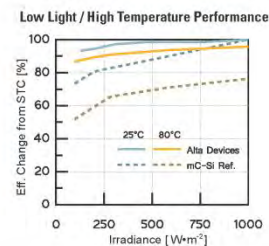
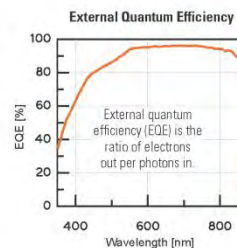
Architecture Options



Electrical Specifications

Performance at STC of a 24.2% efficient cell		
Eff.	[%]	24.2 (shingle area)
Eff.	[%]	26.0 (active area)
P_{max}	[mW]	220
V_{oc}	[V]	0.96
I_{sc}	[mA]	230
FF	[%]	84.2
V_m	[V]	1.09
I_m	[mA]	239

Standard Testing Conditions (STC): 1000W•m⁻², AM1.5, 25°C



c-Si Solar Panel

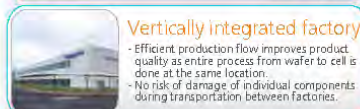
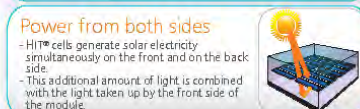
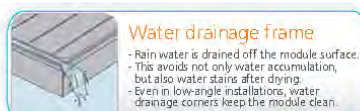
Panasonic

HIT[®] photovoltaic module

HIT-N245
HIT-N240



Electrical and Mechanical Characteristics
N245, N240



19.4%*
194 W/m²



* For N245

HIT[®] cell technology

The HIT[®] solar cell is made of a thin monocrystalline silicon wafer surrounded by ultra-thin amorphous silicon layers. This product offers the industry's leading performance and value, using state-of-the-art manufacturing techniques. The development of the HIT[®] solar cell was supported in part by the New Energy and Industrial Technology Development Organization (NEDO).

Quality

Panasonic is truly committed to quality since it began developing and manufacturing solar PV technology in 1975. Our long track record is supported by our claim-rate of only 0.0036% in our European factory in Dorog, Hungary (as of September 2013).

Special features

HIT[®] solar modules are 100% emission free, have no moving parts and produce no noise. The dimensions of the HIT[®] modules enable a space saving installation and the achievement of maximum output power possible on a given roof area.

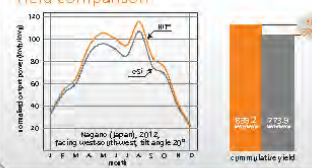
High performance at high temperatures

With its very low temperature coefficient of only -0.25%/°C, the HIT[®] solar cell can maintain a higher efficiency than a conventional crystalline silicon solar cell, even at high temperatures.

HIT[®] solar cell structure



Yield comparison



Model	Cell efficiency	Module efficiency	Output/m ²
N245	22.0%	19.4%	194 W/m ²
N240	21.6%	19.0%	190 W/m ²

HIT[®]
Photovoltaic Module

*HIT[®] is a registered trademark of Panasonic Group.

Panasonic Eco Solutions Energy Management Europe
SANYO Component Europe GmbH

www.eu-solar.panasonic.net

Electrical data (at STC)

	VARIABLES	PARAMETERS
Max. power (P _{max}) [W]	245	240
Max. power voltage (V _{mp}) [V]	44.3	43.6
Max. power current (I _{mp}) [A]	5.54	5.51
Open circuit voltage (V _{oc}) [V]	53.0	52.4
Short circuit current (I _{sc}) [A]	5.86	5.85
Max. over current rating [A]	15	
Production tolerance power [%]	+10/-5*	
Max. system voltage [V]	1000	

Note: Standard Test Conditions: Air mass 1.5, irradiance = 1000 W/m², cell temp. 25°C
* All modules measured by Panasonic facilities have an output with positive tolerance

Temperature characteristics

	PARAMETERS	PARAMETERS
Temperature (NOCT) [°C]	44.0	44.0
Temp. coefficient of P _{max} [%/°C]	-0.29	-0.29
Temp. coefficient of V _{oc} [V/°C]	-0.133	-0.131
Temp. coefficient of I _{sc} [mA/°C]	1.76	1.76

At NOCT (Normal Operating Conditions)

Max. power (P _{max}) [W]	187.4	183.2
Max. power voltage (V _{mp}) [V]	42.5	41.7
Max. power current (I _{mp}) [A]	4.41	4.39
Open circuit voltage (V _{oc}) [V]	50.3	49.7
Short circuit current (I _{sc}) [A]	4.71	4.71

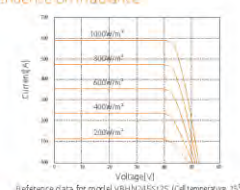
Note: Nominal Operating Cell Temp. Air mass 1.5, irradiance = 800 W/m²,
Air temperature 20°C, wind speed 1 m/s

At low irradiance (20%)

Max. power (P _{max}) [W]	47.0	45.9
Max. power voltage (V _{mp}) [V]	43.2	42.2
Max. power current (I _{mp}) [A]	1.09	1.06
Open circuit voltage (V _{oc}) [V]	49.6	48.0
Short circuit current (I _{sc}) [A]	1.17	1.17

Note: Low irradiance: Air mass 1.5, irradiance = 200 W/m², cell temp. = 25°C

Dependence on irradiance



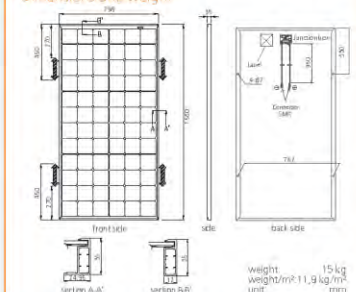
CAUTION! Please read the installation manual carefully before using the products.

Used electrical and electronic products must not be mixed with general household waste. For proper treatment, recovery and recycling of old products, please take them to applicable collection points in accordance with your national legislation.

Panasonic Eco Solutions Energy Management Europe
SANYO Component Europe GmbH

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81829 Murnau, Germany
Tel: +49 (0)89-460095-0
Fax: +49 (0)89-460095-170
http://www.eu-solar.panasonic.net
Info.solar@eu.panasonic.com

Dimensions and weight



Guarantee

Power output: 10 years (90% of P_{min}), 25 years (80% of P_{min})
Product workmanship: 10 years (based on guarantee document)

Materials

Cell material: 5 inch HIT cells
Glass material: AR coated tempered glass
Frame material: Black anodized aluminium
Connectors type: SMK

Certificates



Please consult your local dealer for more information.

Panasonic

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Specifications are subject to change without notice.
01/2014

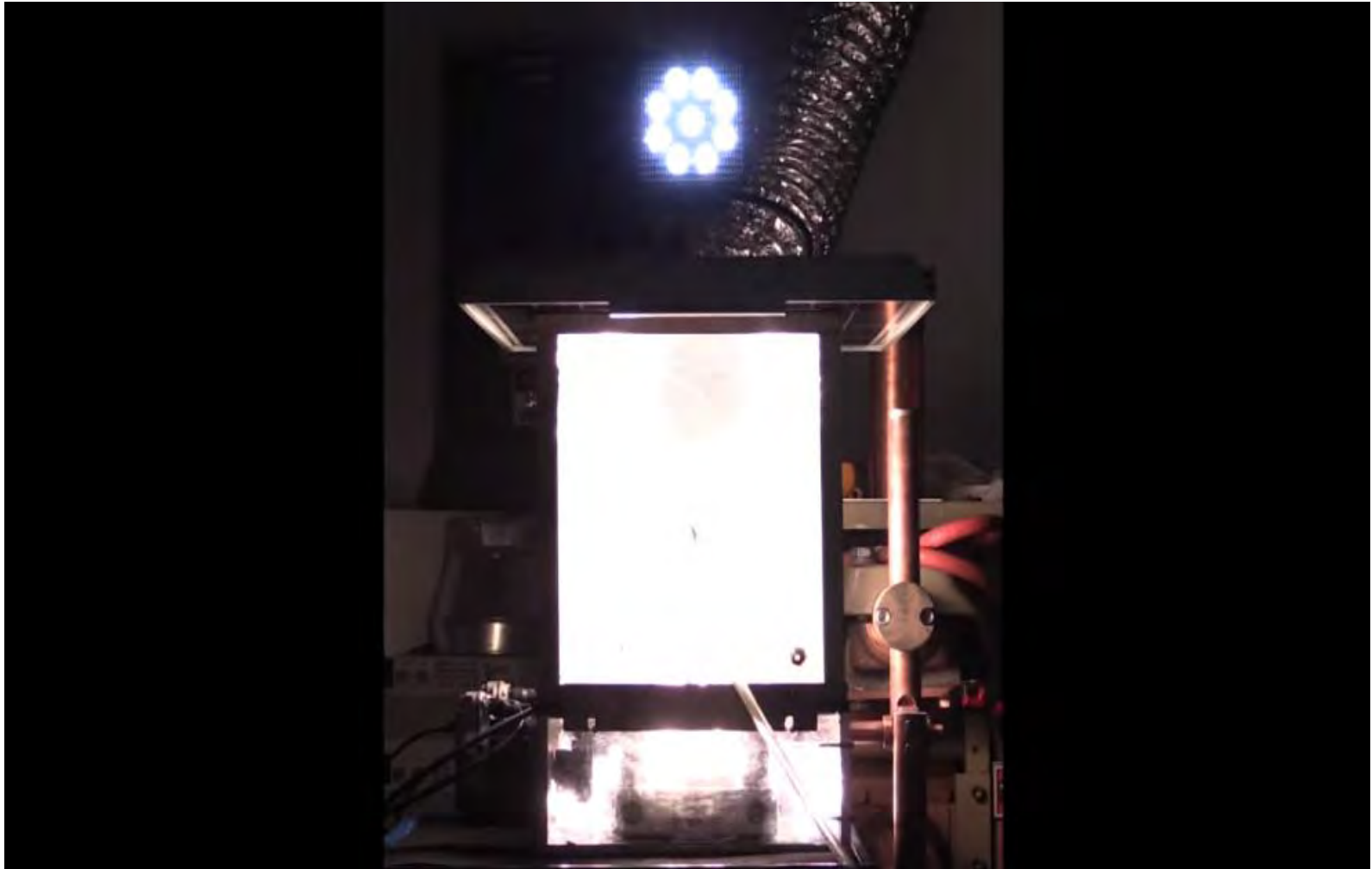
- Bottom Portion-Visible Dichroic Mirrors to c-Si PV
- Top Portion-Infrared Dichroic Mirrors to Ge PV

Generation Three SunCell

SunCell

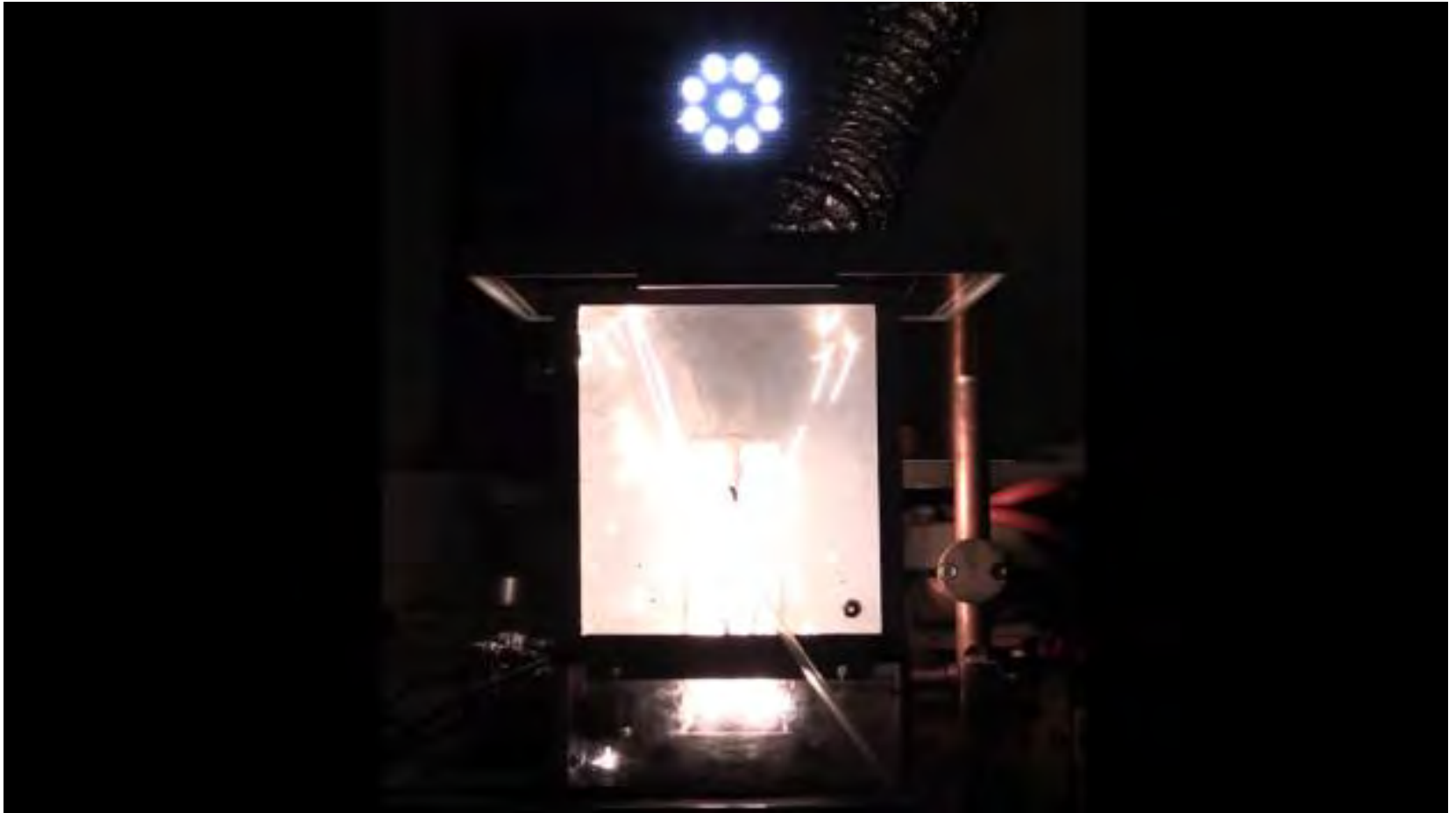


Electricity Demo



Please visit www.BlackLightPower.com to view full video

Electricity Demo



Please visit www.BlackLightPower.com to view full video

Electricity Demo



Please visit www.BlackLightPower.com to view full video

Electricity Demo



Please visit www.BlackLightPower.com to view full video

Power of Demonstration

27 W LED Light

Correction of Losses and Optimization of Parameters

17% efficiency can be increased to 40%

1/2 light collected

40% transmitted through two Lexan shields can be increased to ~100%

Firing frequency can be increased from 33 Hz to 3300 Hz

Fuel thickness can be increased from 0.1 mm to 3 mm

Electrode width can be increased from 1.3 cm to 100 cm

At the same roller diameter the RPMs can be increased from 2000 to 4000

5.4 millions times or 150 MW LED Light

100 kW Electric Prototype

- BLP requested Engineering firms to provide a prototype in 16-18 weeks^a
- Proposal expected in two weeks, estimated cost is \$30,000-50,000 for 100 kW electric (\$300 kW)
 - 3J CPV \$100 kW
 - GaAs 1000 suns \$4/kW
 - c-Si 250 suns \$4/kW
- The payoff time for \$100 kW is $\$100 \text{ kW} / \$0.15/\text{kWh}/24\text{h}/\text{day} = 28 \text{ days}$
- The payoff time for \$4 kW is $\$4 \text{ kW} / \$0.15/\text{kWh}/24\text{h}/\text{day} = 1.1 \text{ days}$

^a
current management estimate, subject to change

SunCell Validation

Four independent validators have confirmed SunCell detonation energetics, energy balance, power, and power density. The hydrino signature of EUV continuum radiation has also been confirmed by leading EUV spectroscopists.

The Validation Reports page on our webpage contains summary biographies and reports from three of the validators:

- Dr. Henry Weinberg, CalTech Professor that advises brand name companies and institutional investment firms on technology and business opportunities;
- Dr. Kandam Ramanujachary, a Professor with expertise in materials science that collaborates with world renowned battery and materials science groups;
- Dr. Nick Glumac, Chaired Professor at University of Illinois, CalTech PhD, US DOD advisor on energetic materials.

Limiting Power Density of Conventional Power Sources Compared to SunCell



BLACKLIGHT POWER
BLACKLIGHT POWER

- The power density of conventional sources are limited by at least one of two factors, the ability to generate power controllably in a given volume and the ability to continuously remove that power such as heat to maintain a steady state.
- **Electrochemical:** 1 kW/l due to oxygen reduction rate.
- **Thermal Rankine:** 1-2 kW/l due to combustion rate and mass flow rate limitation as well as maximum temperature for material failure at the corresponding maximum heat gradient.
- **Thermal Brayton:** 5 kW/l due to low heat capacity of air, maximum air flow rate due to mechanical transport limitation, and maximum air temperature due to material failure limit.
- **Nuclear:** 1 kW/l due to controllable nuclear reaction rate and heat transfer limitations from the fuel rods to the coolant.
- **Internal Combustion Engine (ICE):** 10 kW/l limited by combustion rate of volatile fuel and the pressure and temperature in the cylinder before mechanical failure.
- The **SunCell** can produce more than 100 billion watts of electricity per liter: ten million times that of the pinnacle of power engines, the ICE.

SunCell

Electrical Power Generator Applications



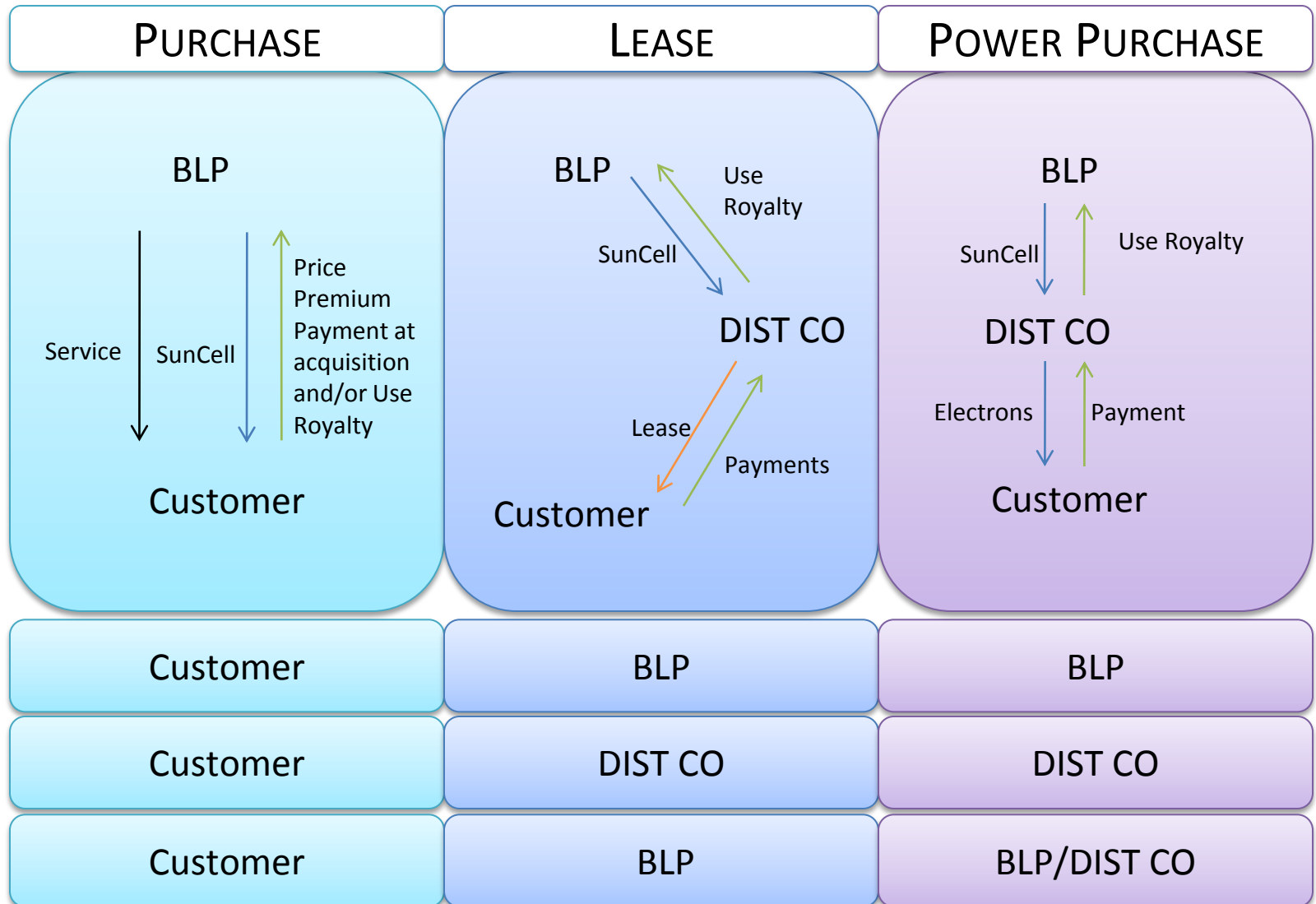
- Using readily-available components, BlackLight has developed a modular system engineering design of an electric generator that is closed except for the addition of H_2O fuel and generates up to 10 MW of electricity, enough to power ten thousand homes. Simply replacing the consumed H_2O regenerates the fuel.
- Remarkably, the cell of the device is less than a cubic foot in volume.
- Applications and markets for the SunCell extend across the global power spectrum, including thermal, stationary electrical power, motive, and defense.
- SunCell power is independent from existing infrastructure:
 - grid and fuels in the case of electricity, and fuels in the case of motive power
- The SunCell power source is a further game changer for all forms of transportation:
 - automobile, freight trucks, rail, marine, aviation, and aerospace
- The power density is one million times that of the engine of a Formula One racer, and ten million times that of a jet engine.
- The SunCell uses cheap, abundant, nontoxic, commodity chemicals, with no apparent long-term supply issues that might preclude commercial, high volume manufacturing. Conversion is achieved with mass-produced solar cells at 50,000 times the light concentration.
- The projected cost of the SunCell is about \$100/kW compared to over ten times that for conventional power sources of electricity.

SunCell Revenue Model

The Company plans to:

- License original equipment manufacturers to fabricate SunCell units to exclusively sell to the Company,
- Lease service companies to install and service the units and sell power under power purchase agreements,
- Revenue sharing
- 250 kW to 10 MW scalable, modular “block” to service essentially all power markets.

Energy as a Service



The Market Potential- SunCell



<u>Revenue to BLP Enterprise</u>	<u>Single 1 MW Generator</u>	<u>United States (1)</u>
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Total Delivered Energy (MW)	1	
Hours in a Year	<u>8,766</u>	
Total Annual Delivered Energy (MWh)	8,766	28 Billion
Equivalent 10 MW units		300 Thousand
Average price of energy per MWh	\$100	\$100

Annual Potential to BLP Enterprise	\$876,600	\$2,800 Billion
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Example Royalty	75%	75%
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Annual Potential BLP Gross	\$657,450	\$2,100 Billion
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Source: EIA

(1) For illustrative purposes, assumes total delivered energy is derived from electrical power plants using the BlackLight Process.

- The Company aggressively files and obtains patents relating to the BlackLight Process, application of the Process and the resulting hydrino products
- Numerous patent applications have been filed worldwide
 - 60 issued patents provide coverage in many major energy markets (4 in the U.S.)
 - >100 pending applications (important applications in U.S.)
 - World-wide applications related to the solid fuels process were filed on April 24, 2008 and July 30, 2009.
 - An application regarding engineered thermal-to-electric systems and CIHT was filed on March 18, 2010. Patents regarding CIHT were filed on March 17, 2011, the application on CIHT entitled "H₂O-Based Electrochemical Hydrogen-Catalyst Power System" was filed on March 30, 2012, and the application "CIHT Power System" was filed on May 21, 2013.
 - World-wide applications on the breakthrough energetic plasma producing SunCell were filed on January 10, 2014 as the application entitled "Power Generation Systems and Methods Regarding Same."
- Management believes these applications, if ultimately issued as patents, will provide broad protection over the Company's proprietary process
- BLP's IP counsel is Finnegan, Henderson, Farabow, Garret & Dunner, LLP

- Medium term goal to build a base of license partners
 - Create partnerships through licensing agreements with existing green entities to fill the roles of
 - OEM
 - Distributor
- Target initial markets with favorable economics and potential for early adopters



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Thank you!

For more information please visit us at www.blacklightpower.com