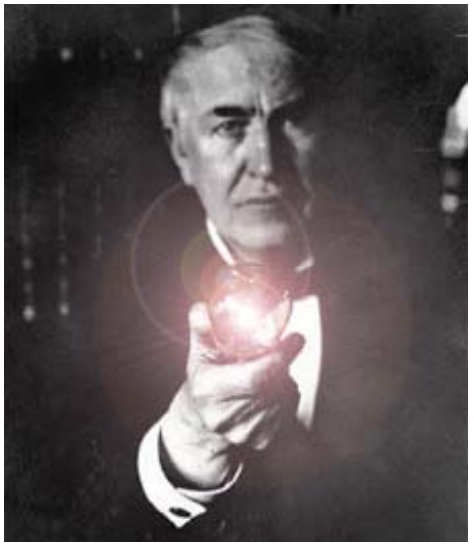
brilliant
LIGHT POWER

Society for Cable & Telecoms Engineers Energy 2020 Conference in Denver, CO

September 12, 2017

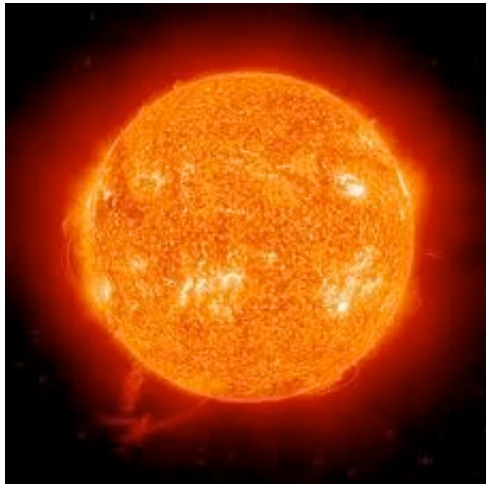
About Brilliant Light Power

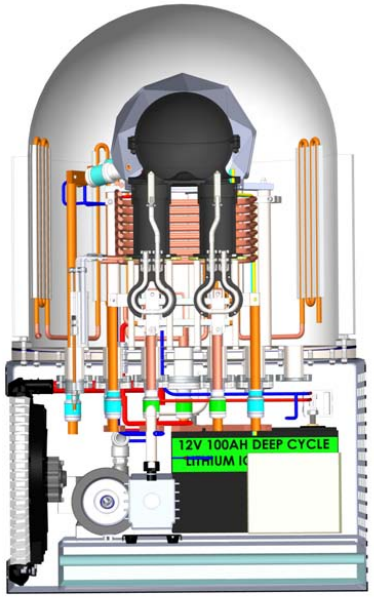
- Reinventing electricity, independence of being completely off grid
- New, sustainable, nonpolluting energy
- Technology and science validated by independent third parties
- Extensive proprietary methods and systems
- Electricity company, sales via lease agreement, no metering
- Partnership & outsource business model
- Transitioning from research to reality
- Profound implications for electric power – accessible, affordable, clean



The Energy Solution: SunCell®

- Continuous power source, developed with proprietary technology
- Non-polluting: by-product is harmless lower energy state of hydrogen called Hydrino®, lighter than air, vents to space
- System is sealed with H_2O fuel injected with nonreactive, recirculated silver, absolutely safe materials and operation
- Capital cost estimated at $50 to $100 per kW at production power & scale, versus $3,463 for solar
- No Metering: Electricity sold at about $0.05 per kWh via a per diem lease fee.
- Low operating cost, only consumable is minimal amounts of water
- Scalable from 10kW to 10 MWs
- Initially heating applications, stationary electric, developing to motive
- Field test in 2H 2018
- Commercial launch in 2H 2019

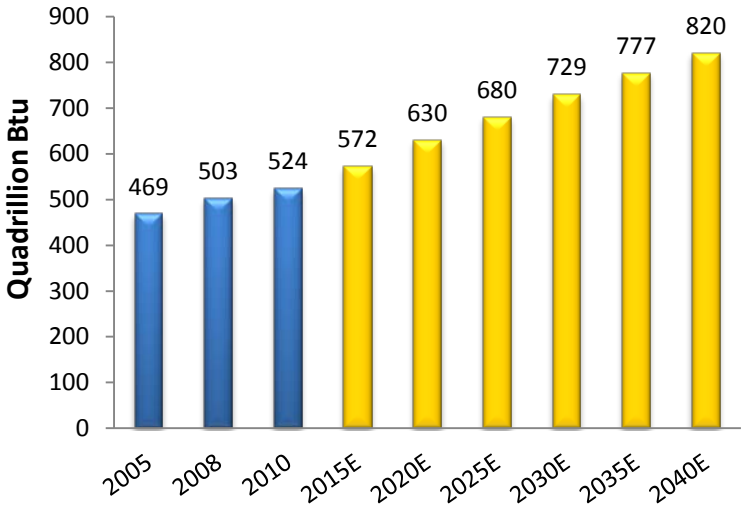




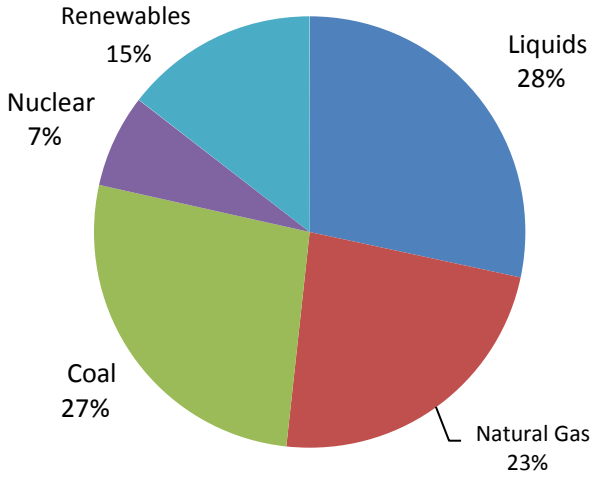
Global Market

- $8 trillion~ expended on total fossil fuels globally in 2013
- $1 trillion+ annually for energy infrastructure through 2030
- Energy demand has nearly doubled over the past 20 years, projected to increase 56% from 2010 to 2040
- Renewable energy to satisfy only ~15% of demand by 2040
- Wind and solar are relatively poor sources of base load power

Global Energy Consumption



Global Energy Use by Fuel 2040



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

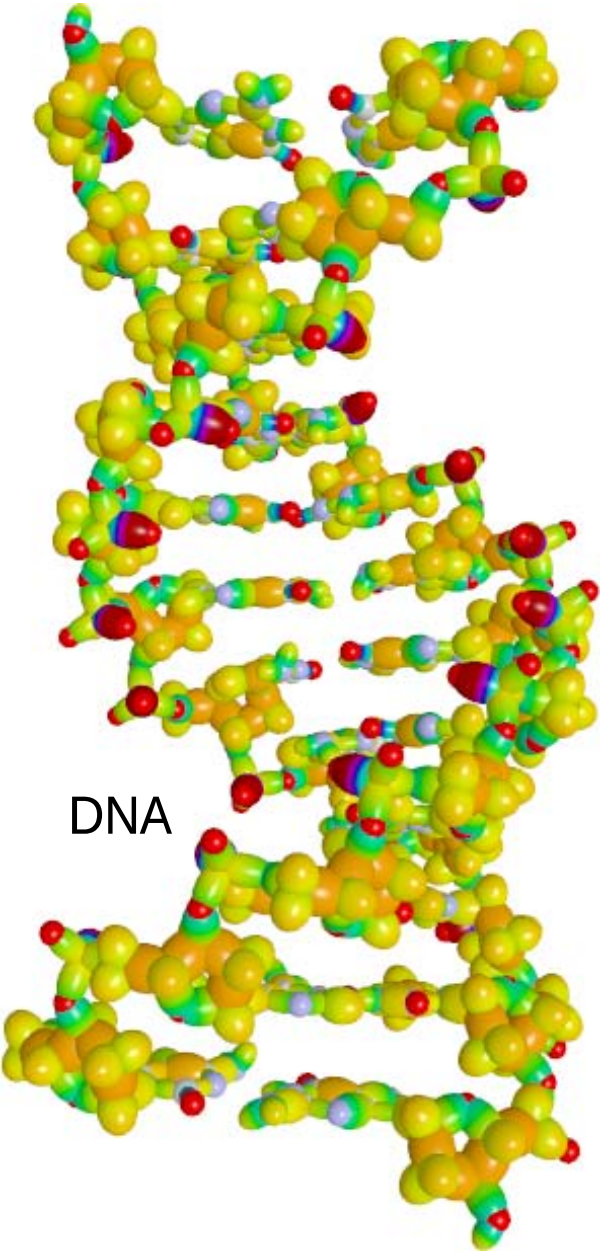
Hydrino® energy key points

22 years of research, success and invention…

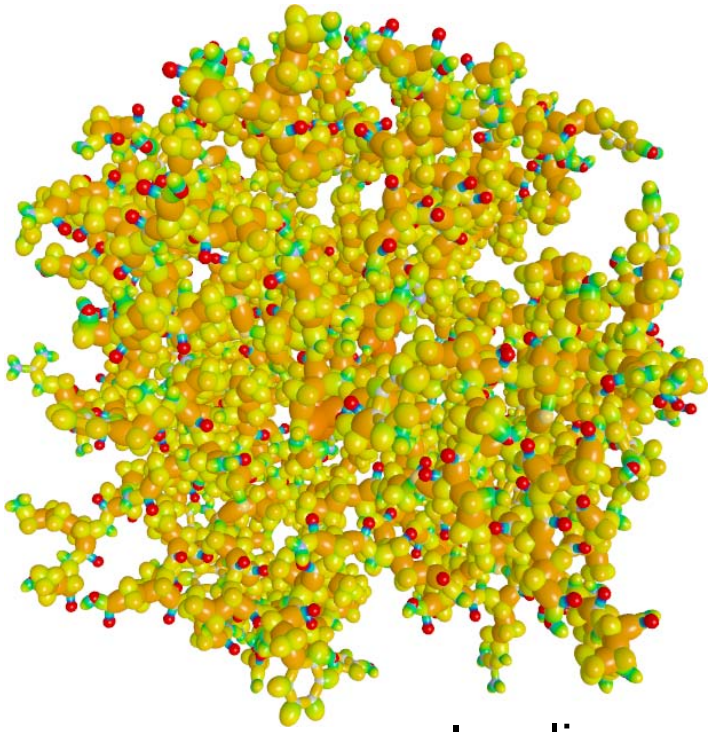
- Hydrino® power has a higher power density than any other power source known to man, the equivalent of millions of watts per liter
- The Hydrino® energy source has been validated by 10 different methods including the latest, gold standard, NIST calibrated light sources and commercial calorimetry
- The Hydrino® is ubiquitous in nature, and matches astrophysicists conclusions that so-named dark matter is a different allotrope or different chemical form of hydrogen
- There are five validation reports published on the Brilliant Light Power website from leading experts identifying massive power output from the process. Multiple other validation reports are available under NDA and upon request from unfunded assessments
- Brilliant Light Power will support all requests for validation testing from **qualified** scientists
- There are more than 100 peer reviewed publications to support the Hydrino® including external scientific authors
- Every evolutionary step has produced a higher power density leading up to the commercial development of SunCell®

Theory Based on Classical Laws

Millsian 2.0: Modeling Molecules

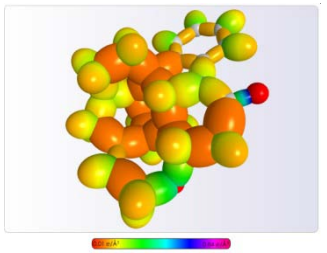


DNA

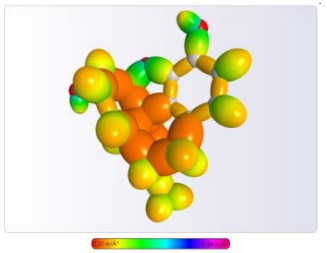


Insulin

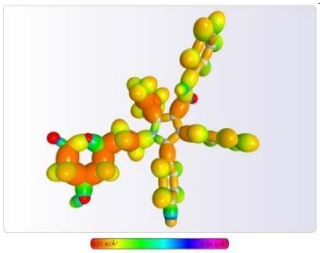
Strychnine



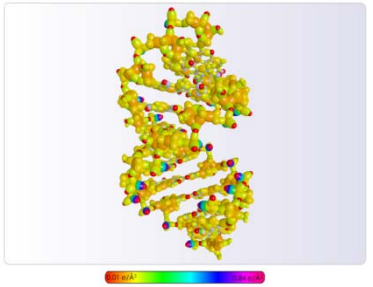
Morphine



Lipitor

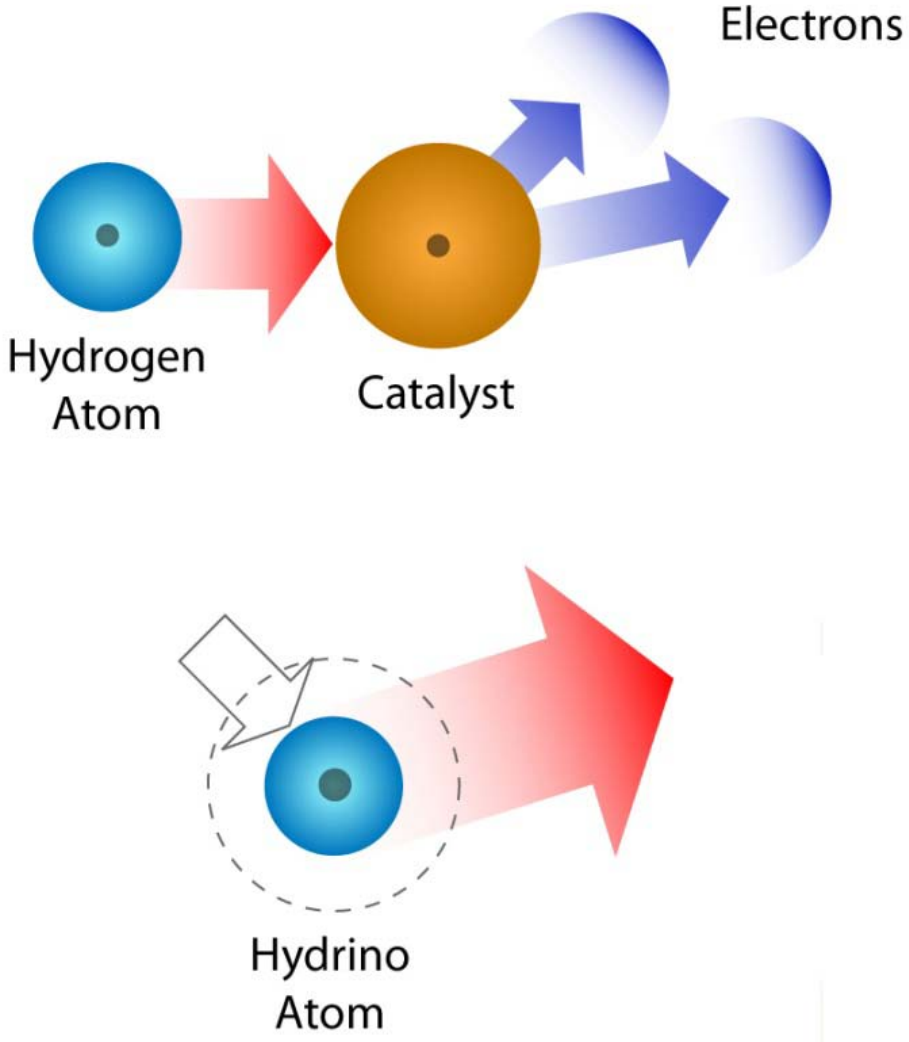


RNA

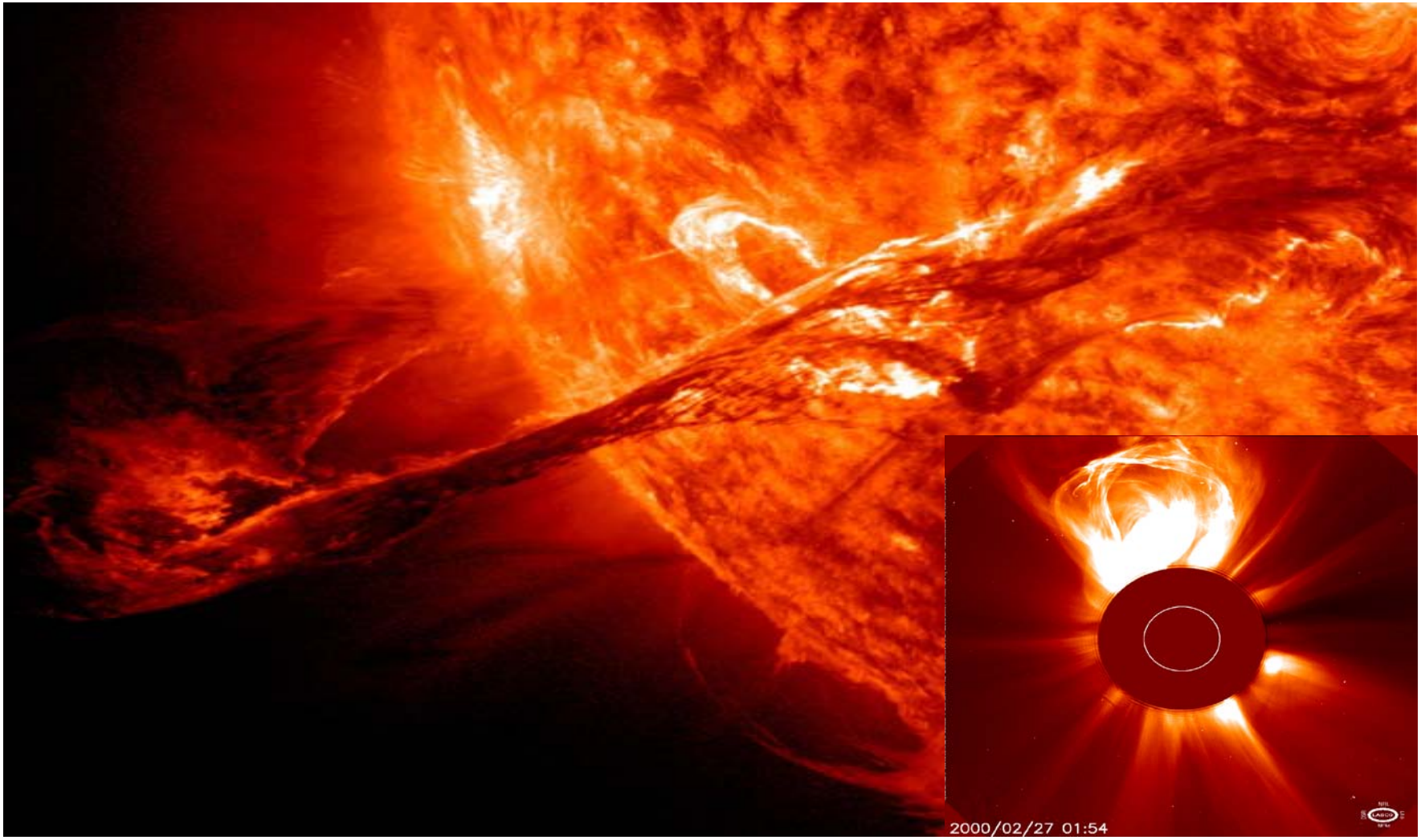


millsian.com

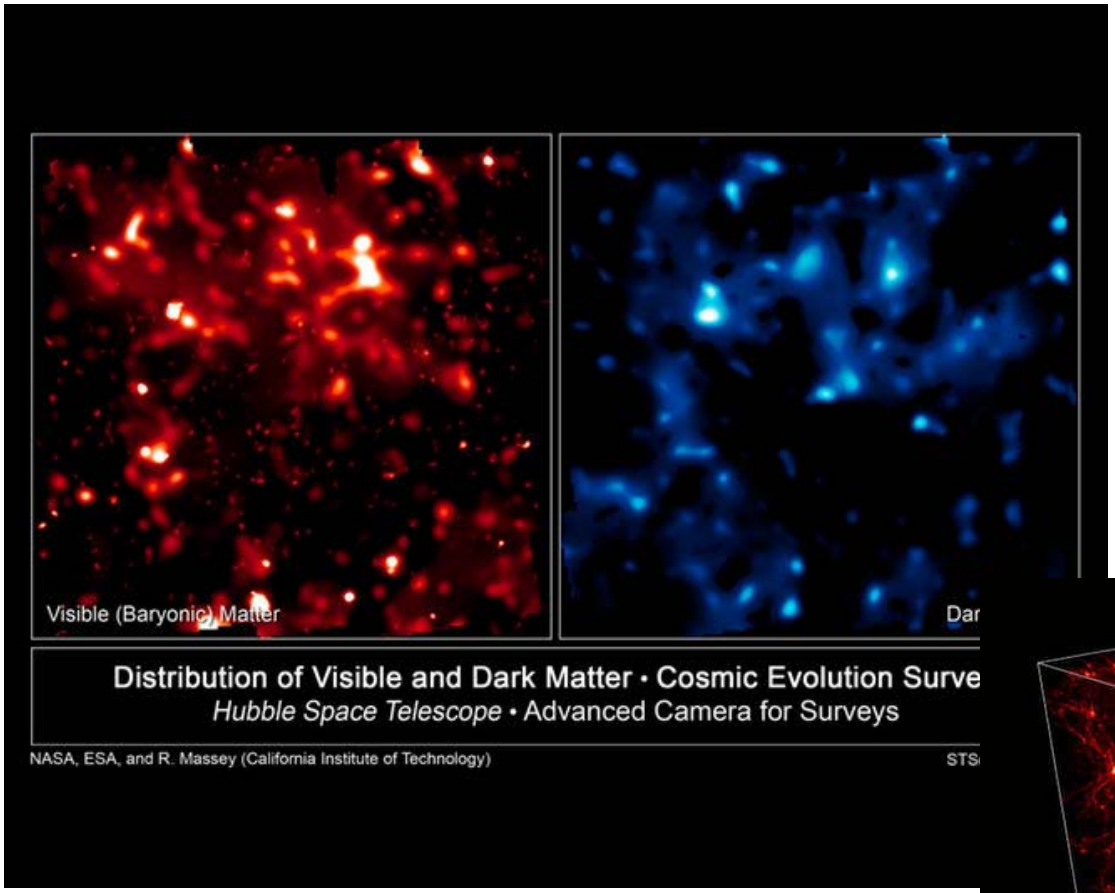
Catalytic Reaction of Atomic Hydrogen to Hydrino®

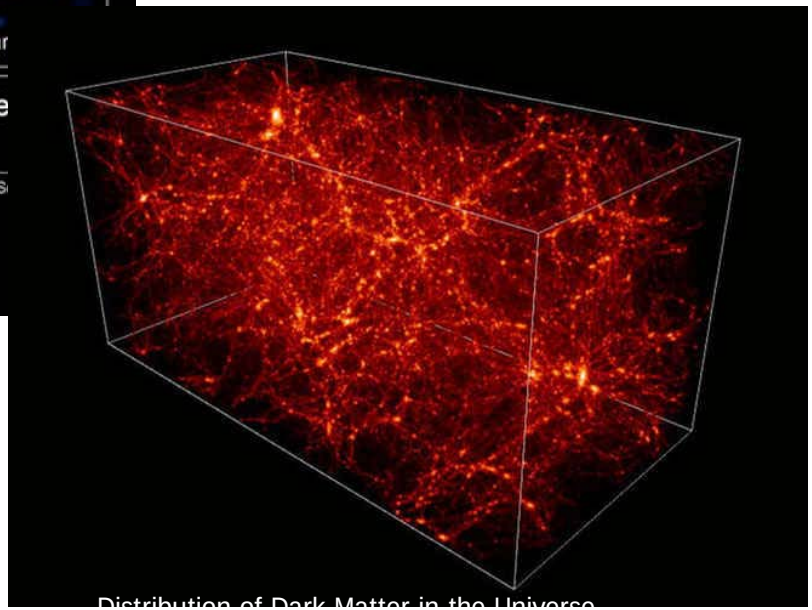


The Hydrino® and the Suns corona



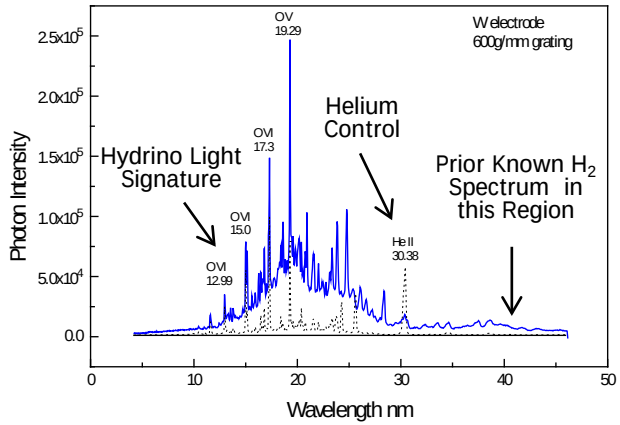
Dark Matter: The Hydrino® observed in nature





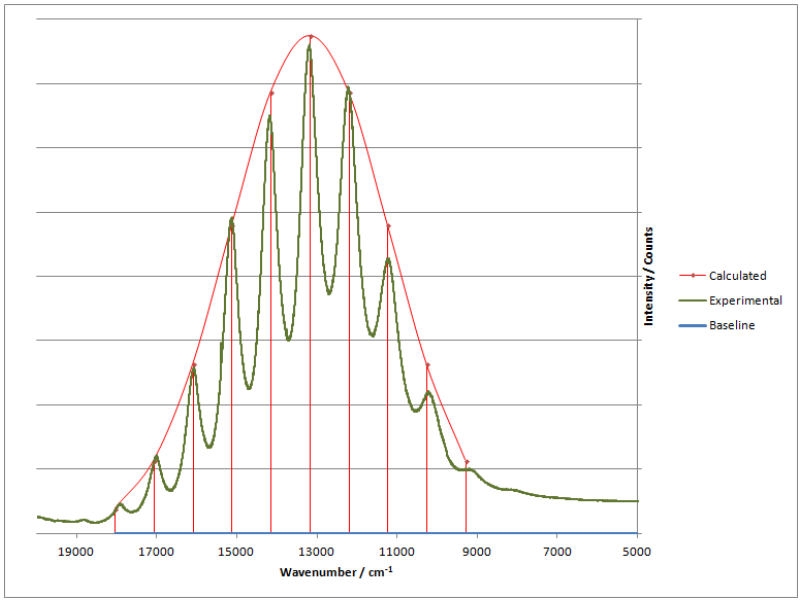
Dark Matter ring in galaxy cluster

$$\lambda = \frac{91.2}{m^2}\ nm \quad (\text{m} = \text{integer})$$



Beyond the over 100 peer reviewed publications, a new important paper published in July regarding the confirmation of the fundamental Hydrino reaction, the SunCell's power source

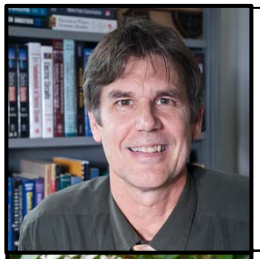
Methods for measuring Hydrino® product



- 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

Validation of Energy Gain by leading experts

http://brilliantlightpower.com/validation-reports/



Dr. Peter Jansson, Associate Professor Department of Electrical and Computer Engineering, Bucknell University, PhD from University of Cambridge, BA from MIT. Dr. Jansson has expertise in the research and development of electric power system fundamentals, sustainability, new energy technology systems, renewable and advanced electric power systems, smart grid technology, electronics, and hybrid/electric transportation and grid storage.

Dr. Randy Booker, Professor of Physics, University North Carolina Ashville, PhD and MA from Duke University, BA from Rice University. Dr. Booker has served as Physics Department Chair at UNCA. Dr. Booker reviewed the theoretical work of Dr. Mills in addition to validating spectroscopy and calorimetry experiments.

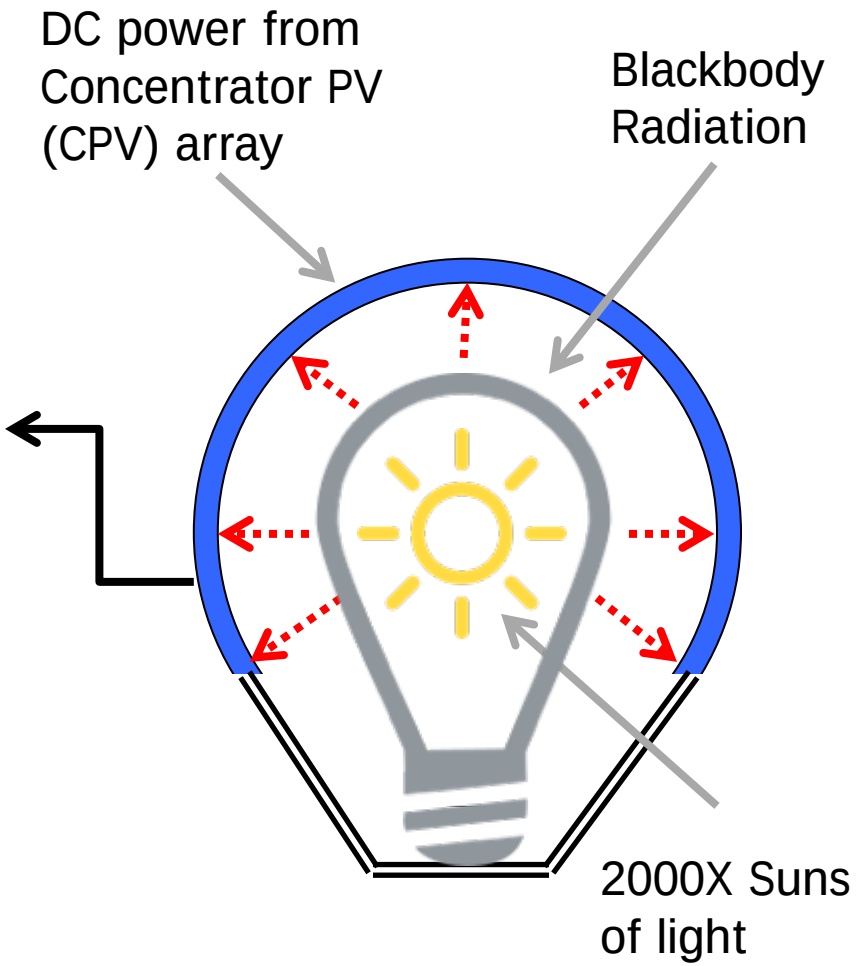
Dr. K. V. Ramanujachary (Chary), Professor Department of Chemistry and Biochemistry, Rowan University. Chary has extensive expertise in materials science and collaborates with world renowned battery and materials science groups. Chary participated in prior independent validation studies measuring energy from solid fuels and validating Hydrino® containing chemical samples.

Mr. Joe Renick, former Chief Scientist for a Defense Contractor. Over 20 years experience at all levels of Research and Development in including managing test and evaluation programs for tier one defense contractors, DTRA and other agencies. Mr. Renick conducted BrLP solid fuel validation programs at third party sites for a prior employer in addition to Solid Fuel and SunCell® tests at BrLP.

Explosive power

Click the above image to view on YouTube:
https://www.youtube.com/watch?v=SDhRvnYZbng

How the SunCell® Works

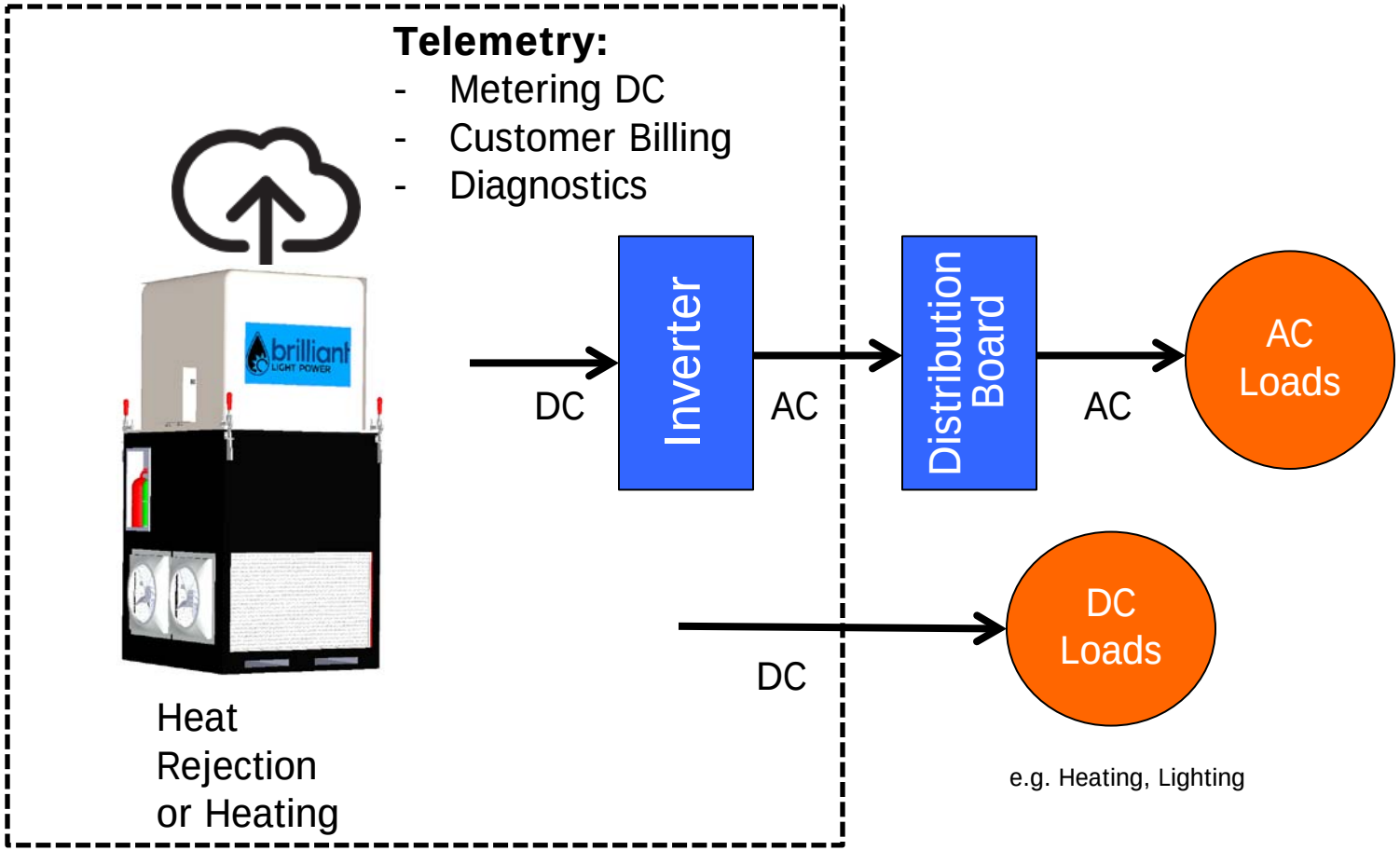


The Process… .

- Plasma is generated through Hydrino® process.
- Plasma heats the carbon blackbody radiator to between 3000 and 3500 Kelvin.
- Blackbody radiator emits brilliant white light, similar to the operation of a tungsten filament in a halogen bulb.
- Light emitted is converted by a geodesic dome of concentrated PV cells delivering the power output

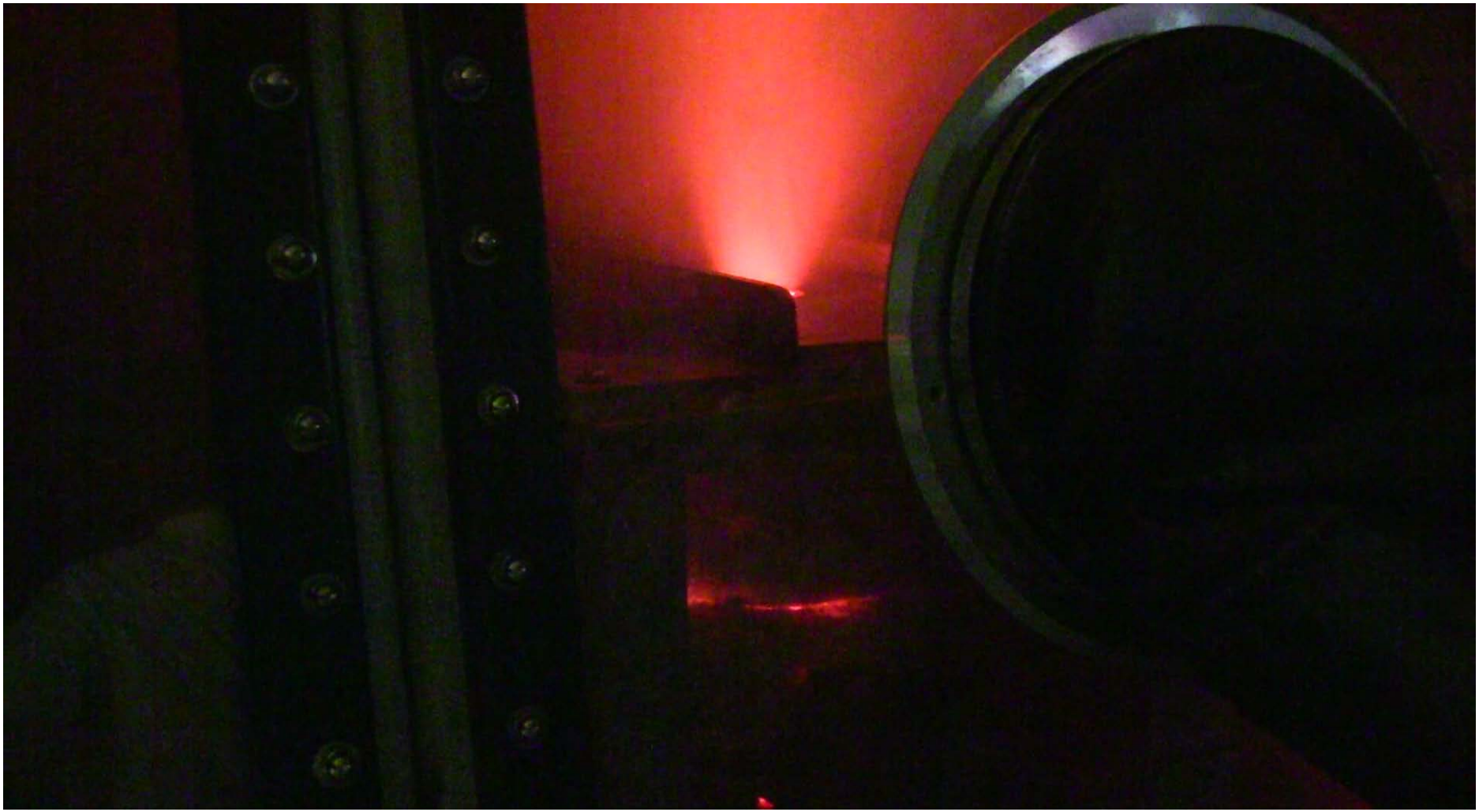
NOTE: Plasma light cannot be directly converted by the concentrator PV cells because of the spectrum at which it is emitted (higher energy than existing PV is currently capable of supporting).

SunCell Turnkey System (Basic)



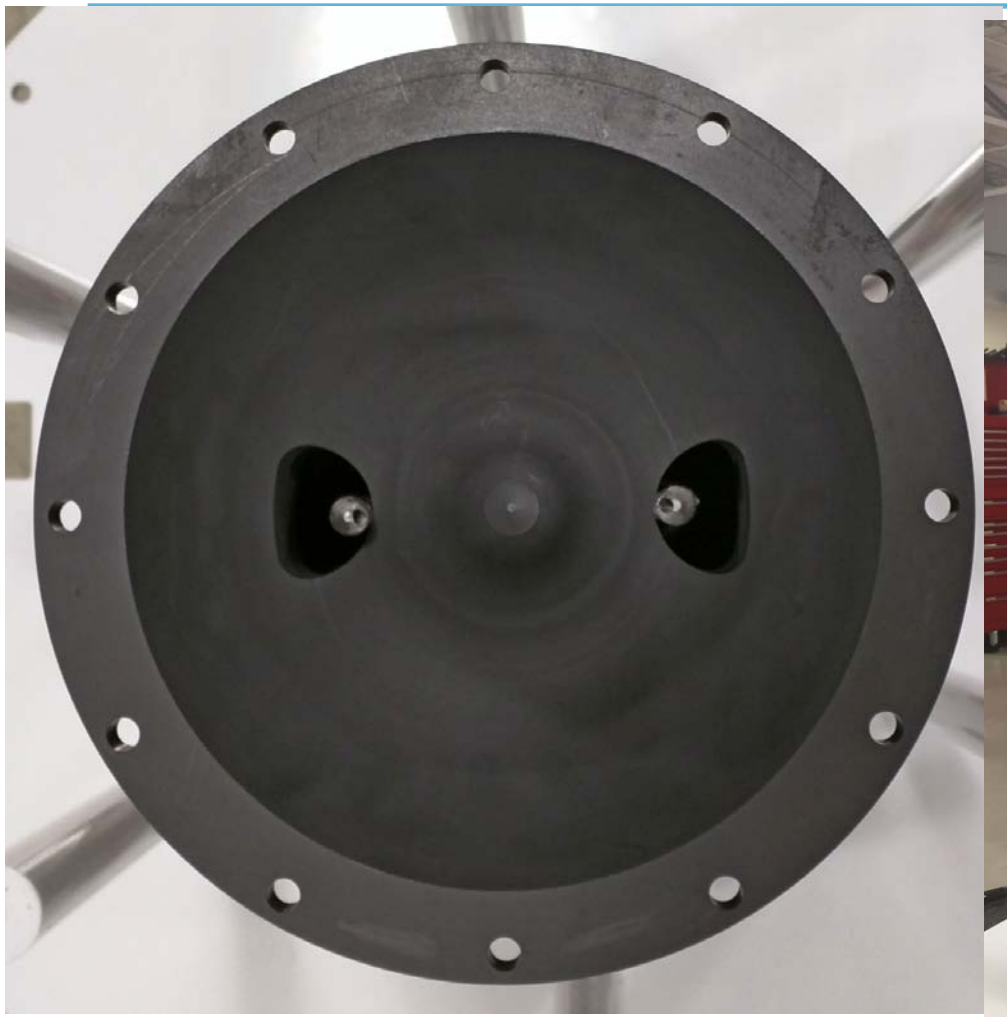
The SunCell® can support either direct DC loads or AC loads with the addition of standard inverter technology as used by the solar industry today.

A million watts in a teacup

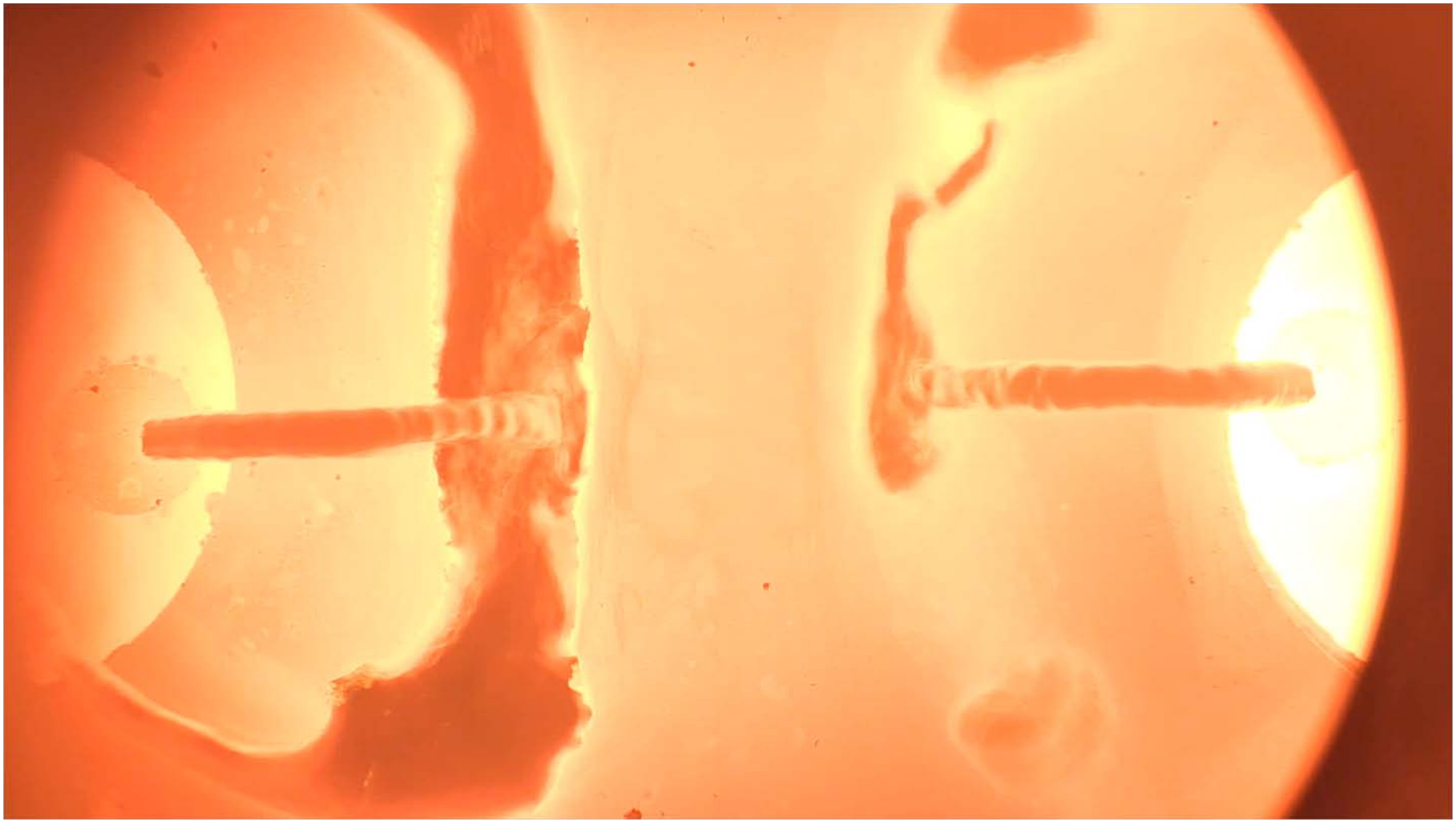


Click the above image to view on YouTube:
https://www.youtube.com/watch?v=1G07iVwthno

Key invention – Liquid electrode injectors



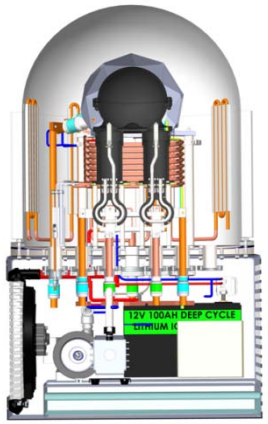
SunCell® in operation



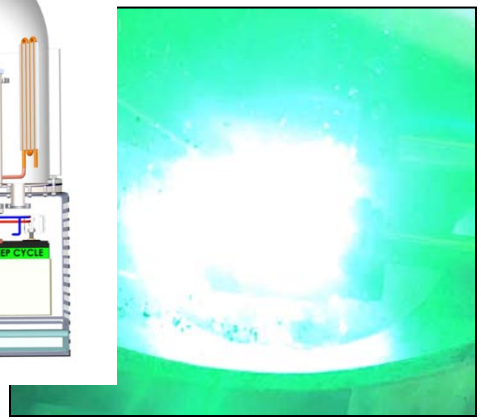
Click the above image to view the video on YouTube:
https://www.youtube.com/watch?v=jUBheBH9eio

SunCell® in operation cont'd

Spectral Emission in the High Energy Region Only

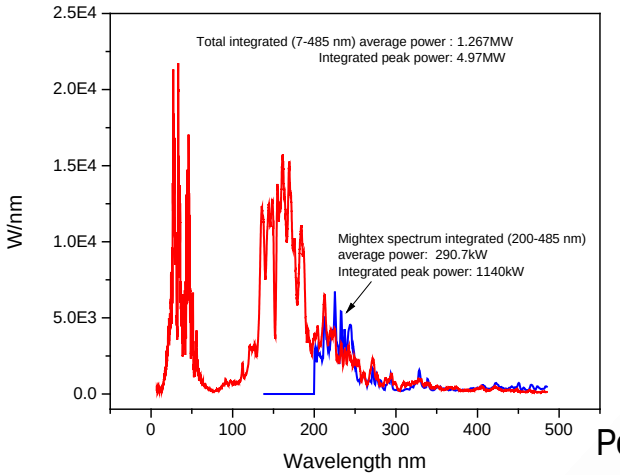


Plasma Ignition



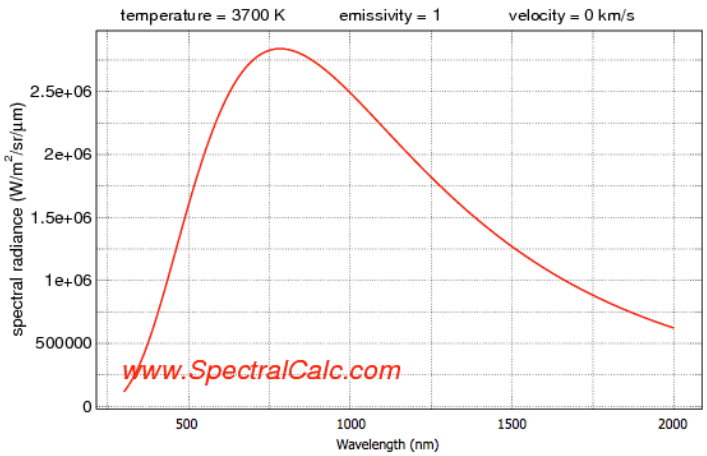
Measurement

Plasma Emission
(Power Calibrated Spectrum)



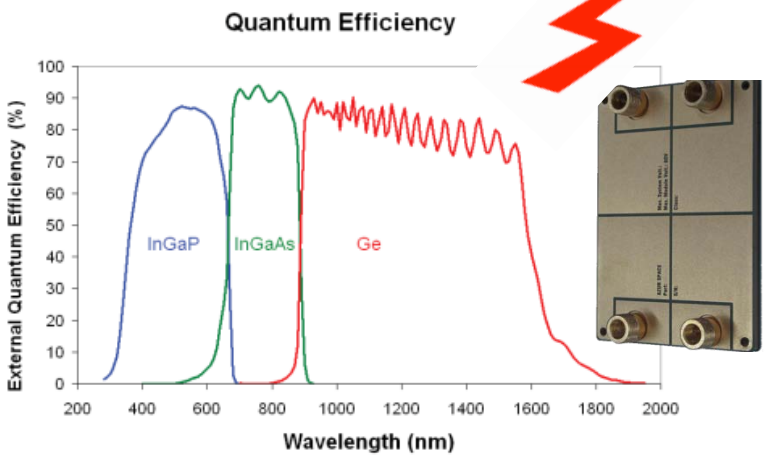
DC Power

Absorb to BB



SunCell Blackbody Radiator

Re-emit to CPV



Concentrator PV
Power Conversion Spectrum

Standard or Concentrated PV Uses the Same Massive Footprint

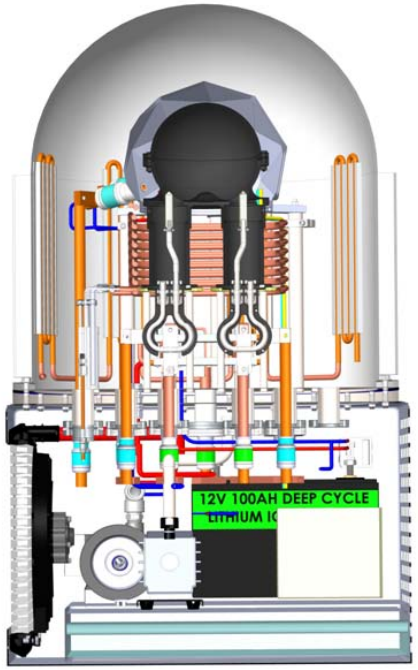
Due to the same low incident light concentration from the Sun, the typical scale is 100 MW on 250 acres (about 1 million m^2)

SunCell® vs Solar PV

An autonomous SunCell operating at up to 10,000 Suns requires 75,000 times less area and complexity than a matched conventional solar power station.

SunCell

11 MW

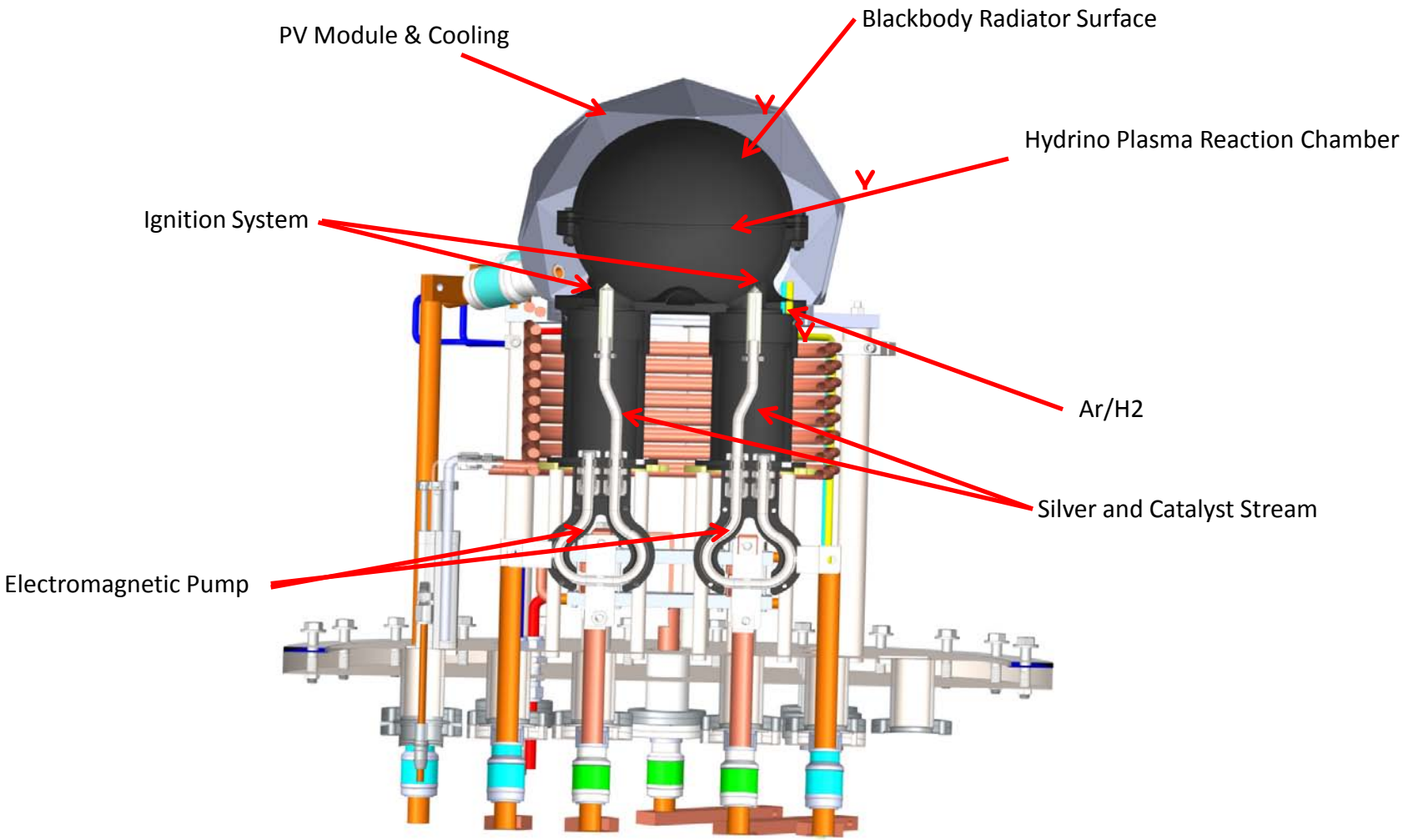


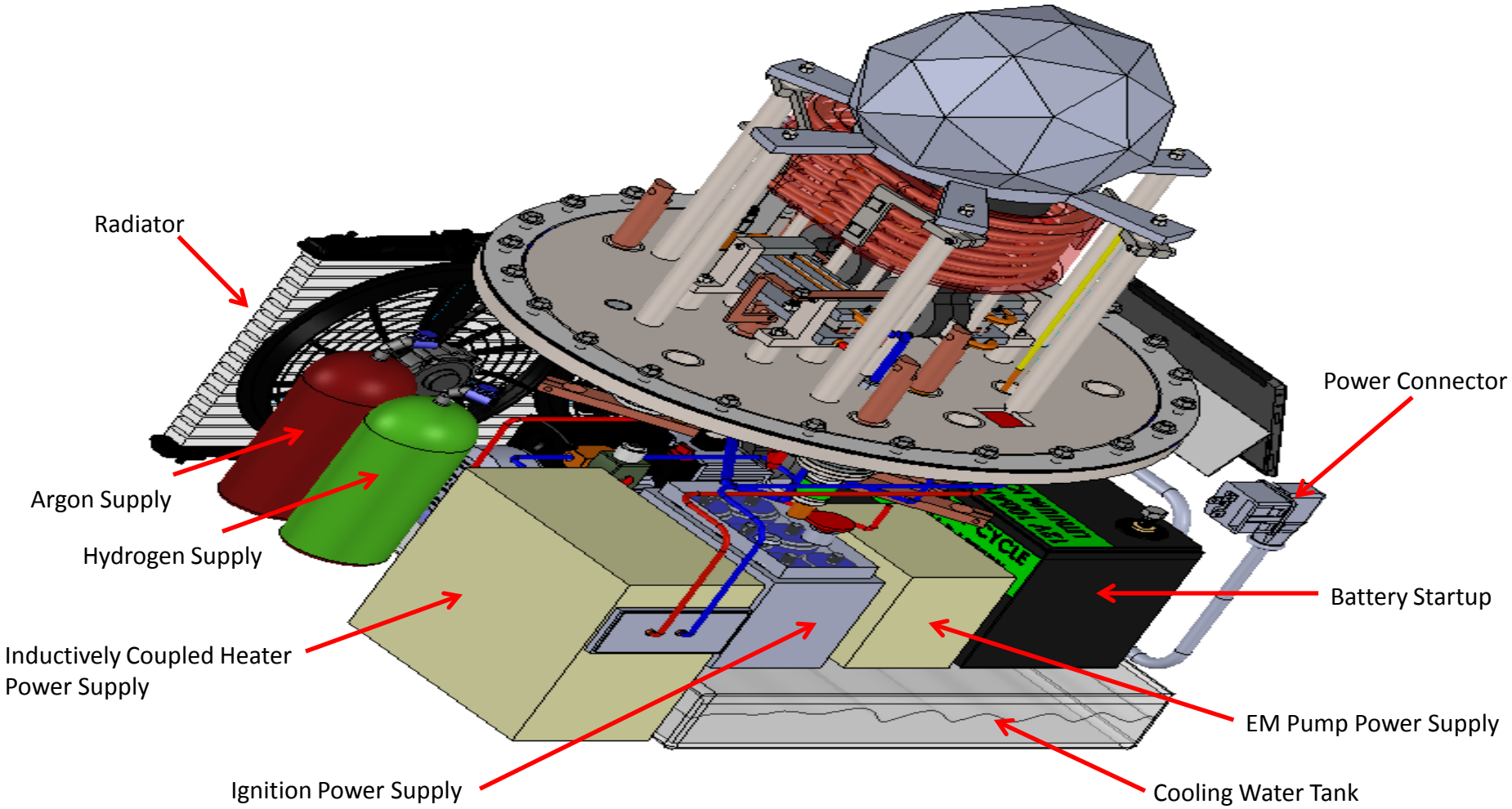
1 m^2

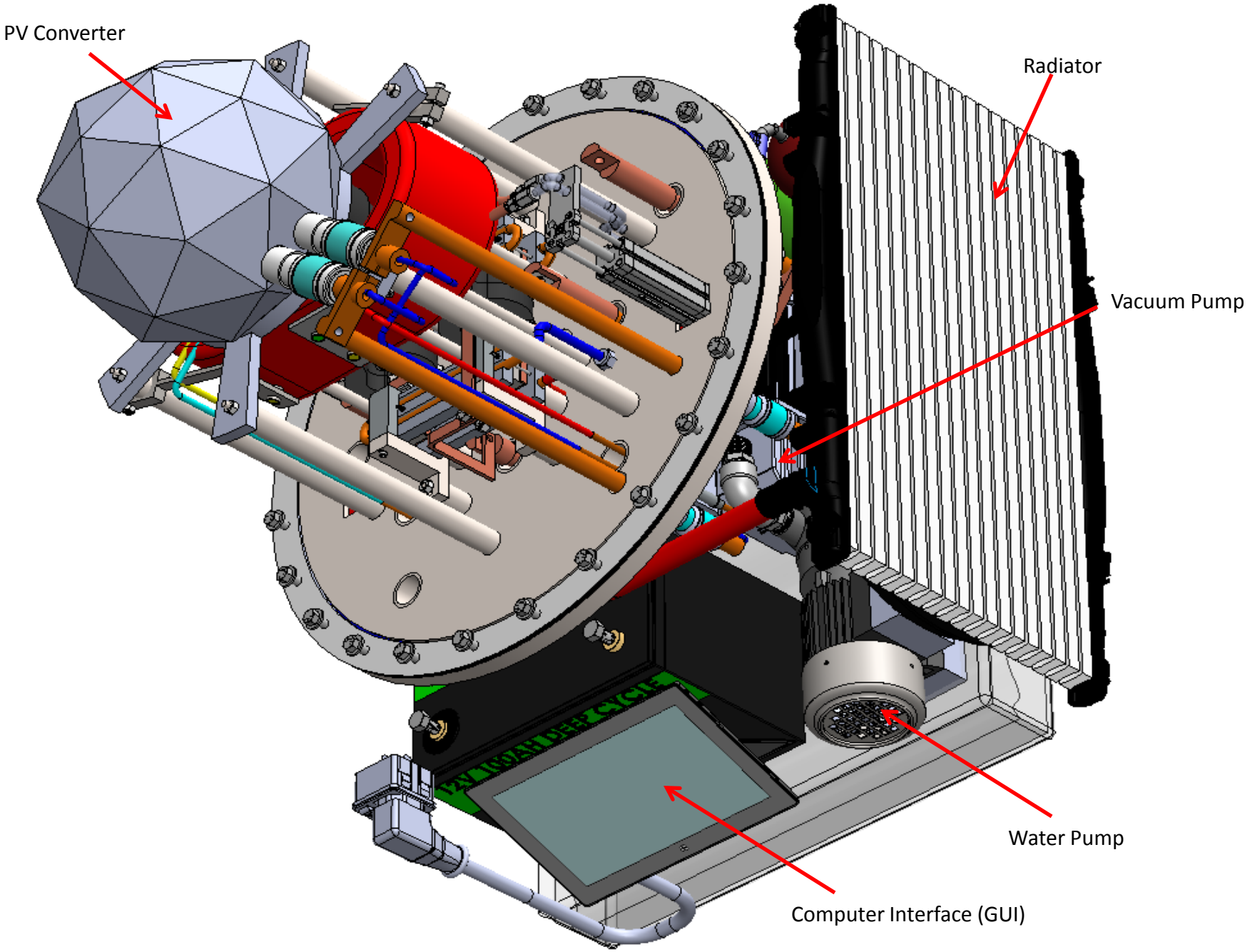
Planta Solar 10, Sevilla, Spain

11 MW

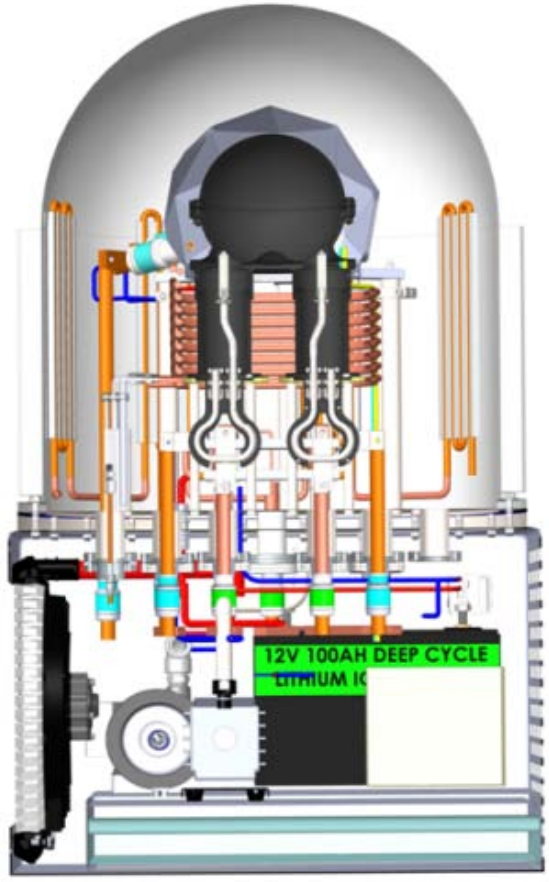
75,000 m^2 (nrel.gov)


PV Module & Cooling
Blackbody Radiator Surface
Hydrino Plasma Reaction Chamber
Ignition System
Ar/H2
Silver and Catalyst Stream
Electromagnetic Pump


Radiator
Argon Supply
Hydrogen Supply
Inductively Coupled Heater Power Supply
Ignition Power Supply
Power Connector
Battery Startup
EM Pump Power Supply
Cooling Water Tank


PV Converter
Radiator
Vacuum Pump
Water Pump
Computer Interface (GUI)

SunCell® - Water Fueled Generator



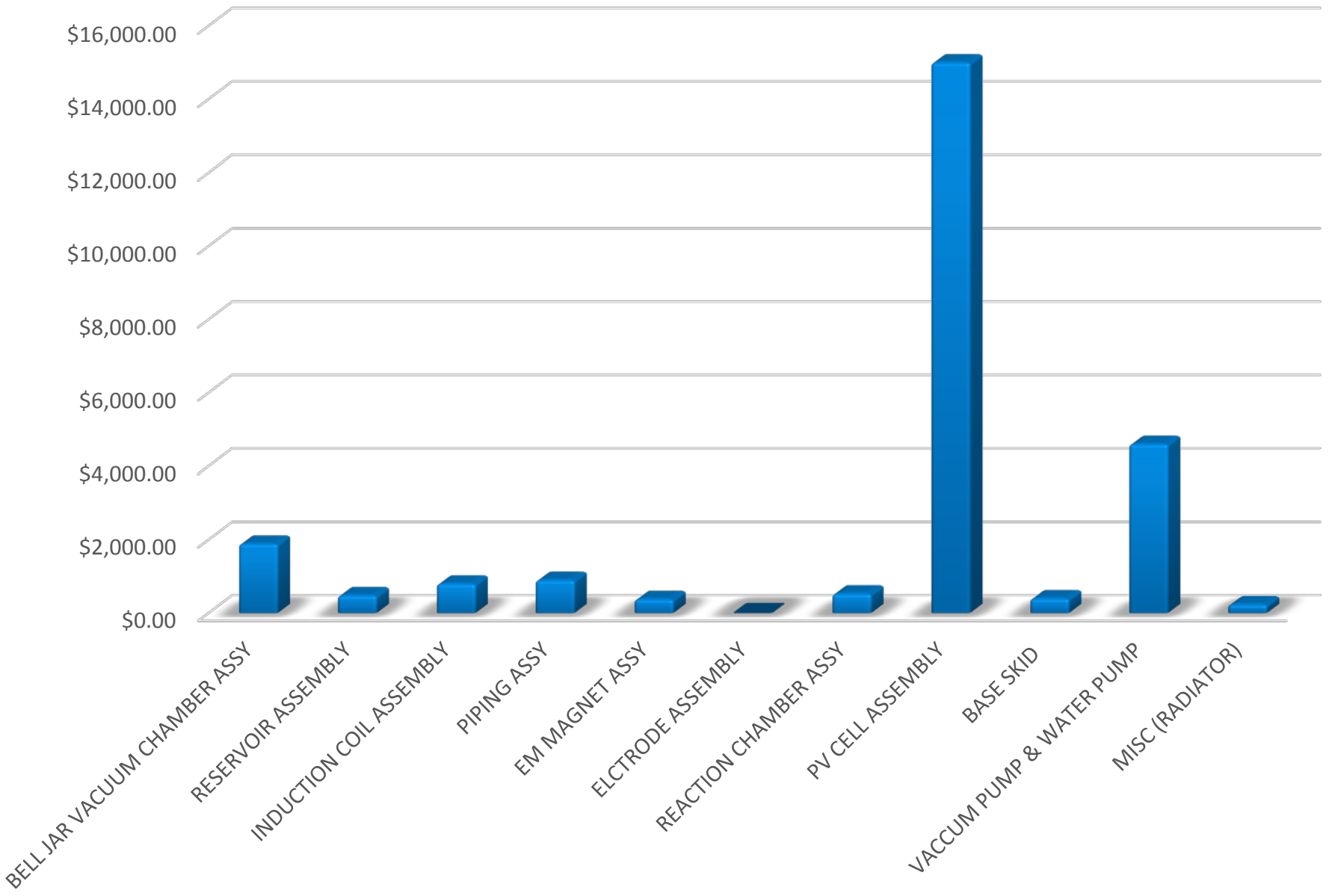
Feature	Est.
Power Output	150 kW DC or AC
DC Voltage	~380 or ~760
AC Inverter for 50/60 Hz	Option
SunCell dimensions (L,W, H)	0.5x0.5x0.5m
Photovoltaic Power Density	400 Suns
Blackbody Radiator Power Density	5 MW/m2
Weight	100 kg
Warm-up Time	<1 min
Self-consumption power	<3 kW
Response Time (standby to peak)	~100ms
Service Life	15 years
Noise Emission	Sound Proofed
Degree of protection (per IEC 60529)	
Climatic category (per IEC 60721-3-4)	

SunCell Economics

- Current Annual Gross Earning Capacity of Any Electrical Generator:
  - o $1/W
- Capital Cost:
  - o $60/kW
- Life Span:
  - o 20 years
- Capital Cost Annually:
  - o $3/kW
- Solar Capital Cost (2013):
  - o $3,463/kW[a]
- Maintenance Cost:
  - o $1.20/kW
- Generation Cost:
  - o $0.001/kWh

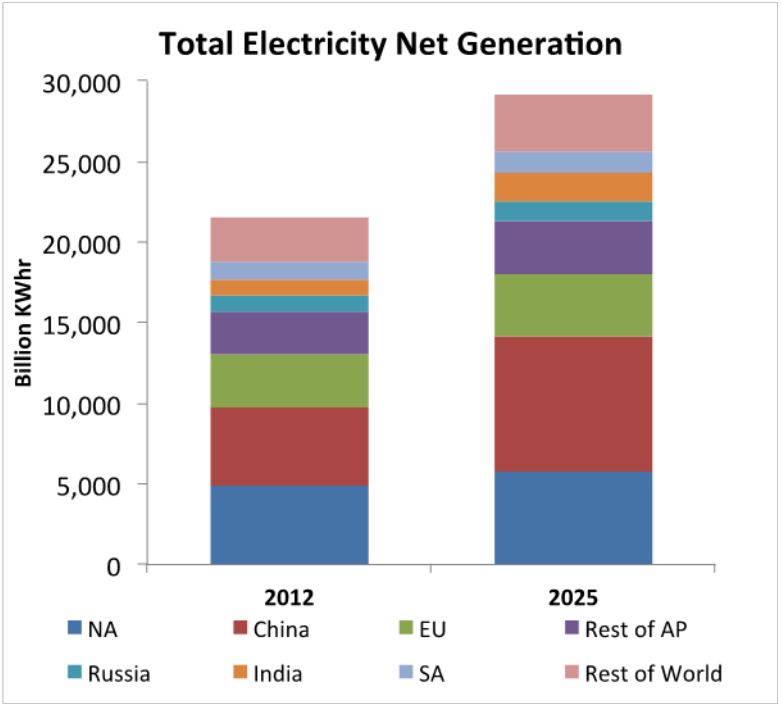
[a]http://www.nrel.gov/analysis/tech_lcoe_re_cost_est.html

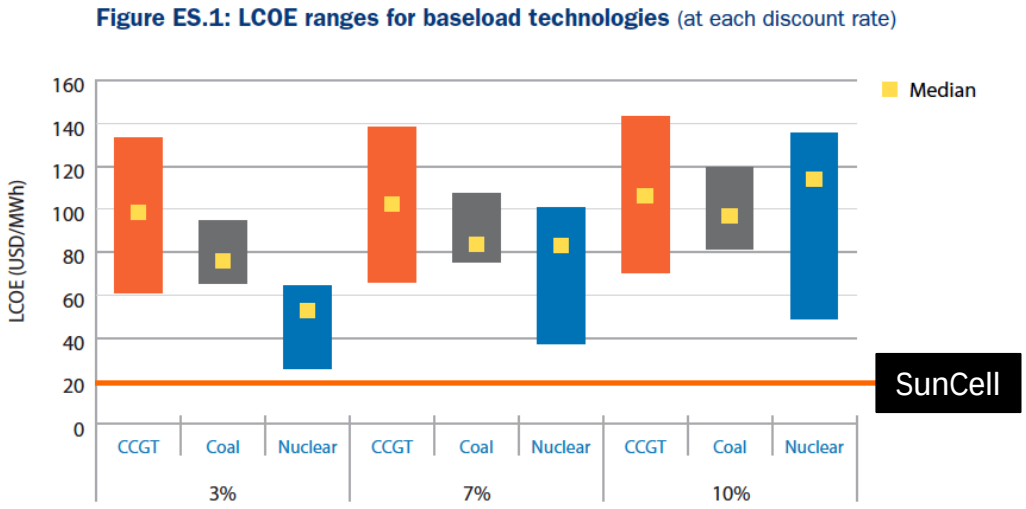
TOTAL COST 250KW SUN CELL AT SUB ASSEMBLY LEVEL



Global Electricity

- $3.5 trillion~ global market at $0.12 per kWh at site
- $1.5 trillion addressable market for SunCell at breakthrough rate of ~$0.05 per kWh
- 28% demand increase by 2025

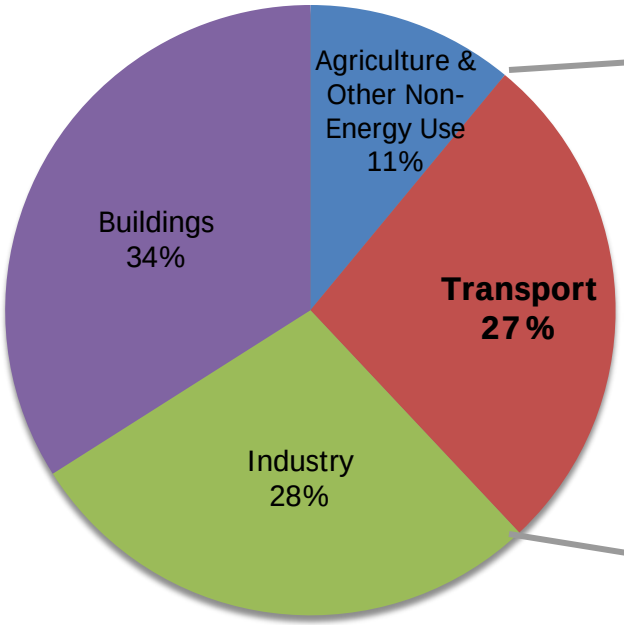




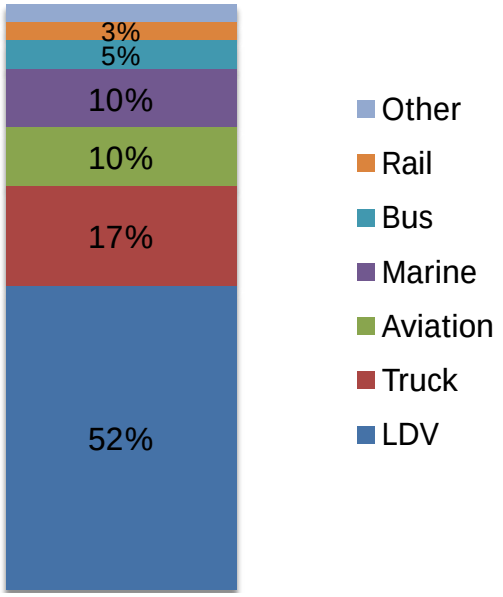
Sources: EIA Total Electricity Net Generation 2012,
IEA Projected Cost of Generating Electricity, 2015 Edition.

Global Motive Energy Use

Global Energy Demand by Sector (2012)



Transport Energy Use by Type



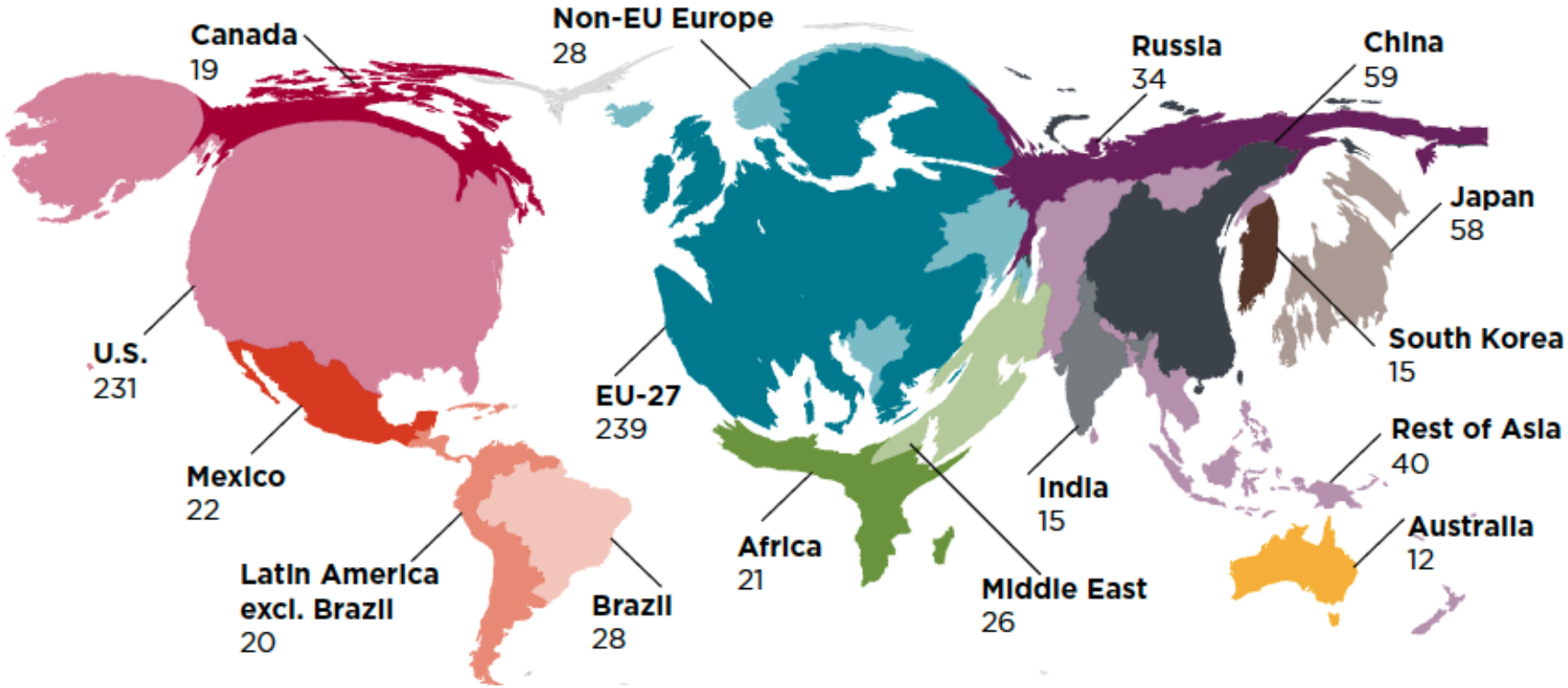
- Transportation consumes ~2,200 million tons of oil equivalent (Mtoe) of energy each year or 25,586 Terawatt hours.
- 700M+ Passenger Car population drives energy use, but hours of operation relatively low (~5% of time)

Light Duty Vehicles includes Passenger Cars and Light Duty Trucks <3.5T

Source: IEA, World Energy Outlook (2012), World Economic Forum, Repowering Transport April 2011
Ward's Automotive Group, Vehicles by Country 2011

Vehicle Population Provides Large Opportunity

Passenger Car Vehicle Stock 2013 (millions)



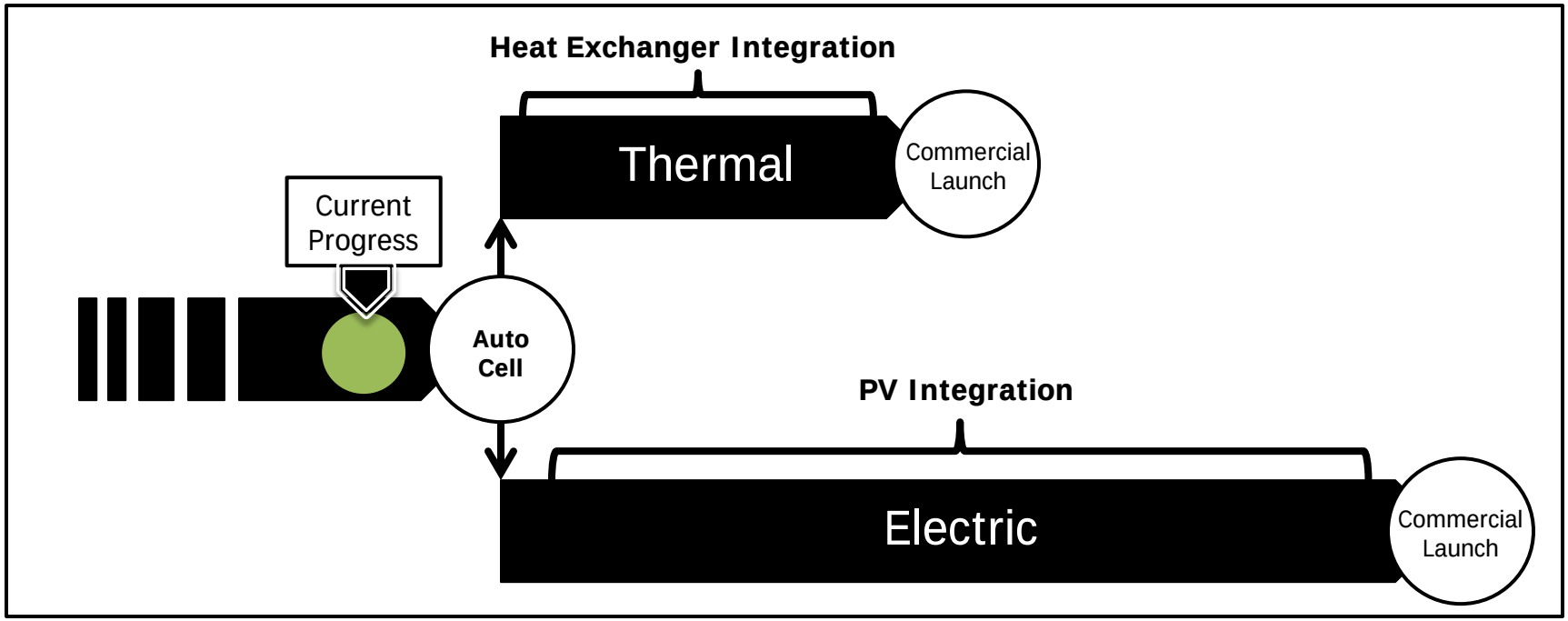
2015 Production: 68M Passenger Cars and 18M Light Duty Trucks

Source: European Vehicles Market Statistics, Pocketbook 2013
International Organization of Motor Vehicle Manufacturers 2016

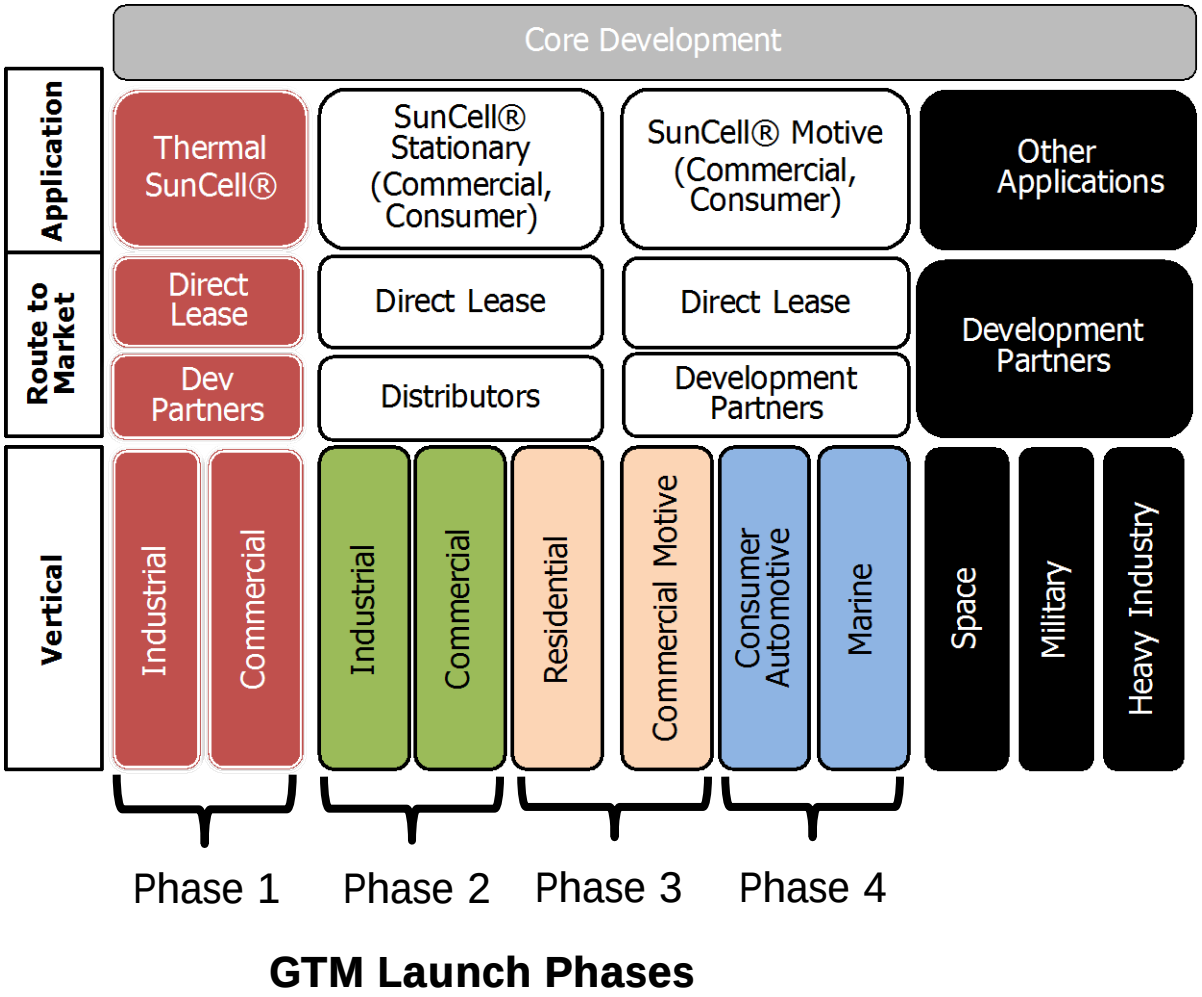
SunCell® development program

The SunCell® development program is broken into commercial pathways following the “Automated Cell” engineering milestone:

- **Thermal** – The integration of the SunCell® with heat exchanger technology to create a commercial heater capable of delivering 500kW for boiler, hot air, or hot water thermal systems
- **Electric** – The integration of the SunCell® with concentrator PV technology to create an electrical generator delivering 150kW of DC power



Brilliant Light Power Go-To-Market Model



GTM Launch Phases

Phase 1 – Thermal Unit-Launch to Industrial, Commercial and Multi-tenant residential markets

Phase 2 – 150kW Unit - Launch to Industrial, Commercial and Multi-tenant residential markets

Phase 3 – launch to Residential through Direct Lease and Commercial Automotive with Development Partner

Phase 4 – Improved/Modified Units – launch to Consumer Automotive and Marine through Direct Lease and Development Partner models

***Development Partners** – Engaged at any phase under Development Partner agreement*

Partner relationships

Strategic Partners

- A partner that is an early adopter of SunCell® technology.
- The Strategic Partner works with BrLP throughout the field trial and production proof of concept phase of the Commercial Launch of a the SunCell®.
- Are offered strategic investment opportunity in BrLP and receive discounted power for their own commercial use.

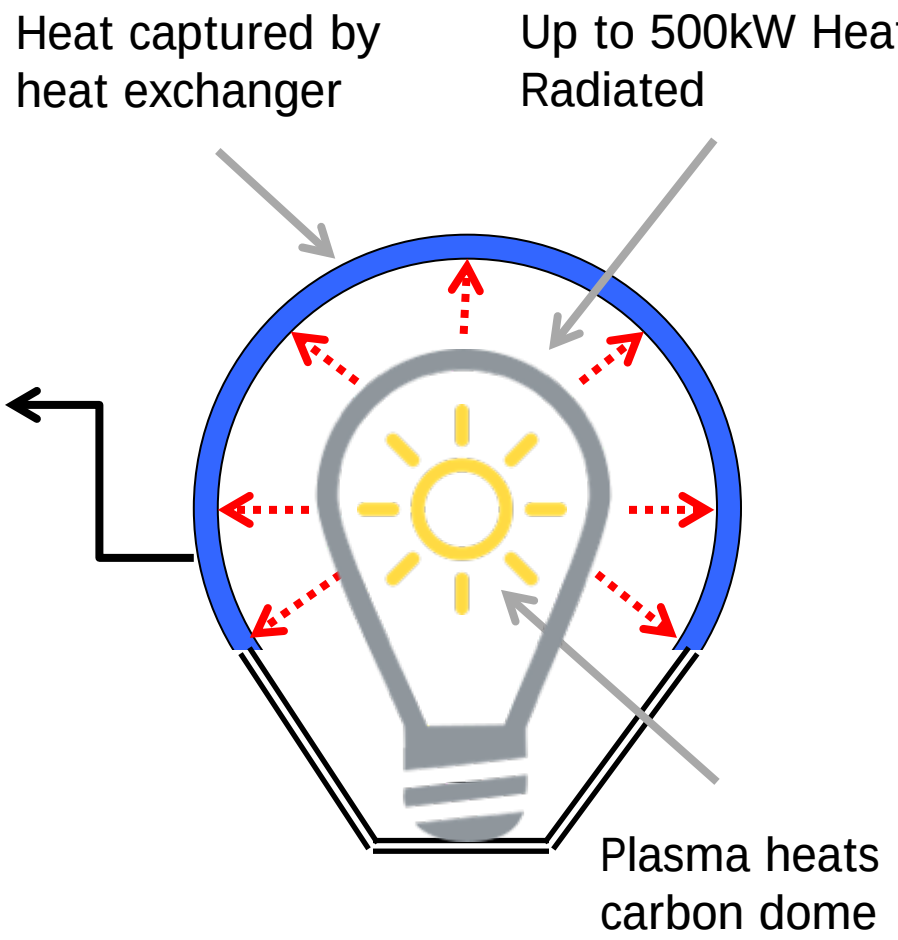
Distributor

- A partner that has the capability to distribute and maintain the SunCell technology in a given territory or field of use.
- A reputable firm with the necessary connections to overcome certification and regulatory challenges within their territory or field of use.
- BrLP will grant a license as per Distributor pricing terms & conditions

Development Partners

- A commercial interest in the core development of the Hydrino® derived energy source and its derivatives
- Has the engineering and production capability to be able to produce products other than SunCells®.
- License the intellectual know-how of generating Hydrino® based energy to solve for heat, light or electrical power requirements in their own applications.

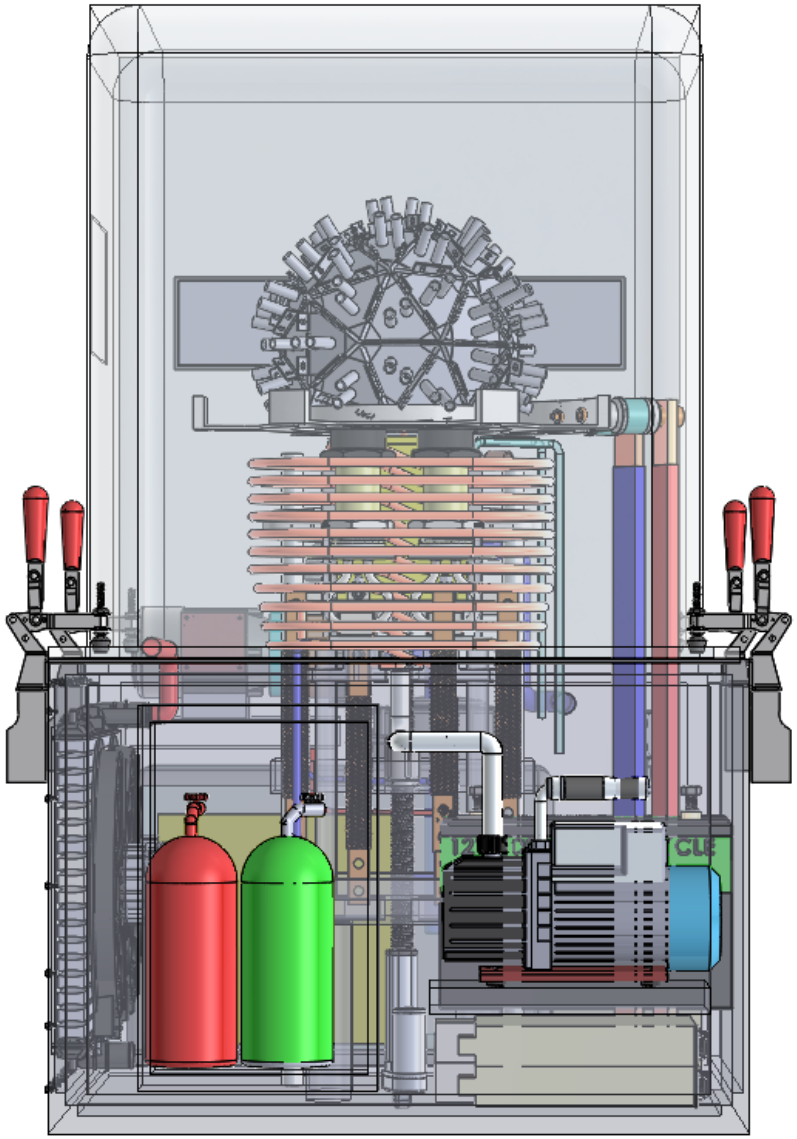
How the Thermal SunCell® Works



The Process… .

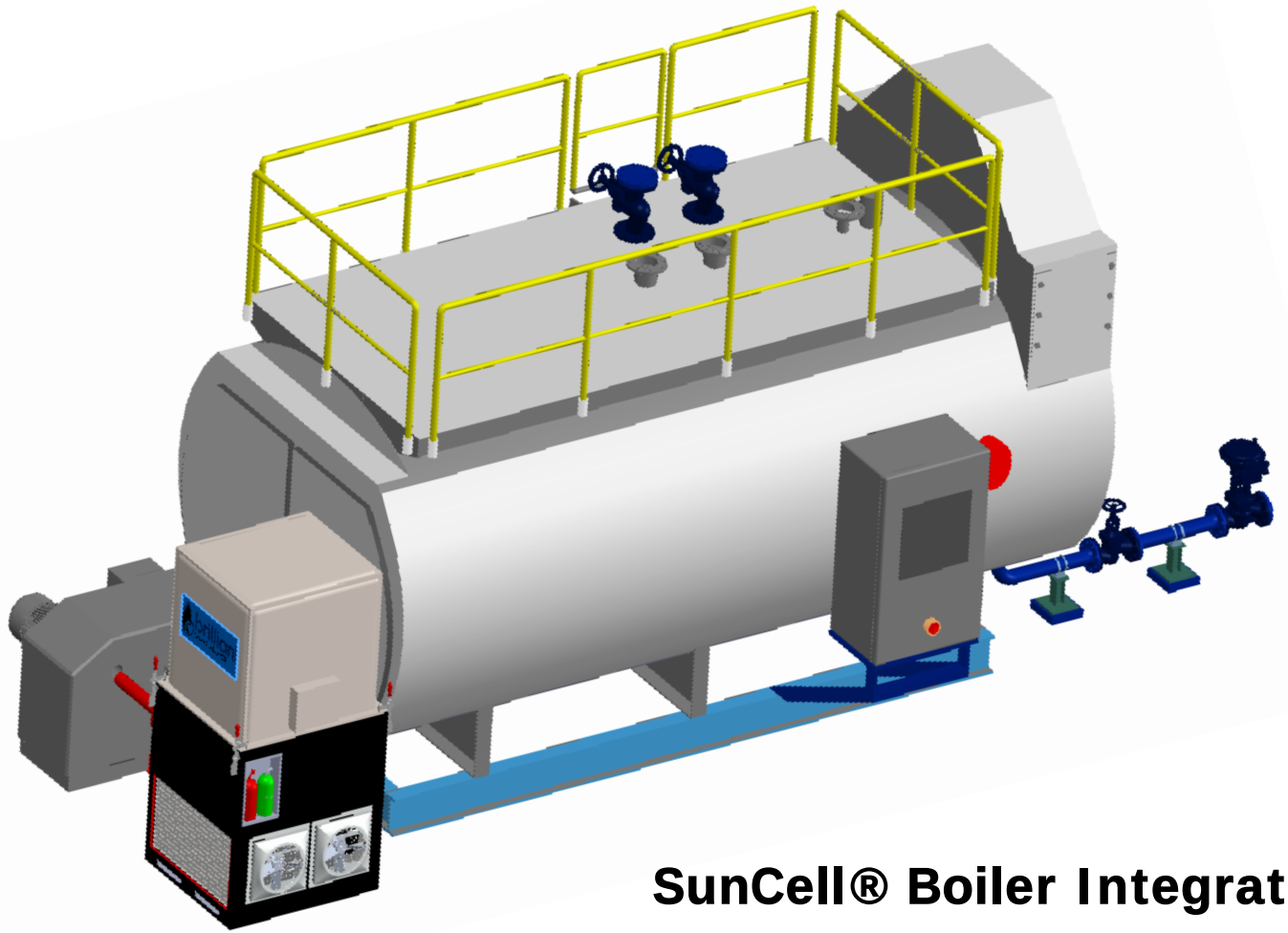
- Plasma is generated through Hydrino® process.
- Plasma heats the carbon blackbody radiator to between 3000 and 3500 Kelvin.
- Blackbody radiator emits up to 500kW of equivalent heat
- Emitted heat is captured by a heat exchanger and heats water, air, or steam to drive a number of thermal applications

Thermal SunCell® specifications



Feature	Est.
Power Output	Up to 500kW THERMAL
Conversion	Heat Exchanger
Thermal Transfer Media	Water, Steam, Air
SunCell dimensions (L,W, H)	0.5x0.5x0.5m
Heat Output	Up to 3500 Degrees K
Blackbody Radiator Power Density	5 MW/m2
Weight	100 kg
Warm-up Time	<1 min
Self-consumption power	<3 kW
Response Time (standby to peak)	~100ms
Service Life	15 years
Noise Emission	Sound Proofed
Degree of protection (per IEC 60529)	
Climatic category (per IEC 60721-3-4)	

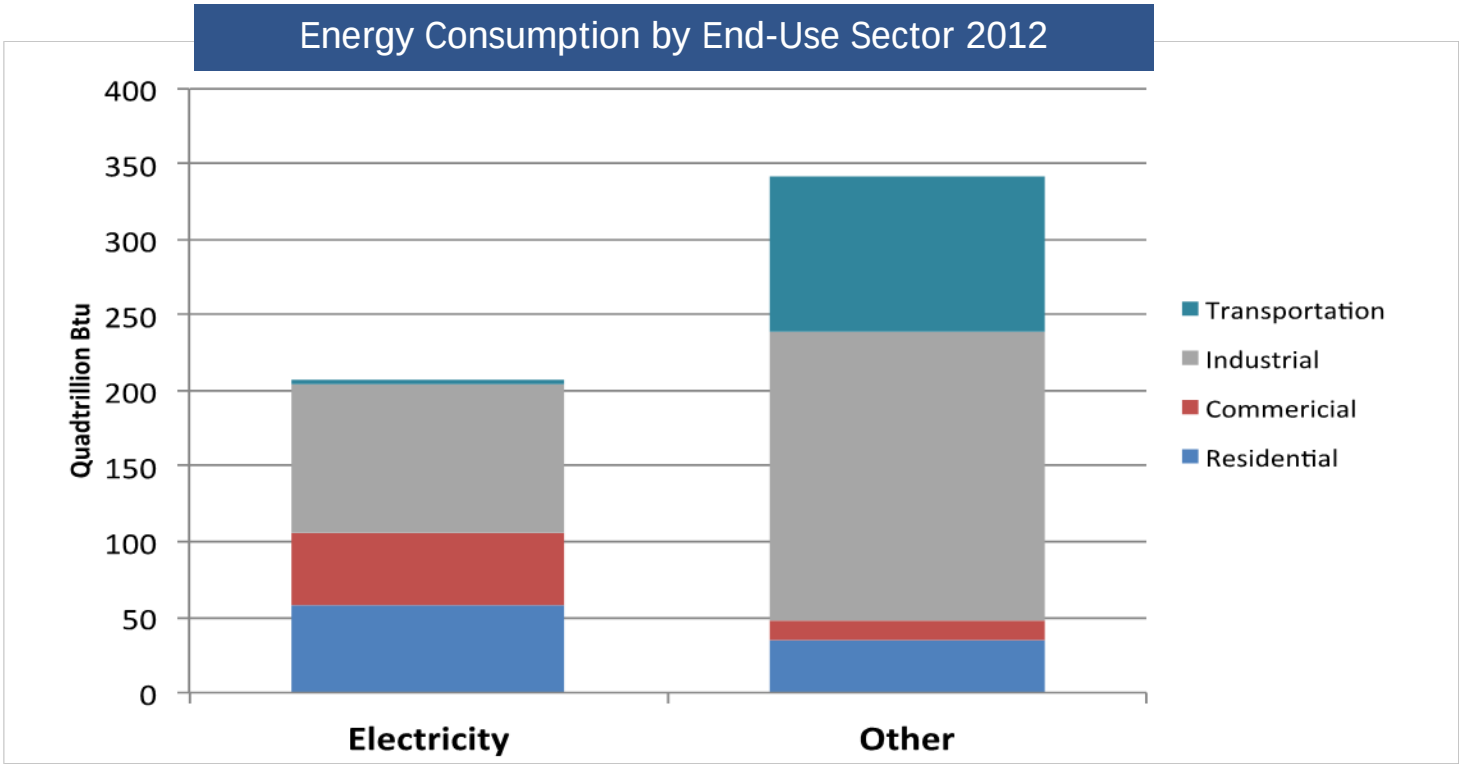
Thermal SunCell® application example



SunCell® Boiler Integration

Global Electricity and Other Energy Sources

- Global electricity markets an obvious fit for SunCell – 42% value and 38% of total energy use
- SunCell applications in non-electric markets even bigger potential
- Energy use expected to expand with disruptive technology, as seen in telecommunications

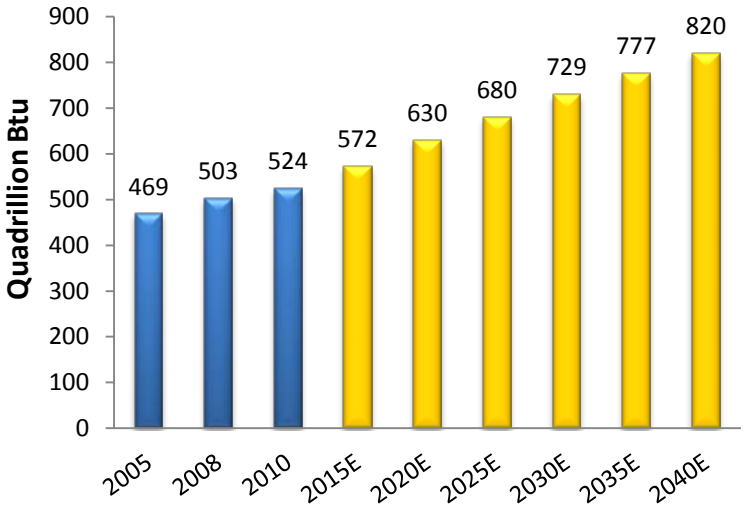


Ref: DOE/EIA International Energy Outlook 2016

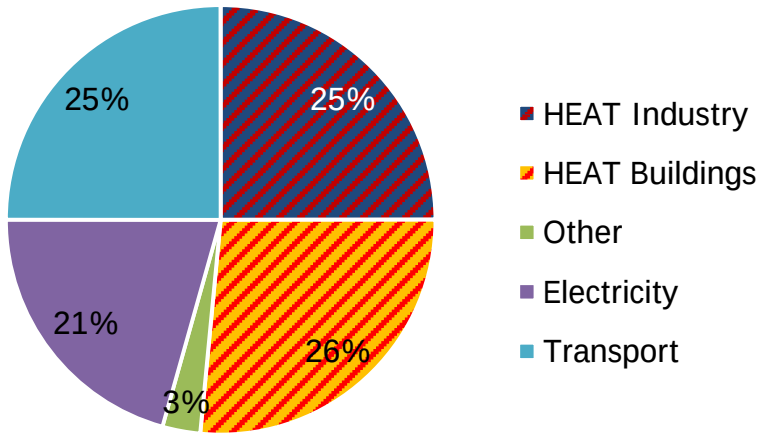
Global ”Heat” Market

- $8 trillion~ expended on total fossil fuels globally in 2013
- 1/2+ of final energy consumption for Heat applications in Industry and Buildings
- 3/4 Heat from fossil fuels
- 1/3 of worldwide CO2 emissions from Heat sources
- Modest average annual growth of 2.6% from 2008-2012

Global Energy Consumption



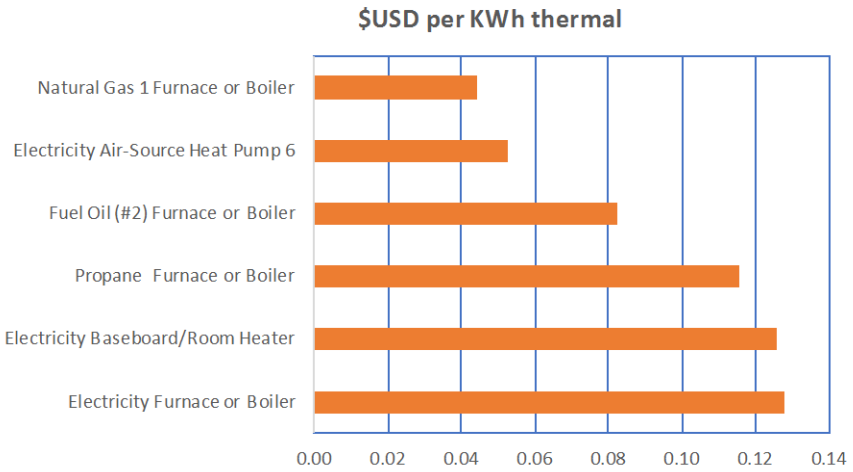
Final Energy Use



Sources: EIA IEO 2013, International Energy Agency and management estimates, Heating Without Global Warming – International Energy Agency 2014
172 EJ for Heat = 163 Quadrillion Btu
Carbon emissions from burning biomass for energy, Partnership for Policy Integrity

Heat Costs & Equipment Vary Widely

- Existing heat fuel sources are diverse
- Equipment offerings range from primitive to massively complex:
  - Biomass stoves & furnaces
  - Natural gas furnaces
  - Electrical heat pumps
  - Low-grade solar heat for air and water
  - Landfill gas for boilers,
  - Resistive electrical heaters
  - Direct geothermal
  - Co-gen power plant district heat
- US residential heating example
  - Costs vary almost 3X depending on the fuel and equipment combination
  - Small unit power for a SunCell®, but consider Buildings and Industry

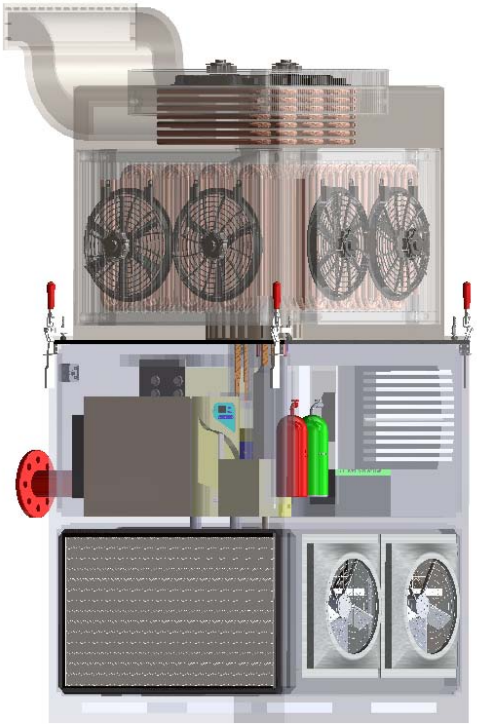


- Target high fuel cost segments & customers that match SunCell thermal output (200KW to 1MW)
- Target high-value industrial partners for applying SunCell to "standardized" segments

Sources: modeled cost using Heating Cost Calculator Auburn University https://ag.purdue.edu/extension/renewable-energy/Documents/ON.../heatcalc.xls

SunCell Heat System Design Commencing

- BrLP has engaged TMI Climate Solutions to develop system concepts and solutions for thermal applications with SunCell Light (power) source
- Assignment is for two designs:
  - 500 kW thermal radiant boiler for a 3000K blackbody radiator
  - 500 kW thermal radiant boiler for a blackbody radiator at a temperature that is optimal for commercialization using existing optimal systems
- TMI Climate Solutions provides an experienced development partner
  - Parent firm MiTek, a Berkshire-Hathaway company, with revenues estimated at $1.6B (St Louis Business Journal Apr 27, 2017)
  - TMI provide manufactures and delivers the best custom solutions available today for worldwide applications.
  - www.tmiclimatesolutions.com



SunCell Light (power) Source Progress

- The SunCell light (power) source has overcome key engineering challenges in prototype development.

✓ Antenna design to control temperature profile

✓ Automated antenna disassembly, retraction, and storage post startup

✓ Automated molten metal level controller

✓ High temperature and pressure ceramic to metal, molten metal ignition system seals

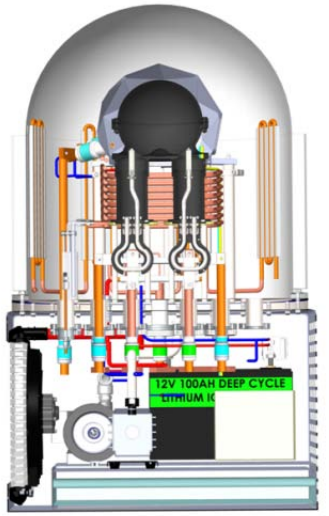
✓ Automated injector alignment system

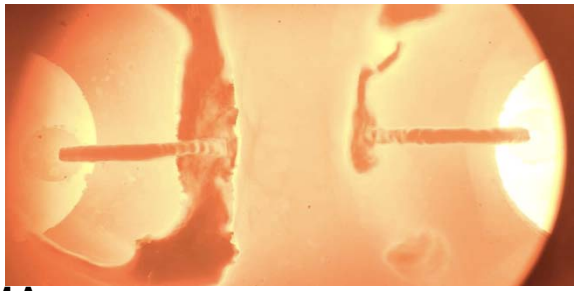
✓ EM pump design to improve pumping power and eliminate magnet heating by inductively coupled heater

✓ Design to prevent cell and injector melting

✓ Design to prevent frame warping

✓ Injector design to assure molten metal stream intersection





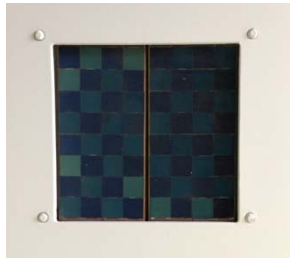
⑩ The SunCell commercialization engineering mature enough to be outsourced to Columbia Tech, Boston MA.
Equipment is being fabricated, procured, shipped.

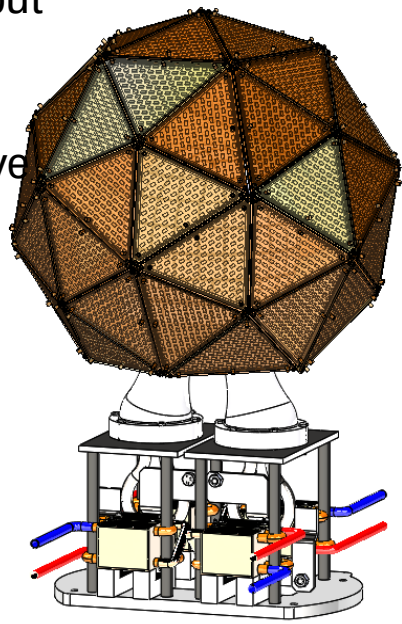
SunCell enabling solutions are not routine engineering; constitute blocking intellectual property

SunCell Evolution

PV Development Progress

- Path forward based on systems analysis:
  - Si technologies are best initial choice; widely available
  - Si-ideal band gap of 0.84 eV at the ideal opening temperature for cooling of 130°C (Cooling technology readily exists)
  - Si paradoxically becomes more efficient at higher temperatures, due to collecting more of the 3000 K blackbody radiator light
  - Larger radius PV shell reduces system to 300-500 Suns
  - Larger radius PV shell reduces cost; 10X more cells are required, but lower cost of cSi cells, overall systems cost reduced along with development risk
  - 1J silicon solar cells operating at elevated temperatures can achieve over 20% efficiency
  - Reduced cooling system complexity
  - Cost feasible at $60 / kW in production volume





PV – SPECTROLAB A Boeing Company

brilliant LIGHT POWER

- Scope:
  - Modeled photovoltaic cell that is optimized to convert energy as efficiently as possible from SunCell black body radiator
  - Considered *mature photovoltaic* material systems with an emphasis on the III-V compounds that are currently used to manufacture multi junction PV and CPV solar cells
  - Light recycling supported by InP
- Conclusion:
  - Coarse band gap modeling defined benefit of multi junction structures. 3J structure yields 4% absolute benefit relative to 2J structure. 2J is 7% absolute higher than 1J
  - Chose 1.3/0.96/0.73 eV lattice matched structure on InP
  - Precision modeling results indicate 29.5% for chosen 3J structure
  - 36% cell efficiency at concentration (Efficiency decreases to 29% at 100C operating temperature, but cooling system and parasitic loss issues are favorable)
  - Light recycling could significantly increase efficiency (study in progress)

6 month development effort for III-V 3J cells on InP substrate

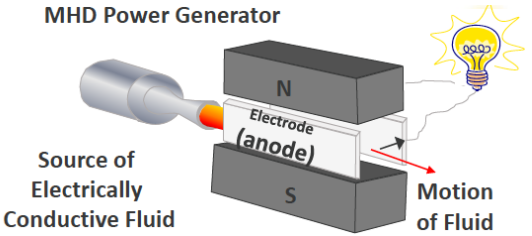
Good Vendor Options

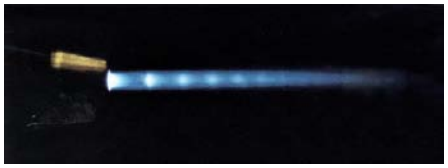
- Multiple vendor proposals in development
- System design now enables robust, commercially available PV

Si PV Cell Company	Working on Si PV cell company contract for cSi. 18 years of CPV field experience
SPECTROLAB A Boeing Company	Fortune 500 Company (F500C1), Working on contract for III-V 3J cells on InP substrate.
Microchannel Company	Off-the-shelf PV cooling system (DRA in house). Working on contract through F500C1 and F500C2.

SunCell Next Generation Breakthrough Potential

- Direct thermal power to electrical power
- Advantages:
  - Basic research development has been supported by energy agencies worldwide
  - Offers breakthrough power generation efficiency (50%+ conversion efficiency)
  - Simplest system physically possible
  - No moving mechanical parts
  - Extraordinarily compact size with DC power output (modeled power density of over 5 MW/liter; 5000+ times more compact than CPV)



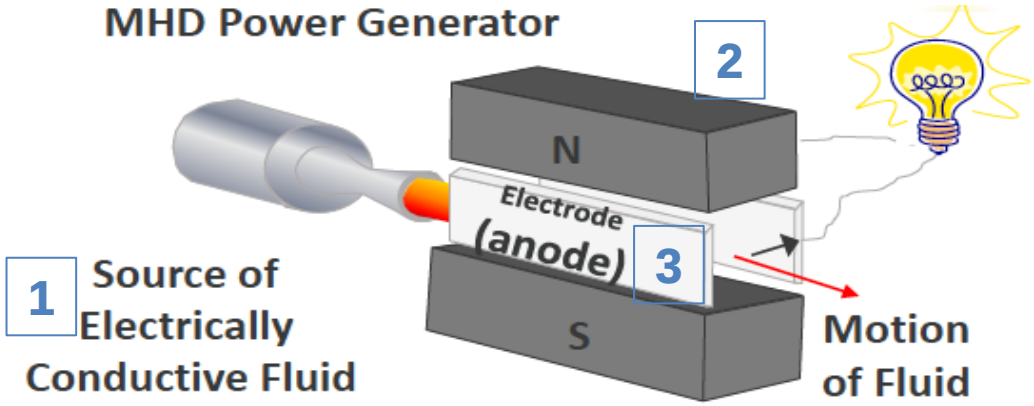


- SunCell-MHD unique advantages
  - Heat exchanger is an infrared radiator with no moving parts or coolant, self adjusts to heat load as T^4
  - Silver working medium protects rather than corrodes the refractory metal electrodes
  - Conductivity >1000X that of ion-seeded combustion flame with no loss of conductivity with temperature drop in MHD channel
  - Inherent high plasma conductivity enables use of low cost, maintenance or power free permanent magnets
  - Essentially 100% unconverted heat recovery due to molten silver recirculation rather than gases
  - No seed recovery and recirculation required
  - Parasitic gas recirculation pumping power drops from about 50% of total MHD power output to near zero due to pumping condensed liquid silver versus a noble gas

Magnetohydrodynamic (MHD) Generators

- Typical MHD method is to expand a high-pressure gas seeded with ions through a nozzle to create high-speed flow through the crossed magnetic field with a set of electrodes crossed with respect to the deflecting field to receive the deflected ions and generates an DC voltage output

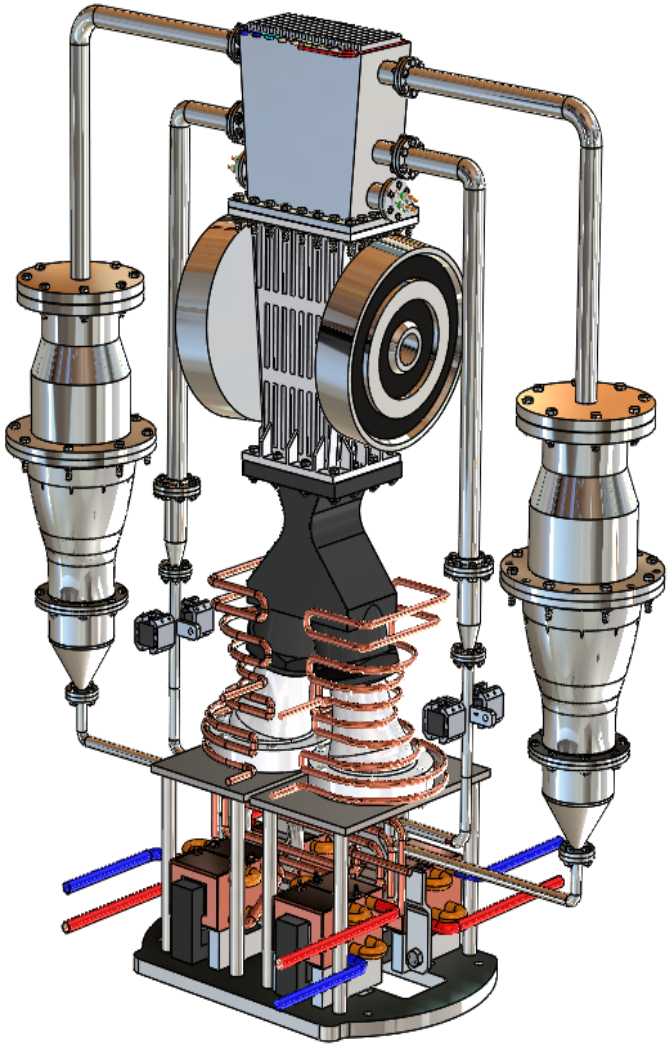
1. A super-hot plasma is created, ionizing the atoms of the fuel mixture, source of electrically conductive fluid (already in place from SunCell).
2. The magnetic field deflects positive and negative charges in different directions.
3. Collecting plates-electrodes, a conductor through which electricity enters for the charges providing a DC voltage out.

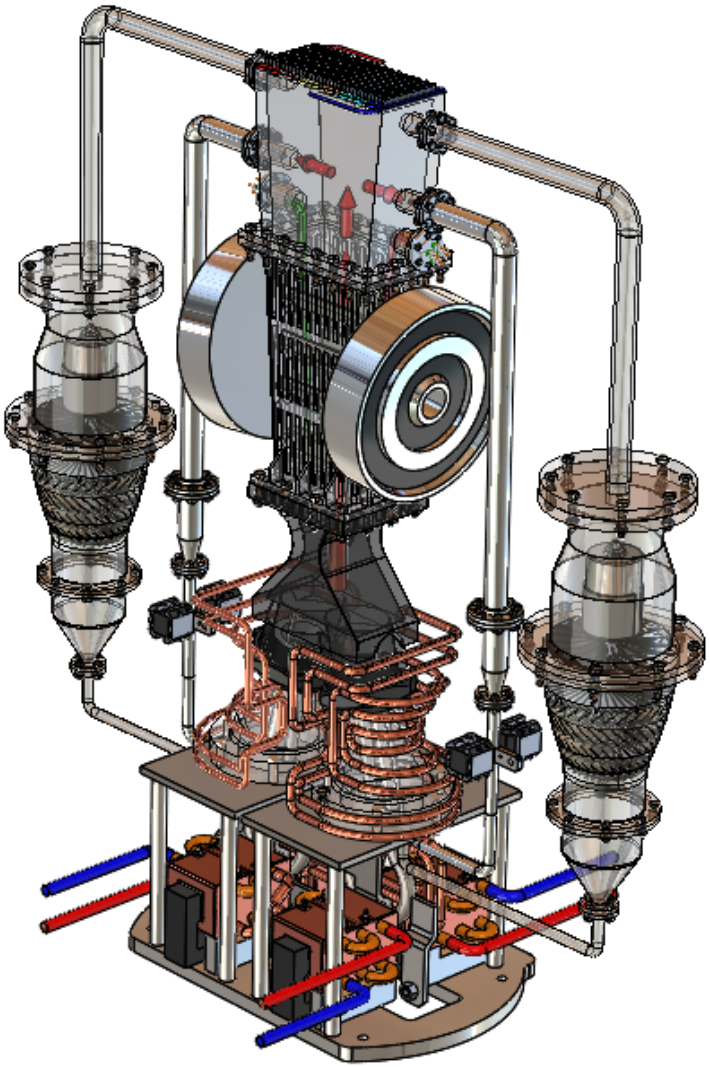


Prototype MHD generators have demonstrated some large-scale commercial feasibility. Failure modes of very low conductivity and corrosion of ion-seeded combustion gas eliminated by SunCell-MHD

SunCell with Magnetohydrodynamic Converter

(external and transparent views)





Validation

- Gold standard method of measuring power and energy balance of single hydrino fuel pellet ignition achieved using NIST calibrations and shunt circuit to overcome interference from electromagnetic pulse
- Results show 20 MW peak optical power as unique signature of a high energy continuum emission spectrum
- Results show energy gain of 200 to 500 times
- New paper to be published in noted science journal demonstrating methods for measuring power and gain from Hydrino® reaction optically and thermally using state of the art instruments
- Hydrino products identified by multiple analytical methods
- Foundation for National Labs experiments and conclusive proof of “better than fire” energy source
- Supports the SunCell® Automated Cell demonstration by showing the potential massive power density and gain of the hydrino power source that can be harnessed into applications by the SunCell with optimization
- Commercial and academic validation in progress
- R. Mills, J. Lotoski, Y. Lu, “Mechanism of soft X-ray continuum radiation from low-energy pinch discharges of hydrogen and ultra-low field ignition of solid fuels”, Plasma Science and Technology, Vol. 19, (2017), pp. 1-28 published in July


Safe, economic, accessible, clean power……


OPEN

Thank you!

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