

# Biosirus Inc.

## Smart Energy Solutions



### Our Edge

*Smart energy solutions (across many verticals) with a focus on retrofit, scalable, quick ROI, eco-friendly, energy-efficient and last-mile (distributed & discretized) architecture.*

We strive to bring superior technology solutions, yet simple in functionality that can be readily retrofitted by most non-sophisticated small customers.

We think of small differentiated details from the global customer's perspective. Our retrofit, offers quick payback, low energy solutions that truly benefits all customer segments.

#### Solutions Portfolio:

- Smart Energy
- Smart Cities
- E-Mobility infrastructure
- Water/Wastewater
- Solid Municipal Waste
- Energy Efficiency
- Rural Energy Access

### About Us

We are a small boutique Canadian company built on global energy experience. Our focus is smart energy solutions.

We are not a Project Manager, EPC contractor or a product manufacturer. We offer select products as a value-added reseller.



### Our Approach

We work with clients, their asset managers/engineers. *Our differentiated details focus on retrofits for quick payback.* We are not IP focused, but believe, global connections provide unique recognition for our solutions.

### Our Business

We cater to industrial, commercial, municipal and utility customers, advise SMEs in their technology development and assist academia in their innovation & research.

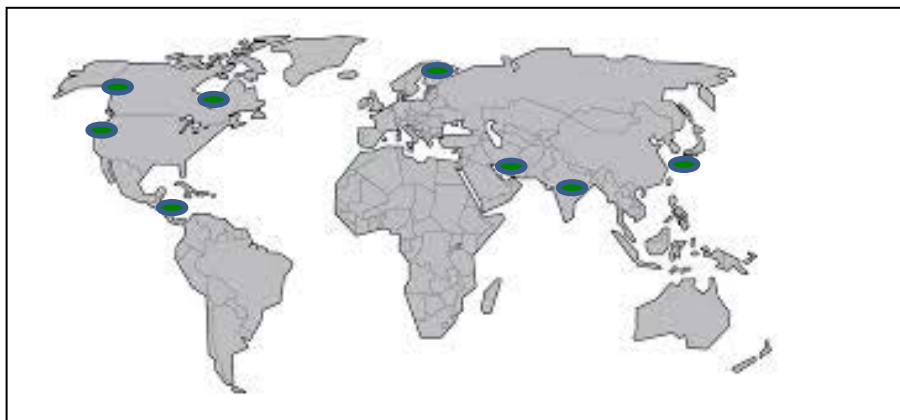
Our best challenges have come from emerging markets in hot, sticky climates with limited affordability.

Non-traditional partnership/channels offer the best business prospects and ideas for us. We scout the world for such select technologies.

#### Global Clientele:

- Canada
- USA
- Middle East
- India
- SAARC Countries (Asia)
- Far East (Asia)
- Central America
- Latin America

## Alliances / Activities



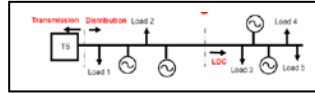
# Solutions



## Smart Energy Infrastructure

Utility, Industrial, Municipal, Commercial:

- **Smart Grid** (Microgrids, Hybrid, DER integration, Energy Storage, Automation)
- **Smart Cities** (Resiliency, Climate Change, Energy Conservation, Load Control)
- **E-Mobility** (Grid Impact, Charging/Battery Sizing, Cost-Benefit Analysis, Fleets)
- **Climate Change** (Resiliency vs Reliability, Operationalizing SBT and MDG targets)



## Energy Access

Small Scale Rural Energy:

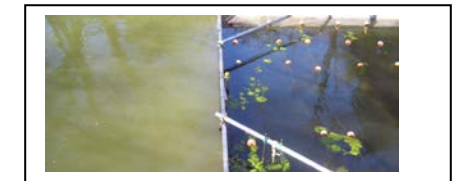
- Low Power rural amenities; Seamlessly scalable from 300W to 5KW+
- Energy infrastructure for rural economic development & community health
- Rural Off-Grid Systems (Micro/Nano/Pico Grids)



## Water/Wastewater

Low Power Natural Treatments (No-Biocide):

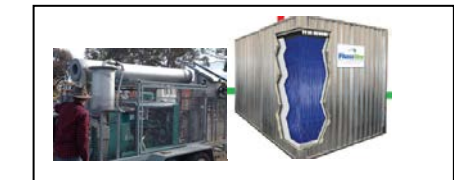
- **Aeration** (Aqua-Jet, Micro-bubble)
- **Algae/Biofilm Control** (Ultra-sonic)
- **Filtration & Disinfection** (Microfiber, Hydroxyl, Electrostatic Deionization)



## Small/Modular Extractive Energy

Low GHG Process:

- **Waste-to-Energy** (Municipal Solid Organics, Biomass and bio-gasifier)
- **Thermal Energy Storage** (Phase Change Material, Small Dish Conc. Solar)
- **Hybrid Heat Pumps** (Heating, Cooling)



## Applied R&D

Governments, Academia, Industrial:

- Thought-leadership and training
- Assist academia in industrial R&D, innovation
- Technology/Product development for SMEs



## Domain Expertise

Talks/Visits/Presentations/Training:

Singapore, Indonesia, Malaysia, Philippines, Taiwan, Japan, India, Egypt, UAE, Saudi Arabia, Qatar, Turkey, Slovenia, Panama, Chile, Colombia, Brazil, USA and many EU countries. Contributed over 50 technical papers and 100+ articles.

## Assignments

Advisory Services:

- Climate Change Resiliency: Lower Cost Direct Buried Cable Undergrounding
- ADMS Review, Malaysia Utility
- Ultrasonic Algae Control, NGO, India
- EV Charging Infrastructure Review, Bengaluru, India
- Expert Energy Panel, Yukon Govt., Canada
- Energy Storage Roadmap, for 40GW Rooftop PV Initiative, India
- Smart Grid Roadmap and EV Roadmap, 8 SAARC countries
- Generation Field Maintenance Service Business Model, GCC Utility
- Electrification of Public Transportation, City of Kolkata, India
- Innovation Center, Canadian College; MOU Energy Center, Panama University; R&D Support, Canadian University
- Technology/Product Development, SME companies, North America and Asia

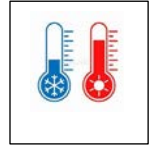
Energy/CO2  
Efficient

# Direct Buried Cable Protection System



## Snap-Pipes

### Recycled High-Grade Automotive Plastics Surface and Below-Grade Land/Water Applications Cable Bend Radius and Terrain Matching



#### • Application:

- **Industry:** Mining, Oil & Gas, Factories, Process industry, Aerospace, Defence
- **Utilities:** Power Plants, Substations, Power Distribution,
- **Renewable Energy:** Wind and Solar PV Plants
- **Transportation:** Rail and Metro lines along tracks
- **Construction Sites:** Temporary Power and Re-Use applications
- **Public Safety:** Prevent accidental contacts, provide mechanical protection/visibility



#### • Features:

- Hinged Split-Pipes snapped close around the cable(s)
- Three duty ratings (moderate, heavy and very heavy duty)
- Heavy and Very Heavy-duty pipes have a sliding plastic colour coded latch (4 colours)
- Surface or below grade in land or water; Multiple cables possible; Can be sand filled
- Low cost 100% Cable protection



#### • How Does It Work:

- Integrated locks and hinges secures the half shells.
- Integrated sleeves secure lengthwise connection between the pipes
- Built in mounts to attach weights or bolt the cable protection to a rock surface

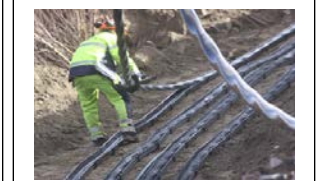
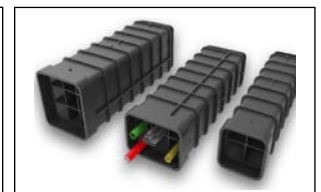
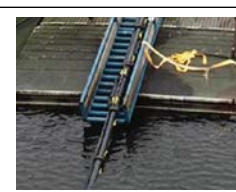
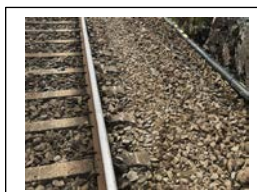


#### • Technical Data:

- **Pipe ID Sizes:** 50/90/100/120/140/160/200 mm (2.0/3.5/4.0/4.7/5.5/6.3/7.8 in)
- **Max. Cable dia. (at 80%):** 40/72/80/96/112/128/160 mm (1.6/2.8/3.1/3.8/4.4/5.0/6.3 in)
- **Length:** About 1m (3 feet) with unique collar to connect segments; Coupling allows 15-22 deg cable bends
- **Material:** Recycled high-grade automotive plastic
- **Ambient Temperature:** -40 deg C to +55 deg C
- **Environment:** Surface & below-grade land/water applications; UV & oil resistant (recycled auto-grade plastic)
- **Mechanical Tests:** Compression (Class 800-1250) and Impact (Code N) tested to EN 61386-24
- **Min. Burial Depth:** 0.6m (2 ft)
- **Weight:** 1.7- 8 kg (3.8-18 lbs) depending on pipe diameter, pipe thickness, and duty rating

#### • Operation:

Self-contained one- or two-person operation to "enclose/wrap" cable(s) as it is being slowly pulled or laid in trench. Each pipe segment is light enough to be carried by an individual. No power tools or mechanical equipment needed. Material can be stored at site. *A much lower cost of cable protection and laying from traditional methods.*



Energy Efficient

# Optical Thermal/Strain Mapping System

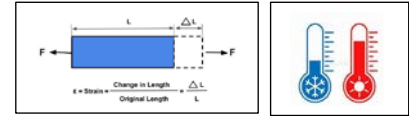


## Opto-Sensor

### Single fiber Sensor

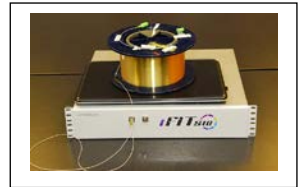
Max. 10-20 km loop; Resolution 1 m along fiber

Sensing Range -50 to +500 deg C



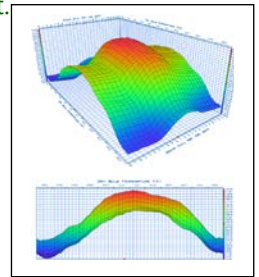
#### Application:

- Industry: Energy, Nuclear, Mining, Oil & Gas, Automotive, Steel, Aerospace, Defence
- Equipment: Power Plant, Substations, Cables, Lines, Transformer, Batteries
- Renewable Energy: Wind Turbine blade deflection; Solar PV Panel temperature
- Asset Management: Real-time Operations; Digital Twin; Remote Monitoring
- OEM Prototype Tests: Batteries, Aircraft vibrations; Ship-hull deflections; E-mobility
- Asset Safety: Mines, Pressure Vessels, Aviation, Power/Nuclear, Other assets



#### Features:

- Max. fiber length/channel (10-20 km loop); Can be laid close (cm apart) for measurement.
- Temperature accuracy 0.5 deg C ( $\pm\Delta T/T$ ) over -50 deg C to +500 deg C range
- Strain accuracy 0.1% ( $\pm\Delta L/L$ ) in both tension/compression
- Measurement distance every 1 meter along fiber; Accuracy  $\pm 1\%$  per meter length
- Real-time data integration into SCADA/DMS/ADMS/BMS/Other
- Multi-channel for logical and physical fiber separation
- Programmable zones and sampling rates (0.5 min. to >60 min); Min-Max & Ramp alerts



#### How Does It Work:

- Optical/stimulated Brillouin scattering principle. The fiber is the sensor.
- Fiber embedded or external (for strain applications fiber needs to be bonded)
- Entire fiber is scanned and the synchronized data-set is time stamped
- Programmable focus on specific areas of interest with more sensing points
- DNP3, IEC 61850-GOOSE protocols; 10BaseT, RJ45, TCP/IP; cloud server upload

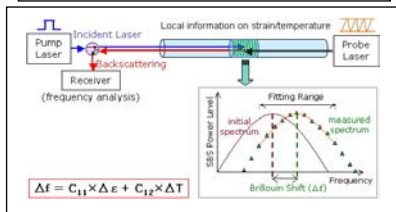
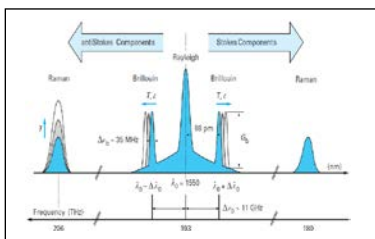


#### Technical Data:

- Controller: 3U 19" rack mount; 100-240VAC or 24-120V DC; 200W; IP40/20 (F/B); 8.1 kg.
- Fiber: Selectable fiber type to suit measurement application
- Ambient Operating Temperature: -40 deg C to +80 deg C; 95% RH non-condensing
- Environment: EHV, Explosive, EMI, RF, Substation (IEEE1613, IEC61850-3) compliant
- Fiber Dielectric: Full withstand (air & oil) for AC 60Hz and Impulse wave (standard and switching surges)
- Software: Cloud-based software with analytics and 3D visualization

#### Operation:

Self-contained all-in-one controller which houses both the optics and power electronics. The two ends of the fiber loop are fed into the optical ports. Measured data can be stored locally or exported periodically.

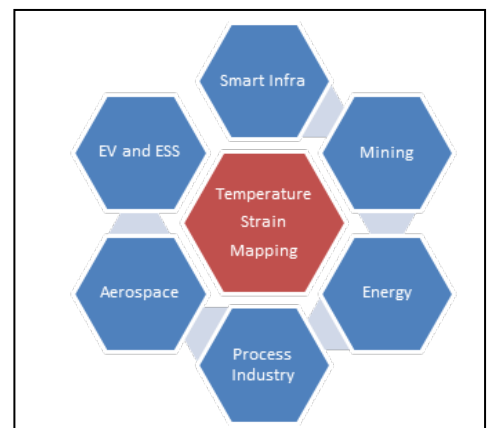


### Target Clientele

- OEMs
- Asset Owner/Managers
- Consulting Labs

### Applications

- Extreme Climate
- High value assets
- High Insurance
- Expensive Failures
- Fire/Safety



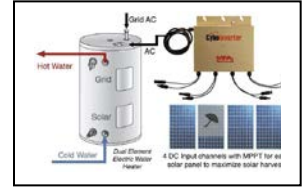
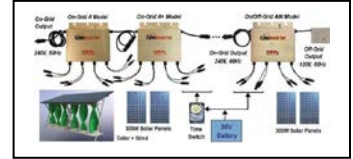
**Energy Efficient**

# Hybrid Energy Solutions



## Solar Hybrid Inverters (Grid-Tied /Off-Grid)

- **Application:**
  - Scalable Systems: 300W-1200W – Higher (easy daisy chained systems)
  - For Lights, Fans, TV, PC, Chargers, Refrigerators, Food Processors, Small Appliances
  - Benefits of standard AC components/appliances (wires, switches, equipment)
  - Urban: Residential, Apartments, Condos, Townhouse, Schools, Small Shops
  - Rural: Residential, Shops, Irrigation, Threshing/Grinding Mills, Hot/Boiled water
- **Features:**
  - Each Module: 1.15 KW (4 x 300W DC input); Individual MPPT for each solar panel
  - 100/110/120V; 220/230/240V; 50/60 Hz.; Ambient: -40 to +65 deg. C; Pure Sinewave
  - Solar or Battery auto-detection; Battery overcharge protection
  - Peak Eff. 96%; MPPT Tracking 99%; Built-in DC GF Detector/Interrupter



## Smart Energy Storage Systems (Grid-Tied /Off-Grid)

- **Application:**
  - Scalable Systems: 5-15KW, 10-15 KWh ESS
  - Residential, Small Business, Community Centers
  - Scalable Options: PV Input, Grid Input, Backup Generator input, Load output
- **Features:**
  - Self Contained 5-15KW, 10-15 KWh ESS with Inverter and electrical sub-panel
  - Advanced 48V LFP Battery (6,000 cycles); Deep discharge to 90% DoD
  - All-in-One Configuration for very easy connections
  - 8x8 way programmable for TOU, FIT, Net Metering, Peak Shaving, Load Shifting, etc.
  - Electrical panel includes breakers for emergency sub-panel
  - Grid-tied or Remote application; With or Without Solar PV panels
  - Inverter capable of supporting any 48V battery (AGM, GEL, LFP, LiON, Others)



The system has grid support functions too (UL 1741 SA). The fixed power factor correction has a wide band of 0.7 pf (lead/lag). The frequency ride-through is 57-62 Hz, and the voltage ride-through is from 40-120% Vac. In addition, it has an auto Volt-Var (Q) function to maintain PCC voltage between 0.88-1.1 Un with maximum 3.5 KW and 3.57 KVAR (lead/lag) injections (ramp rate 500 Var per second).

# Hybrid Energy Storage Solutions

## Hybrid Battery Systems

Residential, Commercial, Industrial, Automotive

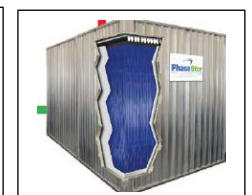
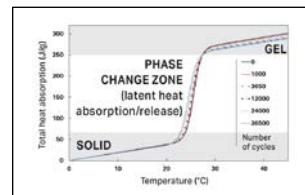
- **Customized Hybrid Applications:**
  - Hybrid mix: Lead Acid; various Lithium chemistries; Ultracapacitors
  - Mitigation against extreme battery cycling
  - Allows for Lead-acid batteries as a viable option (despite low cycle-life)



## Phase-Change Thermal Energy Storage

Residential, Commercial, Industrial

- **Customized Applications:**
  - PCM (Solid to GEL); Customizable Melting Point selection
  - Indoor or Outdoor Tanks; Hot or Cold thermal storage
  - Organic or Inorganic compounds



Energy Efficient

# Rural Energy Solutions



## Solar Agro Processing

- **12/24/48V DC Systems with Charge Controllers – Complete Package:**
  - **Rice Mill Huller and Polisher** (up to 240/100 Kgs -Brown Rice /White Rice per day)
  - **Corn Huller and Flour Mill** ( up to 200 kg/day from dried corn cobs)
  - **Coconut Scraper-Grater** ( up to 60 coconuts/ hour)
  - **Cassava Grater** (up to 60 Kg/hour)



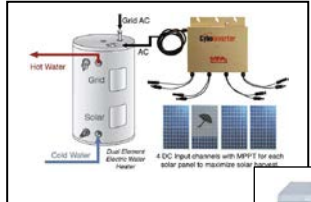
## Solar "Mobile" Irrigation Pump-sets

- **DC Solar fed AC VFD-drives (120V/240V - up to 7KW)**
  - Pump-motor system tractor flatbed mount ;
  - Solar Panels – use customers or employ movable easy "ground-mount" kits
  - DC charge controller, inverter, VFD - all in one
  - Configurations: 100/110/120V; 220/230/240V; 50/60 Hz.;
  - AC motor deployed as it is easy to fix (than DC motors) in most rural communities
  - No Diesel or Batteries
  - Can supply housing load batteries if required during early morning and evenings
  - Typical pump operation (10am – 4:00pm) – 6 hours for larger pump-sets



## Solar Heat/Cool Ancillary Systems

- **Solar Heating Systems:**
  - Boiled Water for community safe drinking
  - Warm water for other community washing services
- **Solar Refrigerator/Freezer Systems (120/240V AC or 12/24 V DC)**
  - **Chest Freezers:** 100-525 L (3.5-18.5 Cu. ft.) for medical, meats, other
  - **Small Refrigerators:** 92-212 L (3.3-7.5 cu. ft.) for vegetables, perishables
  - **Freezer:** Input Power 70-110 watts; Temp. < -18 deg. C
  - **Refrigerator:** Input Power 62-77 watts; Temp. < 3 deg C



# Rural AC-DC Hybrid Architecture

### DC Source (15-48V)

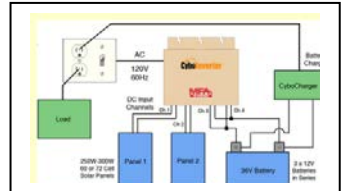
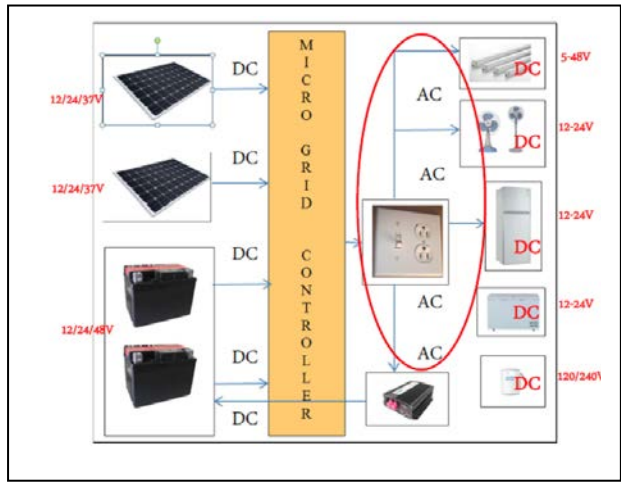
- Solar PV, Battery, Wind
- Scalable input

### AC Delivery (120/240V; 50/60Hz)

- Longer wiring
- Higher loads & Scalability
- AC Standards / Market Parts

### AC/DC Load (120/240V; 12-48V)

- Low energy/high efficiency
- BLDC low motor start current
- Inexpensive AC-DC Adapters



Energy Efficient

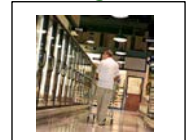
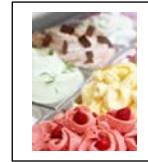
# Advanced HVAC-R Solutions



## Individual Unit HVAC-R Retrofit Controller

### Single Stage and Dual Stage Compressors

- **Suitability:**
  - Scroll or Reciprocating compressors (not centrifugal)
  - Works with existing thermostat controls (analog, digital, BMS – On-Off type)
  - Wired in series with existing thermostat and on the same circuit
  - Override /bypass capability; Fail Safe in Bypass Mode; Screen Display for data verification
- **How Does it Work:**
  - Dynamically analyzes compressor operation (on/off, cycling, rest-time); Does not violate thermostat settings
  - Predictive algorithm monitors & adapts to changing heat loads/compressor demand
- **Energy Savings:**
  - Payback: 1–3 years through less compressor operation time and efficient cooling
  - Compressors consume 75%-90% of energy – so less equates to more savings



## Wireless Wi-Fi HVAC-R Sensors

### Temp/RH/Dew Point/CO/CO2/Occupancy Significant Reduction in wiring costs

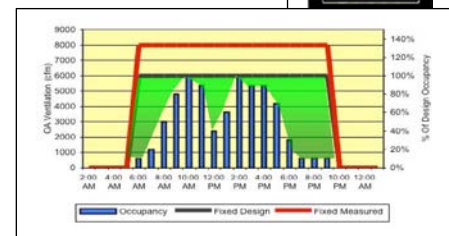
- **Application:**
  - Retail, Gyms, Auditoriums, Class-rooms, Hospitals/Clinics, Airports, Bus/Rail Terminals
  - Wi-Fi to Cloud/Internet/Wire (for BACnet, Modbus, SNMP); Babel Buster Gateway - up to 200 Wi-Fi sensors
- **How Does it Work:**
  - Battery Powered or Low Voltage (5-24V) AC or DC line supply
  - 12dBm 2.4 GHz 802.11 b/g WiFi Radio; Transmitter is configured using a plug in PC-USB interface
  - Encryption: Supports WEP128, WPA-PSK (TKIP), and WPA2-PSK (AES)
  - Communication Packets: Small data packets (~75 bytes), Supports DHCP or Static IP, Channel agility
  - Data Packet Spec Link: TR9299UDPSpec; Certification: FCC, CE, and IC Class B compliant



## Demand Controlled Ventilation Systems

### Monitored Control for Optimum Fresh-Air Intake – CO/CO2/Occupancy Energy Saving

- **Application:**
  - Indoor variable occupancy areas:
    - Retail, Gyms, Auditoriums, Class-rooms, Hospitals/Clinics, Airports, Bus/Rail Terminals
    - Mall or Office Buildings, Indoor Parking garages
  - Older buildings; High Electricity and/or Gas tariff jurisdictions
- **Features:**
  - Real-time CO<sub>2</sub> monitored feedback for fresh-air intake damper control
  - Variable Occupancy Savings and Over-ventilation energy savings
  - Real-time monitoring, control, alarm notifications, data logging
- **How Does it Work:**
  - Low levels of indoor CO<sub>2</sub> (< 400 ppm) denotes low occupancy and/or excessive ventilation
  - High levels of indoor CO<sub>2</sub> (> 1100 ppm) denotes very high occupancy and/or lack of ventilation
  - Feedback loop control to Air-handling /damper control based on CO<sub>2</sub> levels



Energy Efficient

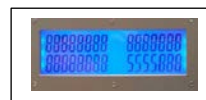
# Load Management Solutions



## Power Theft Deterrent Metering

**Tamper Resistant; Optical Sensing; Wireless Communications**

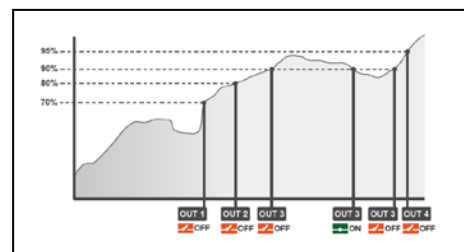
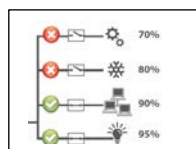
- **Suitability:**
  - Theft Proof Metering Box; Tamper detection; Totalizer for every 10 meters
  - 30-50 meters (each two 100A relays for remote connect/disconnect)
  - Programmable meter current limit (1 to 100A); Can act as CB
  - Scalable Wireless Communication mesh to Gateway
  - Meters communicate optically inside box (increased security)
  - Centralized customer Display; Prepaid Metering enabled (STS)
  - Capable of elevated mounting; 15-34KV "wire wrap" around box



## Demand Management

**Demand/Load Controller**

- **Suitability:**
  - Industrial, Commercial, Other; 110/240V, 50/60Hz.
  - Single/Three Phase (3W/4W); Onboard Analyzer
  - Four Output Relays (6A); Activation by percentage level (programmable)
  - Measuring accuracy: Power 0.5%; Energy 1%

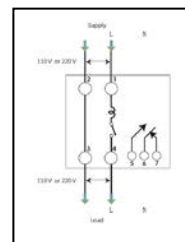


**KVAR Controller Available**

## Sub Metering

**CB Power Meter; Load Switch Sub-Meter**

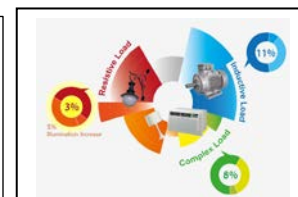
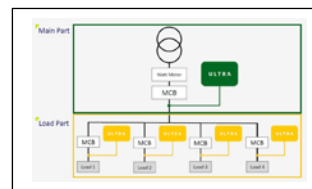
- **Suitability:**
  - Industrial, Commercial, Residential, Other
  - 1-Phase 2Wire; Accuracy 1%; 90-260V; Dim. 5x13x7 cm.
  - Measurement communication RS 485
  - 1 x 80A Relay (0.1A – 60A programmable); 1NO/NC dry contact
  - Load Shedding



## Energy Saver - Ultra

**Main Incomer or Branch Circuit or Individual Loads**

- **Suitability:**
  - Industrial, Commercial, Residential, Other
  - Single/Two/Three Phase
  - Capacity: 0.5 KVA – 1500KVA; 100– 600Vac; 50/60 Hz.
  - Compact form-factor; Wall mount; No auxiliary power supply needed
- **Performance:**
  - Energy Savings: Min 5%; Average 8-15%; Inductive Loads 11-18%
  - Average Lifespan: 10 years
  - Certification: CE, TUV, TGM, UL, CSA
  - Value for Money



## Ultra Efficient Appliances

**Split A/C; Fridge; Freezers; Cooktops; Lighting; HW-Heaters**

- **Suitability:** Residential /Small Commercial /Small Office/Off-grid solar
- **Technology:** ECM/BLDC motors; Heat pump; Efficient compressors
- **Capacity:** A/C (9000-24,000 BTU); DWT (300-1.2 KW); Fridge/Freezer (60-120W)
- **Energy Savings:** High EER rating > 14.5 (BTU/h/W); > 5.3 (W/W); Energy Savings > 35%
- **Supply:** 120V AC, 240V AC, 12-48V DC





**Energy Efficient**

# Water Treatment Solutions



## Algae and Biofilm Control

**No-Biocides, Low Power; High O2 Levels**

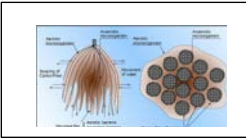
- **Suitability:**
  - Lakes, Ponds, Streams, Canals, Small Rivers
  - Treatment Plants, Holding tanks, sludge/digester tanks, Lagoons
  - Long lasting treatment; autonomous; Remote control/monitoring
- **Aeration:**
  - **Jet Aerators:** High velocity subsurface; 0.4-3.75KW
  - **Nano-Bubble Aerators:** Side/bottom; slow-release micro air bubbles
- **Ultrasonic Algae & Biofilm Control:**
  - High-frequency low-power multi-directional subsurface emitters
  - Not harmful to aquatic life; Multi-frequencies for different algae species
  - 35-50% energy savings compared to traditional systems; 120V/240V 12-48V DC



## Carbon-Fiber Sewage Control

**No-Biocides; Carbonaceous/Nutrient Removal Sludge Removal**

- **Suitability:**
  - Lakes, Ponds, Streams, Canals, Small Rivers, Marsh
  - City Sewage Plants, Apartment complex, Septic Tanks
  - Factory Organic Waste Water (Food, Brewing, Chemical, Dairy, Farms)
- **How Does it Work:**
  - Carbon fiber bundles of 12,000 ultrafine, 7 µm filaments in lattice pattern
  - Sludge adhesion onto fibers; Fast organic matter decomposition by bacteria and microorganisms
  - Little or no aeration needed
  - Models: 25 / 50 / 75 / 100 Kilo-litres per day; Large denitrification and dephosphorization



## Small/Mobile Extractive Energy Solutions

### Municipal Solid Waste

- **Low Temperature Waste Reduction**
  - Standalone systems 500-12,000 kg/day; No Dioxins; Clean Flue Gas
  - Oxygen rich low temperature (50 – 350 deg C) decomposition
  - Significant waste reductions (1/300 to 1/500)
- **Plastic Pyrolysis Waste Reduction**
  - Standalone systems; 85% energy efficient
  - Pyrolysis temperature 400 – 500 deg C; Little flue gas (mostly self consumed)
  - Hydrocarbon yield 75-85% by weight of plastics
  - Input Plastics: PP Bags, Snacks & Pouches, Carry Bags, Packaging, LDPE, HDPE & PP



### Biomass Gasification

**Mobile Trailer Platform**

- **Suitability:**
  - Agricultural, Community, Residential, Small industrial
  - Mobile Bio-gasifiers for Heat and Electricity (10KVA-1500KVA) producing syngas & biochar
  - Multiple Feedstocks; Efficient Burn with very low ash



### **Biosirus Inc.**

21 Amber Street, Unit 3, Markham, Ontario, Canada L3R 4Z3; Tel: 416-410-4782

email: [info@biosirus.com](mailto:info@biosirus.com) / Website: [www.biosirus.com](http://www.biosirus.com)