



IEEE-ECCE 21

Special Session

EMPOWER
A BILLION LIVES

Energy Access and Empower a Billion Lives

A deep dive into the competition guidelines

Empower a Billion Lives II

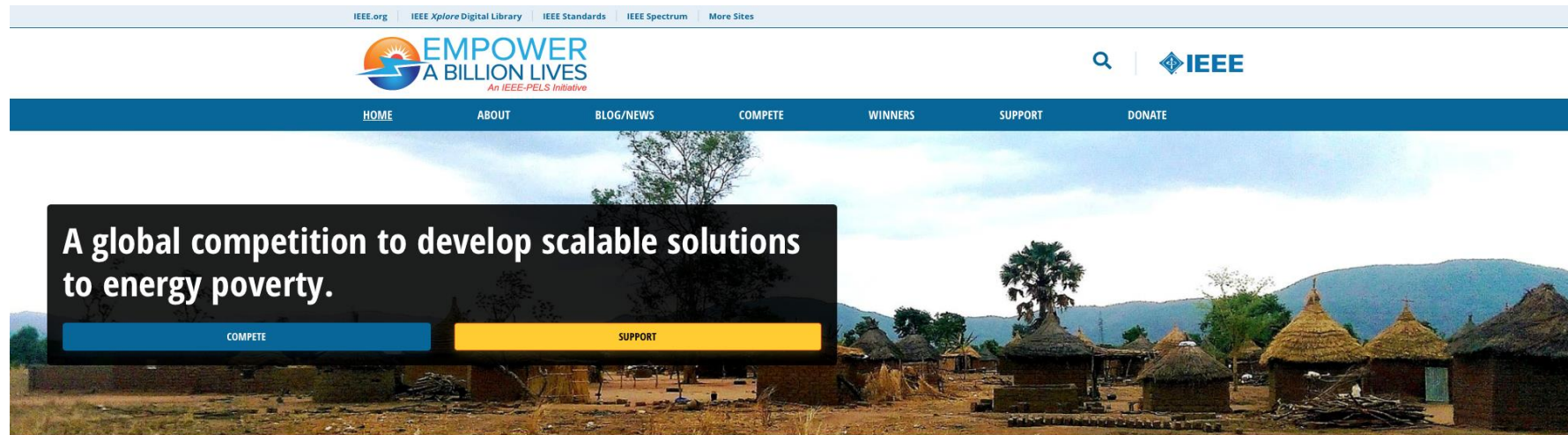
*Global Competition to Crowdsolve Solutions to Energy
Access*

November 16, 2021



Please visit the website for EBL-II for more information and a copy of today's material

<https://empowerabillionlives.org>



Introducing IEEE Empower a Billion Lives

IEEE Empower a Billion Lives is a global competition aimed at fostering innovation to develop solutions to electricity access. Solutions are expected to be scalable, regionally relevant, holistic, and leverage 21st century technologies with exponentially declining prices.

Deep Dive into the Guidelines Webinar to be held on November 16, 2021

This Webinar will provide an overview of the competition guidelines and structure ahead of the November 30, 2021 deadline for the initial 3-page concept paper. Please review the guidelines prior to the webinar.

To register for the Webinar click [HERE](#)

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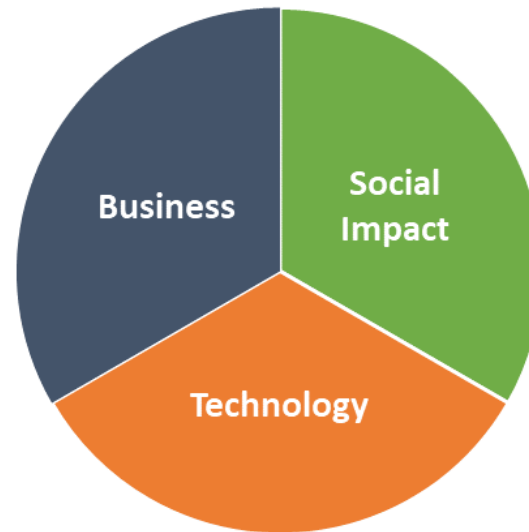




EBL: A Global Competition to Crowdsource Innovation

IEEE EMPOWER A BILLION LIVES is a biennial competition to foster interdisciplinary innovation in the global community to develop and demonstrate solutions to electricity access that are designed to scale, regionally relevant, holistic, and leverage 21st century technologies that feature exponentially declining prices.

Empower a Billion Lives
Essential Metrics



Ongoing competition cycles will drive a continuous learning process that allows successive generations of competitors to leverage past learnings, adopt fast-moving new emerging technologies, and demonstrate these capabilities and impact in realistic environments.



Who is this competition for?



This is a completely open competition:

- Student teams
- SMEs and large enterprises
- Research laboratories
- Nonprofit organizations
- Everyone!



Target Solutions

- A proposed solution could address:
 - Entire power generation, storage, delivery and management systems;
 - End-use energy solutions such as productive energy use appliances, cooling solutions, clean cooking solutions, transport;
 - Enabling technology solutions that address some of the key challenges in energy access (scalability, automation, interoperability, sustainability, affordability)
- Holistic solutions — technically, economically, environmentally and socially viable and appropriate





Examples of Desirable Features

The competition is agnostic to energy sources, technologies, business models, and will primarily evaluate potential impact and ability to rapidly and sustainably scale the solutions to a large number of customers (overall scaling to a Billion).

- Holistic sustainable technology-based solutions that are designed to scale
- Enables economically viable electricity access for small communities
- Enables new income generating opportunities for target customer group
- Enables health and well-being improvements, is gender-inclusive
- Includes a business plan designed for the Base of the Pyramid
- Creates additional value streams for external stakeholders
- Integrates communications, Pay/Go, Cybersecurity, microfinance as needed
- Addresses challenge of managing a fleet of large number of devices
- Utilizes carbon neutral technologies

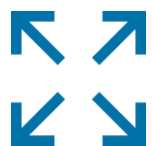


Innovation Opportunities



NEW BUSINESS MODELS

New service, lease, billing, and microfinance models



SCALABILITY

Deployment across multiple regions with minor customization



SUSTAINABILITY

Circular solutions, reducing e-waste, long life-time, automation for easier maintenance



EXPANDABILITY

Systems grow with growing needs



'LAST MILE' DISTRIBUTION

Supply chain, distribution, installation, commissioning, servicing costs



GENDER EMPOWERMENT

Enabling gender-just economic opportunities



REGIONAL EMPOWERMENT

Support local business development



DATA ANALYTICS AND VALUE STACKING

Value to external stakeholders (e.g. credit risk monitoring)



ENABLING DIGITAL AND FINANCIAL INCLUSION

New customer income opportunities & new revenue streams for the provider



DEVICE MONITORING

Diagnostics, upsell, asset tracking, managing end-of-life



WOW! FACTOR

Disruptive game-changers



Competition Tracks *(See EBL-II Competition Guidelines Doc)*

- Targeting two groups as consumers of energy access solutions: the single family and the community. *(see Appendix I for more details)*.
- Successful EBL solutions will solve energy access problems for both groups.
- The traditional approach has been through electricity generation and delivery, but other solutions that take a completely different approach.
- Teams encouraged to focus on the broad goals, offer solutions that solve the technology and business issues and are able to demonstrate impact.
- Solutions can range from an entire power generation, delivery and management system; appliances; or an enabling technology for energy access
- Teams can compete along the following 6 tracks, noting that solutions may fit into more than one track:
 - **TRACK D: DECENTRALIZED MODEL**
 - **TRACK C: CENTRALIZED UTILITY MODEL**
 - **TRACK A: AUTOMATION-CENTRIC SOLUTION**
 - **TRACK P: END-USE ENERGY (PRODUCTIVE USE OF ENERGY)**
 - **TRACK E: ENABLING TECHNOLOGIES**
 - **TRACK S: STUDENT TEAMS**



Competition Tracks *(See EBL-II Competition Guidelines Doc)*

- **TRACK D: DECENTRALIZED MODEL(TrD)**

Single household solution without creating an entire distribution infrastructure in advance. May be expanded and interconnected as needed.

- **TRACK C: CENTRALIZED UTILITY MODEL(TrC)**

The proposed solution is a centrally planned and implemented power generation and distribution model serving a community and individual customers.

- **TRACK P: END-USE ENERGY (PRODUCTIVE USE OF ENERGY, CLEAN COOKING)(TrP)**

Solutions may include appliances enabling productive use of energy, clean cooking solutions, cooling solutions, agri-food processing hubs, commercial activities. Can be a single user (solar powered appliances) or community solution (cold storage rooms)

- **TRACK C: AUTOMATION-CENTRIC SOLUTION (TrA)**

Solutions that are enabled by automation, with the underlying advantage of autonomous operations demonstrated via increased scale, resilience, simplicity, or a combination thereof.



Competition Tracks *(See EBL-II Competition Guidelines Doc)*

- **TRACK E: ENABLING TECHNOLOGIES (TrE)**

Solutions enable solving some of the key challenges of energy access solutions such as scaling, affordability, sustainability, interoperability

- **TRACK S: STUDENT TEAMS(TrS)**

Open only for teams from higher education institutions. Solutions can fit in any of above four categories (decentralized model, centralized model, Automation-centric, end-use energy and enabling technologies). Less stringent requirements for field testing, can be done in a suitable environment



Competition Tracks *(See EBL-II Competition Guidelines Doc)*

General Remarks:

- Even though teams can compete along the above 6 tracks, some solutions may fit into more than one track:
- Successful solutions will show technical viability, the business model needed to reach scale and demonstrate the social and environmental impact of the solution.
- Best performers will provide the highest level of technical performance and functionality at the lowest cost with a viable business model and the ability to rapidly scale in this market segment.
- A team may state their preferred participation category; however, the category decision of the EBL Rules and Judging Committee will be final.



Two groups of end-users: single family and community

Multi-Tier Framework (MTF) - ESMAP (World Bank Group)

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3 ^b	TIER 4	TIER 5
Capacity	Power capacity ratings (W or daily Wh)	Less than 3 W	At least 3 W	At least 50 W	At least 200 W	At least 800 W	At least 2 kW
		Less than 12 Wh	At least 12 Wh	At least 200 Wh	At least 1 kWh	At least 3.4 kWh	At least 8.2 kWh
	Services		Lighting of 1,000 lmhr per day	Electrical lighting, air circulation, television, and phone charging are possible			
Availability ^a	Daily Availability	Less than 4 hours	At least 4 hours		At least 8 hours	At least 16 hours	At least 23 hours
	Evening Availability	Less than 1 hour	At least 1 hour	At least 2 hours	At least 3 hours	At least 4 hours	
Reliability		More than 14 disruptions per week			At most 14 disruptions per week or At most 3 disruptions per week with total duration of more than 2 hours ^c	(> 3 to 14 disruptions / week) or ≤ 3 disruptions / week with > 2 hours of outage	At most 3 disruptions per week with total duration of less than 2 hours
Quality		Household experiences voltage problems that damage appliances				Voltage problems do not affect the use of desired appliances	
Affordability		Cost of a standard consumption package of 365 kWh per year is more than 5% of household income			Cost of a standard consumption package of 365 kWh per year is less than 5% of household income		
Formality		No bill payments made for the use of electricity				Bill is paid to the utility, prepaid card seller, or authorized representative	
Health and Safety		Serious or fatal accidents due to electricity connection				Absence of past accidents	



Two groups of end-users: single family and community

Multi-Tier Framework (MTF) - ESMAP (World Bank Group)

Required:
At least
Tier 2

ATTRIBUTES		TIER 0	TIER 1	TIER 2	TIER 3 ^b	TIER 4	TIER 5
Capacity	Power capacity ratings (W or daily Wh)	Less than 3 W	At least 3 W	At least 50 W	At least 200 W	At least 800 W	At least 2 kW
		Less than 12 Wh	At least 12 Wh	At least 200 Wh	At least 1 kWh	At least 3.4 kWh	At least 8.2 kWh
	Services		Lighting of 1,000 lmhr per day	Electrical lighting, air circulation, television, and phone charging are possible			
Availability ^a	Daily Availability	Less than 4 hours	At least 4 hours	At least 4 hours	At least 8 hours	At least 16 hours	At least 23 hours
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Target Customer

Target Household:

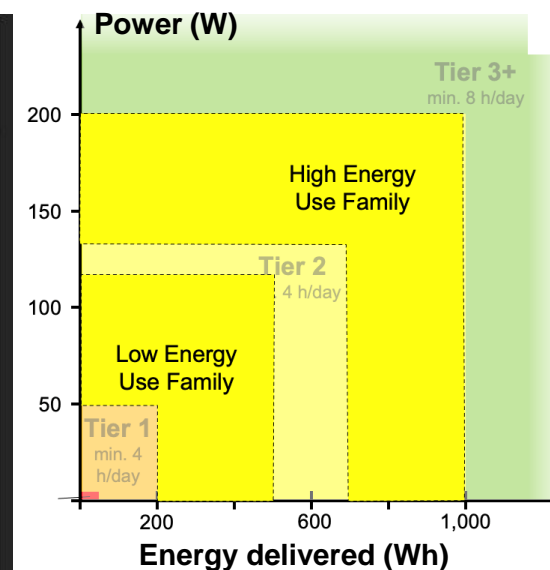
- A typical target household is five people including two parents under forty years of age, with three children under the age of 10
- Parents typically have no formal education or crafts training
- The family's primary language is a regional language
- Their average income is \$1.90 per person per day or \$1,500 per year for the whole household. (Calculated on a purchasing power parity basis.)
- Child labor is not allowed.

LOW ENERGY USE FAMILY: Minimal System Performance with Proposed Solution

- Min 200 Wh/day and min 50 W peak power
- Max 500Wh/day or min 120 W peak power
- Available min of 4 hrs/day, and 2 hrs/night
- Lighting and phone charging are high priority
- Digital inclusion & productivity enhancement
- Family is financially constrained, using services when funds are available

HIGH ENERGY USE FAMILY: Expanded System Performance as Family Situation Improves

- Min 700Wh/day, Max 1,000 Wh/day or min 200 W peak power
- Minimum of 6 hrs/day, and 4 hrs/night
- Lighting and phone charging are high priority
- Appliances and productivity are important
- Family aspires to grow, productivity and community services increasingly important





Target Community

Qualification Requirement: The proposed set of products or services have to meet customer's growing needs. Anticipate that a target family may start below a Tier 2 level, but may grow over several years to Tier 2 or higher. The solution should be able to meet the energy needs of the Target Household and the Target Community through this journey.

Target Community:

- 20-1000 homes per community with low population density
- Average purchasing power \$1500/year per household
- Currently off-grid with little to no penetration of solar lanterns (Tier 0-1)
- Possibility of a poor grid on a 7-10 year horizon for some locations
- Mostly residential and agricultural, some small commercial, light manufacturing activities present – seeking to transition to a community with much higher income earning potential
- Less than 50% of households have bank accounts, and less than 30% have smart phones



PROPOSAL SUBMISSION PROCESS

TEAM REGISTRATION:

The online registration and submission website is open:

<https://empowerabillionlives.org/compete/resources/>

Fill out an online form indicating the team's 'Intent to Participate' in the competition as soon as possible.

ONLINE ROUND 1: Concept Paper Submission - Deadline December 15, 2021

Each team must submit a Concept Paper, must not exceed 3 pages in length.

Concept Paper decision will be made by January 15, 2022

ONLINE ROUND 2: Full Proposal submission – Deadline March 1, 2022

Each team must submit a full proposal including Field-Testing plan, must not exceed 10 pages in length.

Full proposal decision will be made by April 30, 2022

FIELD TESTING: Between June 1, 2022 – Aug 31, 2022

Invited teams from the Online Round will be invited to participate in Field Testing.

Final details on the process for the Field-testing Round will be released end of Online Round.

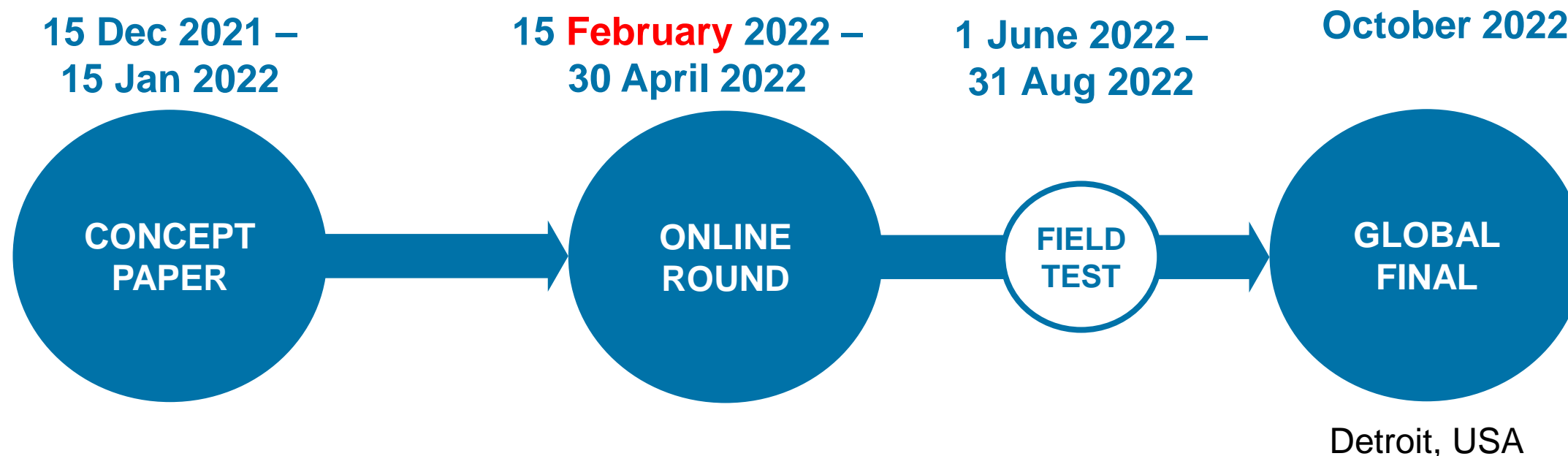
GLOBAL FINAL: Detroit, Michigan, USA – October 9-10, 2022

The teams who complete Field Evaluation will be eligible to participate in the Global Final Round.

Final details on the Field Evaluation and Global Final will be released prior to the close of the Online Round.



Competition Rounds



Important Dates:

- Concept Paper Submission Deadline: Dec 15 2021
- Decision by: Jan. 15, 2022
- Full Proposal Submission Deadline: **March 1, 2022**
- Interview with Regional and Global Judges: May 2022
- Field Testing: 1 June 2022 – 31 August 2022
- Global Final: October 2022

Prizes:

Prizes at the Global Final will include a Global Grand Prize Winner, Student Team Award, and may include Regional Awards and Global winners in each of the tracks, as well as additional prizes.



CONCEPT PAPER

Concept Paper Requirements:

- The Concept Paper must not exceed 3 pages including graphics, figures and/or tables:
- The Concept Paper must be written in English.
- Page 1 – Cover and Summary page
Title, Target Track(s), Concept Summary, Relevance with EBL-II Goals, Team Organization and Capabilities, and may have photographs to support the Concept Paper.
- Pages 2-3 - Main body of the Concept Paper
Challenges, Innovation, Proposed Work and Impact.
- All pages must be formatted to fit on a 8-1/2 by 11 inch (or A4) paper in font size 12.
- The Concept Paper is to be registered on the EBL submission platform and the EBL Control Number should be included on the right-side header of every page.

Concept Papers review criteria:

- Alignment with EBL-II Goals and Criteria
- Overall Technical Viability
- Impact and Business Model
- Field testing readiness



Evaluation Criteria

The judging process is not intended to be prescriptive, given below are some of the factors judges will consider:

Table 1.1 – Impact Score

	Key Factors to Consider
Creates Value for Family and Community	Meets basic LOW-ENERGY USE family residential needs
	Expands to meet HIGH ENERGY USE family needs (including clean cooking, digital inclusion and basic comforts in an energy constrained context)
	Improves livelihood and enhances income earning potential for single family
	Meets critical community needs
	TrD: <u>Interconnected</u> single home solutions meet community needs
	TrC: Utility system meets community needs
	TrP: Appliance suitable for community productive energy needs
Easy for Target Family to Use	Simple to deploy and use for target family Allows family to affordably meet increasing energy needs
Affordable	Meets family cost and service targets and expandability
	Flexible pricing/payments options, PAYG, subsidized payments
Creates positive social impact	Health and well-being improvements, gender inclusivity
Environmental impact	Reduces or avoids GHG emissions, reduces e-waste, enables circular design
WOW factor	WOW factor

Table 1.2 – Tech Score

	Key Factors to Consider
System Specification	Generation and energy storage
	Meets min Tier 2 requirements Power delivery, control and monitoring
Scalable	Technology enables rapid scaling and large device fleet management
Expandable	System expands as need grows without large upfront investment
Operations and sustainability	Ease of installing, commissioning, maintaining and servicing system and fleet of devices and wires (if needed)
Interoperability	Enables use of solutions from different vendors at the end-user level; stimulates standardization of hardware, software and architectures; enables integrated power system of the future
Cloud Connectivity	Novel low-cost communications backbone (or similar function without connectivity)
Advanced Features	System optimization and analytics
WOW factor	WOW factor

Table 1.3: Business Score

	Key Factors to Consider
Financial Model	Simple financial model, including key assumptions
	Target is to serve two representative communities - of 100 homes, 1000 homes, where consumption grows from LOW-USE to HIGH-USE in 5 years
	Economic viability
Scaling	Value Stacking
	Billing and Collection Model
Resilient	Dropping prices
	Sporadic income streams
External Funding	Subsidies
	Novel funding models to help scaling
	Value for external stakeholders
WOW factor	WOW factor



IEEE as a Partner in Energy Access

- IEEE is the world's largest technical organization with 423,000 members in 160 countries, dedicated to fostering technological innovation and excellence for the benefit of humanity.
- EBL is organized by the Power Electronics Society (PELS), its volunteers and partners
- The Global Energy Access Forum is to begin to build a global community, looking broadly at technology, policy, social and business issues that define success
- Many IEEE societies have committed to supporting EBL – II, and are interested in the intersection of energy access with their technical specialty
- PELS is creating the GEAF community that is accessible to everyone, including non-IEEE members – to allow volunteers to engage with the community at large.
- Special workshops, tutorials, webinars, conferences and publications to provide focus on energy access.



SUBMIT YOUR PROPOSAL NOW!



EMPOWER
A BILLION LIVES



Thank You



In Remembrance of
Braham Ferreira (1958-2021)
EBL Co-Founder & Impassioned advocate