EMPOWER
A BILLION LIVES

Competition Overview

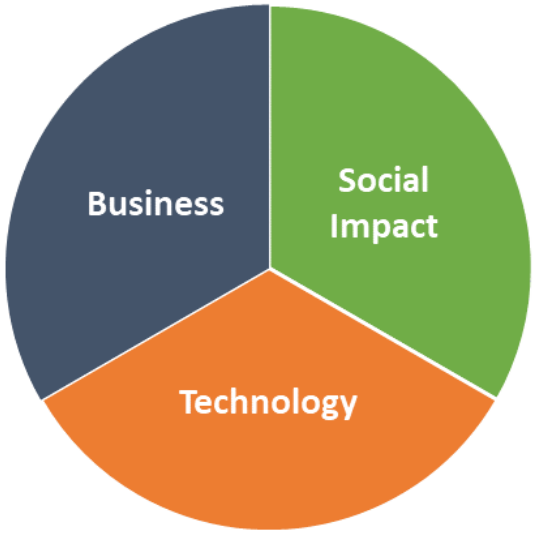
Jelena Popović
University of Twente, The Netherlands

- Dedicated to **Braham Ferreira**, EBL Founder
  - PELS President 2015-2016

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, automated operation

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

- **TRACK D: DECENTRALIZED MODEL**

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

- **TRACK C: CENTRALIZED UTILITY MODEL**

  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)**

  Solutions may include appliances enabling productive use of energy, clean cooking solutions, cooling solutions. Can be a single user or community solution.

- **TRACK E: ENABLING TECHNOLOGIES**

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

- **TRACK S: STUDENT TEAMS**

  Less stringent requirements for field testing, can be done in a suitable environment

- Two groups of end-users: single family and community
- At least Tier 2 ESMAP (World Bank Group) Multi-Tier Framework (MTF)

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"	(> 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	

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	**HIGH ENERGY USE FAMILY:** Expanded System Performance as Family Situation Improves
▪ Min 200 Wh/day or min 50 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	▪ Min 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

Competition Timeline

Important Dates:

- Concept Paper Submission Deadline: 1 Nov 2021
- Decision by: December 15, 2021
- Full Proposal Submission Deadline: 15 February 2022
- Interview with Regional and Global Judges: May 2022
- Field Testing: 1 June 2022 – 31 August 2022
- Global Final: October 2022

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: Interconnected 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
	Value Stacking
Scaling	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


SUBMIT YOUR PROPOSAL NOW!
EMPOWER
A BILLION LIVES