IMERGY POWER SYSTEMS

QER / National Academy of Sciences

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Imergy Company Overview

IMERGY POWER SYSTEMS

- **Leading developer of flow battery Energy Storage Solutions (ESS)**
  - Highly scalable, vanadium redox chemistry
  - Uses recycled vanadium
- **HQ in US (Silicon Valley) and India (New Delhi)**
- **Commercial sales in India, Africa, US, Asia**
- **Extensive IP portfolio with 20 patents**
- **World class, proven, executive leadership team with global experience at Fortune 500**

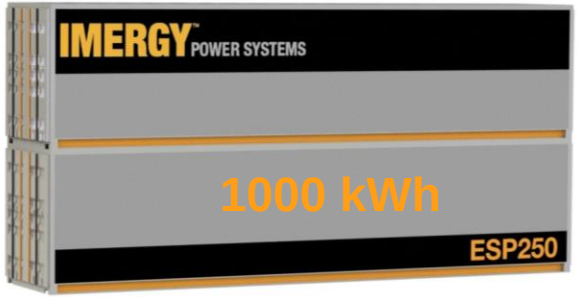
Offices

Fremont, California

New Delhi, India

Investors

BlueRun ventures NEA TECHNOLOGY PARTNERS



Community Microgrids for Empowering the Globe

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- **Next 20 years: world-wide electricity demand expected to increase 60% (per IEA)**
  - >80% of incremental growth from just: Latin America, Africa & Middle East, Chindia
- **About 20% of global population (~1.5 B people) lack access to electricity**
  - Decades and massive capital investment required to build out the grid, large-scale generators
- **Apparent solution: build distributed, self-sustaining, community microgrids**
- **Significant Barriers**
  - ***Finance***: Source of capital/revenue to fund capex and opex of microgrids
  - ***Technical***: Conventional technologies do not address needs of distributed microgrids

Requirements to Build Distributed Microgrids

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- **Local, mini grid / operator**
- **Distributed/ renewable power source, scalable as needed**
- **Suitable energy storage solution to provide firm & dispatcheable power**

Microgrid Market Segmentation

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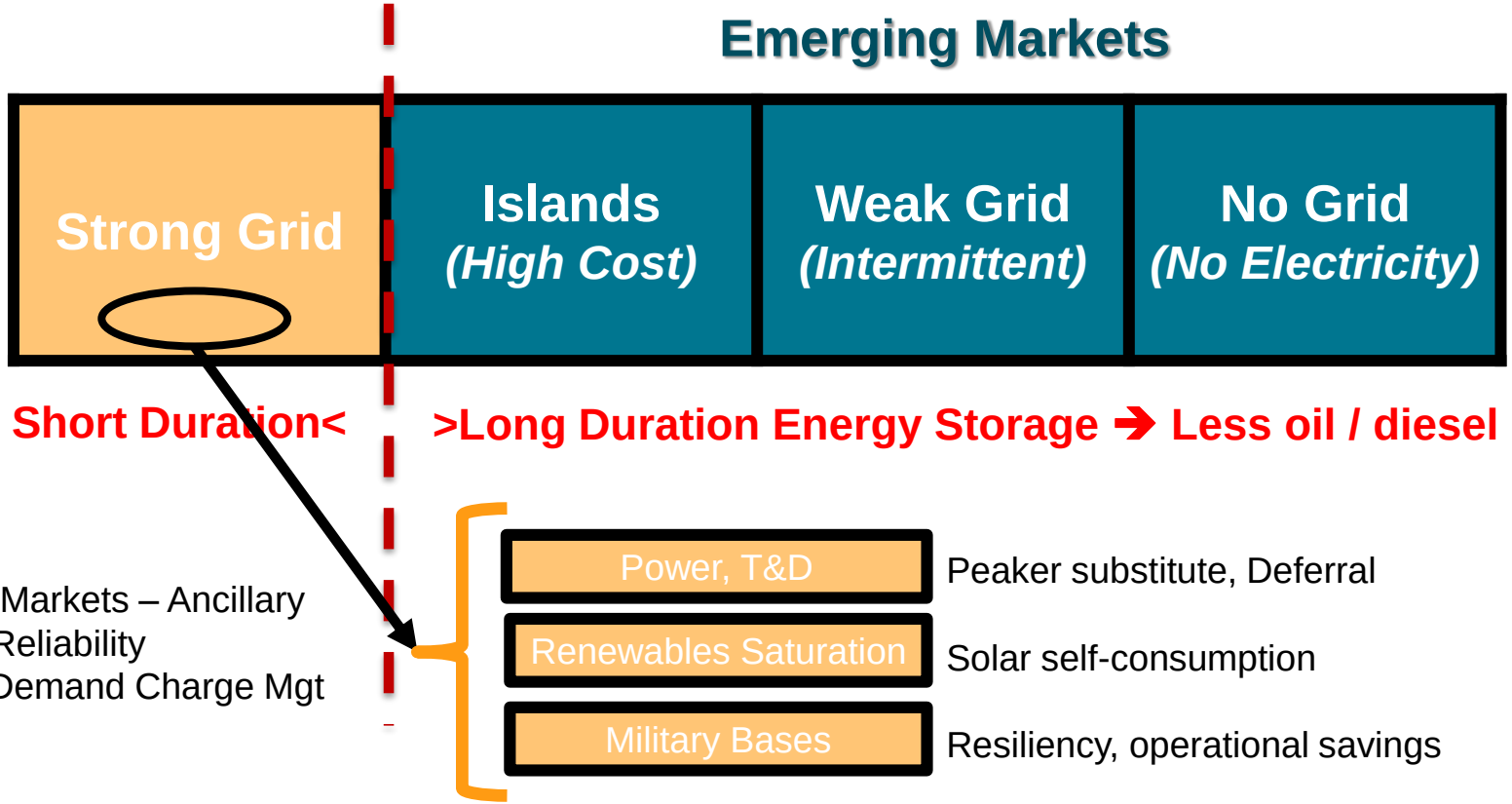

- Power Markets – Ancillary
- T&D –Reliability
- C&I – Demand Charge Mgt

Requirements to Build Distributed Microgrids

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- **Local, mini grid / operator**
- **Distributed/ renewable power source, scalable as needed**
- **Suitable energy storage solution to provide firm & dispatcheable power with particular attributes:**
  - Scalable, long discharge duration
    - *Minimize diesel run hours*
  - Long calendar life (high cycle count) without degradations
    - *Avoid expensive replacements*
  - Robust / harsh environmental conditions
    - *Avoid expensive cooling/heating equipment*
  - Safe and environmentally friendly
  - Low maintenance
  - Low cost (initial costs, lifecycle costs)

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Lead Acid Battery

Lithium Ion Battery

Imergy's ESP Flow Battery Designed for Microgrids

- **Highly scalable, long discharge duration (4 to 8 hours)**
- **Long calendar life (> 20 years), high cycle count (> 100K)**
- **Resilient under harsh environmental conditions**
  - -20 to 55 C operation demonstrated in field (No external thermal management required)
  - ***Full capacity available at all times (100% DOD)***
- **Safe and environmentally friendly**
  - Non-flammable, non-explosive, non-poisonous
  - All components re-usable or re-cyclable
- **Low maintenance, abuse tolerant, theft proof**
  - Secure, steel enclosures (20 foot containers with liquid electrolyte)

Standard 20' Shipping Container

- **Cost effective: solution achieves lowest TCO (total cost of ownership)**
  - Non-degradable electrolyte ➔ High residual value

Case Study: Rural Microgrid in India

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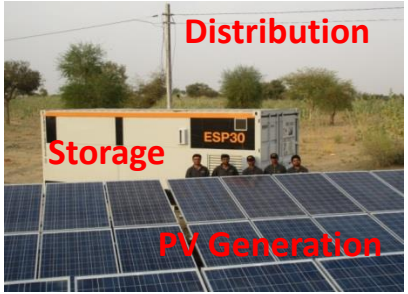
Built in partnership with SunEdison

- 12 – 24 kW anticipated load growth
- 100 Homes, metered connection with load limit per home
- 7 km of wiring and 100 poles, mounted near each home
- 27 kW PV (10 Strings of 3 x 3 modules of 300 Watt each)
- 30 kW x 170 kWh Imergy ESP30 energy storage system
- 2 CFL + Mobile Charging + provision for additional load

Grid Connectivity	Off Grid
Load	12 – 24 kW
PV System	27 kW
Energy Storage Capacity	170 kWh
Ambient Temperature	0C Min to 55C Max



Long Term Field Operational Data (Hot)

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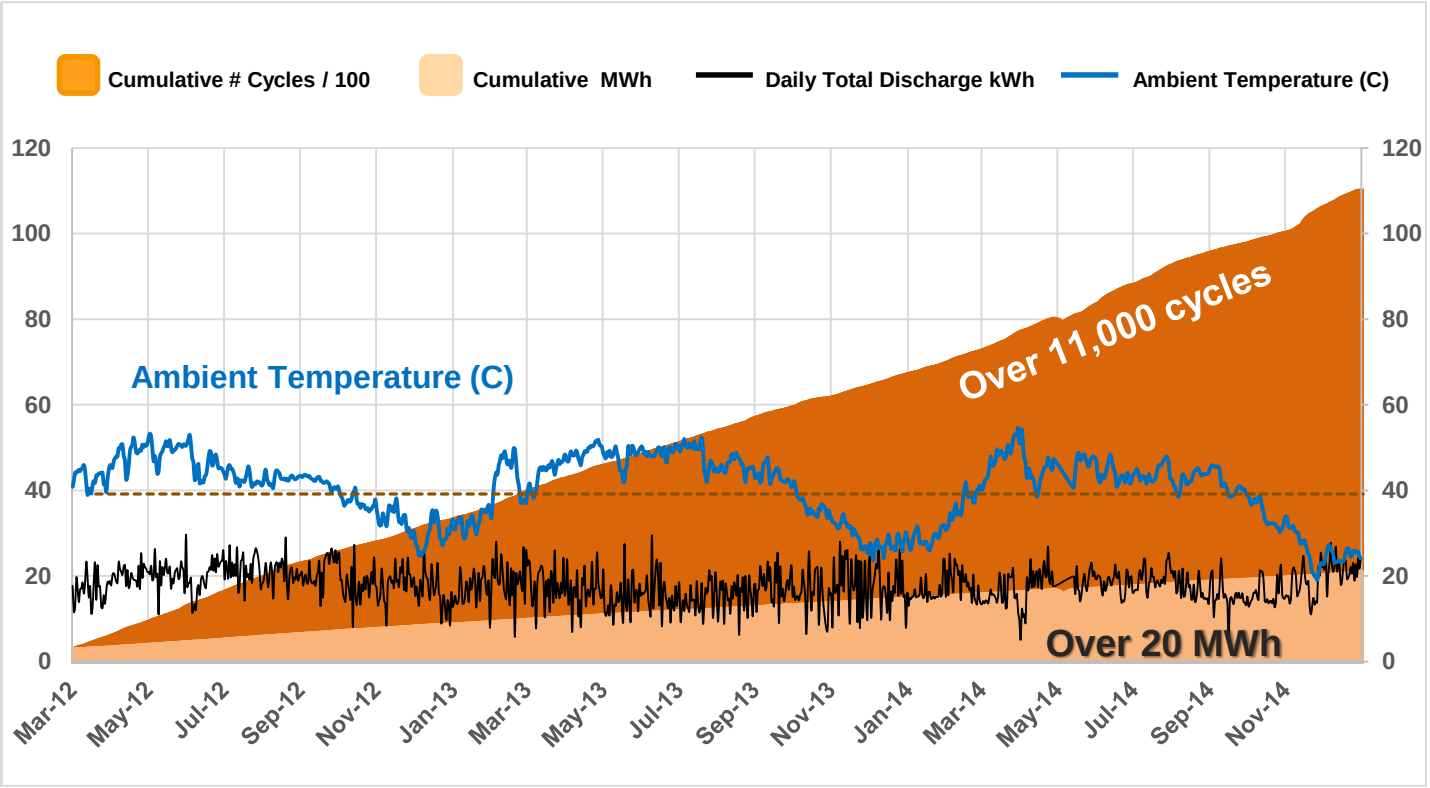
- Imergy's energy storage system installed in Asia
- Field data collected over 3 years
- High temperature tolerance exceeding 50° C / 122 F
- Over 11,000 cycles realized; full and partial
- System delivered stable output ~20 kWh/day
- Over 20 MWh delivered over 3 years



Cold Weather Operational Data

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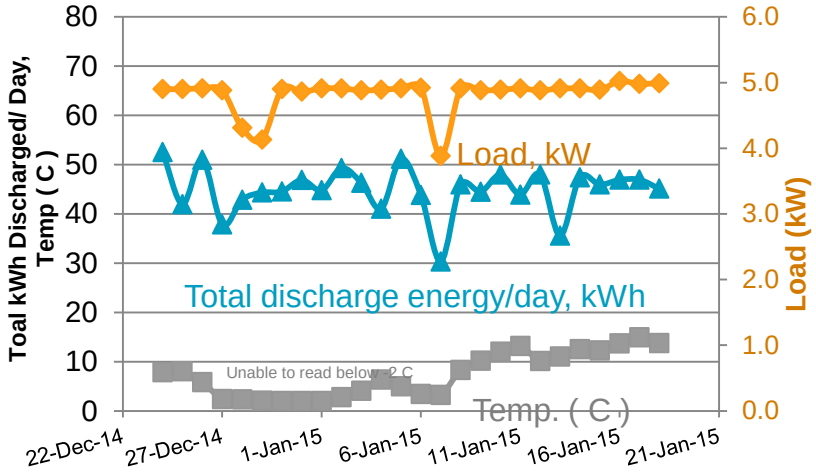
Installation date	19-Dec-14	20-Dec-14
Site Name	Trojane-1	Trojane-2
Country	Slovenia	

- **3 to 4 cycles/day**
- **45 kwh /day/ system**
- **Temperatures *below -10 C***



Case Study: College, India

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Case Study: Remote Telecom Towers (India, Africa)

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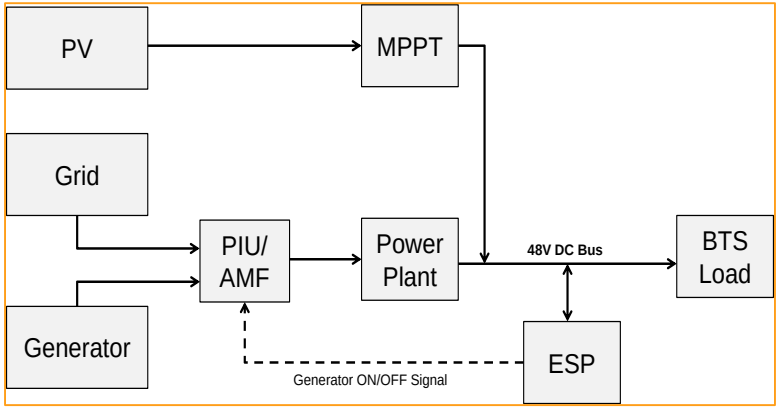
Site Name	Bairiya	Daniawan
Grid Connectivity	Off Grid	Weak Grid
Load (kW)	3.1	2.1
PV (kW)	4.5	6.5
Install Date	1/29/15	2/4/15



Exploiting Telecom and Microgrid Synergy

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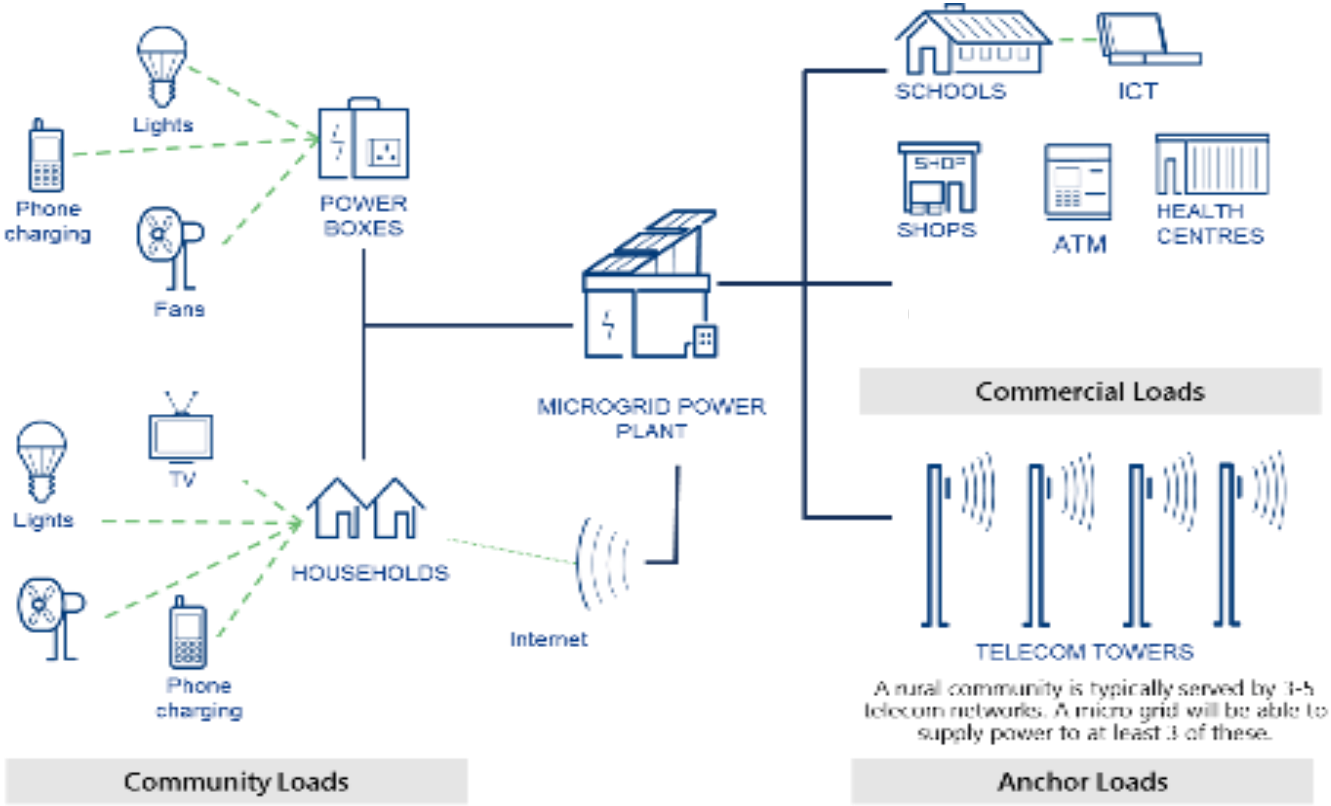

Imergy Energy Storage Solutions

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A leading solutions provider of commercially available, high performance and cost-effective energy storage systems based on innovative vanadium redox flow technology for on- and off-grid applications

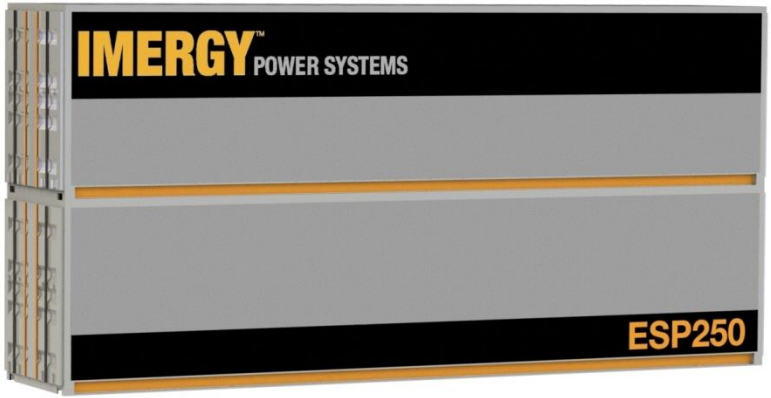
30 kWh

ESP5: small load

200 kWh

ESP30: medium load

1000 kWh



ESP250: large load

(Not to Scale)

QER Recommendations

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- **Expand recognition/support of flow batteries beyond DOE (to other federal departments and agencies)**
- **Reduce threshold, transaction cost for financing ESS**
- **Proactively qualify flow battery technology for financing**
- **Facilitate connecting microgrid technology suppliers to cooperatives (“exchange”)**

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Thank you

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