



Actualizing Energy Storage in Emerging Markets

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RTI International is an independent, nonprofit research institute dedicated to improving the human condition. We combine scientific rigor and technical expertise in social and laboratory sciences, engineering, and international development to deliver solutions to the critical needs of clients worldwide.

International Development Core Areas:

- Education
- Energy for Development
- Climate, Nat'l Resources, Water
- Food Security & Agriculture
- Global Health
- Governance
- Integrated Learning Solutions
- Monitoring, Evaluation, Research, Learning, and Adapting (MERLA)
- Youth Economic Opportunity

Energy for Development Capabilities:

We are experts in strengthening electric utilities, energy efficiency and demand-side management, understanding energy markets and cross-border trade, energy sector governance and regulatory reform, and increasing off-grid energy access.

RTI Staff by Region:

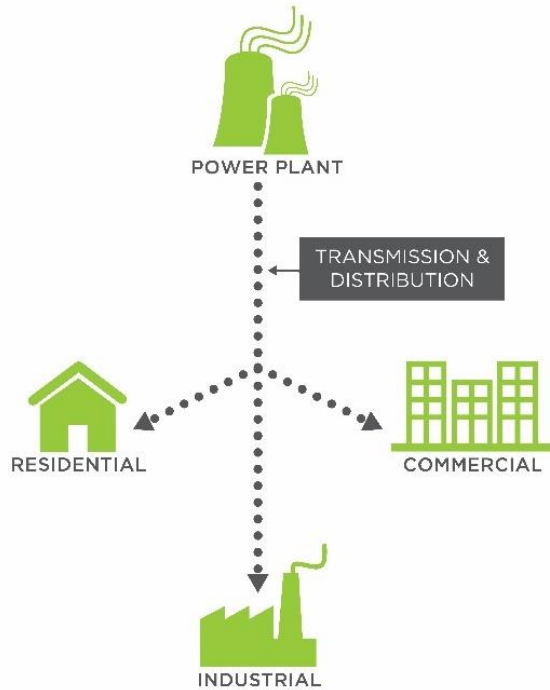


12 
U.S. Offices

13 
International Offices

The Emergence of the Smart Grid

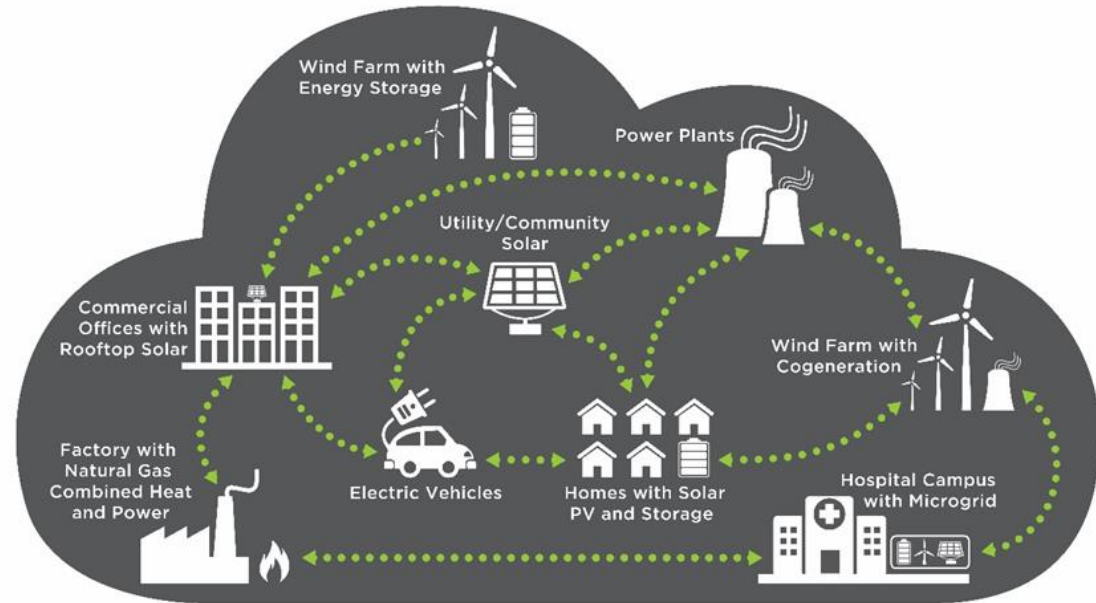
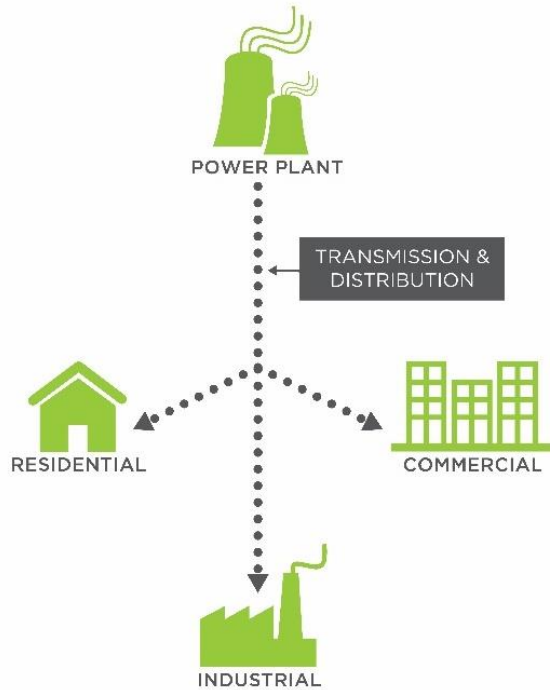
TODAY: Traditional Power Grid
Central, One-Way Power System



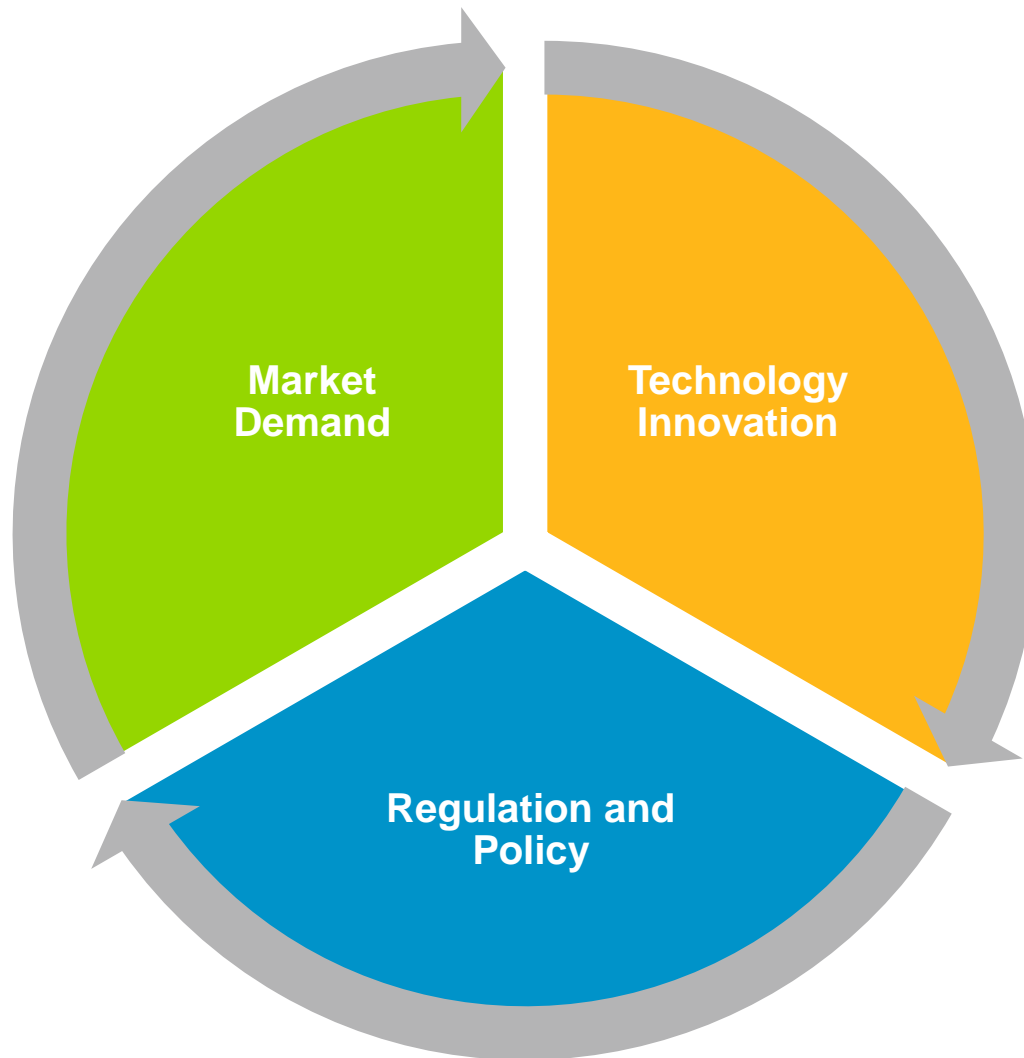
The Emergence of the Smart Grid

TODAY: Traditional Power Grid
Central, One-Way Power System

EMERGING: The Energy Cloud
Distributed, Two-Way Power Flows



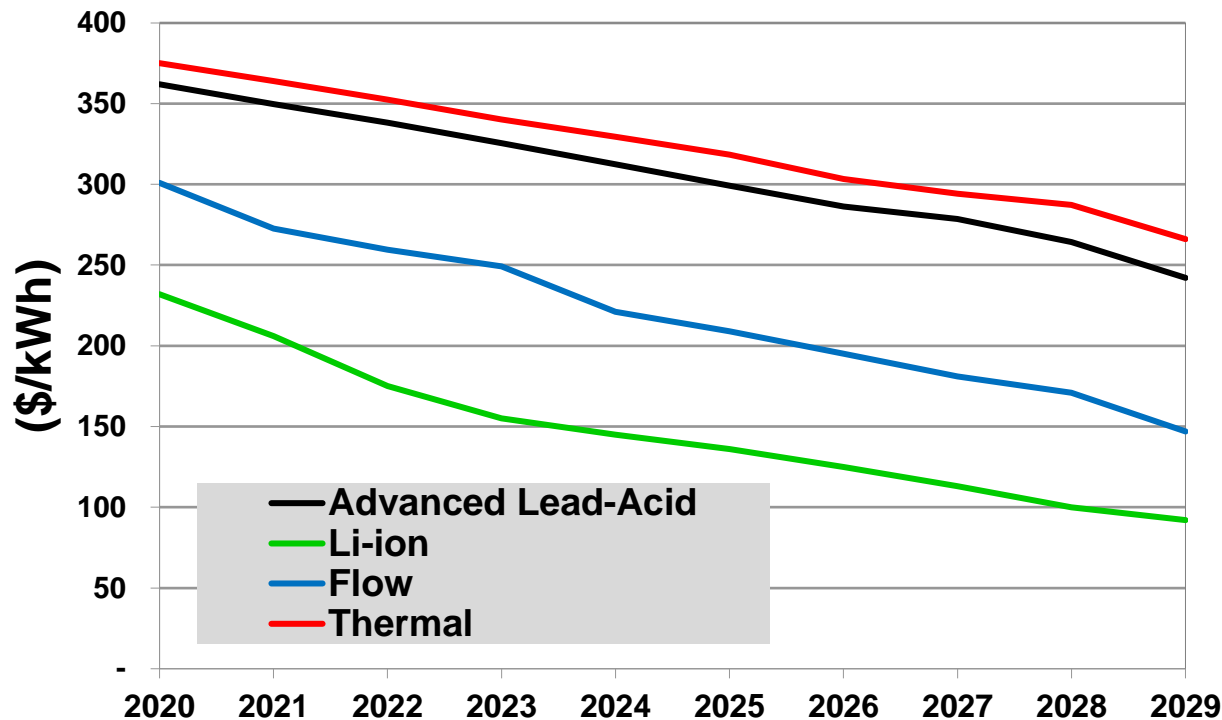
Disruption is a prevailing and un-compromising threat to our industry.



Drivers for Energy Storage Adoption

- ✓ Allow more variable renewable energy to be deployed
- ✓ More productive use of energy, particularly in off-grid applications
- ✓ Rapidly declining technology costs

Advanced Battery Price Forecast, Global Market Averages: 2020-2029



Barriers for Energy Storage Adoption

- ❑ Making business models and stacked revenue streams justify CAPEX
- ❑ Uncertainty of how benefits translate to operational efficiency
- ❑ Grid safety and security



Key Concerns from Utilities in Emerging Markets

Rise of Ancillary Services

Adoption of renewable energy sources, increasing population, and new industries with special power requirements are driving the need for increased grid flexibility.

Key services include

- Frequency control
- Voltage Support
- Congestion Management
- Black Start

Key Concerns from Utilities in Emerging Markets

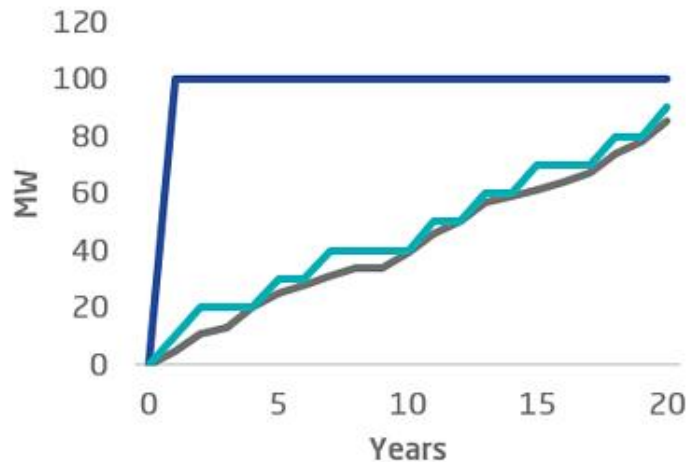
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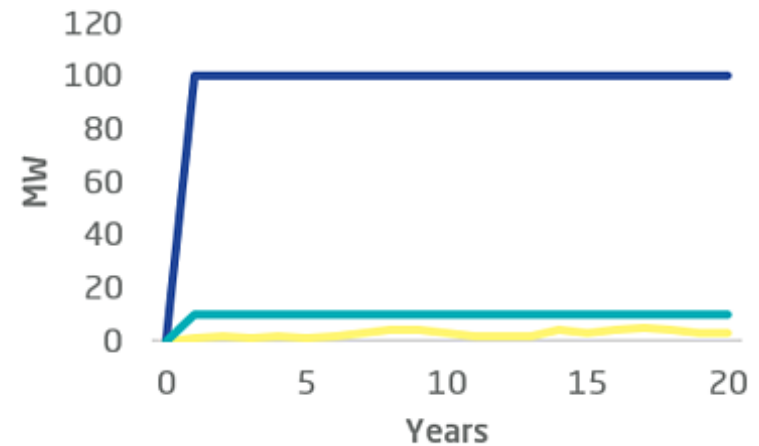
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- Voltage Support
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- Black Start

B) High Load Growth



— High Load Growth — T&D Capacity
— Energy Storage

D) Low Load Growth



— Low Load Growth — T&D Capacity
— Energy Storage

Conclusions

- Advanced energy technologies in developed markets are trickling down into emerging markets
- Developing policy that adequately reflects the value of storage is important for future growth in emerging economies
- Declining system prices have largely driven emerging energy markets to consider more storage
- Safety and security must be prioritized to improve project economics over the lifespan of the asset
- Ancillary service markets and energy storage will grow simultaneously in many emerging markets

