



# “Smart Cities and the ‘Utility’ of the Future”



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Who we are

# ABOUT VRINDA

# Thought Leadership



New York REV a bold vision but implementation approach may not benefit industry as well as utilities



New York REV demonstration projects, right approach to understand DER value



Retail competition is back without regulatory changes driven by customer choice



Business model transformation key to utilities future as Distribution Service Providers.



Could iTunes™ be the model for Utilities of the future . An Architecture for Utilities As ENERGY SERVICE PROVIDER platform



Capability maturity model for Utility of the Future - Utility 2.0



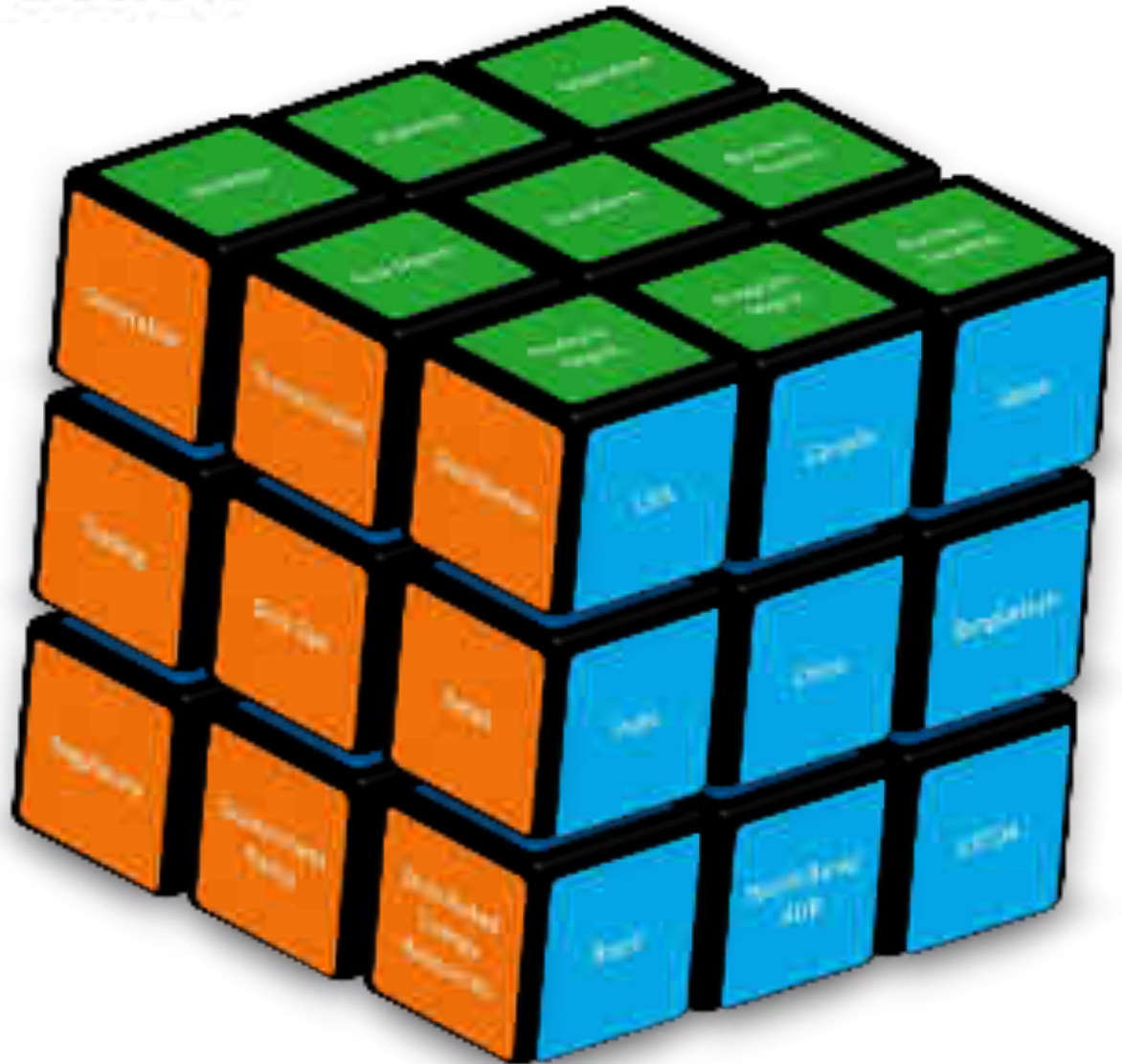
# Introduction

Navneet Trivedi  
Co-Founder and COO

- ✓ 24 + Years in Energy & Utility Sector
- ✓ 100+ Utilities
- ✓ Across the value chain from strategy to implementation
- ✓ In 8+ countries

## Values

- Integrity
- Trusted relations
- Passion
- Commitment



Why are we here today...

# CONTEXT

# Why are we here...

- Cities are center of human civilization
  - Cities are home to over half of the world's population
  - Cities are expected to grow to 5.1 billion people by 2030
  - Cities are increasingly centers of special, cultural and economic growth
- Pain of growing cities...
  - There is an exodus of young people in particular from rural areas to large cities in search of professional opportunities
  - Densely populated and highly urbanized regions concentrate disaster risks
  - Cities are becoming more vulnerable to climate change
- Access to energy is fundamental for economic prosperity
- Utility industry is not prepared to support urban challenges
  - Reliability and Quality pursuits leading to higher costs
  - Resiliency a key requirements but not provided by utilities
  - There is no interconnection between Electricity, water and waste management and urban transportation
- We are here to debate “Smart cities and Future of utility industry”

# Challenges of Urbanization

## Daily challenges

- **Stressed infrastructure** – transportation, electric delivery (peak) - Congestion
- **Constrained resources** – Water, clean air
- **Unplanned growth**
- **Poor quality** – service delivery outage, restoration,
- **Climate change**

## Catastrophic challenges



- In US, the annual average number of power outages related to severe weather and affecting more than 50,000 customers doubled between 2003 and 2012
- Duration of outage is on average 14 hrs. every two years
- 25 million customer hour lost per year from 2008-12

Utilities inadequate response...

# CURRENT UTILITIES APPROACHES



# Smart cities

...are Utilities ready to support

Number of outage  
Duration of outage

Reliability



Quality



Voltage  
Harmonics  
Flicker

Affordability



Cost of electricity

Resiliency



Ability to provide electricity  
during severe weather event

# Are utilities relevant for 21<sup>st</sup> century needs?

## Utilities expensive solutions

- Making billions of dollar investment in poles and wires hardening which will fail during storms!
- Significant investments in the name of grid modernization in outdated technologies  
AMI/ Smart meters
- Still working on developing grid of the past for needs of the future








10-year, \$10-11 billion New York utilities investment in upgrading and modernizing electric grid.

10-year, \$2.6 billion ComEd investment in upgrading and modernizing Illinois' electric grid.

# 5 Key challenges for utility industry

Global experience suggest that five main challenges are likely to influence the impact of sustainability on affordability and reliability

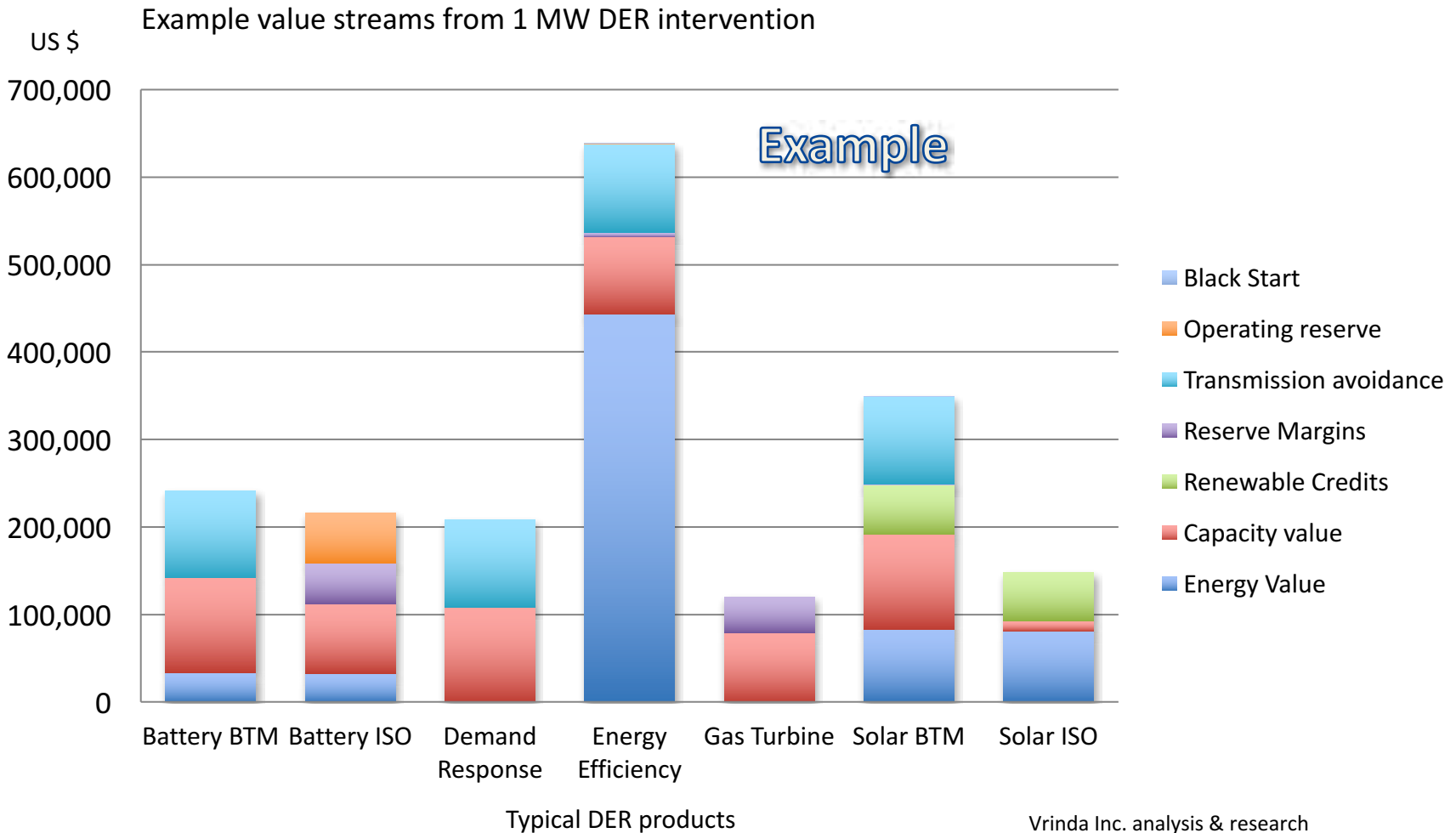
	Challenge	Cause	Impact
 <b>Generation</b>	Generation / demand matching	Growing renewable deployment will reduce traditional generation needs but require back up	<ul style="list-style-type: none"> <li>▪ Additional generation capacity will increase costs</li> <li>▪ Supply-demand balancing creates reliability risks</li> </ul>
 <b>Transmission</b>	Rightsizing transmission	Grid investment is needed BUT a distributed system could reduce transmission need	<ul style="list-style-type: none"> <li>▪ Investment leads to costs that could be stranded</li> <li>▪ Underinvestment = constraint costs / reliability risks</li> </ul>
 <b>Balancing</b>	Maintaining balanced markets	Supply / demand matching is more complex and close to real time balancing may be needed	<ul style="list-style-type: none"> <li>▪ Mismatched supply / demand threatens reliability</li> <li>▪ More expensive generation increases costs</li> </ul>
 <b>Distribution</b>	Distribution engagement	Utilities have a limited understanding of the DSO role and rates do not support DERs	<ul style="list-style-type: none"> <li>▪ Utilities do not support demand side products that could have reliability or cost benefits</li> </ul>
 <b>Customers</b>	Engaging the demand side	Customers do not understand demand side options and may not change behaviour	<ul style="list-style-type: none"> <li>▪ Economically viable demand side products are not used; potentially increasing costs</li> </ul>

Utility of the Future

# WHAT IS NEEDED

# Leverage value of Distributed Resources

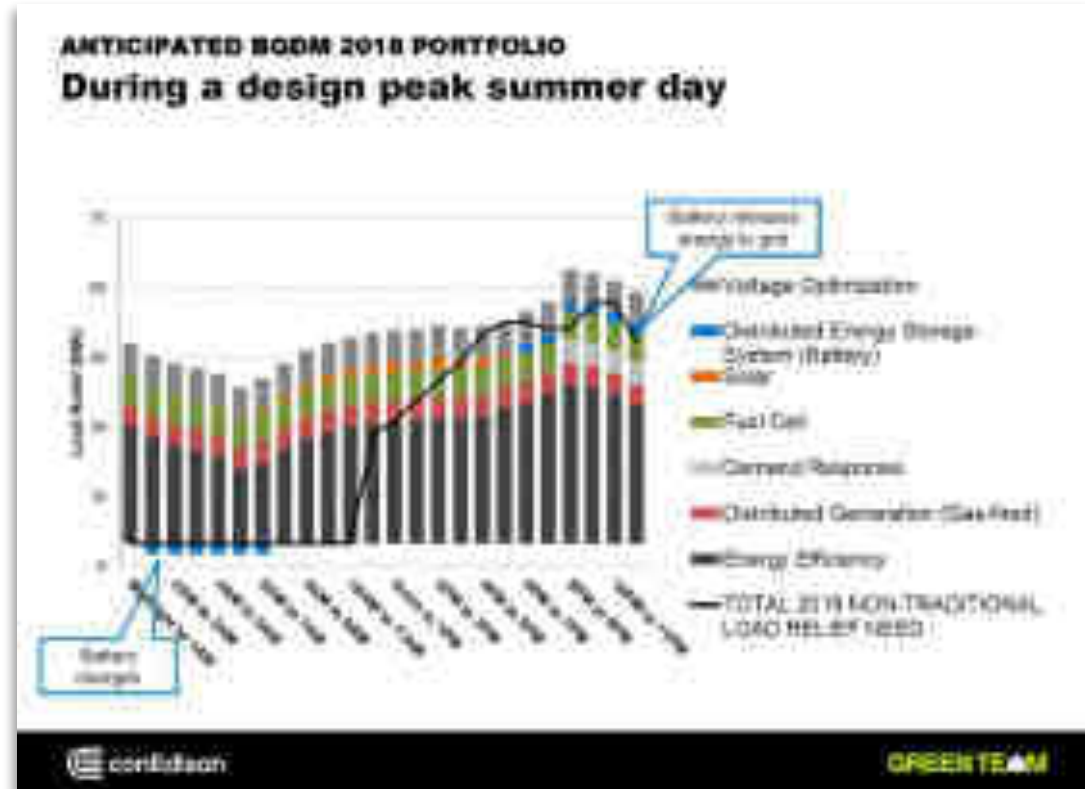
## What Makes the Difference? – How you value DERs



# Provide Non Wires Alternative (NWA)

Value: Asset Utilization, Renewable Integration & Cost Savings

- ✓ Power system average asset utilization factor is below 50% - Far below other capital intensive industries
- ✓ Most commercial & residential demand can be shifted in time
- ✓ If wholesale loads settled on actual demand, suppliers could compete to efficiently manage demand
- ✓ Customization -> consumers could choose:
  - Lower flat price in exchange for demand management
  - Dynamic retail price, OR Dynamic retail price + custom price hedge
- ✓ With smart devices, demand can be shifted to lower cost intervals, flattening load curves



# Adopt Energy Storage

Energy storage has taken away argument against renewables intermittency

Cost of storage expected to decrease by ~40%

Revenue for storage companies increased by 54% in 2016

Storage provides multiple values if utilities can monetize

## Grid scale

- Frequency response
- Peaker replacement
- T&D deferrals
- Renewable integration

## Behind the meter

- C&I demand charge savings
- Microgrids and Islanded operation
- Roof top capacity factor improvement



# Promote Urban mobility

## Electric Vehicles

- Electric vehicles will be 35% of total cars sold by 2040
- By 2022, electric vehicles will cost the same as their internal combustion counterparts.
- More electric vehicles will be sold in 2040 than ICEs
- In short term, EVs will be 3-5% but reach 50-90% of all vehicles sold by 2040
- On an average, utilities will increase sale of electricity by 8-9% adopting EV's
- EV charging is key opportunity



# That's why Utilities are offering \$10,000 rebate!

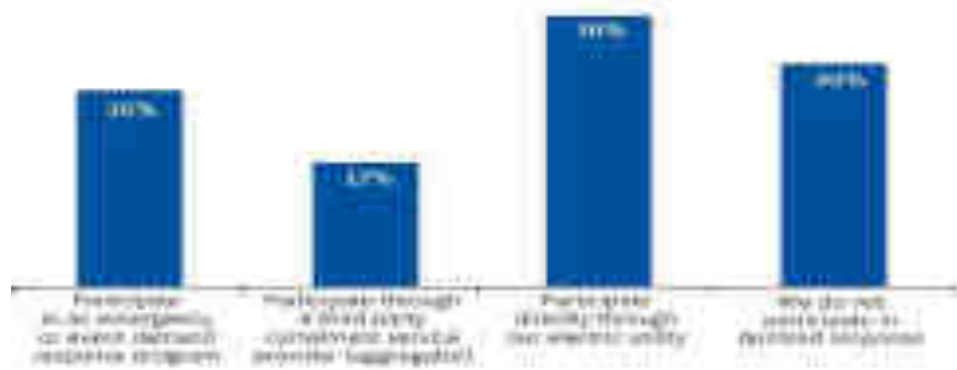
The image is a screenshot of a utility company website. At the top left is the logo for "GREEN MOUNTAIN POWER". To its right are navigation links for "Service & Support", "Products", and "My Account". A search icon is located in the top right corner. The main content area features a large photograph of a house with solar panels on the roof. Overlaid on the bottom left of this photo is the text "Powerwall. Energy when you need it." Below this text is a small "Get it all" link. To the right of the main photo is a vertical list of three promotional cards. The top card, which is circled in blue, has a "Product" header and text that reads "Receive \$10,000 off the purchase of an electric Nissan Leaf." Next to this text is a small image of a silver Nissan Leaf. The middle card has a "Product" header and text that reads "By paying electric rates based on a floor pump, you'll save thousands." It is accompanied by a small image of a green plant. The bottom card has a "Product" header and text that reads "Save during peak times with our smart products." It is accompanied by a small image of a smart thermostat.

# Use Energy efficiency as a service

## EE and DR are market resources now

- Energy efficiency market bigger than supply side investment ~ USD 360 billion in 2012
- Average 50% organizations in 2016 are paying attention to Energy efficiency, Brazil averages 81%
- Brazil's gross demand doubles but net demand remains flat till 2040
- Value of energy efficiency is highest among different DER options

Demand response programs engaging market

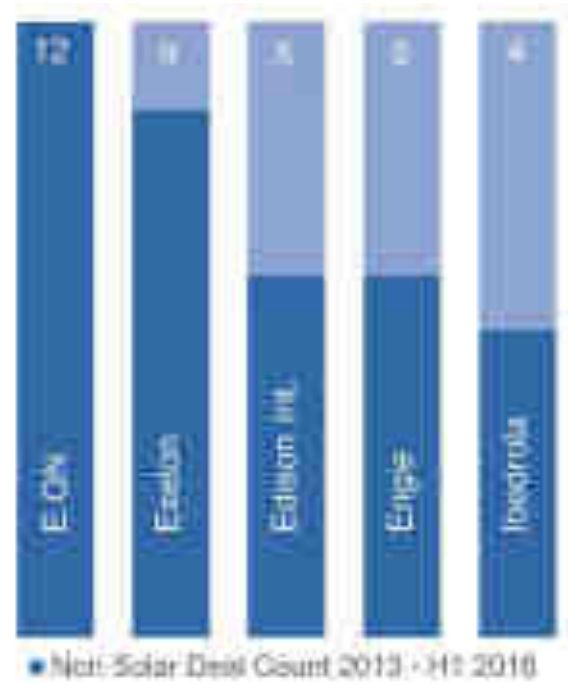
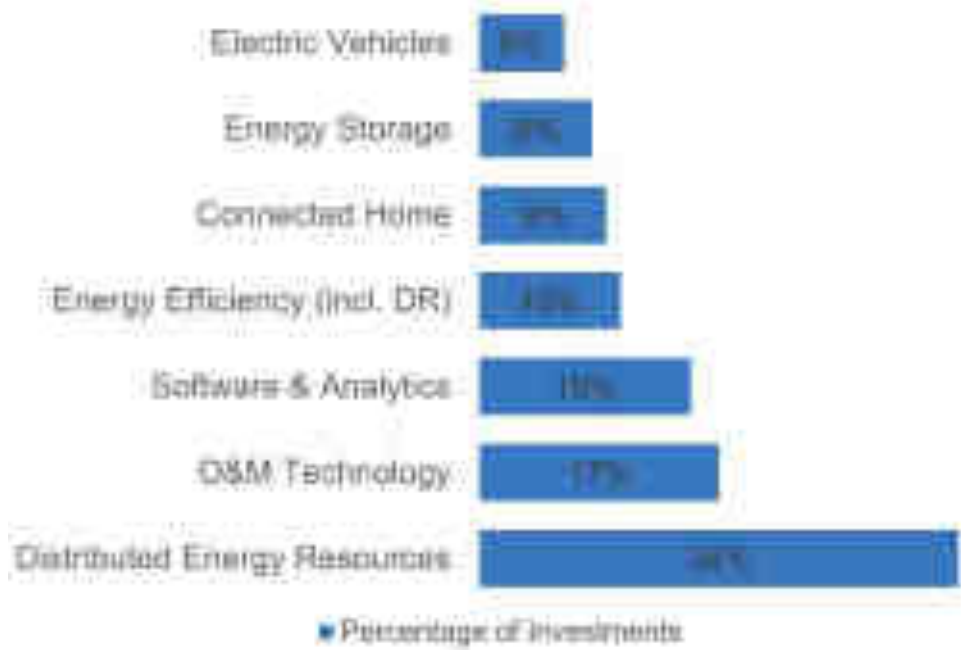


Do you participate in demand management programs? (select all that apply)

2014/2016 energy efficiency indicator survey

# How Utilities are Investing at the Edge

60-70% investment in Distributed Energy Resources



Business Models

# WHAT UTILITY INDUSTRY NEEDS TO PREPARE?

# Utility 2.0 and DERs

## What is Utility 2.0

*Utility 2.0 – A business transformation leveraging DERs in utilities current and future business operations*

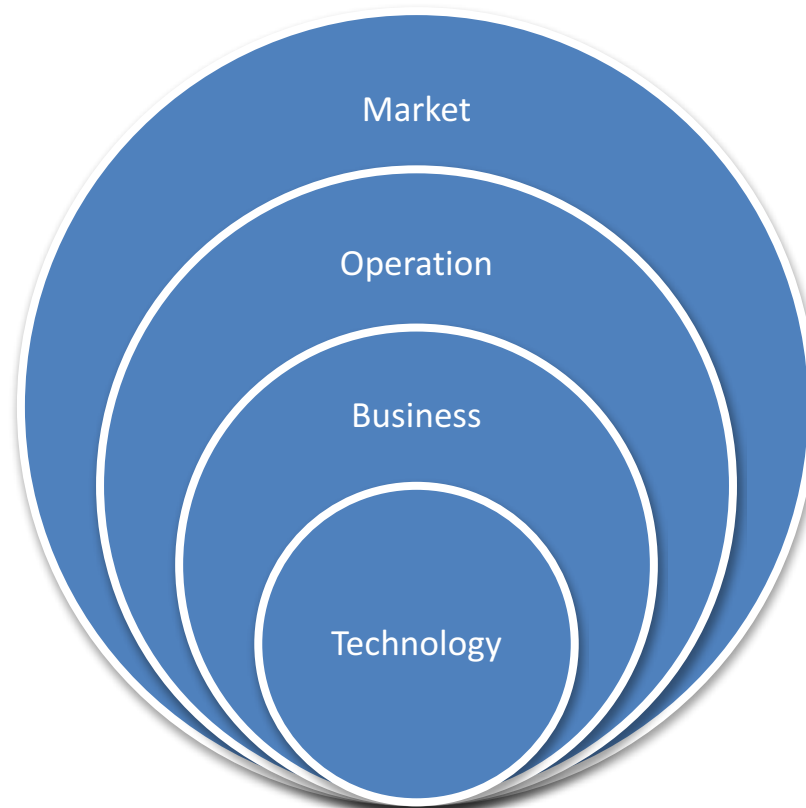
*Distributed Energy Resources (DERs) -includes renewable generation, energy efficiency, demand response, electric vehicles, energy storage*

# Key questions for the utilities

- What role will the customer play, and how can customer engagement be optimized?
- What should utilities be in the future?
- What services and value should they provide and to whom?
- What is the role of the industry/markets and how utilities will interact with key players in market?
- What capabilities utilities/ industry need and when to play in the future market scenarios?

# What is Utility 2.0 model

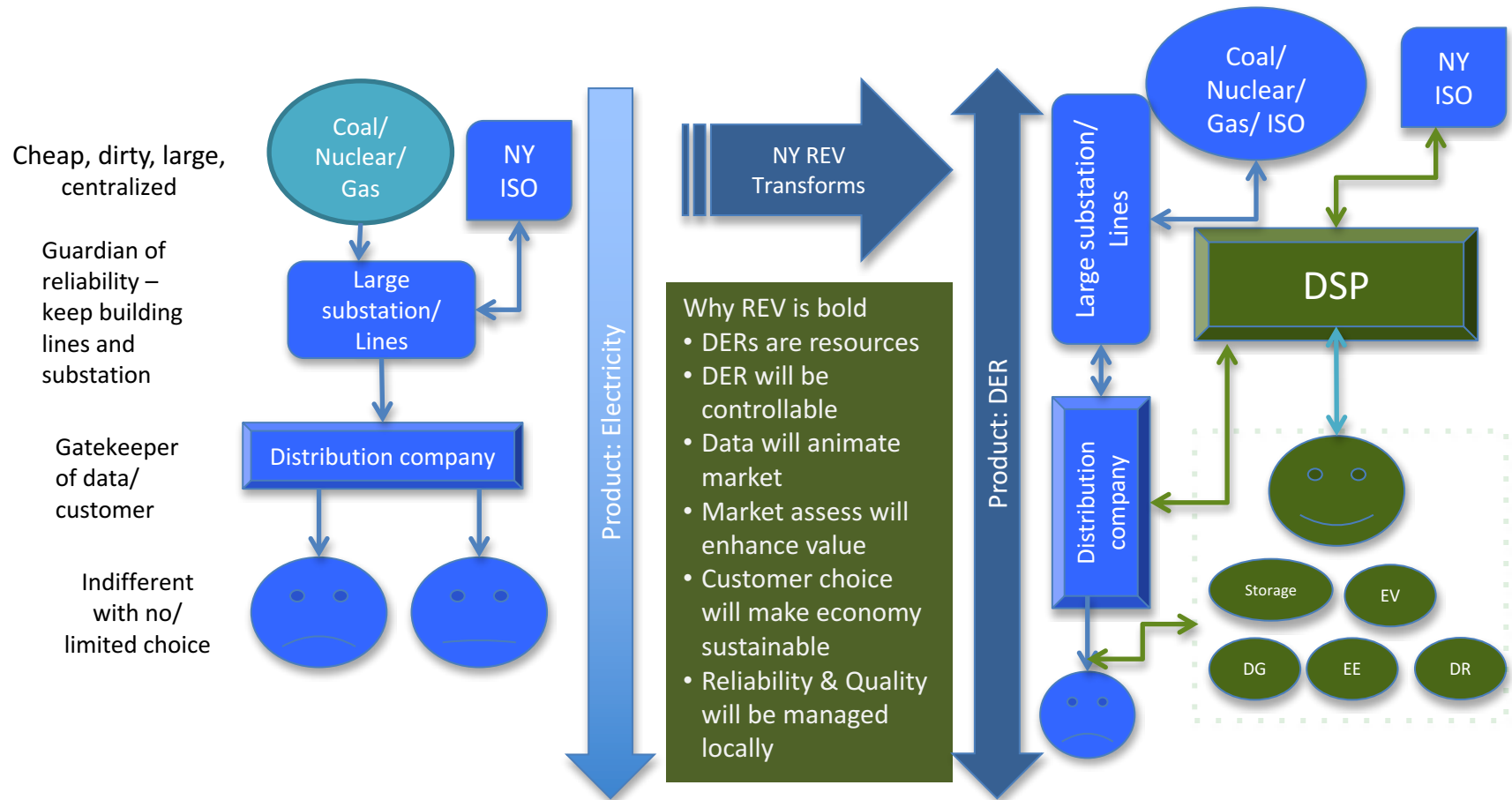
A Distributed Energy Resources led utility model transformation



**Technology, Operations, Business and Market** capabilities maturity in each dimension determines level of sophistication of **Product** and Services to deliver **Value** to the **Customers**

# Operating models are evolving

NY REV is a bold vision...



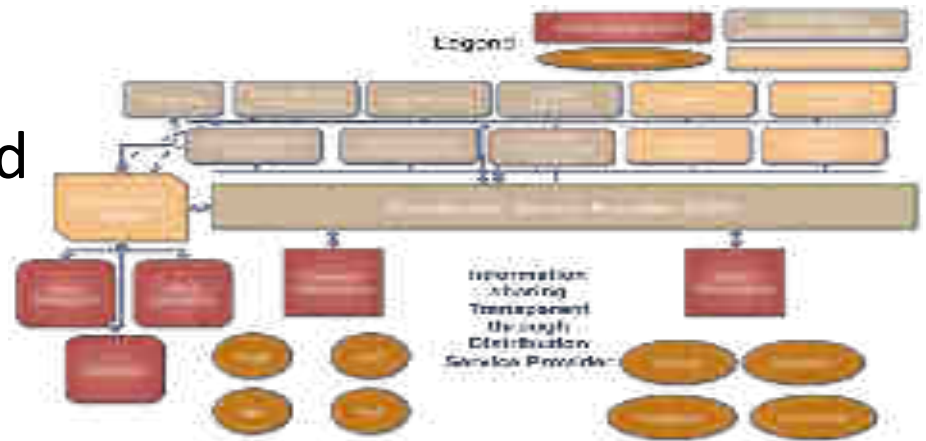
## From Electricity provider to Service provider



# Technology models

Should bring true integration of technologies

- Current DER technology deployment is making utilities more nervous
- Multiple technologies need to be able to talk to each other
- Standards and model for technology platforms creation required



Interoperability is a key to integration of technologies

# Market models will change

## wholesale markets not designed for DERs

- Need **level playing wholesale markets** which can recognize all resources as per their value
- Change the definition of reliability and how we manage it
- Agree on **value of distributed resources**
- Demonstrate value of DER resources

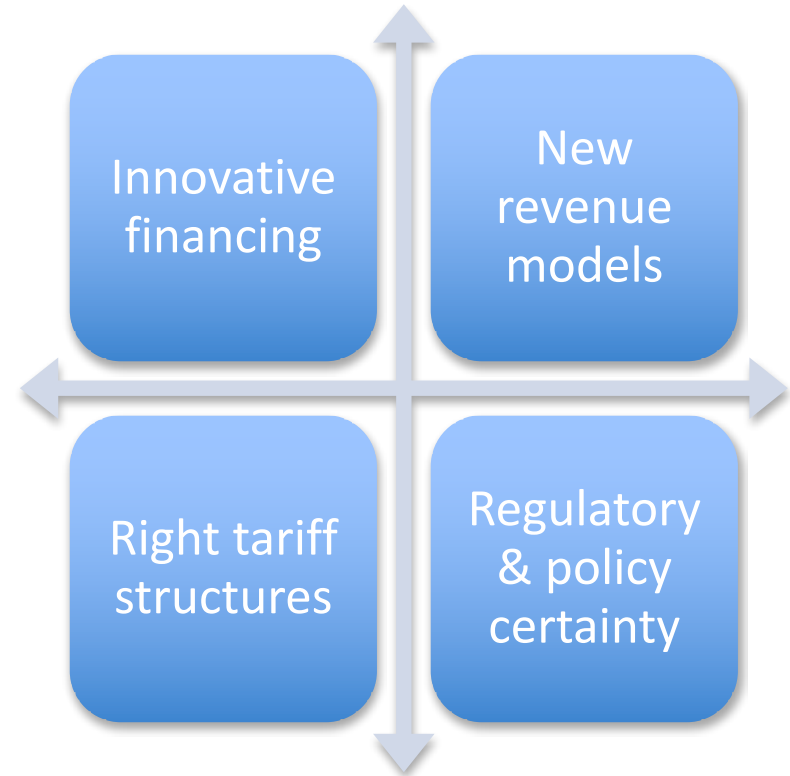


Redesign of ISO/ power markets!

# Business model

Should focus on long term play

- Financing renewable technology is not traditional start up game
- Have to find new way of charging for the value delivered
- Long term policy certainty is a must to attract investment
- Utilities need to prepare for customer centric approaches



## Persuade investors for long term view!

Utility 2.0 capabilities

# HOW TO DEVELOP

# Planning with Distributed energy



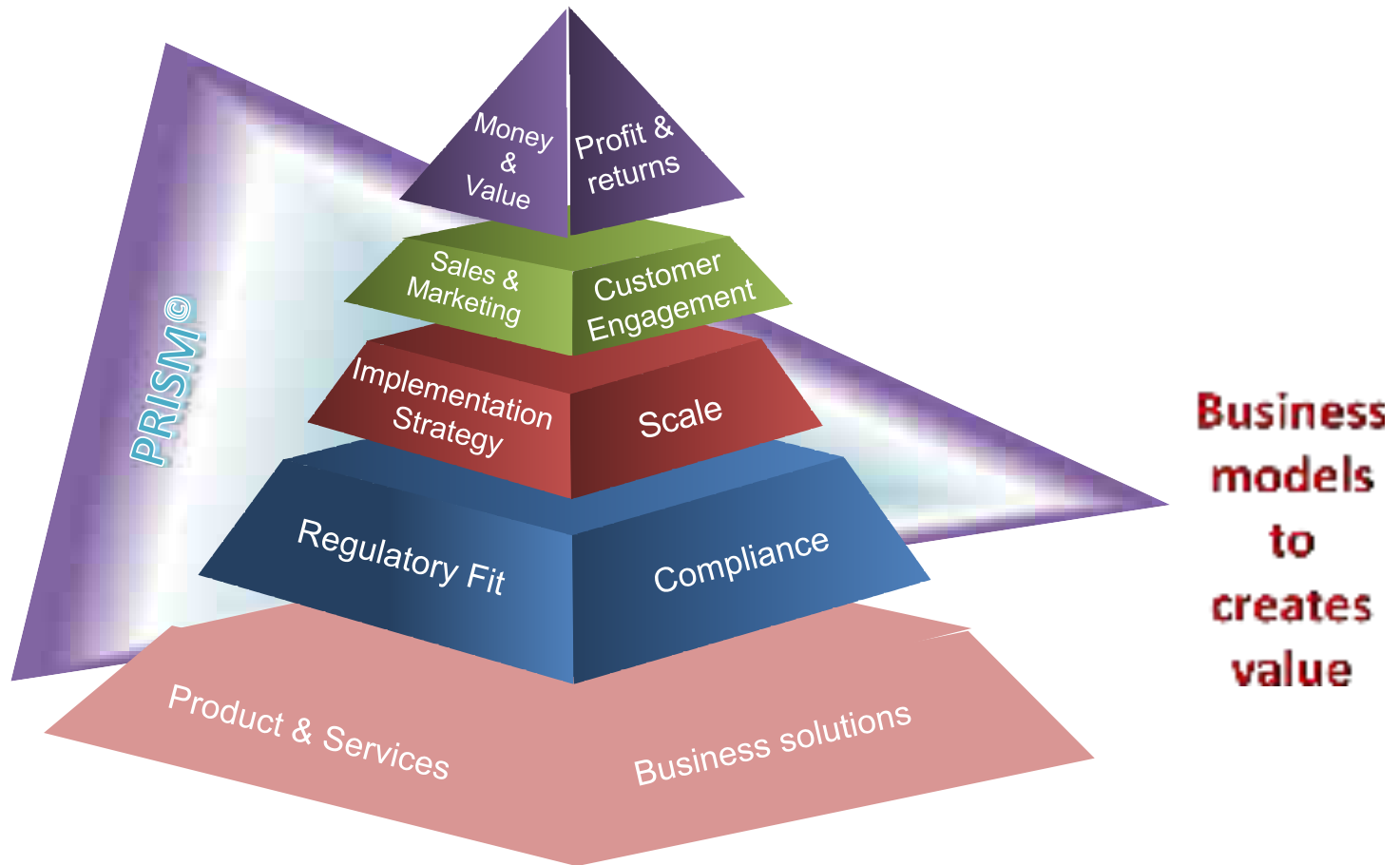
## DISTRIBUTION SYSTEM PLANNING ANALYTICS:

- ❖ **Forecasting:** Future case scenarios that predict DER growth penetration levels and associated impacts to the grid using engineering criteria such as voltage limits, thermal overloads, voltage variability, feeder power factor etc.
- ❖ **Mitigation:** Identify the strategies that best align with utility objectives such as system reliability, power quality, carbon reduction and cost
- ❖ **Capital Resource Planning:** Identify high value locations for capital improvements or non-wires alternatives

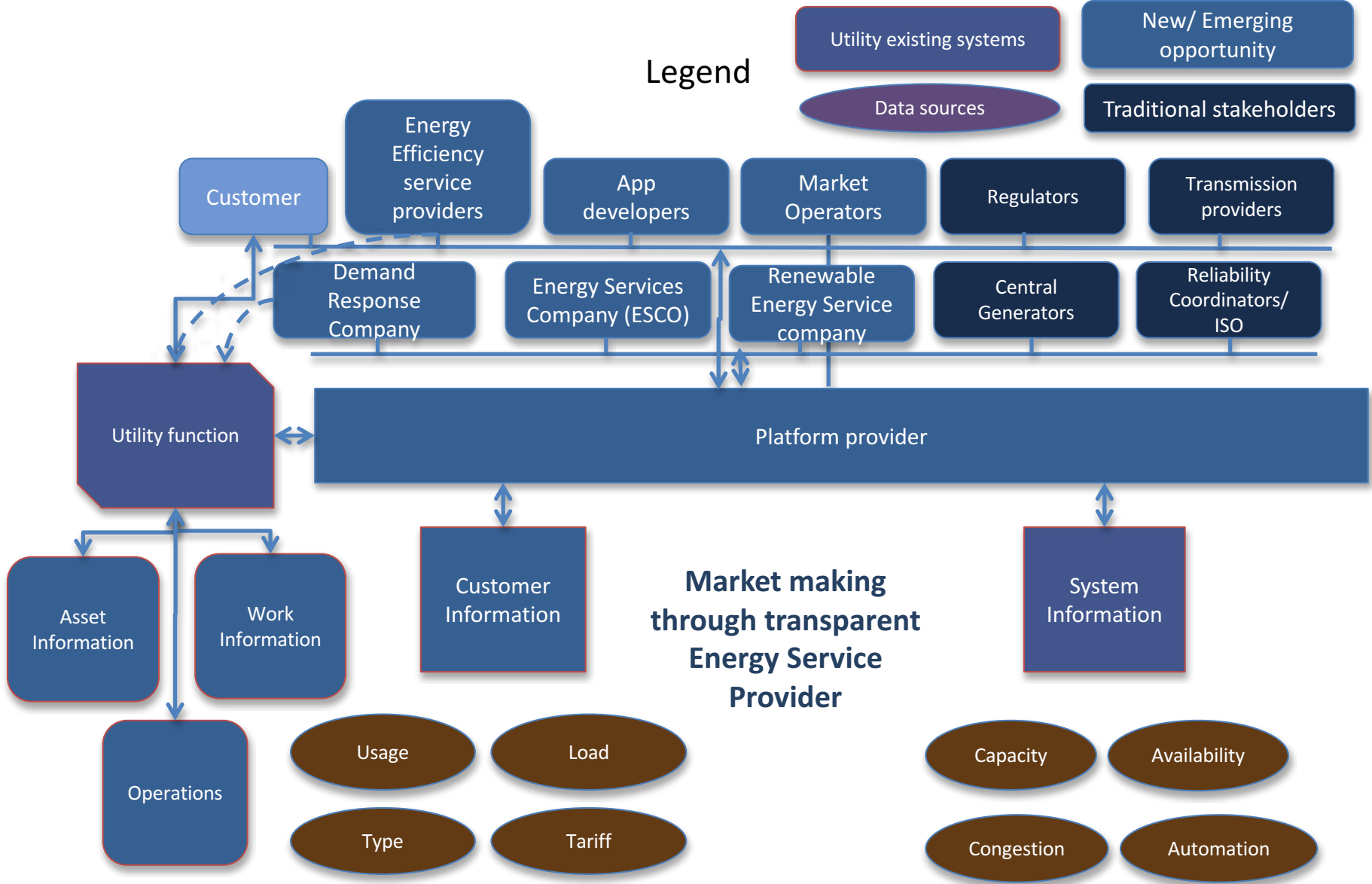
## CREATING A NEW UTILITY OPERATIONAL MODEL

Source: Gridunity – Interconnection portal

# Business model development



# Utility 2.0 – An Energy Service platform



# In Conclusion

- Utility industry is under a profound change
- Everything is up for debate – plan to operate, Market to customer engagement
- Customers are becoming important as they are learning choices!
- Technologies are disrupting but Business model innovation is key to successful transition
- New Business and revenue opportunities are available, need to develop focused offering
- This is once a life time opportunity for us in the sector to redefine utility industry...
- Collaborate and work together to build legacy!



# Thank You



## About Vrinda Inc.

Vrinda Inc. is a New York based business and technology innovation firm. Vrinda Inc. creates success in your business through focus on value creation by providing trusted, actionable advice and practical solutions. We work at the intersection of solution providers and utilities/energy companies to translate technology into business value. We provide business and technology solutions to Energy, Utility and Transportation sector

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