



**NC SUSTAINABLE  
ENERGY ASSOCIATION**

**Energy Storage in the Southeast**

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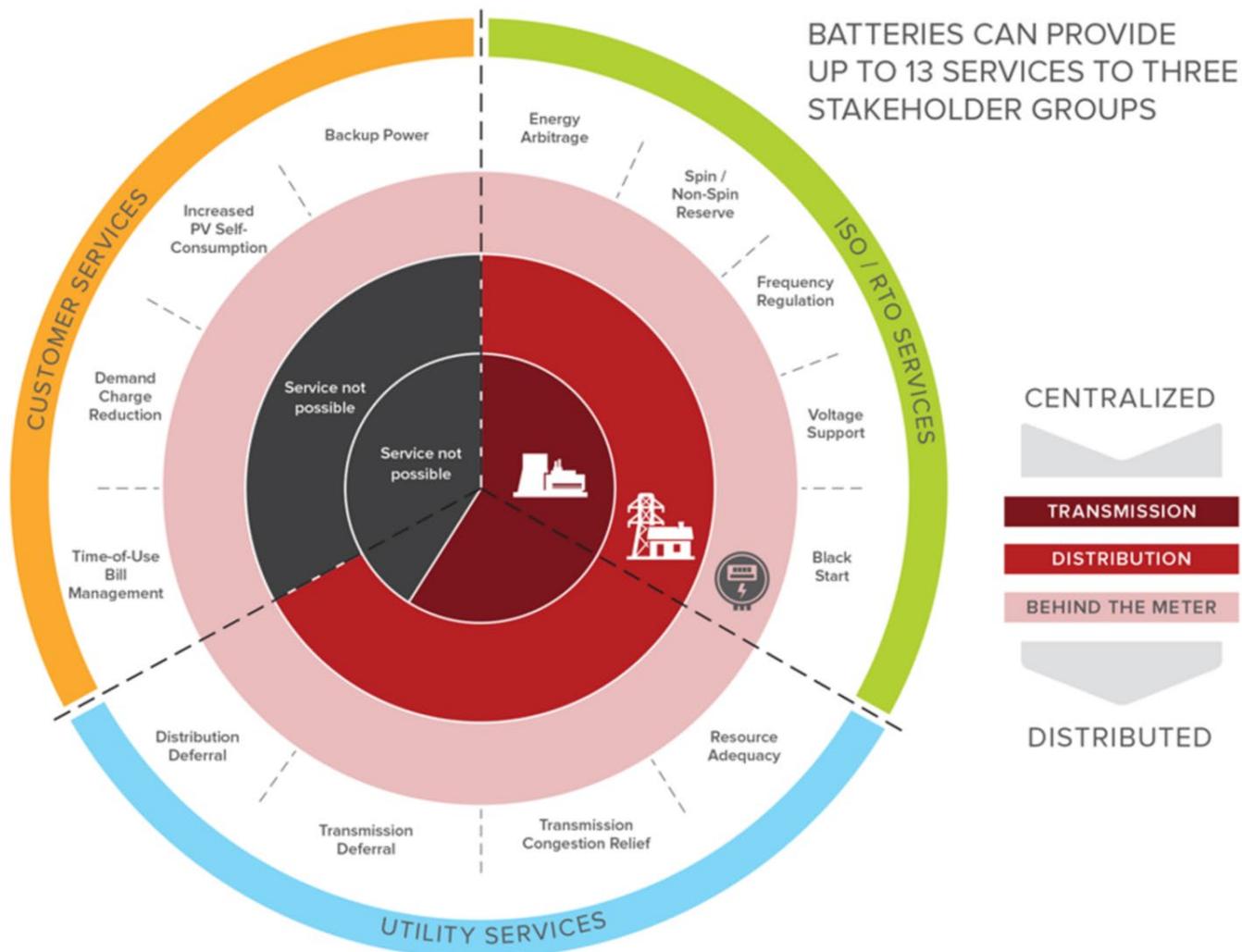


# Outline of Discussion

- Overview of Energy Storage Services
- Current State of Energy Storage Deployment
- Factors Driving Energy Storage Growth
- Challenges & Opportunities for Energy Storage in the Southeast
- Recent NC Legislative Action on Energy Storage
- What's Next for Energy Storage?



# Services Provided by Energy Storage



Source: Rocky Mountain Institute



# Storage Services across Power System

## The Value of Storage

Energy storage technologies have the capacity to benefit each segment of the power system.



Utilities



Increase renewable integration



Reduce dependence on fossil-fuel peaker plants



Reduce operating expenses



Grid Operators



Balance electricity supply and demand



Improve power quality and reliability



Avoid costly system upgrades



Commercial Consumers



Keep critical equipment online during power disruptions



Reduce utility bills and generate revenue



Residential Consumers



Reliable backup power during severe weather and other blackouts



Reduce utility bills and generate revenue



# **CURRENT STATE OF ENERGY STORAGE DEPLOYMENT**



# Number of Energy Storage Installations in the U.S. is Growing

U.S. Annual Energy Storage Deployment Forecast, 2012-2022E (MW)



Source: GTM Research



# Factors Driving Energy Storage Growth

1. Improvements in Energy Storage Technology
2. Declining Energy Storage Costs
3. Increased Opportunities for Compensation Nationally
4. Greater Need for Reliability and Resilience



# Energy Storage Duration Increasing

## Where Are We Headed?

U.S. Energy Storage Deployments (MWh) and Average Duration (hrs)

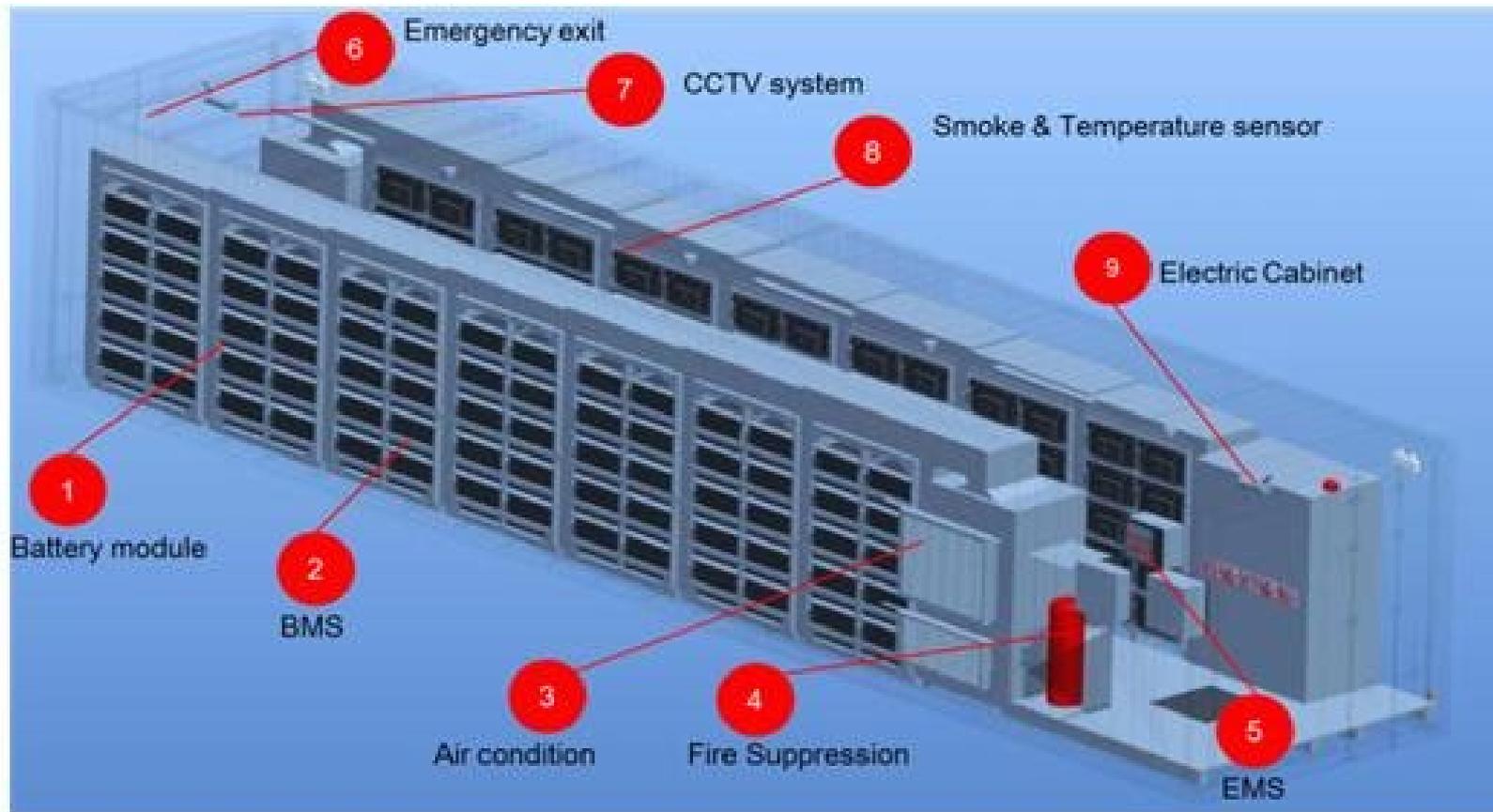


Source: ESA/GTM



# Energy Storage Safety

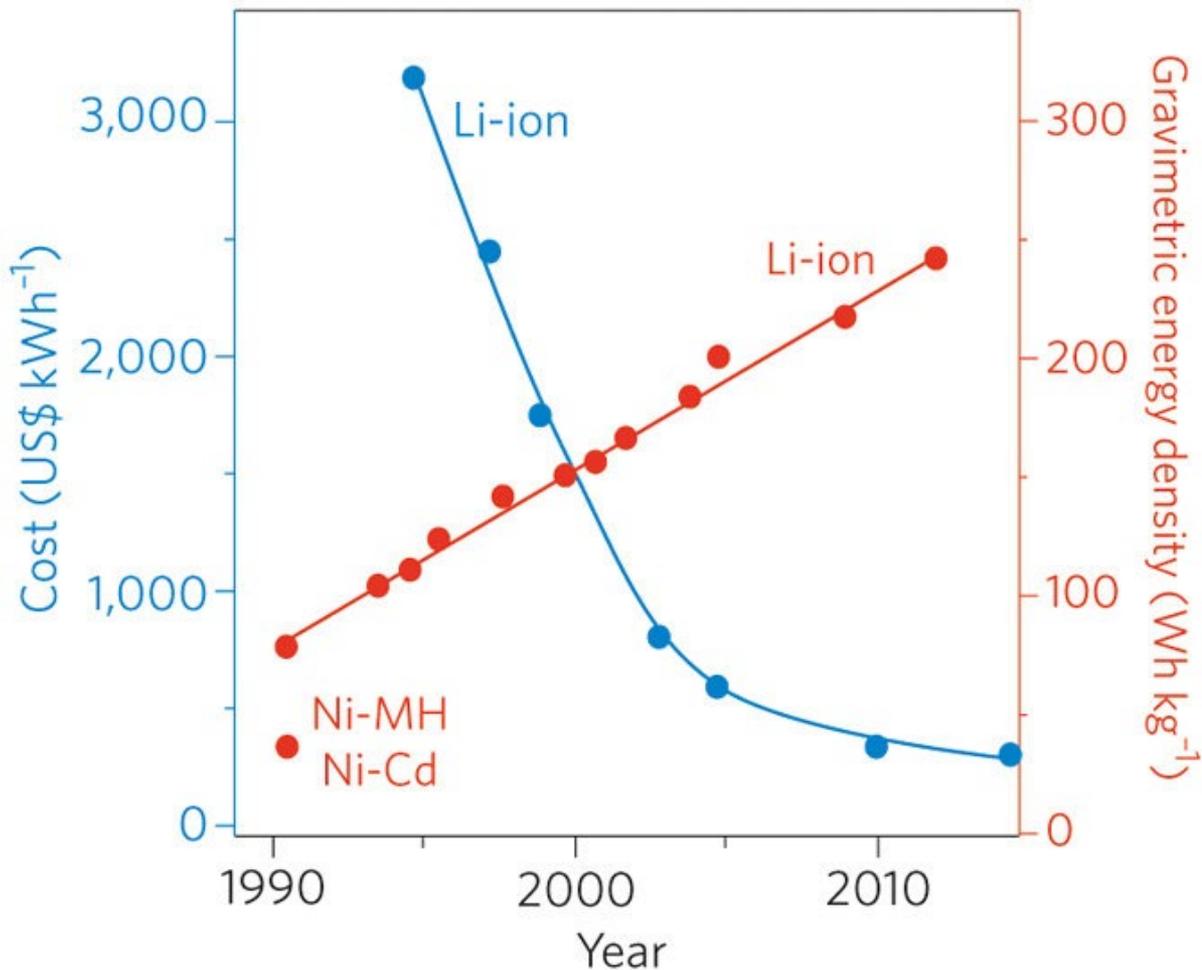
Utility scale battery systems are now outfitted with technology to prevent fires





# Batteries Increasing in Energy Density

## Development of Lithium Ion Batteries, 1990-2015

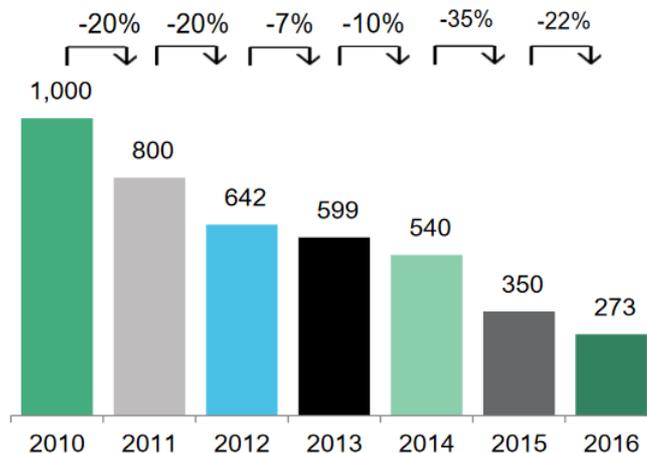




# Costs Continuing Steep Decline

**Economics:** Lithium-ion battery pack prices, 2010-2016  
(\$/kWh)

**Bloomberg**  
NEW ENERGY FINANCE



Source	Cost	Past	Projected
IHS <sup>1</sup>	Installed cost	52% reduction 2012-2015	50% reduction 2016-2019
Lazard <sup>2</sup>	Installed cost		50% reduction 2015-2019
BNEF <sup>3</sup>	Battery cost	60% reduction 2010-2015	35-50% reduction 2016-2020
Navigant <sup>4</sup>	Battery cost	50% reduction 2010-2015	
UBS <sup>5</sup>	Battery cost	50% reduction 2010-2015	55-65% reduction 2016-2020
GTM <sup>6</sup>	BOS cost		41% reduction 2016-2020
IHS <sup>7</sup>	BOS cost		50% reduction 2016-2020

Source: Energy Storage Association policy workshop, Feb. 2017.

Potential Revenue Stream	Vertically Integrated Utility	RTO/ISO
<b>Time shift energy</b>	<ul style="list-style-type: none"> <li>• Depends how PPA is structured; restrictions on storage usage if seeking ITC</li> <li>• Does storage enhance the capacity value of solar?</li> </ul>	<ul style="list-style-type: none"> <li>• Energy storage as of now does not participate in RTO energy markets but awaiting final rules from FERC.</li> </ul>
<b>Reduced Need for Peaking Plants</b>	<ul style="list-style-type: none"> <li>• Value to utility ratepayers, but limited value or price signal for third party developer</li> </ul>	<ul style="list-style-type: none"> <li>• Energy storage does not participate in the RTO capacity market</li> <li>• Awaiting final rule that would open capacity market to front of meter</li> </ul>
<b>Ancillary Services</b>	<ul style="list-style-type: none"> <li>• Value to ratepayers but no material value to third-party developers</li> </ul>	<ul style="list-style-type: none"> <li>• Energy storage resources permitted to participate in frequency regulation market</li> </ul>
<b>Reduced Power Plant Ramping</b>	<ul style="list-style-type: none"> <li>• Value to ratepayers and the utility but no price signal for third party developers</li> </ul>	<ul style="list-style-type: none"> <li>• Some RTOs have a ramping product.</li> </ul>
<b>Avoided T&amp;D</b>	<ul style="list-style-type: none"> <li>• Value to utility and customers on same circuit as solar project, but no price signal for third-party developers</li> </ul>	<ul style="list-style-type: none"> <li>• FERC is open for energy storage to be compensated but on a case-by-case basis</li> </ul>
<b>Improved Renewables Integration</b>	<ul style="list-style-type: none"> <li>• Potential value to third party developers but price signal depends on ability to use storage in lieu of network upgrades for interconnection</li> <li>• Potential value in reduced curtailment from utility but no price signal</li> </ul>	<ul style="list-style-type: none"> <li>• Would become RTO issue during transmission planning</li> <li>• Local utility manages distribution planning</li> </ul>



# **RECENT NORTH CAROLINA LEGISLATIVE ACTION ON ENERGY STORAGE**



# HB 589 Energy Storage Study

- Section 12 of HB 589 directed the NC Policy Collaboratory to conduct a study on how energy storage could provide value to customers in the state.
- Faculty at NC State University – headed by Joe DeCarolis – will conduct the study.
- Final study must be delivered to NC General Assembly & NC Energy Policy by Dec. 2018.



# WHAT'S NEXT FOR ENERGY STORAGE?



# Stakeholder Groups

Where are the following stakeholder groups with regard to energy storage:

- Utilities
- Regulators
- NCSEA Members
- Partners

How will the energy storage study shape the issue with regard to each of these groups?



# Addressing Storage “Fears”

What do our stakeholders “fear” about energy storage?

- Curtails traditional energy asset deployment?
- It is still unproven?
- Will stakeholders be held accountable for failure?

Third party study on energy storage should address some of those fears.

*Once study has finished, the state will have the information needed to decide what policies, if any, will drive energy storage deployment and how the state will benefit from this technology.*



# Energy Storage is Already Reshaping Nationally

- Utility generation planning
- Grid modernization
  - *transmission/distribution upgrades*
- Utility business model
- Project finance
- The market
  - *utility solar deployment, residential products and services*
- How electricity service is valued and priced



# Energy Storage Deployment Dependent on Answers

**What values do regulation, law, and utility rate design need to price in the market so that storage or solar plus storage can be financially viable for Southeastern firms?**

- Regulation and Policy
  - What is the best way for regulators to create the appropriate price signals to help energy storage asset owners and customers “capture” value?
- Technology and Economics
  - How can the cost for the entire energy storage system (including storage hardware, engineering, procurement and construction and soft costs) pencil out so that developers find it cost-effective to include with other distributed energy resources?