



Edison Electric  
INSTITUTE


# Electric Industry

## *In a State of Change*

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November 10, 2016  
Wires 10<sup>th</sup> Annual Meeting  
Washington, DC

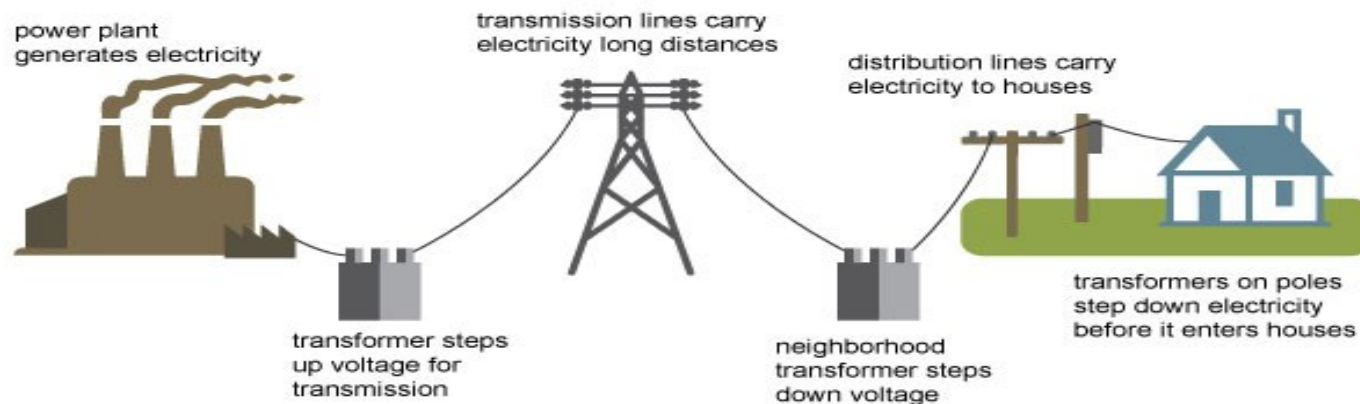
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# The Grid is Changing

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- The grid was built for a different time and purpose
  - Centralized Resources
  - Centralized Control
  - Unidirectional power flows serving well defined and predictable loads

## Electricity generation, transmission, and distribution



Source: Adapted from National Energy Education Development Project (public domain)

# The Modern Interconnected Grid

## *Dynamic & Flexible*

- Characteristics
  - Open, efficient, resource agnostic, supports bi-directional power flows, reliable, resilient and secure
  - Built on sustainable energy and supported by energy storage
  - Run on advanced controls that maintain resilience and reliability



# Grid Evolution

## *Maintaining Reliability in a Modern Interconnected Grid*

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- Adapting to a Changing Resource Mix
- Maintaining Essential Reliability Services
- Leveraging New Technologies to Facilitate Change
- Rapid Integration of Distributed Energy Resources (DERs)
- Sensibly supporting bi-directional power flows and facilitating open access

# Essential Reliability Services

*The invisible glue that holds it together*

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- Frequency Support
  - Many newer resources do not supply inertia or primary frequency response
  - DERs add control challenges and safety issues
  - New compensation models will need to be developed to ensure ERS are supported
  - Energy Storage will help but this is still years from deployment
- Load Ramping
  - Renewable resources create huge ramping concerns
  - Again Energy Storage will help but.....
- Voltage Support
  - Reactive and Voltage support is changing and becoming more complicated

# Build the Smarter Energy Infrastructure Customers Want

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**Projected: \$52.8 Billion Invested  
in the Energy Grid in 2016**



## **SMART METERS**

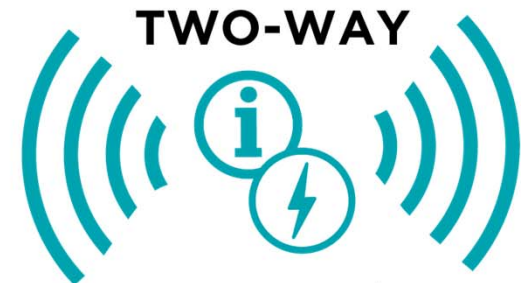
give half of all U.S. households  
more control and flexibility

Electric  
companies are  
projected to invest

**\$32B**

in the  
distribution grid in 2016

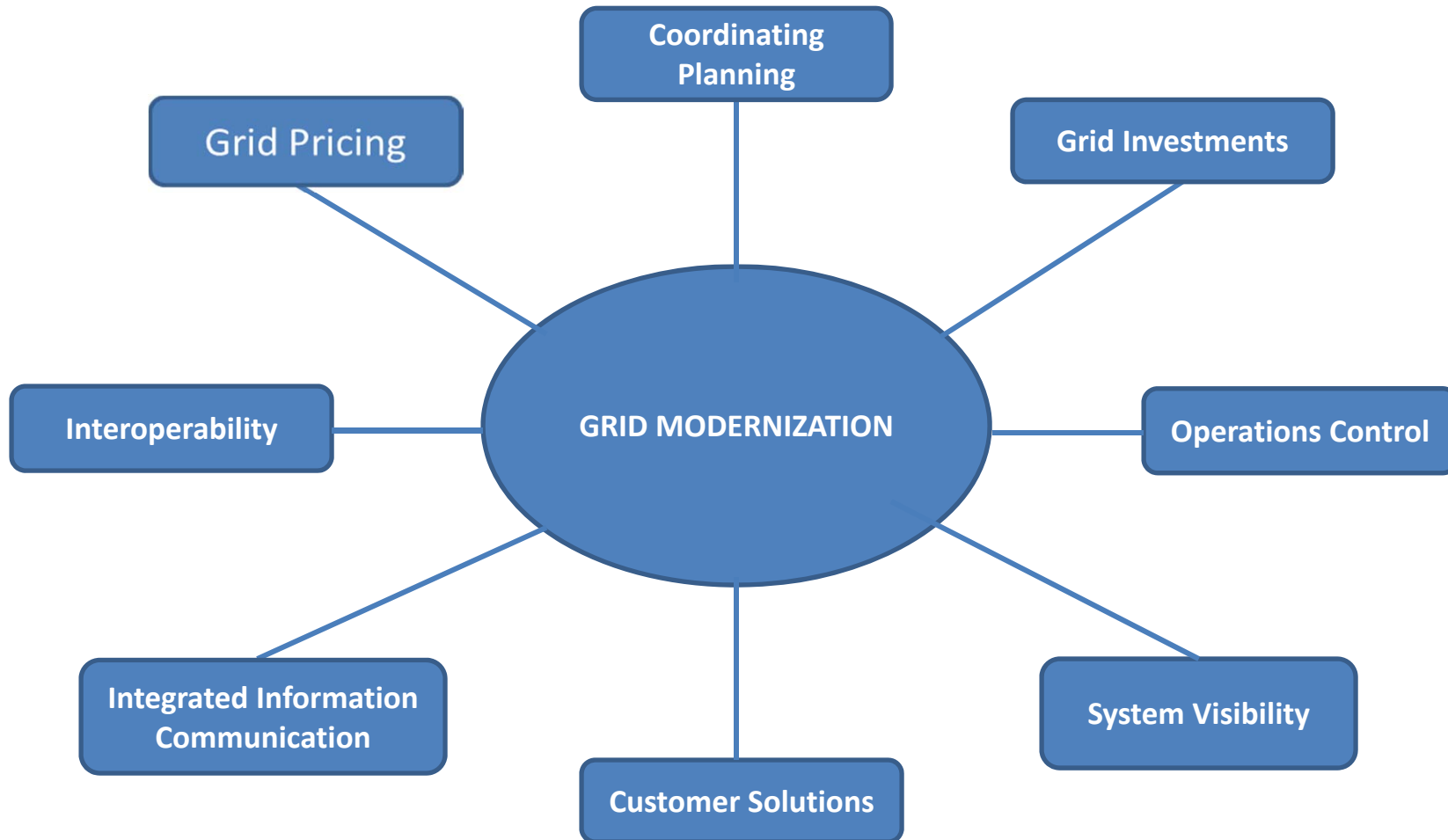
Digital grid enables



power and  
information flows

# Grid Modernization: Building Smarter Energy Infrastructure

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# Conclusion

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- The integrated grid is the backbone of our economy. Electric utilities are making investments for a modern reliable grid to meet the growing demands of our digital society.
- Electric utilities are adapting and changing to ensure the grid remains reliability and affordability for all.
- Regulations are evolving to ensure a diverse and resilient integrated electric grid, as well as the deployment of new technology and innovation that will benefit ALL customers.
- An interconnected and adaptable grid is now becoming a reality and will remain the engine that drives and facilitates innovative improvements to our economy broadly.