



U.S. Department of Energy

Office of Electricity Delivery and Energy Reliability

*Data Collection and Reporting for
Metrics and Benefits*

Smart Grid Investment Grant Program

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An Opportunity for Transformation

Investments

- **Equipment Manufacturing**
- **Customer Systems**
- **Advanced Metering Infrastructure**
- **Electric Distribution Systems**
- **Electric Transmission Systems**
- **Integrated and/or Crosscutting Systems**

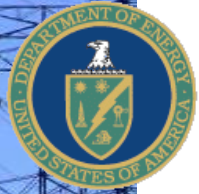
Transformation

Customer Empowerment

Advanced Grid Functionality

Results

- **Job Creation and Marketplace Innovation**
- **Reduced Peak Load and Consumption**
- **Operational Efficiency**
- **Grid Reliability and Resilience**
- **More Distributed and Renewable Energy**
- **Lower Carbon Dioxide Emissions**



Primary Intent Is to Determine SGIG Program Impact

Secondary Intent Is to Learn (to Address Uncertainty)

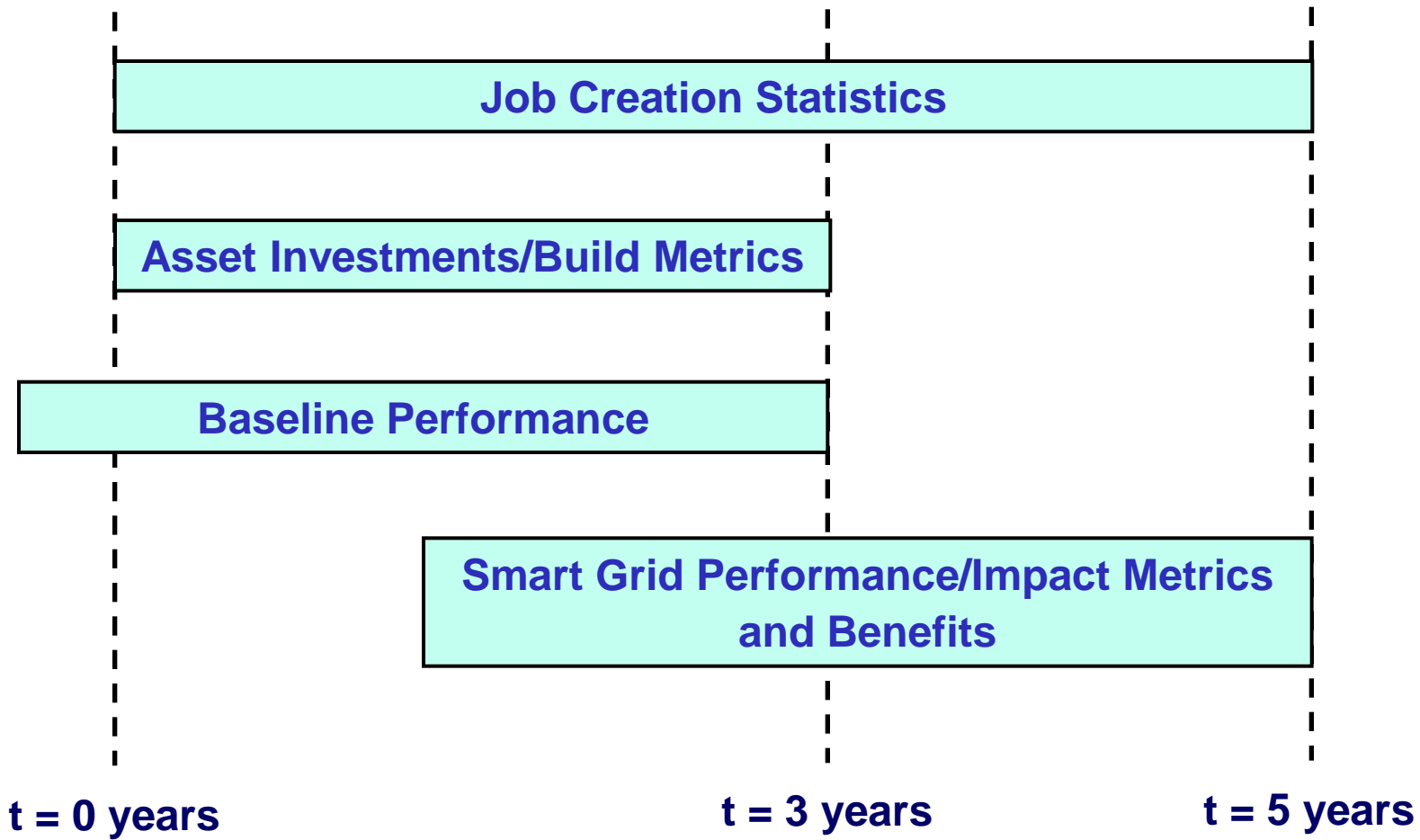
~~Project-Based
Cost/Benefit
Analysis~~



**SGIG Program –
Building the
Smart Grid,
Impacts, Benefits**



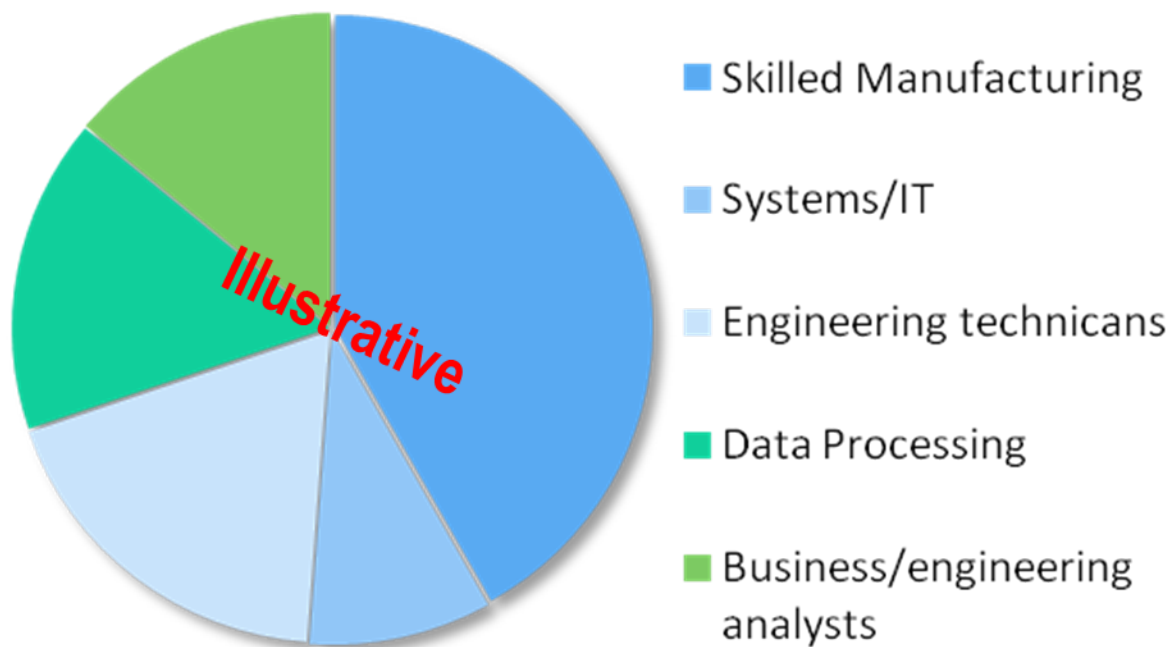
Key Components for Information Gathering

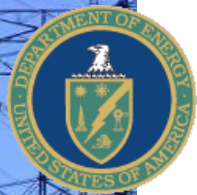




Job Creation Statistics

Smart Grid Programs have created X,000 jobs to date





Build Metrics

Customer Empowerment

- Over XX million customers involved
- YY different pricing programs tested
- Over \$X billion in related investment

Advanced Grid Functionality

- Over XX,000 advanced grid devices deployed
- YY grid management systems in operation
- Over \$X billion in related investment

Key Assets

- Number of in-home energy displays
- Number of customer web portals
- Number of customers with smart appliances
- Number of PEV charging stations
- Number of smart meters
- Number of meter data management systems

Key Assets

- | | Key Assets |
|---------------------|--|
| Distribution | <ul style="list-style-type: none">▪ Number of substations with automation▪ Number of feeders with sensing/automation▪ Number of distribution management systems▪ Number of advanced feeder switches |
| Transmission | <ul style="list-style-type: none">▪ Number of phasor measurement units▪ Number of phasor data concentrators▪ Number of grid visualization systems▪ Number of lines with dynamic ratings |



Measuring Smart Grid Performance – Impact Metrics and Benefits

Shared Responsibility between Project Teams and DOE



AMI Example:

- | | | |
|---|--|---|
| <ul style="list-style-type: none">▪ Electricity consumption by customer class per pricing program and technology▪ Cost of generation to serve load | <ul style="list-style-type: none">▪ Peak load reduction▪ Peaking generation reduction▪ Transmission and generation capacity deferral | <ul style="list-style-type: none">▪ Economic: T&D capital and O&M savings; electricity cost savings▪ Environmental: Reduced carbon dioxide emissions▪ Energy Security: Reduced consumption of oil |
|---|--|---|



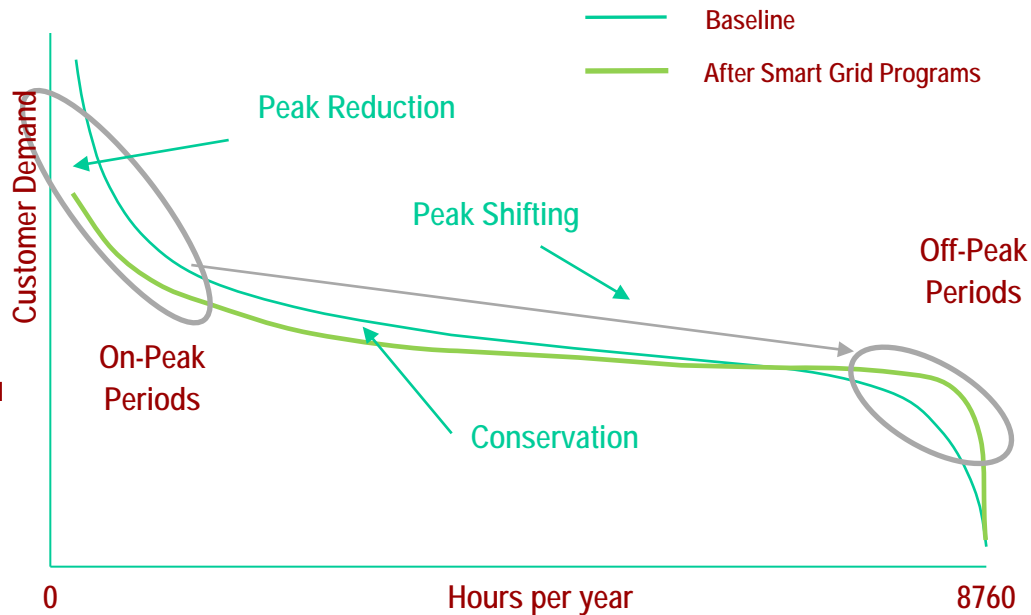
Impact on Peak Load and Total Consumption

Technologies and pricing programs designed to reduce peak demand and electricity consumption have modified the load curve

Contribution to Peak Reduction



- Direct Load Control
- Time of Use Rates
- Critical Peak Pricing



Contribution to Peak Shifting



- Direct Load Control
- Time of Use Rates
- Critical Peak Pricing



Understanding the Impact of Dynamic Pricing on Customer Behavior

Special Case: AMI, Dynamic Pricing and Randomization

- **Nine projects currently have submitted “acceptable” study plans; others may participate**
- **DOE will work with the project teams to ensure that data collection and analysis efforts will satisfy goals (elasticity of demand)**
 - **Valid control and treatment groups**
 - **Customer demographic information for consistent segmentation of results into cohorts**
- **Rich dataset correlating demand, rate tariff design, and customer-level information**



Metrics and Benefit Estimation Plans Due 30 Days After Award

- **DOE will provide standard templates for data collection (to define build/impact metrics with mapping to benefits)**
- **Each project team will customize the template according to the assets and systems deployed**
- **DOE will provide assistance to project teams in developing final plans**
- **Formal plans will be required 30 days following project award**