



# **REDEFINING QUALITY IN THE AGE OF SMART GRID:**

CONSUMERS AS PARTNERS IN TRANSFORMATION

The background is a solid dark blue-grey color. It features several diagonal lines: a solid light grey line running from the top-left towards the bottom-right, and a dashed light grey line running from the top-right towards the bottom-left. The text is centered in the middle of the page.

# Moving Forward: Smart Grids

# SMART GRID STEP 1: FINDING THE GAPS

- Voice of the customer
- Improved performance metrics
- Benchmark to world standards
- Apply metrics and find the gap that matters

# BOB GALVIN ON CHANGE: THINKING THAT INFLUENCED THE FOUNDING FATHERS



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- A group of leaders must step outside the crowd to advocate for what is right
- Enlightened thinking: free, open, objective, rational, and tolerant of new ideas
- Change is predicated by a candid acknowledgment of the deficiencies:

## The Gap

“America’s Founding Secret: What the Scottish Enlightenment Taught our Founding Fathers,” Robert W. Galvin, 2002

# IS THE GRID PREPARED TO SERVE THE 21<sup>ST</sup> CENTURY?

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**August 29, 2005:** Power poles are pushed over in a flooded street after Hurricane Katrina

- Powers the critical pumps that take water out from New Orleans and make drinking water in a water treatment plant
- Powers the communication towers and central telephone stations that are essential for the communication infrastructure
- Powers essential life-saving services
- Powers the continuous process industries that are the lifeblood of an industrial society
- Powers the computers, servers, routers and the billions of energy supplies that power the digital revolution

# VOICE OF THE CUSTOMER

- Our nation's cities are competing fiercely for new businesses and people
- Electricity service can be a competitive advantage
  - Drive out waste to lower cost
  - More reliable, safe, high power quality
  - More efficient
  - Less polluting with an emphasis on carbon
  - More competitive
  - Improved esthetics

# FINDING THE GAP METRICS

- Goal: Consumer-driven and competitive
  - Cost
  - Efficiency
  - Reliability
  - Carbon/Environment
- Perfect Power Seal of Approval

## Reliability/Safety

- ✓ Deaths/Injuries
- ✓ Outage frequency
- ✓ Outage duration
- ✓ Momentary outage
- ✓ Power quality

## Cost

- ✓ Distribution cost
- ✓ Energy cost
- ✓ Ancillary cost
- ✓ Repair cost
- ✓ O&M cost
- ✓ Improvement cost

## Green Grid Rating

- ✓ Building efficiency
- ✓ Fossil fuel intensity
- ✓ Carbon Intensity
- ✓ NOx/SOx Intensity
- ✓ Water Intensity
- ✓ Local Impacts
- ✓ Grid Impacts

## Customer Empowerment

- ✓ Access to usage data
- ✓ Dynamic pricing
- ✓ Ancillary service
- ✓ Long-term finance
- ✓ Consumer protection
- ✓ Consumer aggregation
- ✓ Local grid investment

# FINDING THE GAP GRID PERFORMANCE METRICS

- Reliability/Safety
  - Do no harm
- Eliminate Waste/ Cost Transparency
  - Repetitive repairs
- Customer Empowerment
  - Price transparency
  - Ancillary service payments
- Green Grid Rating



# FINDING THE GAP BENCHMARKING CEER

- Outage definitions
  - Transient or momentary,  $\leq 1$  second
  - Short interruption,  $\leq 3$  minutes
  - Long interruption,  $> 3$  minutes
- Reporting by voltage level
  - Low, medium, high, and transmission voltage
  - England reports for 9 separate voltage levels
- Report underground and overhead separate

# FINDING THE GAP BENCHMARKING

Country	SAIDI, min	SAIFI
United States	240	1.5
UK	90	0.8
France	62	1.0
Netherlands	33	0.3
Denmark	24	0.5
Germany	23	0.5

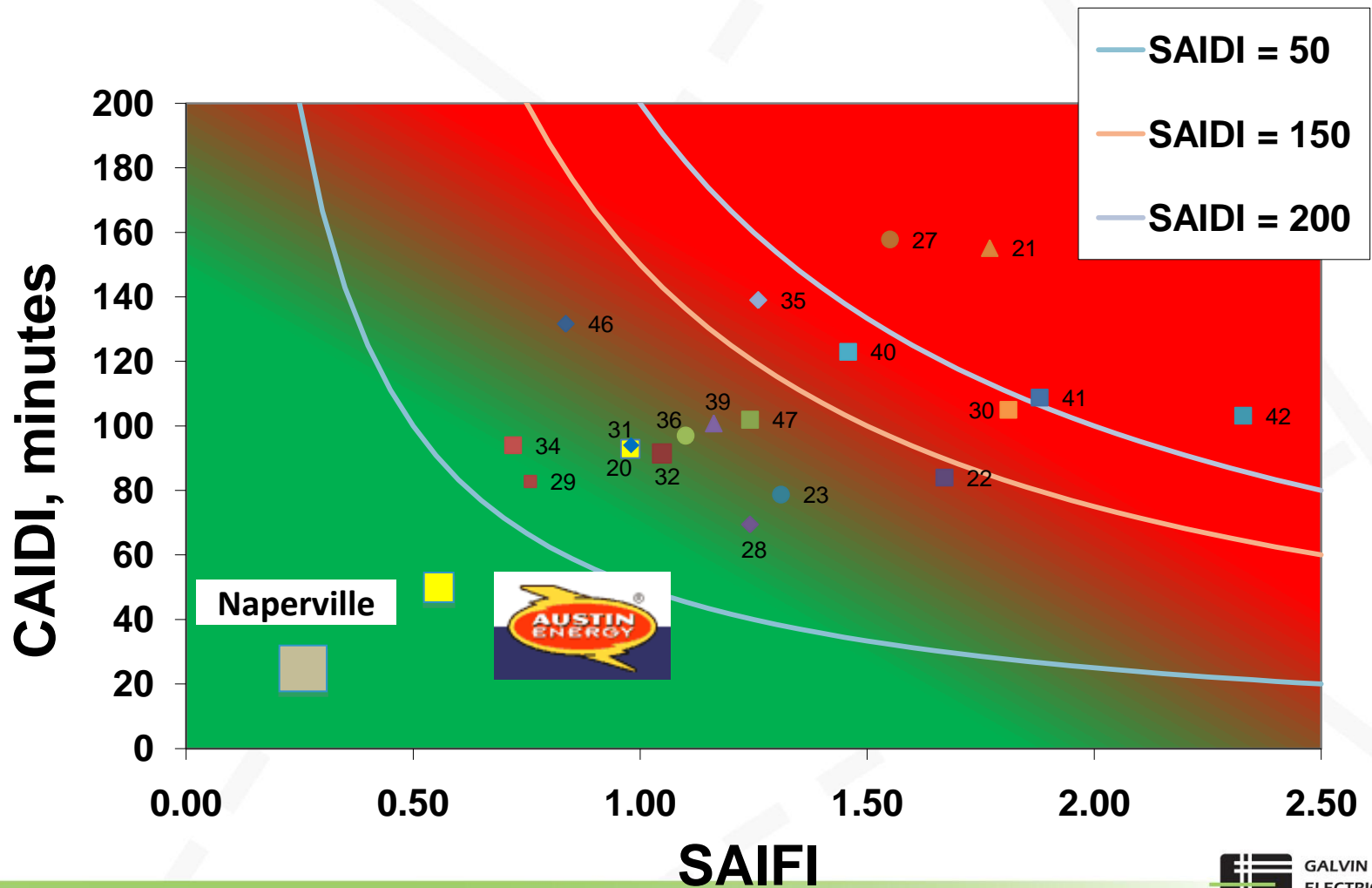
- Council of European Energy Regulators 4<sup>th</sup> Benchmarking Report
- Ernest Orlando Lawrence Berkeley National Laboratory, LBNL 1092E, October 2008

# BENCHMARKING FIRST QUARTILE RELIABILITY SURVEY



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# SMART GRID FINDING THE GAP

- What market, technological, demographic, or policy changes necessitate major changes in strategy, products/services, or target markets?
  - Ford example: Small car market shift
  - Restructuring, energy sustainability, role of electricity in life safety?
- Where is green really red?
- How does industry measure customer value?

# Smart Grid Based on Quality Thinking

# SMART GRID GOALS AND METRICS SIMPLE AND COMPELLING



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- Perfect safety
- Reliability and power quality
- Conservation
- Reduced emissions
- Eliminate waste



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# ELIMINATE SYSTEM WASTE



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Waste Type	Wasted \$, Billions	Wasted, ¢/kWh
Wasted Fuel, 16 Quads	~ \$ 50	¢ 1.2
Market Inefficiency	~ \$ 40	¢ 1.0
Wasted Capital	~ \$ 40	¢ 1.0
Outages/Repair	~ \$ 100	¢ 2.5
Emissions Cost	~ \$ 65	¢ 1.5
Water Cost	~ \$ 3	¢ 0.1
Total Waste	~\$ 300	¢ 7.3

See Galvin Electricity Initiative Issue Brief, Improving the Grid: Why Consumers Should Care

# RETHINKING SMART GRID



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- Voice of the customer
- Reading the world
- Improve goals
- Improve metrics
- Find the Gap
- Do better/do different or improve/invent
  - projects



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# Next Steps

# WHERE TO START? BOB GALVIN'S RECIPE FOR RENEWAL

- A continuous quest for new ideas
- Rapid prototyping
- Pursuit of perfection using quality methods and tools
- Policy reforms that enable and attract innovation and investment

“The Idea of Ideas,” Robert W. Galvin, 1991

# THE FOUR SIDES OF RENEWAL

- At the base - keep the right things the same, continuously reaffirm they are right
- On one side – Do differently, train, rejuvenate, extend, contract, and redo
- On the other side – Begin again, replace people and technology, be capable of being replaced
- On the top – Start up or begin an original

“The Idea of Ideas,” written by Bob Galvin, 1991

# PROCESS OF RENEWAL



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Time



Voice of the Customer	Improve Goals	Measure	Gap	Improve Do Better
Reading the World	Improve Metrics			Invent Do Different

Education / Change Culture / Collaborate / Share

Voice of the Customer	Improve Goals	Measure	Gap	Improve Do Better
Reading the World	Improve Metrics			Invent Do Different

# NEXT STEPS? BRAINSTORM SESSION

- Metrics and benchmarking
- Education
  - Executive, senior management, emerging leaders
- Projects
  - Smart grid optimization, operations efficiency, rapid prototyping of scalable solutions
- Industry best practice research
  - What do participants have in common – standards/FMEA

# SYSTEMS APPROACH TO PROJECTS

- Define the boundaries and gather input data
- Form interdisciplinary team
- Voice of the customer and process mapping
  - Metrics, goals, and outcomes
- Failure modes and effects analysis (FMEA)
- Review and optimize solutions sets and conceptual designs
- Perform cost/benefit analysis



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