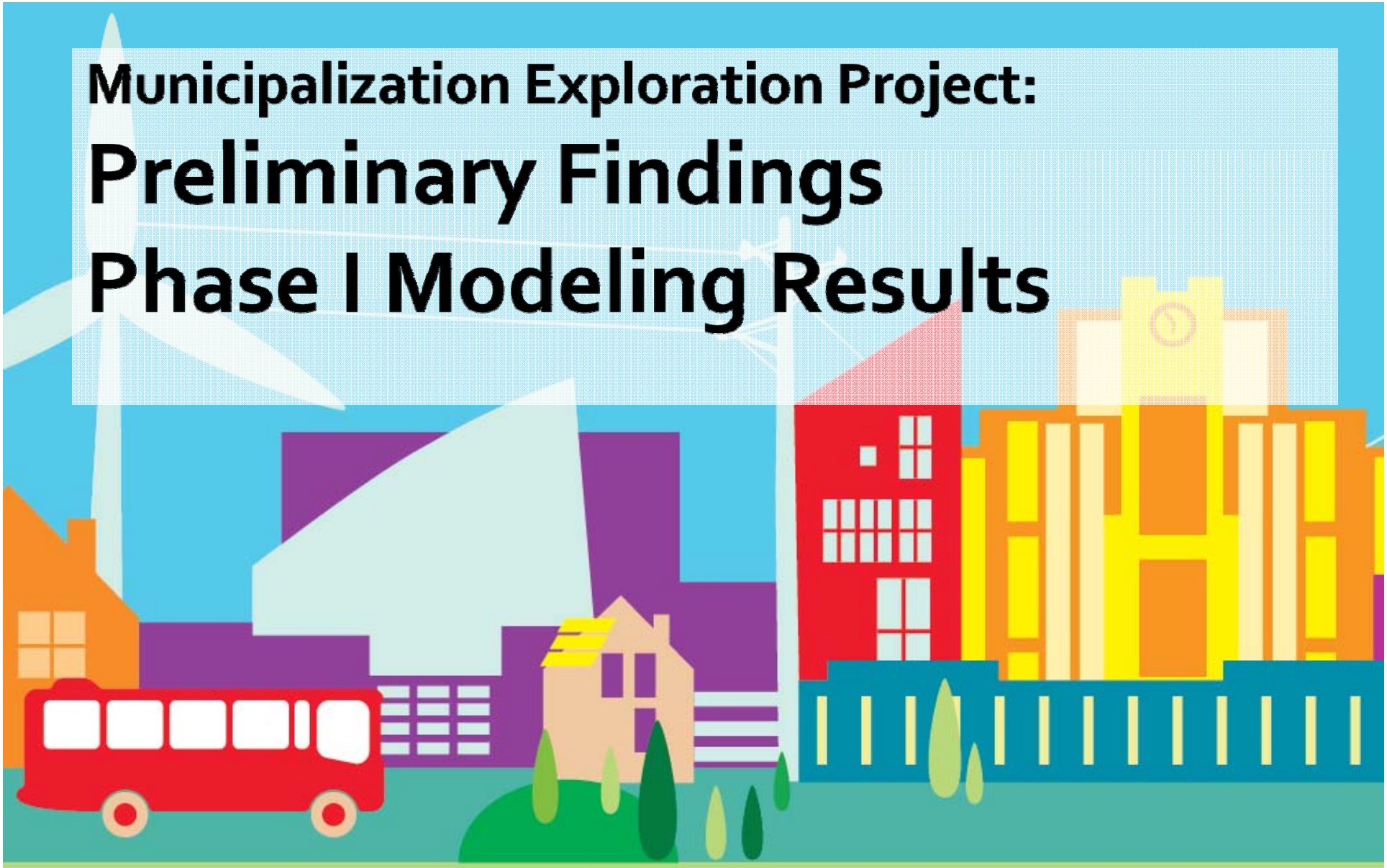
Municipalization Exploration Project:
Preliminary Findings
Phase I Modeling Results



City Council Study Session
February 26, 2013

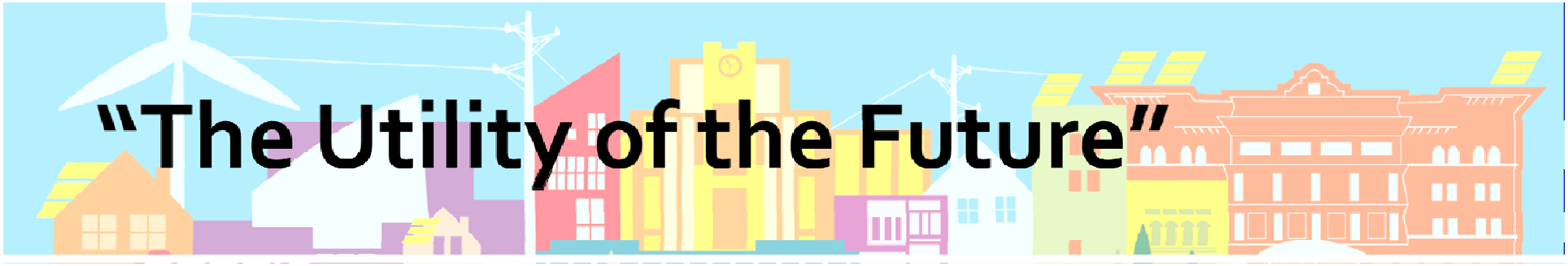
Agenda

- Introduction (6:00-6:05)
- Overview (6:05-6:20)
- Staff Presentation (6:20-7:30):
  - Options and Resources
  - Reliability
  - Financial
  - Risk
- Utility of the Future Overview (7:30-7:50)
- Next Steps (7:50-8:00)
- Council Questions & Discussion (8:00-9:00)

www.BoulderEnergyFuture.com

Purposes of Study Session

- Review process and results
- Not a decision to municipalize:
  - First major deliverable – "can we?"
  - Incremental future steps to "should we?"
- Confidence in integrity of the process and what we have learned



"The Utility of the Future"

Sustainability is good business and this is the bridge to get there

- Roadmap
  - Reliability
  - Affordability
  - Reduced emissions
  - Localized /community based decisions

Overview of Phase I Process

- Work plan approved
- Formed Working Groups
- Metrics approved by Council
- Selected modeling tools and consultants
- Developed assumptions and vetted data
- Modeled sensitivities and risk
- Compared to Xcel Baseline
- Findings reviewed by Working Groups

Summary of Key Findings

A local utility has a high likelihood to:

- Under some options, offer customers equal or lower rates over 20 years
- Maintain or exceed current reliability
- Reduce emissions by more than 50%
- Obtain more than 50% of electricity from renewable resources
- Provide path for strong economic development

Consultants

Consultants

Appraisers

Hegarty and Gerken, Inc., Charlie Hegarty
NewGen Strategies and Solutions, LLC, Nancy Heller-Hughes
The Rothweiler Group, Steve Rothweiler

Communications and Engagement

Egan Energy Communications, Inc., John Egan
Walden Hyde LLC, Robb Shurr

Engineering

Excergy Corporation, Andy Owens
Exponential Engineering Company, Tom Ghiodossi
Schneider Electric, Bob Lachenmayer
Wendling Consulting, LLC, Warren Wendling

Financial

Piper Jaffray Companies, Jonathan Heroux
Public Financial Management (PFM), Inc., Mike Berwanger, Eric Espino, Will Frymann, Dan Hartman

Legal

Duncan and Allen
Duncan, Ostrander and Dingess, P.C., Don Ostrander
Kutak Rock, LLP, Jennifer Barrett

Modeling

EPSIM Corporation, Nils Tellier
HOMER Energy, LLC, Dr. Peter Lilienthal, John Glassmire, Tom Asprey
Stratelytics, LLC, Dr. Gregory Hamm

Working Group Members

Resource Modeling Group
Alison Burchell – Community Modeling Team
David Cohen – Evolution 7
Brad Davids – Enernoc
Steve Drouilhet – Sustainable Power Systems
Gregg Eisenberg – Eisenberg Energy
Thomas Feiler – Clipper WindPower
Leslie Glustrom – Clean Energy Action
Wayne Goss – Spinnaker Energy, LLC
Joshua Kuhn – Community Member
Puneet Pasrich – Colorado State University
Ken Regelson – Five-Star Consultants
David Rhodes – Southwest Generation
Debra Sandor – NREL
Sam Weaver – Cool Energy
Ted Weaver – First Tracks Consulting

Resource Working Group
Pete Baston, Community Member, IDEAS iQA
David Corbus, Community Member, NREL
Burrell Eveland, Community Member, Western Area Power Administration
Jim Look, Community Member, IEEE
Puneet Pasrich, Community Member, Colorado State University

Financial Working Group
Jim Barrett – Applied Solutions
David Becker – EFAA
Alison Burchell – Geologic consultant
Lynda Gibbons – Gibbons White
Steve Pomerance – Community member
Dan Powers – Western Disposal Services
Joshua Putterman – JP International Advisor
Nick Rancis – CU Cleantech
Frank Selto – University of Colorado
Sam Weaver – Cool Energy, Inc.
Bob Greenlee – Community Member

Decision Analysis Working Group
Pete Baston – IDEAS, LLC
Tom Feiler – Clipper Windpower, Inc.
David Kline – National Renewable Energy Laboratory
Tom Leifer – QI Path
Frank Selto – University of Colorado
Zane Selvans – Clean Energy Action
JoAnn Silverstein – University of Colorado
Edith Zagona – University of Colorado

Communications Working Group
Craig Cox - Lyght Co
Angelique Espinoza - Boulder Chamber
Chris Hoffman – Whole Systems Consulting; community member
Robert O'Herron – community member
Jennifer Pinsonneault – Boulder Economic Council
Julie Zahniser – community member

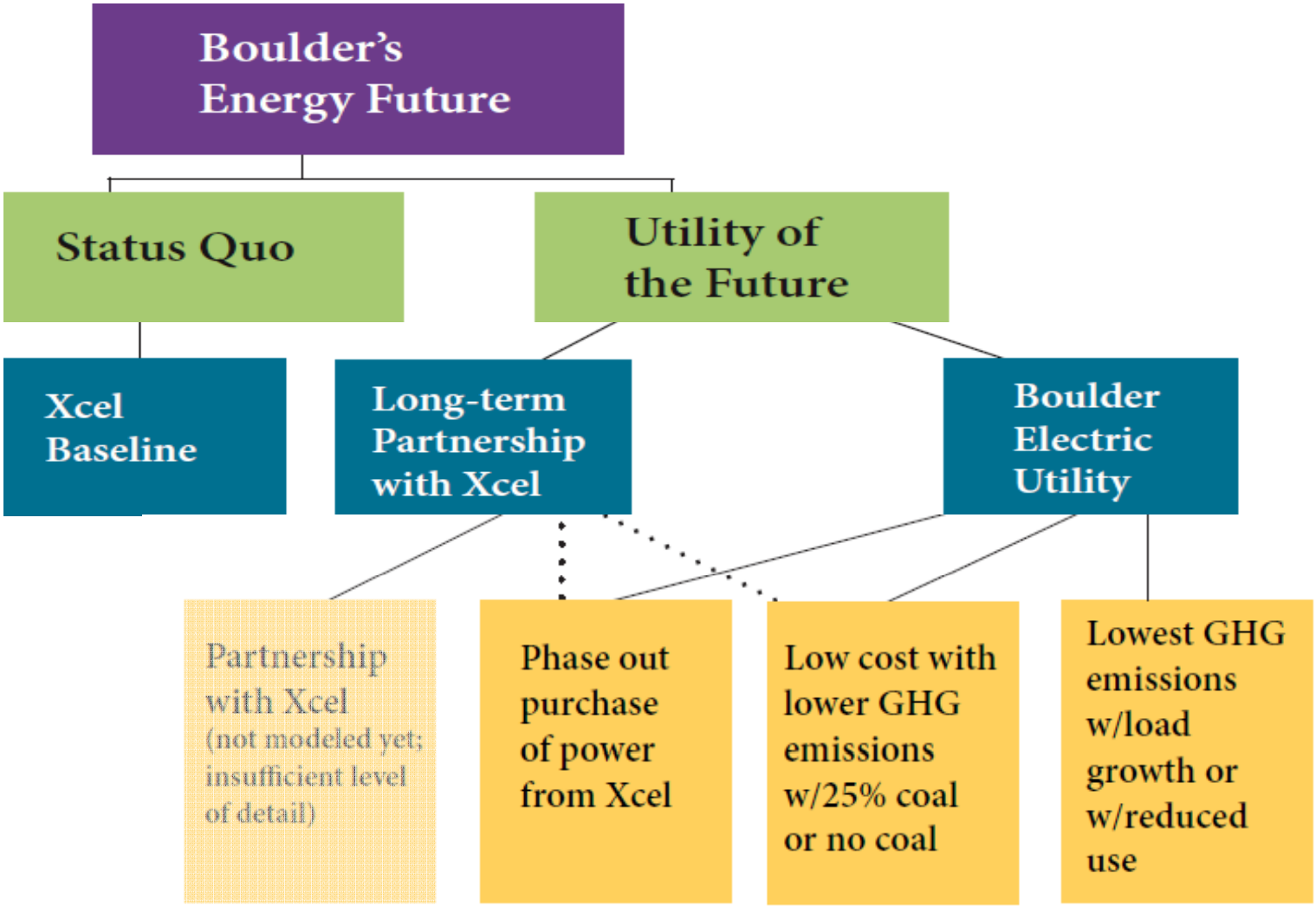
What's Different This Time?

2011 Feasibility	2013 Feasibility
Modeled 10 years (2011-2021)	**Modeled 20 years (2017-2037)**
Resources selected based on preset outcomes	Allowed HOMER to optimize for the resource mixes
Analysis based on single sets of inputs and sensitivity testing	**Analysis based on wide ranges of inputs, exposing risks**
Based on Xcel's average 2011 rates	Dissection of Xcel's resource forecasts and tariff filings
Feedback from community stakeholders	Inputs and assumptions vetted by 5 working groups with over 50 volunteers

Issues Raised

- **Charter issues:**
  - Governance
  - 4% limit on transfers to General Fund
  - Cross-subsidization
- **Liability for legal fees**
- **Emergency Response**

What Options were Modeled?



What Options Were Modeled?

- Xcel Baseline
- Phase out power purchase from Xcel
- Lowest generation cost (includes some coal)
- Lowest generation cost (excludes coal)
- Lowest GHG reductions (only power supply purchases)
- Lowest GHG reductions (also includes increased investment in local energy efficiency & generation)

Resource Modeling

Purpose

- Analysis of specific energy sources over 20-years including projected capital and operating expenses
- Match Boulders energy needs with specific resources

Methodology

- Developed Boulder 20-year load profile
- Utilized HOMER: resource simulation software
- Modeled real and available resources

Resource Modeling

Assumptions

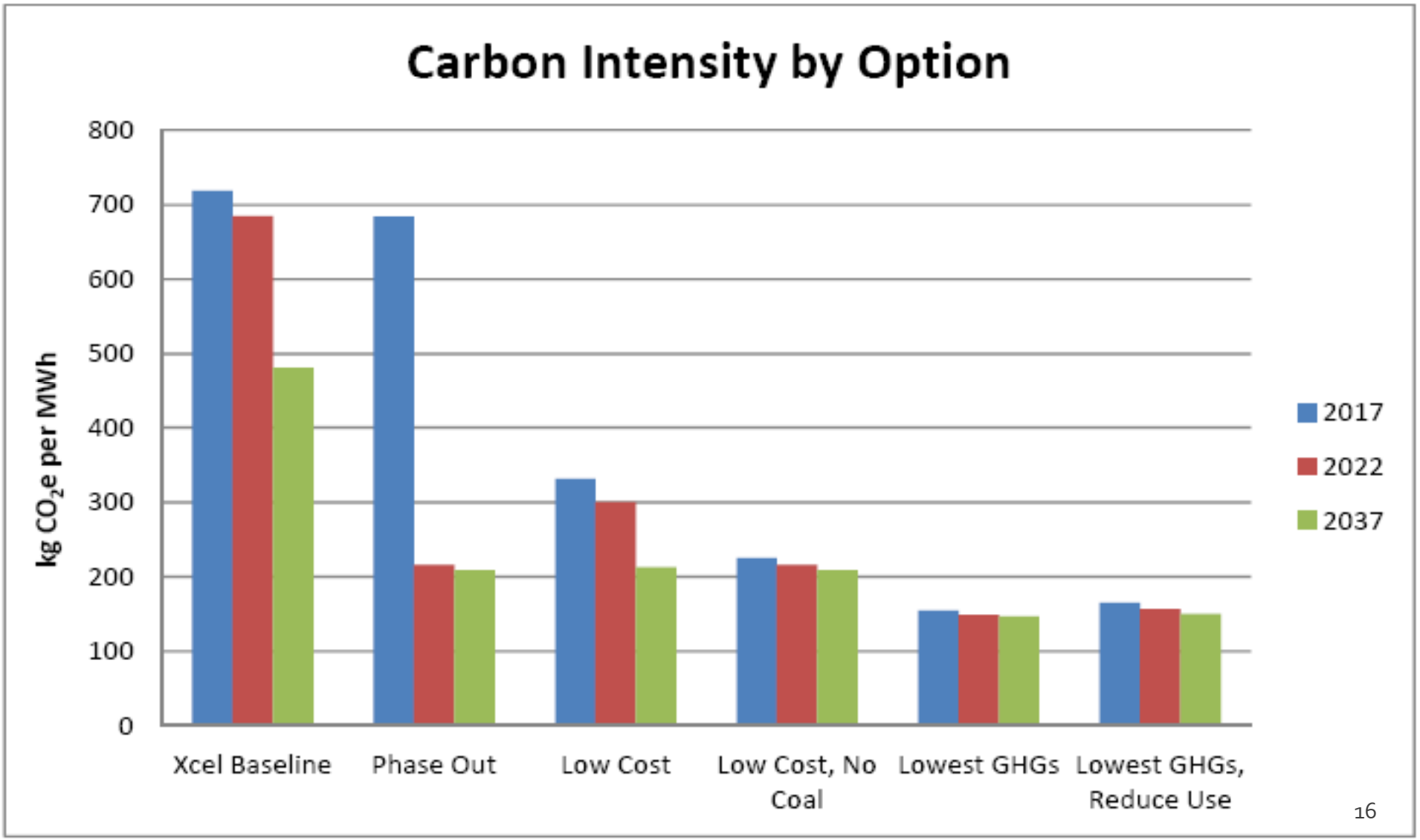
- Boulder specific load growth
- Matched Xcel' s projected fuel costs
- Assume PPAs
- Resources "trued-up" for reserve requirements
- Replace coal with renewables; gas for firming

Resource Modeling

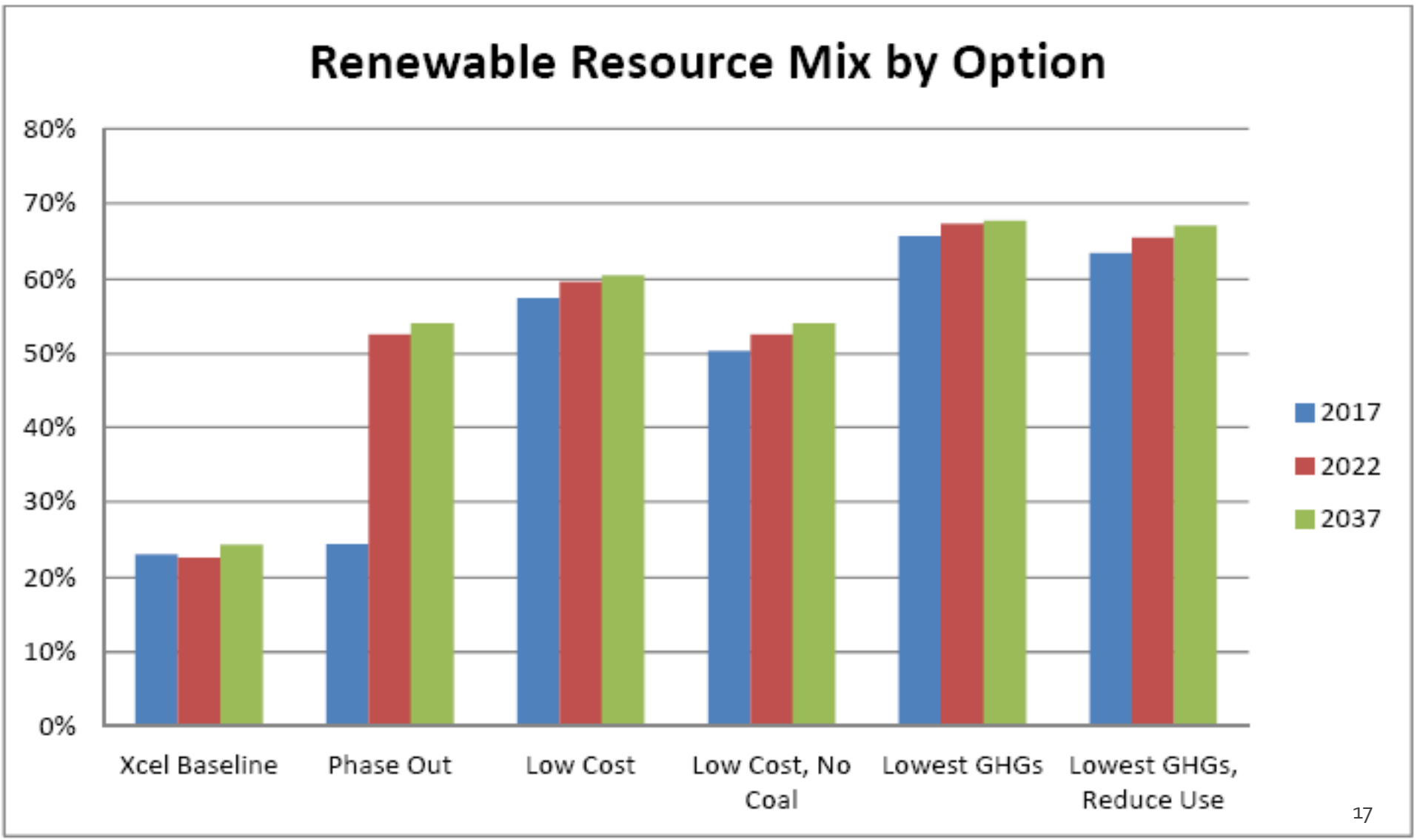
Key Findings

- Wind/gas prices & carbon costs have high impacts on feasibility
- There are municipal utility options that are likely to meet the Charter requirements of emissions and renewables
- Four Options exceed Kyoto in year 1; a fifth in year 5
- High likelihood to cut emissions by more than 50%, with 54% renewables

Metric: Emissions Reductions



Metric: Renewables



Reliability

Purpose

- Meet or exceed Xcel Energy's reliability

Methodology

- Consultant and staff team
- Reliability Working Group
- Optimal service area and separation plan
- Regulatory review – NERC and WECC
- Resource mix assumptions
- Financial assumptions

Metric Assumptions

- Comply with all federal, regional, and local requirements - NERC and WECC
- Comparable electric equipment
- Reserve margin – 15%
- Outage Duration (SAIDI) – 85 minutes
- Outage Frequency (SAIFI)- 0.85

Key Findings

- Separation plan requirements
- Startup work plan and costs
- Capital replacement schedule and costs
- Operation and maintenance work plan and costs
- APPA benchmarking
- APPA best management practices
  - Reliability indices
  - Mutual aid agreements
  - Emergency response plan
  - Cyber and physical security

Financial Modeling

Analysis of financial feasibility

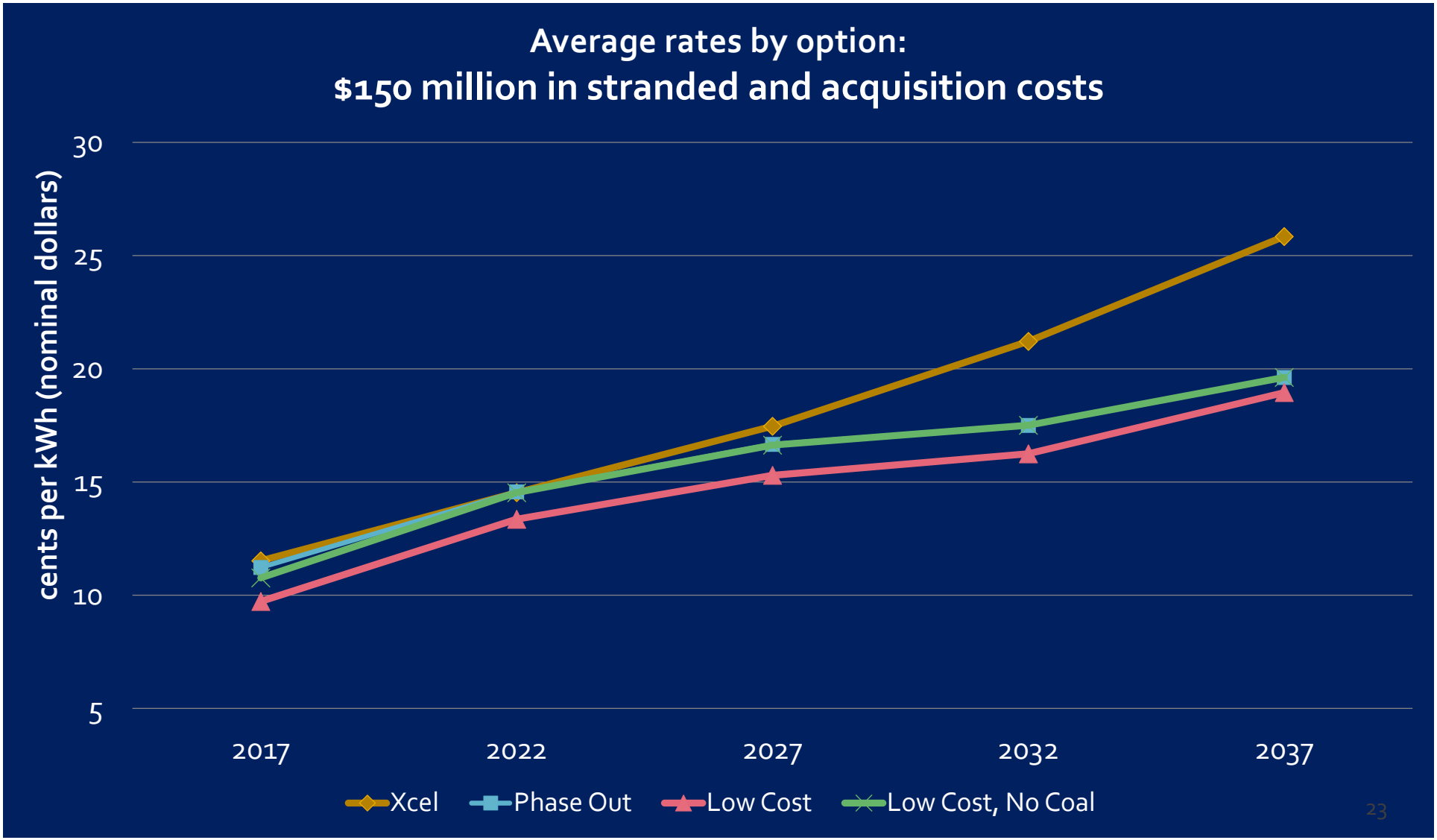
- Rate parity and debt service coverage ratio (DSCR)
- Robust model
  - Target "A-" rating
  - Inputs from resource and load models, platform for risk analysis
  - Data updated and refined
- Rate calculations and stabilization

Financial Modeling

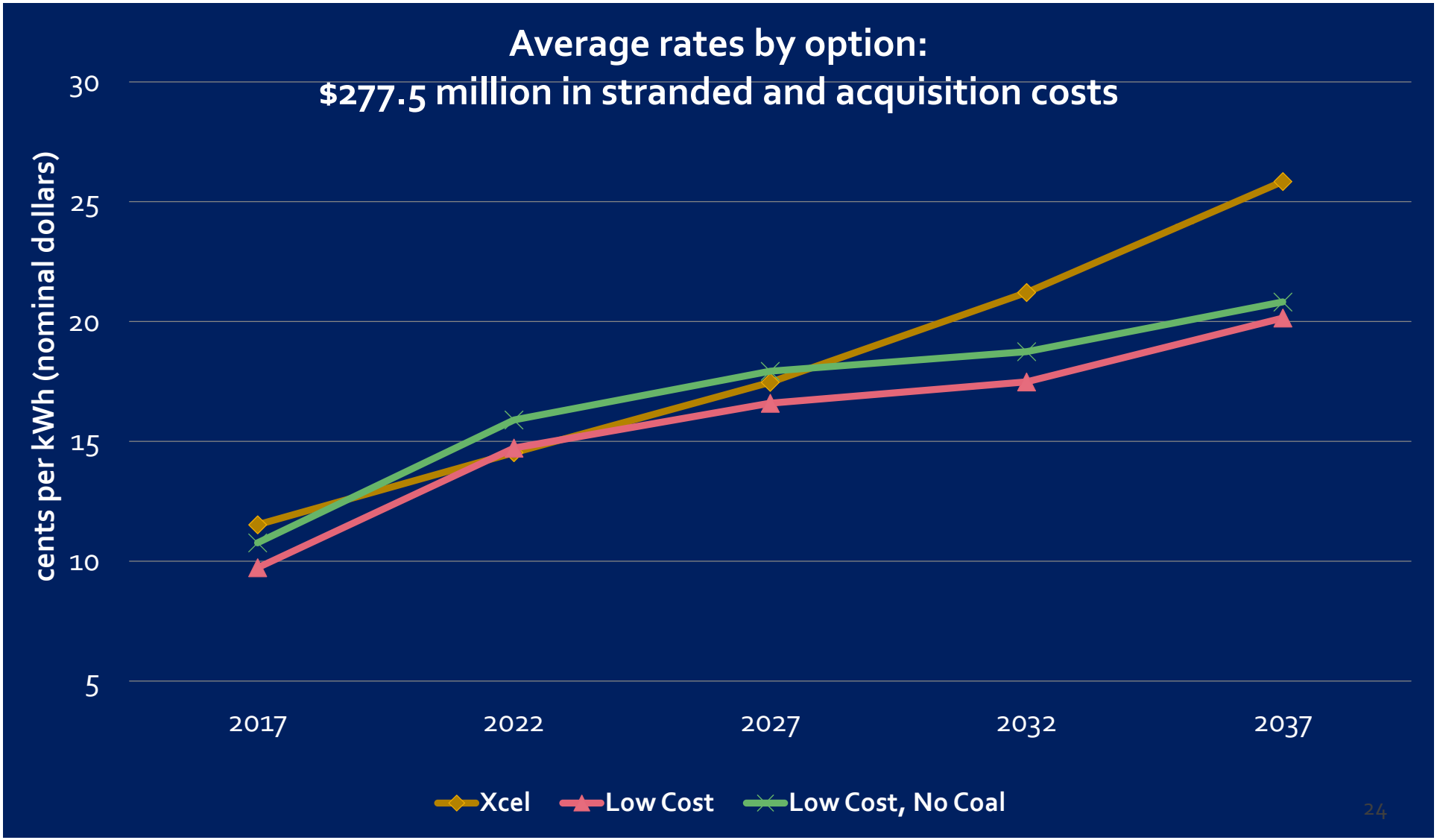
Key Findings

- Some options meet the rate parity requirement under different stranded and acquisition costs.
- All options are able to meet the DSCR requirement of 1.25x
- Rates can be stabilized in some options to start at parity and stay at parity or below over time

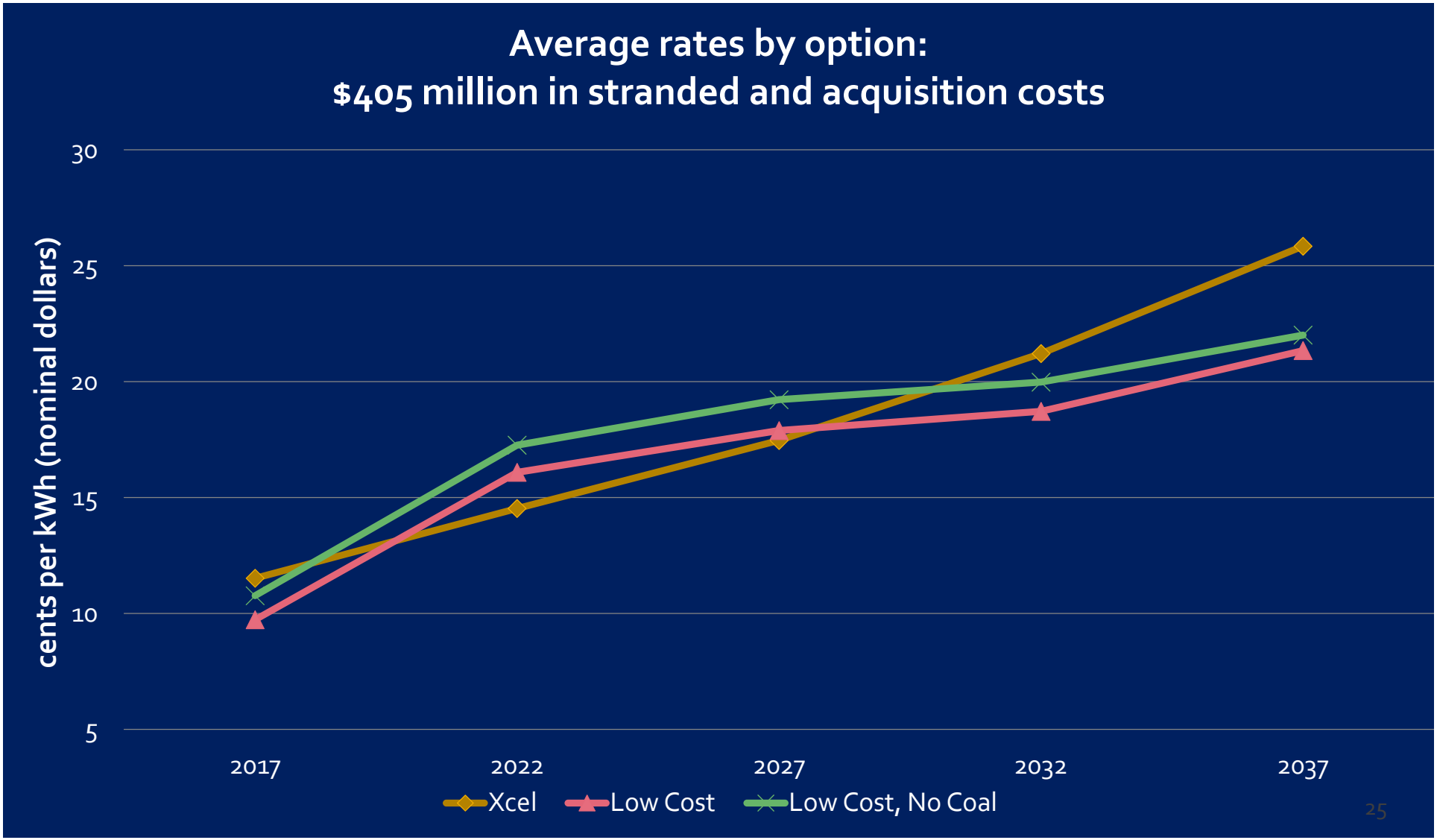
Metric: Rate Parity



Metric: Rate Parity



Metric: Rate Parity



Risk Modeling

Purpose

- Determine risks and opportunities

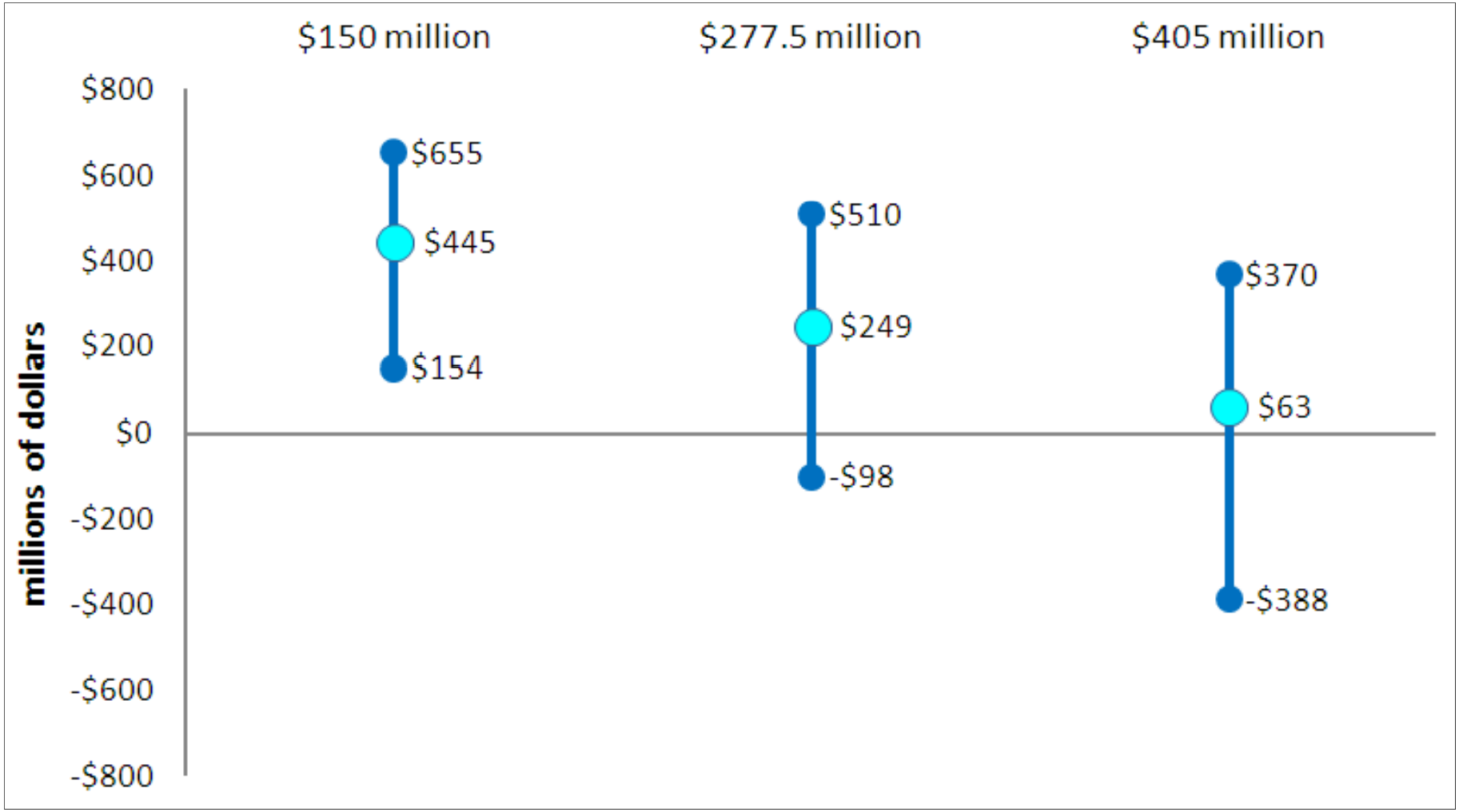
Methodology

- Develop ranges of uncertainties
- Test for sensitivity
- Run financial model 100's of times

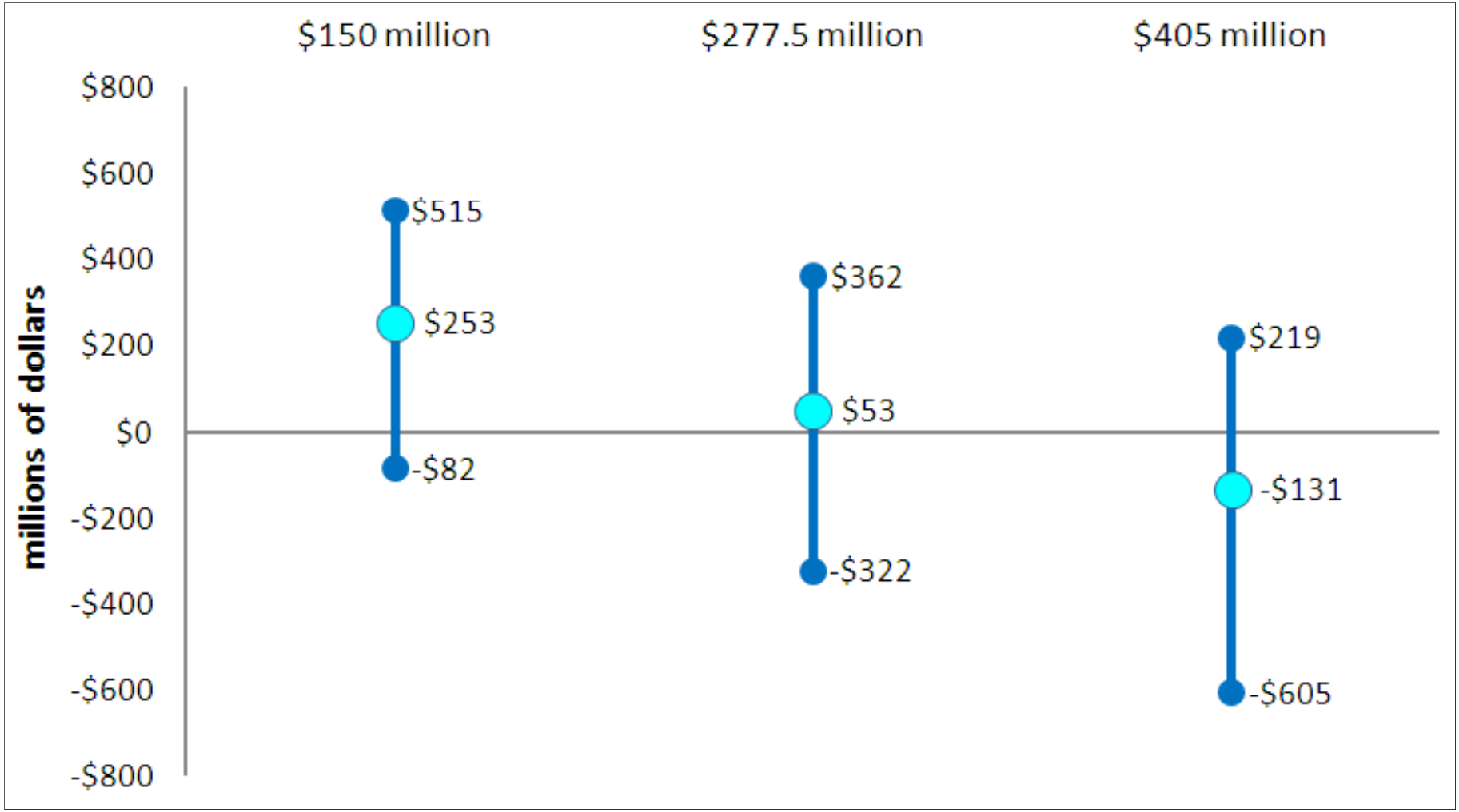
Assumptions

- Stranded & acquisition costs set at $150, 277.5, 405M
- Uncertainties: natural gas prices, wind prices, carbon prices, interest rates, O&M, debt service
  - Fewer modeled on Xcel Baseline

Long-Term Cost Savings/Losses: Low Cost Option



Long-Term Cost Savings/Losses: Low Cost, No Coal Option



Key Findings Related to Charter Metrics

	Phase Out	Low Cost	Low Cost, No Coal	Lowest GHGs	Lowest GHGs, Reduce Use
Reliability	●	●	●	●	●
Rate Parity	◐	◐	◐	⊘	⊘
Debt Service Coverage	●	●	●	●	●
GHG Emissions	★	★	★	★	★
Renewable Energy	★	★	★	★	★

● Meets metric

◐ >80% probability of meeting metric for at least one level of stranded & acquisition costs

★ Greatly exceeds metric

⊘ Does not meet metric

Envisioning the Utility of the Future

Make the most of your energy™

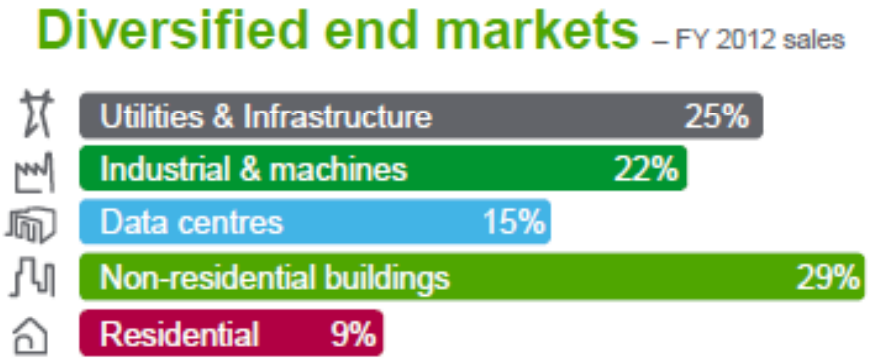
Bob Lachenmayer
February 26, 2013

The Utility of the Future

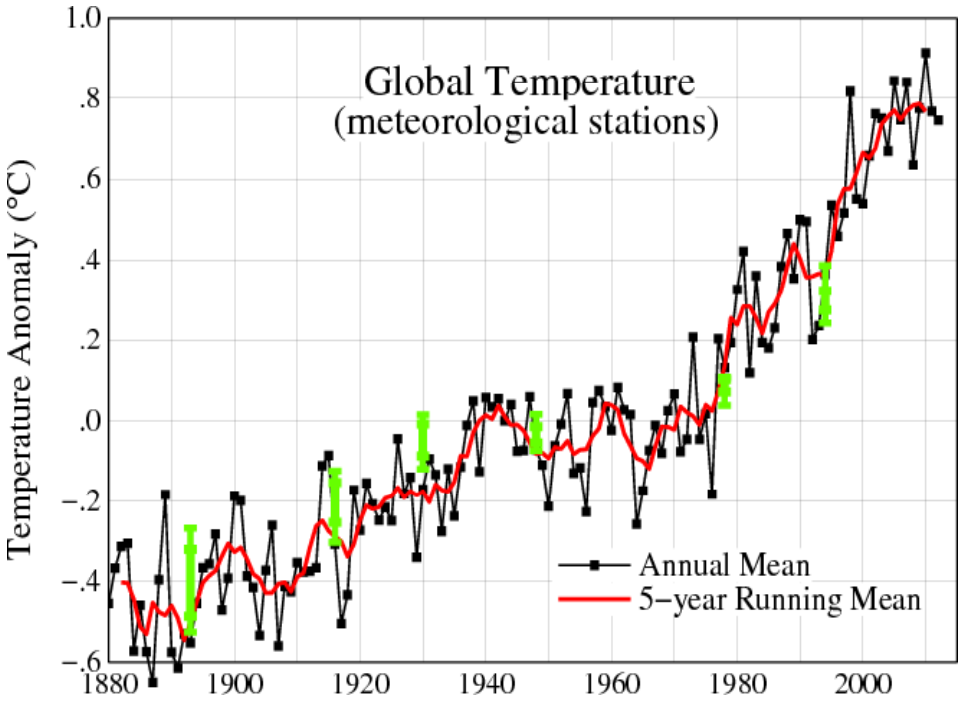
Schneider Electric

Schneider Electric – Global Energy Management

- 177 years old
- 140,000 employees
- Projects on every continent
  (including a zero energy base on Antarctica)
- Ranked 13th most sustainable corporation in the world
- $1B's deployed in Energy Performance Contracts
- 4-5% of sales committed to R & D

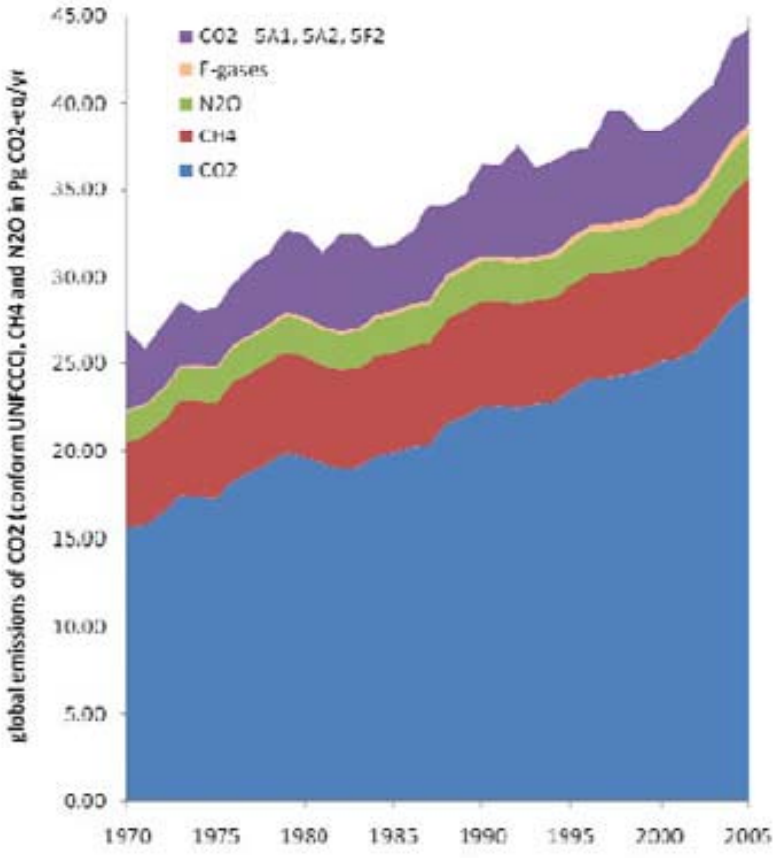


The World is Changing



This image shows the instrumental record of global average as compiled by the NASA's Goddard Institute for Space Studies. (2006) "Global temperature change".

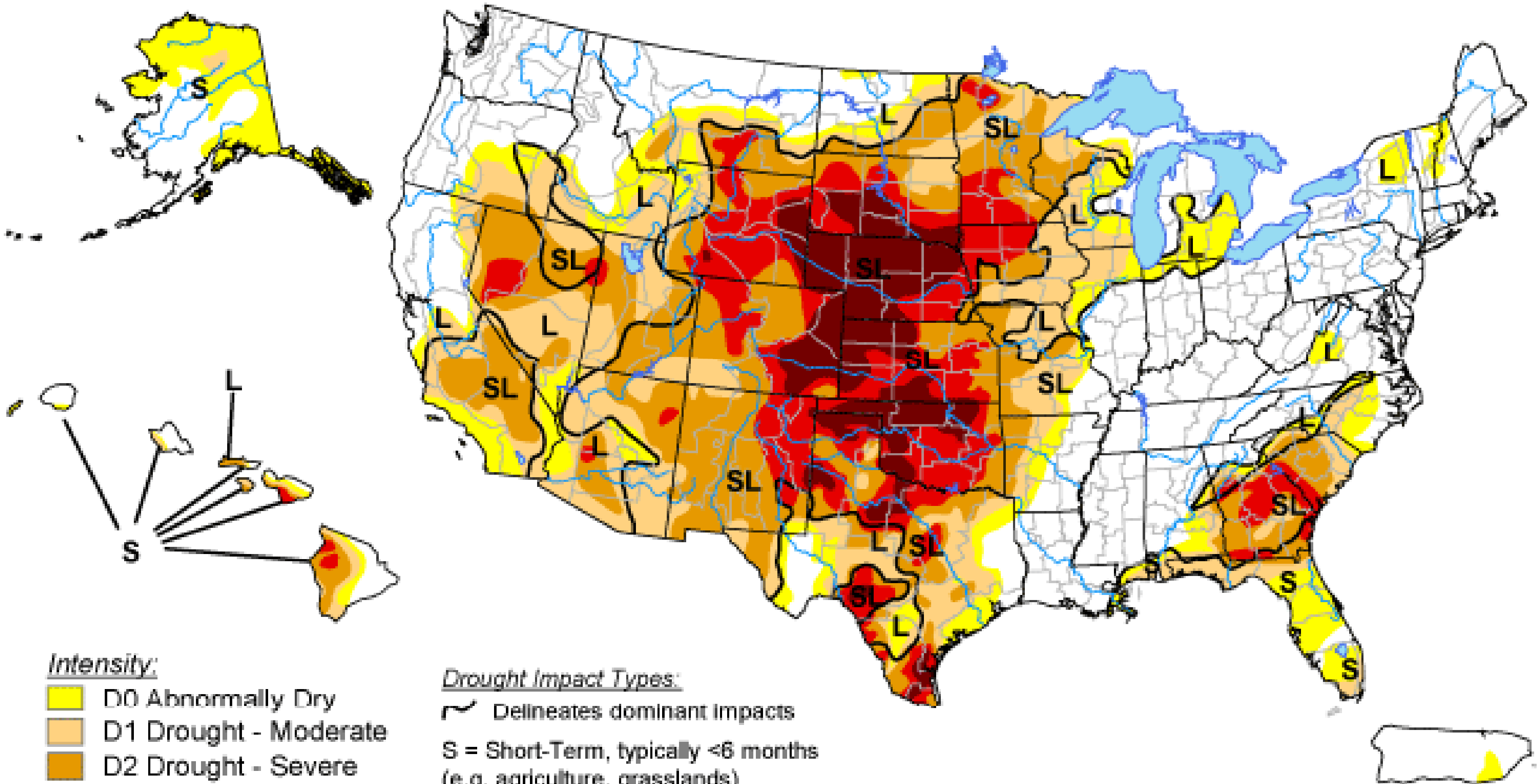
Global GHG emissions



GHG emissions in Pg CO2-eq (using the UNFCCC definition for CO2, including LULUCF (categories 5A1&2,5F2) (GWP100 values of SAR)

U.S. Drought Monitor

February 12, 2013
Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

Delineates dominant impacts

S = Short-Term, typically <6 months (e.g. agriculture, grasslands)

L = Long-Term, typically >6 months (e.g. hydrology, ecology)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

USDA National Drought Mitigation Center

http://droughtmonitor.unl.edu/

Released Thursday, February 14, 2013
Author: Michael Brewer/L. Love-Brotak, NOAA/NESDIS/NCDC

Energy is everywhere

Without a fundamental change in how we engage energy…

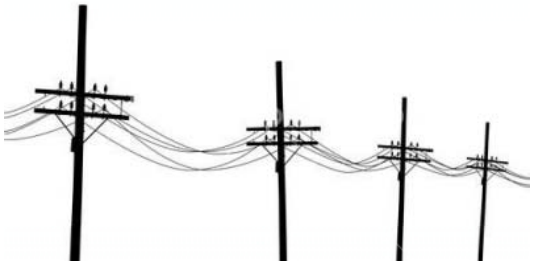
These trends will continue

The World is Changing

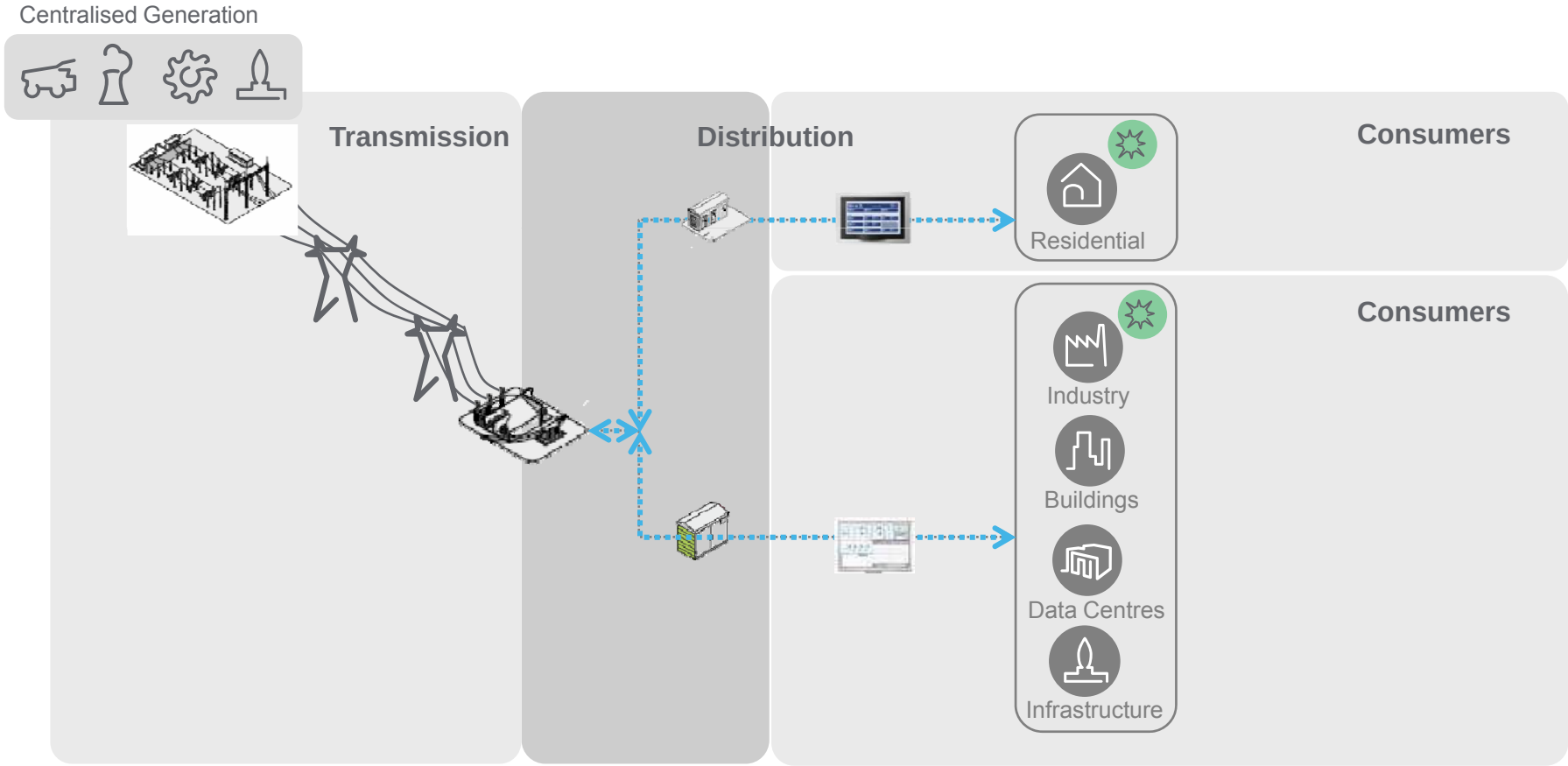
We have seen this before - Telecommunications

Centralized
Monopolistic
Formulaic
Top down
Paternalistic

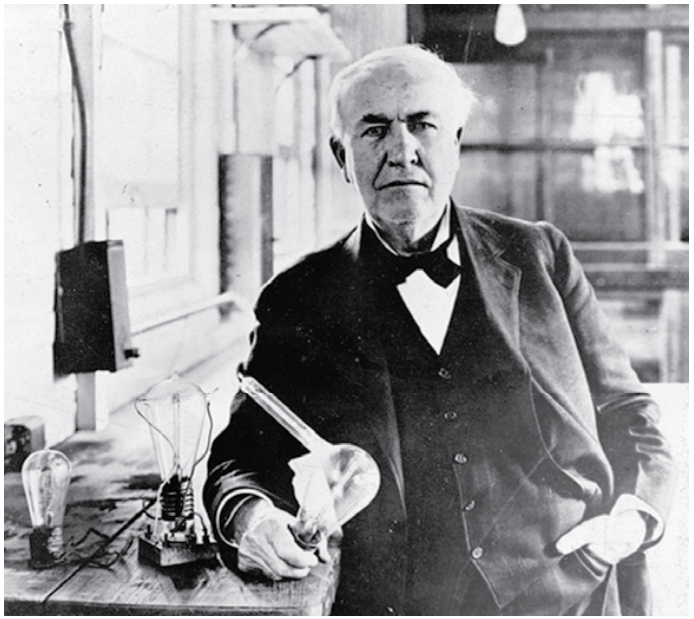
Disaggregated
Competitive
Innovative
Bottom up
Customer centric



The Existing Grid



The Existing Grid



The story goes like this:

- If **Alexander Graham Bell** were somehow transported to the 21st century, he **would not begin to recognize** the components of modern telephony – cell phones, texting, cell towers, PDAs, iPhones etc.

- while **Thomas Edison**, one of the electrical grid's key early architects, **would be totally familiar with** the grid.

From "The Smarter Grid: An Introduction" prepared for the U.S. Department of Energy by Litos Strategic Communication under contract No. DE-AC26-04NT41817, Subtask 560.01.04

The Existing Grid

Limitations

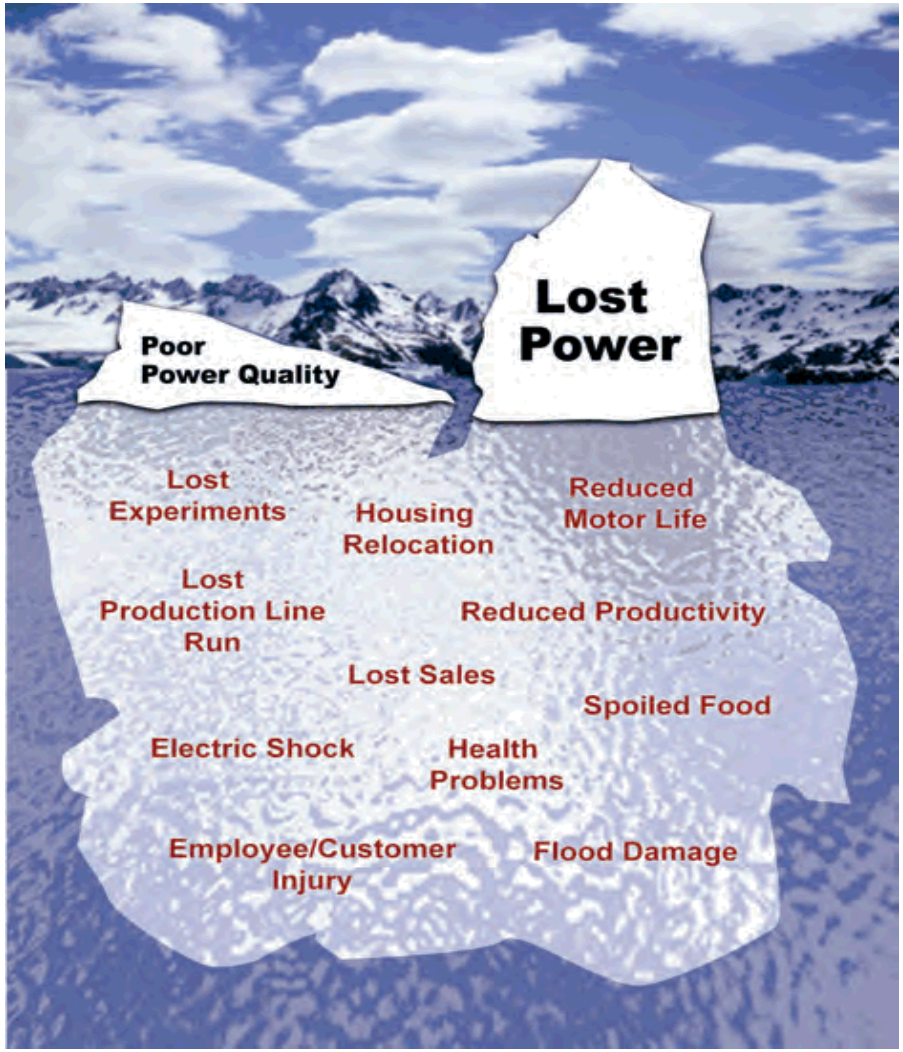
- Rigid Business Model
- Aging power equipment
- Obsolete system layout
- Inflexible system
- Outdated engineering
- Increased need for higher reliability and security

> The Existing Grid

2011 Reliability Data - Includes Major Events

Country	Outage Duration SAIDI	Outage Frequency SAIFI
United States	244	1.49
Austria	31.77	0.66
Denmark	16.95	0.49
France	95.1	0.98
Germany	19.27	0.3
Italy	88.84	2.27
Netherlands	33.7	0.38
Spain	*133.86*	*2.19*
UK	81.42	0.72

The TRUE cost of Reliability (Energy+Losses+Infrastructure)

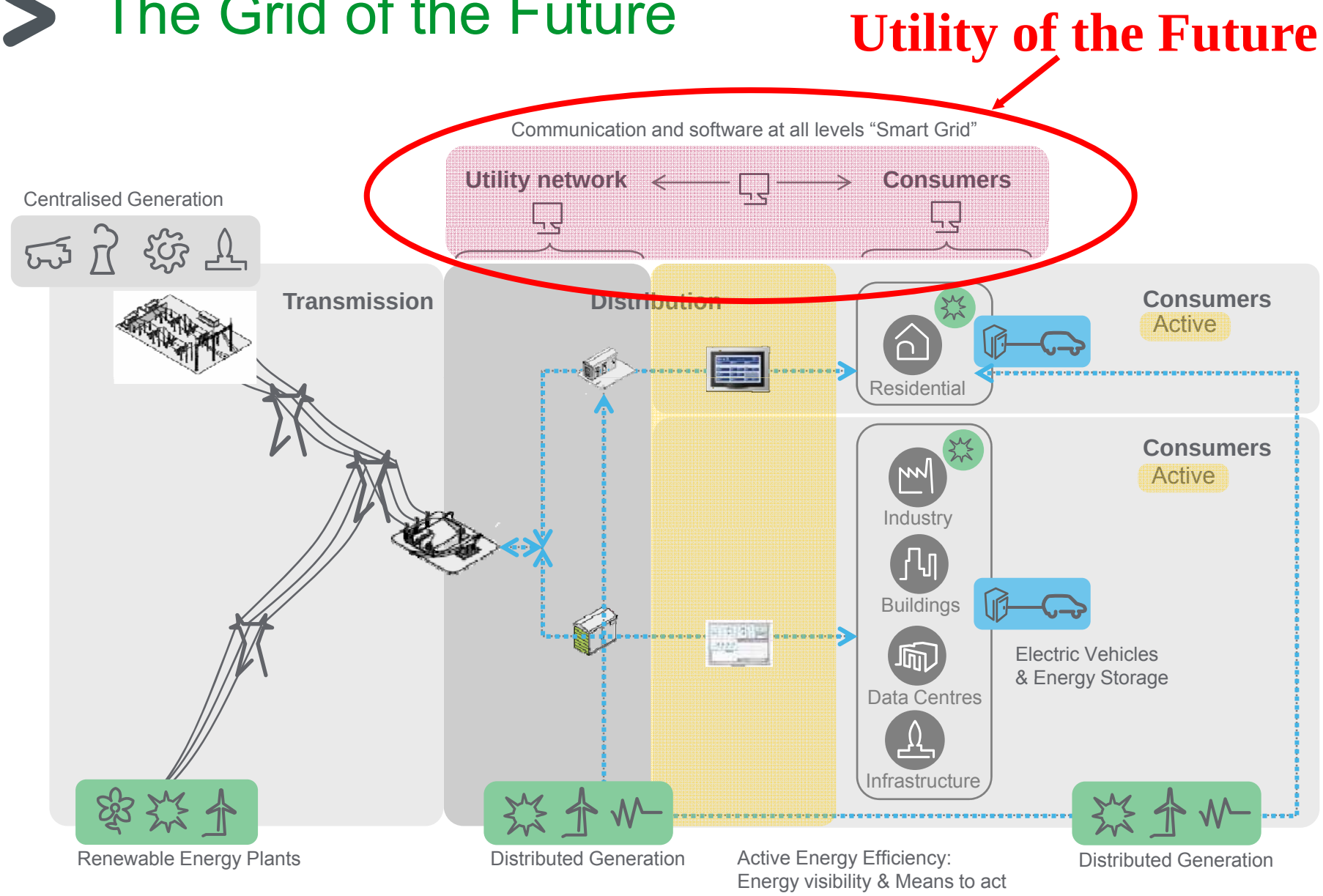


Cost of Energy is more than just the cents per KWH provided

Some studies estimate power interruptions cost the US economy about

- **$150 billion each year**
- **or 4 cents/kWh**
- **or $500 per person**

The Grid of the Future



The Utility of the Future

is the **Unifying Entity** that connects

the needs and wants of the **User**

with the core values of the **Community**

in the most **Efficient and Sustainable** way possible

The Grid of the Future

Opportunities

- Higher Reliability
- Lower overall System cost
- Flexible Design
- Open Architecture
- User centric
- Community driven
- Whole systems approach optimizes outcomes

Electricity and the Community

The **Utility collaborates with the User** to evaluate all available options to meet all of the their energy needs and wants:

- Cost
- Reliability
- Sustainability Goals (GHG, renewable mix, etc…)
- Time of use
- Security

Electricity and the Community

The **Utility** is responsible for **connecting** the delivery of energy related services to the **core values** of the community:

- Economic Development
- Economic competitiveness
- Quality of Life
- Energy localization framework: democratization, decarbonization and decentralization

Electricity and the Community

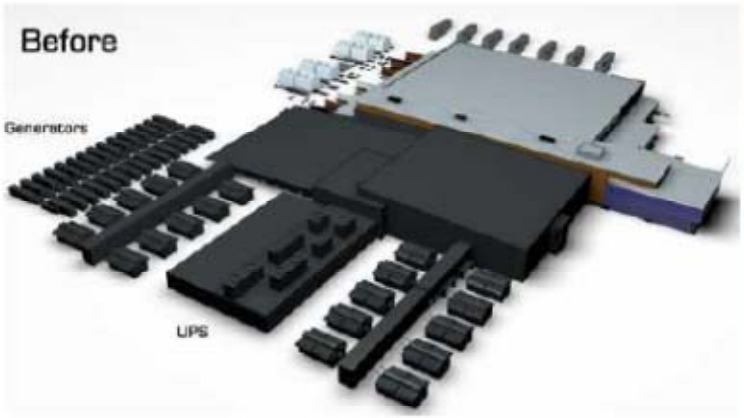
Enabling Options in Energy

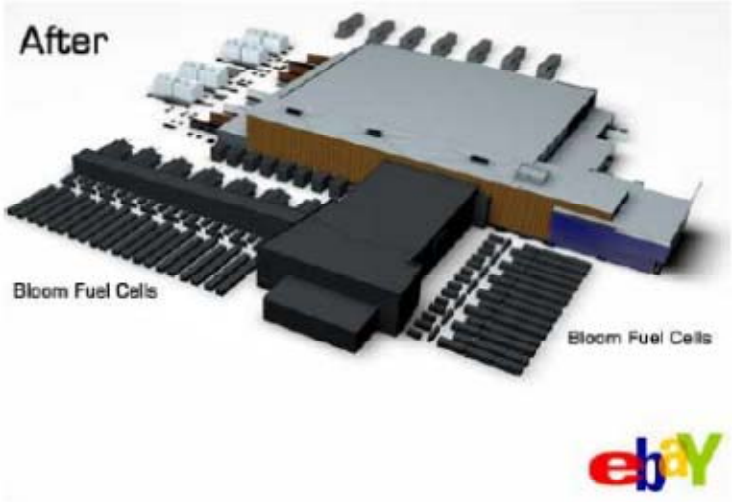
- Distributed Generation
- Demand Response
- Advanced Distribution Management
- Renewable Integration
- Storage
- Electric Vehicles
- Micro Grids
- Energy Optimization

The Energy Business is Changing

Micro Grid

Bloom Powers eBay Data Centers





- **Rapidly-escalating cost of grid power** - 17% increase in 2011
- **Legacy UPS** capex & losses
- **Legacy Diesel** Gensets

- **Bloom as primary, grid as backup**
- **Avoids UPS & Gensets**
- **Scalable: 6 MW to start, expands as eBay's needs grow**

The Energy Business is Changing

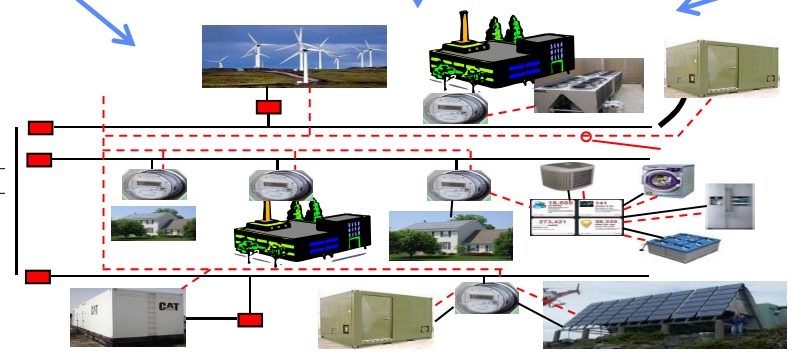
Secure Micro Grid

Department of Defense

Smart Grid
- Advanced Metering Infrastructure
- Substation & Distribution Automation
- Two-Way Communications & Control
- Adaptive Relaying

Cyber Security
- Virtual Secure Enclave
- Live Action Network
- Secure Distributed Monitors
- Situational Awareness

Dynamic Control
- Load Control Systems
- Islanding Control System
- Energy Management System
- Seamless Grid Synchronization



Energy Secure Installation

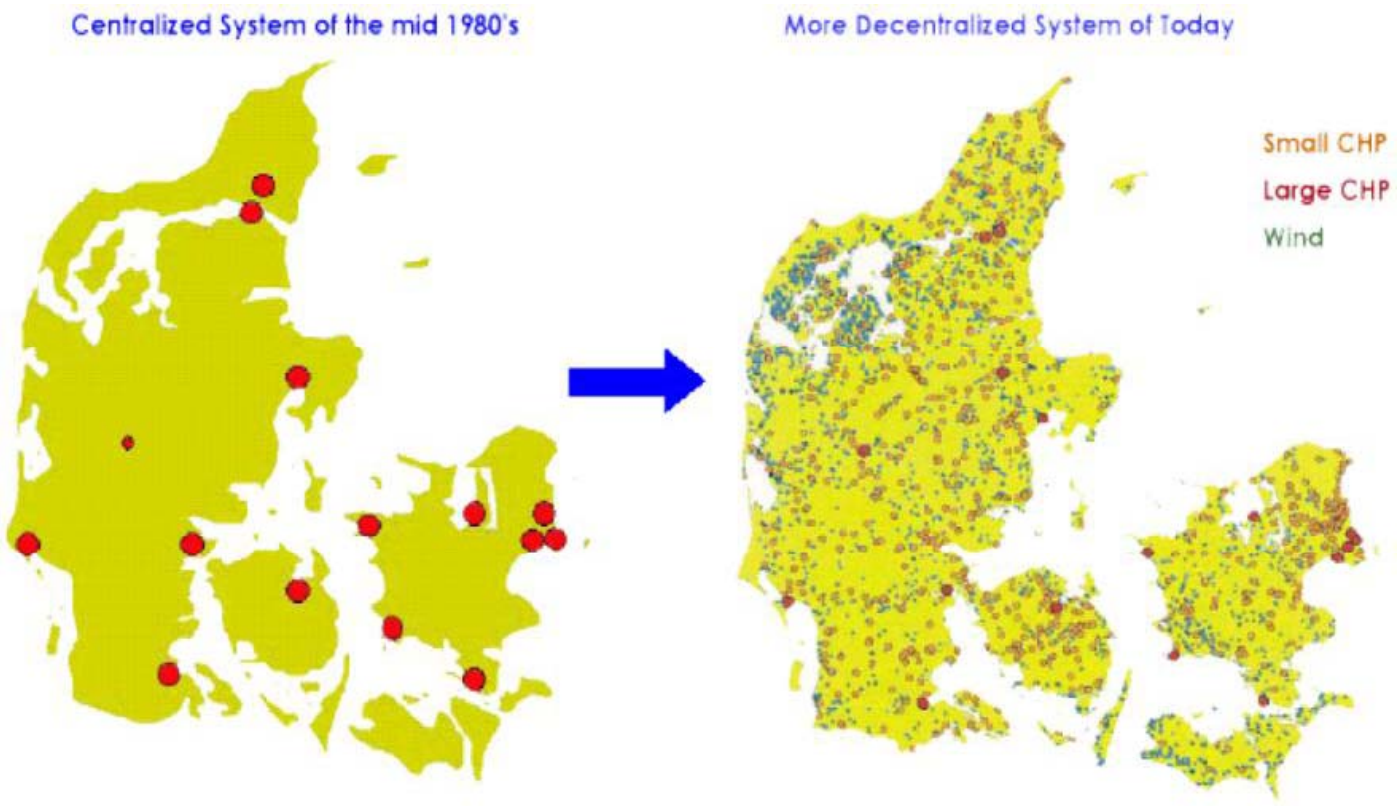
Demand Side Management
- Energy Efficiency Technologies
- Dynamic Voltage Regulators
- Smart Sockets
- Automated Load Shedding

Energy Storage
- Vehicle-to-Grid
- Hydrogen
- Batteries

Renewable Integration
- Photovoltaic
- Wind
- Fuel Cells
- Biofuel

The Energy Business is Changing

Denmark centralized to decentralized energy distribution



Source: Danish Energy Center

> The Energy Business is Changing

Denmark centralized to decentralized energy distribution

- Price of Power - Flat
- Reliability
  - Outages frequency is **1/3rd the US average**
  - Outage duration is **1/14th the US average**
- Renewable Energy sources, 5% to 20%+
- CO2 emissions have been cut in half

New Relationship Between Customer & Utility

The Utility of the Future

Energy Services Provider vs Commodity Provider

- Is concerned about the entire system not just their side of the meter
- Benefits from optimizing the use of energy vs. maximizing
- Plans for a more cost effective system by sharing data, load, services
- Evaluates cost of end use service vs. just cost per kWh
- Leverages device intelligence from the bottom up

New Relationship Between Customer & Utility

The Utility of the Future

Energy Services Provider vs. Commodity Provider

- Enables alternative financing mechanisms;
  - On-Bill Financing
  - Performance Contracts to benefit building owner and tenants
  - Private-Public Partnerships to extend beyond bonding authority
- Provides Life Cycle, whole system energy assessments
- Creates an Open Architecture environment

The Utility of the Future is **not** just about **Smart Meters** or even **Smart Grid**.

It is about becoming

A Smart Community

Make the most of your energy™

schneider-electric.com

Schneider Electric

Next Steps

- 2/27-3/27: Public outreach
- 4/16: Council decision
  - "Can we" municipalize, based on meeting Charter?

Next Steps

- **If yes, next steps**:
  - Approve legal action – valuation and filings
  - Governance discussion
  - Initiate 3rd party review process
  - Xcel partnership exploration
  - Phase II work plan (Summer 2013)
  - Condemnation resolution (August 2013)

Questions for Council

Does council have any questions or comments about…

1. The process used to develop and analyze the five municipalization options and the "Xcel Baseline" option?

2. The results and key findings of the analysis?

3. Given the risks and opportunities identified to date, does Council have enough information to make a decision at its meeting on April 16 about whether to take the next steps toward the potential creation of a local electric utility?

4. The proposed next steps?