Ketchum Energy Advisory Committee

Welcome to the first of the energy town hall series:

KetchEmpower:

Taking Charge of our Energy Future

Tonight!

Our Energy Security:

The Redundant Line & Local Energy Sources

Agenda

- 5:30pm Welcome by Mayor Nina Jonas
- 5:35pm Panel
  - Aimee Christensen, KEAC
  - Adam Richins, Idaho Power
  - Alan Richardson, KEAC
  - Rick LeFaivre, KEAC
  - Kerrin McCall, KEAC
- 6:15pm Q&A

KEAC Members

Aimee Christensen
CEO, Christensen Global Strategies

Steve Cook
Architect and member of the Ketchum Planning & Zoning Commission

Molly Goodyear
Executive Director, Environmental Resource Center

Wendolyn Holland
Consultant to early state energy companies and formerly with U.S. Department of Energy

Dean Holter
CFO/General Counsel at Christensen Global Strategies

Rick LeFaivre
Investor and former senior executive at Apple and Pacific Northwest National Laboratory advisory board memberm

KEAC Members

Bill Mann
Owner, Sagebrush Solar

Kerrin McCall
Writer, artist, environmental advocate

Alan Richardson
Former President & CEO, American Public Power Association

Josh Solly
Co-Founder, Ketchum Energy Company

Deb Bohrer
Environmental Resource Center board member and Energy Summit founding member

Joyce Allgaier
Staff liaison for city of Ketchum

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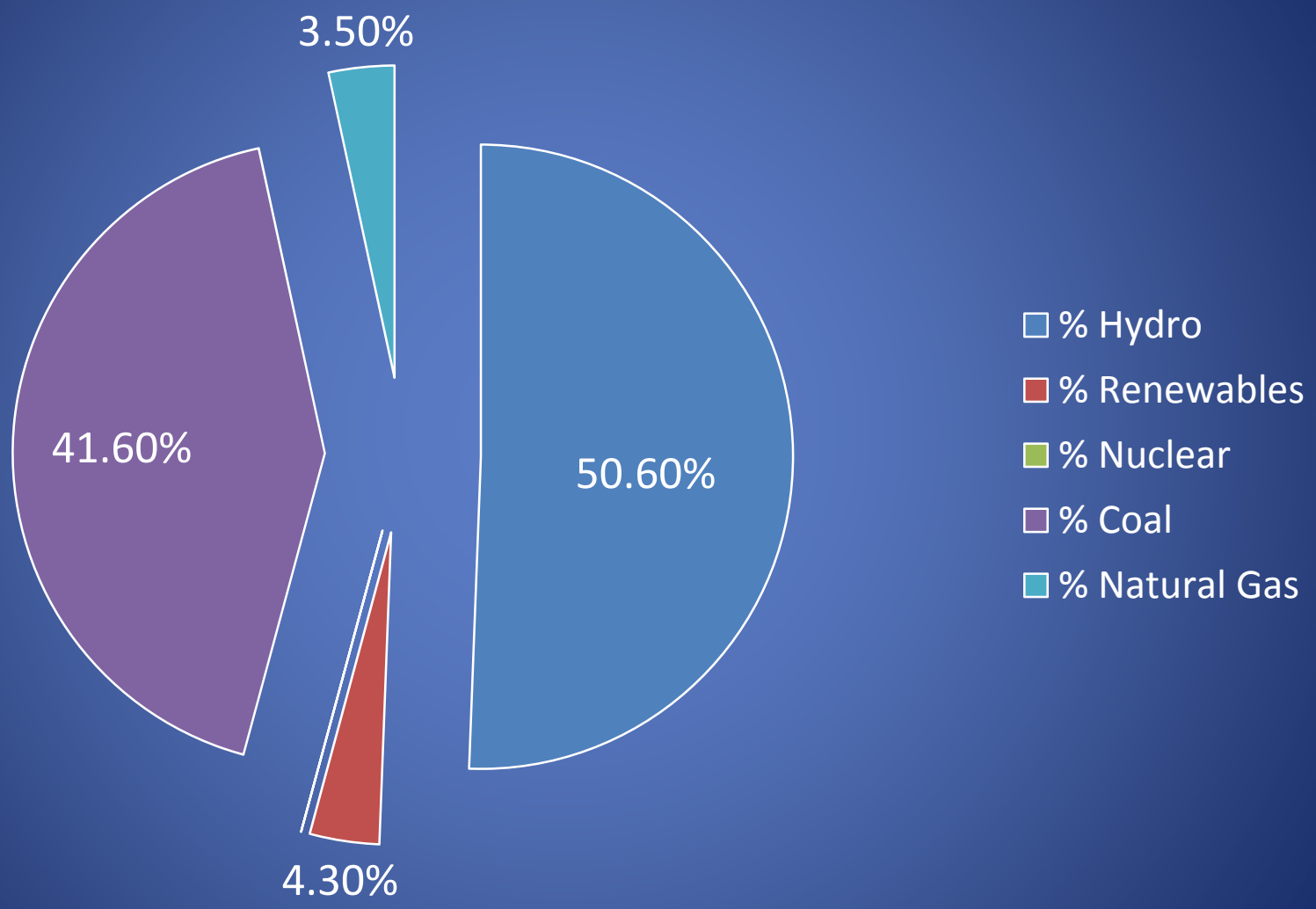
Introduction: Community Goals

Resilience: reliability of power, ability to respond to emergencies, adaptable (water, new technologies)

Economy: reduce costs, create jobs, keep $ in the valley

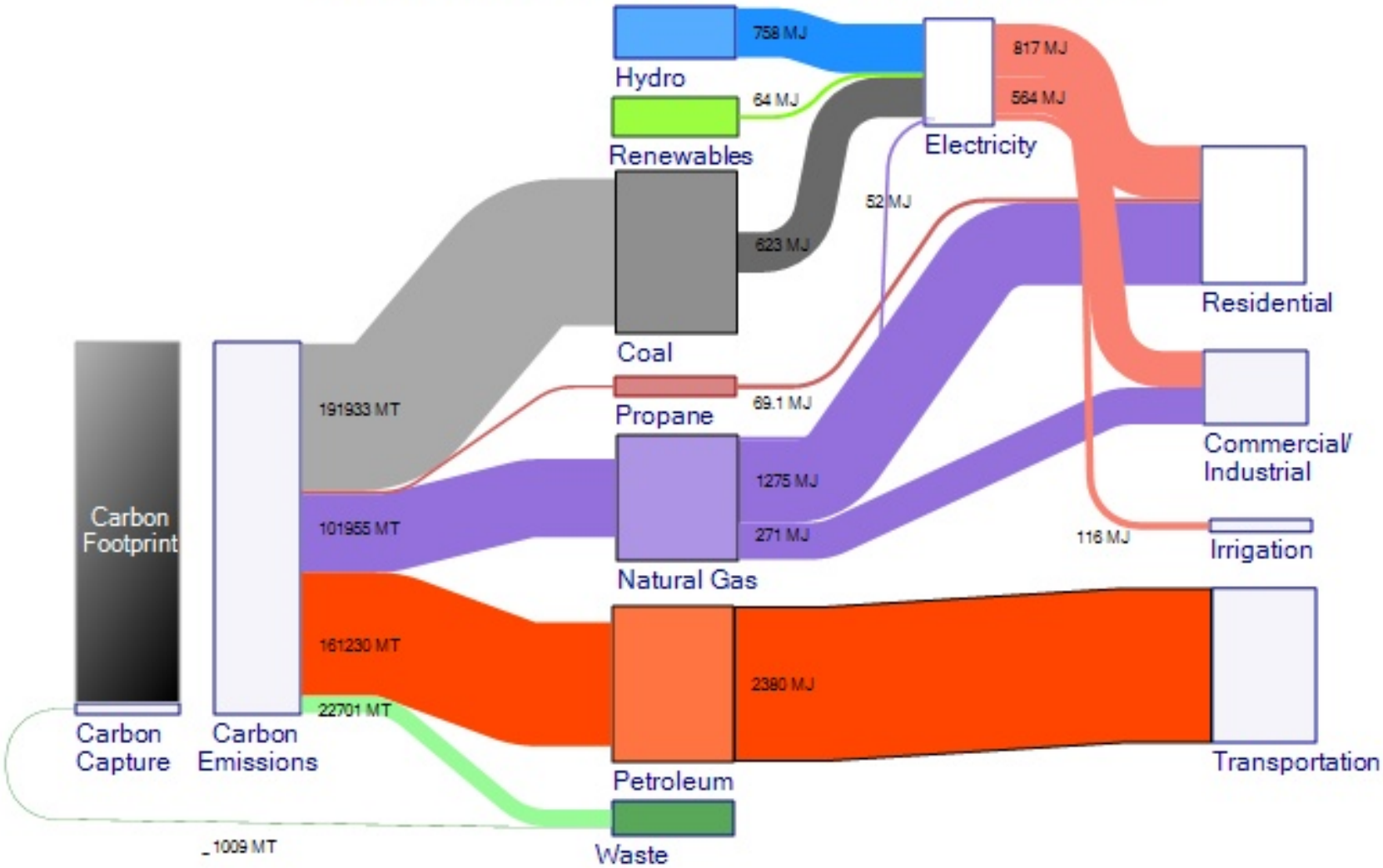
Environment: efficiency, renewables, transportation

Idaho Power Fuel Mix



New Energy Cities
Pioneering the Clean Energy Economy in the Northwest

Wood River Valley Region Energy Map 2010



New Energy Cities
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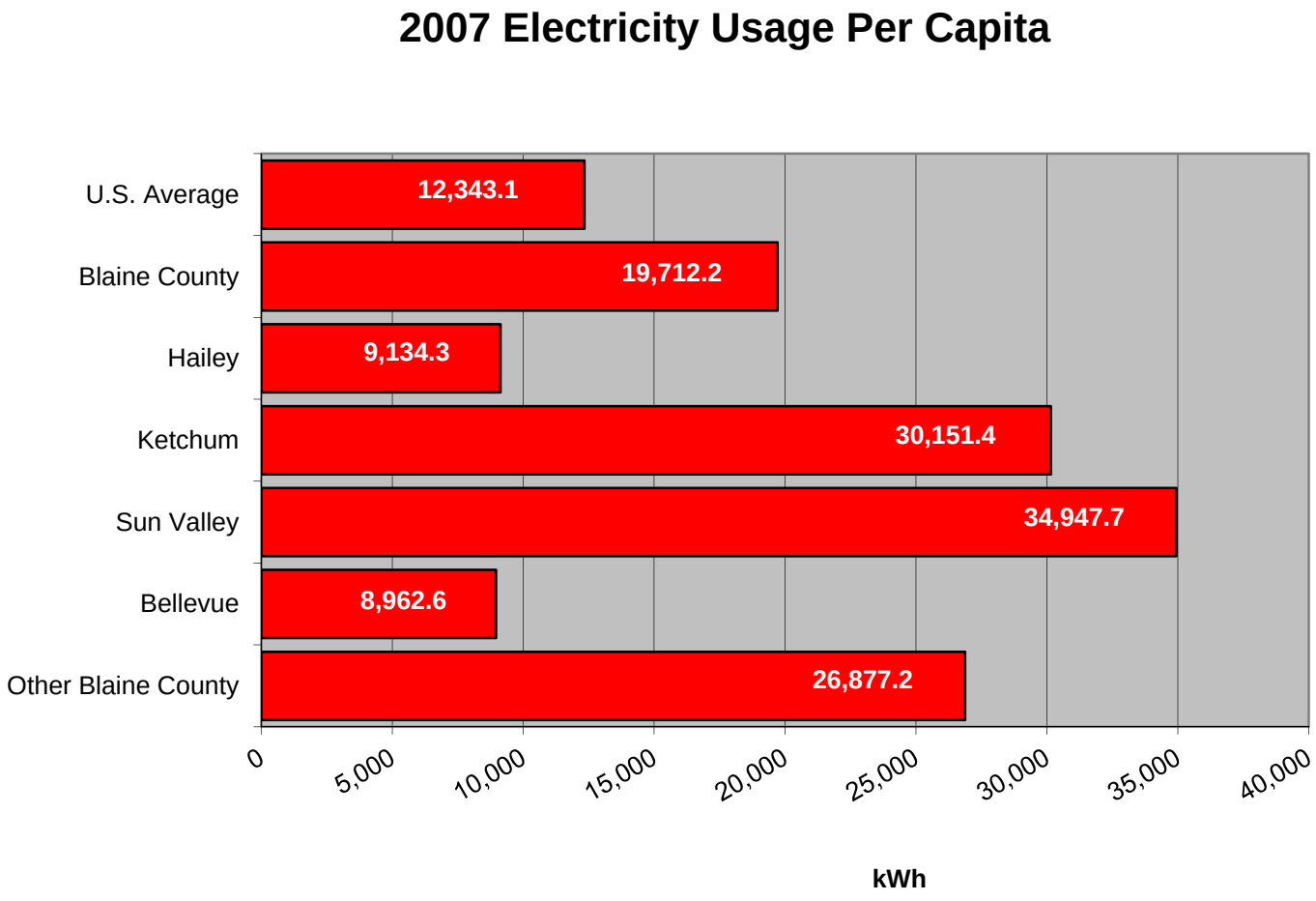
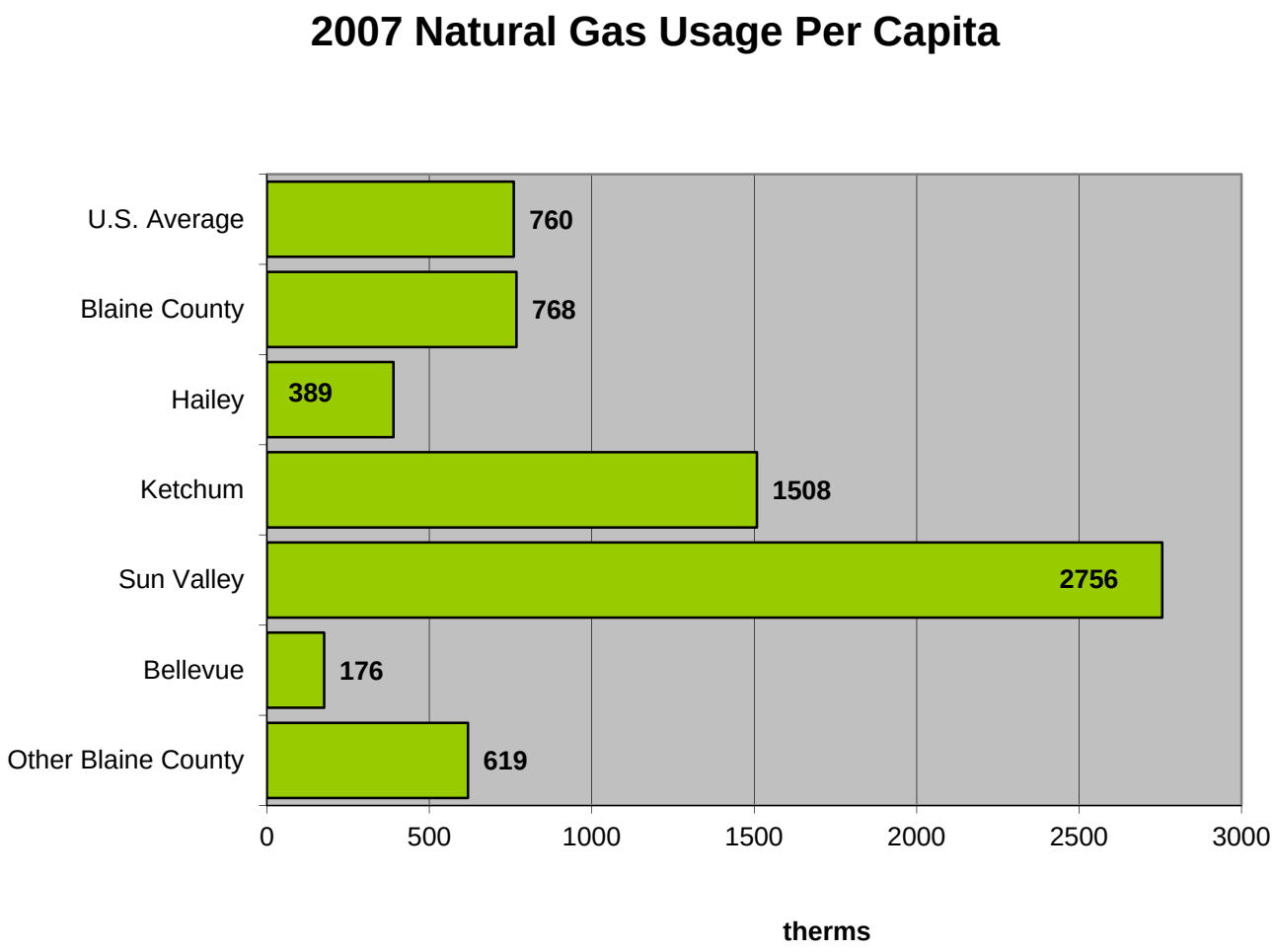
Energy by Jurisdiction: Electricity



Energy by Jurisdiction: Natural Gas



Community Energy Summit

- April 27-28, 2011
- Approximately 60 Community leaders
- Blaine County, Camas County, Hailey, Ketchum, Sun Valley, Bellevue, Cary, Fairfield
- Idaho Power Company (our local utility)
- Comprehensive view of community energy
- Community discussion about opportunities

New Energy Cities
Pioneering the Clean Energy Economy in the Northwest

Summit: Catalytic Projects

Initial List

- Solarize Sun Valley
- Building Energy Efficiency (municipal buildings & CARP; schools)
- Green Hospitality (Sun Valley resort; green accommodations; green highway; food scrap)
- Geothermal

Our Community + Idaho Power

- Supply our grid
- Provide incentives for efficiency
- Net metering: solar home/business systems
- Other renewable energy:
  - Wind, solar – utility-scale
  - “WR Renewable Energy Working Group”
  - IPCO & community members

Idaho Power

Past, Present and Future of the Electric Utility Industry

- Edison “invents” modern electric utility - 1882
  - “Greatest invention of mankind”
- Thousands of electric utilities in cities and towns by end of the 19th century
- No “service territories” – street-by-street cutthroat (and wire cutting) competition
- Head-to-head competition was destructive, ugly and uneconomic

Natural Monopoly + The Regulatory Compact

- Certain industries are "natural monopolies"
  - Service or production most efficient if concentrated in one company – monopoly
  - But monopolies abuse monopoly power
- Solution: The Regulatory Compact
  - Utilities granted <u>exclusive</u> service territories
  - In return agreed to serve everyone within that territory and allow rate regulation by 3rd party
- Result – vertically integrated, regulated utilities that controlled generation, transmission and distribution

Monopoly Model Worked Well For Decades

- Economies of scale in generation produced lower and lower kWh prices
- Consumers were happy
- Cheap energy electrified America
- Expanded uses for electricity ("live better electrically") resulted in tremendous growth – 7% per year, year after year.
- Utilities thought this would last forever.

1960's: Monopoly Model Begins to Crumble

- Late 60s, early 70s, power prices begin to rise
  - Large power plants were capital intensive
  - Nuclear wasn't in fact too cheap to meter
  - Environmental regulations increased costs
- Oil embargo, energy crisis forces America to consider national energy policy
- President Carter proposed, Congress enacts the Energy Policy Act of 1978
  - Focused on energy efficiency and conservation

PURPA Fractures Monopoly Model

- Public Utility Regulatory Policies Act of 1978 – One of five parts of Energy Act
  - PURPA Goals –
    - promote conservation
    - energy efficiency and
    - environmentally friendly commercial energy production
  - Breaks utility monopoly control over generation
    - Authorized “NUGs” to produce power
    - Required utilities to purchase that power

1980's-2000's
Continued Erosion of Monopoly Model

- After deregulating airlines, natural gas, telecom, U.S. flirts with utility deregulation
- Energy Policy Act of 1992 opens wholesale markets to greater competition
- Congress in 2005 required utility commissions to consider "net metering" opening door for individual distributed generation

Today: Nails in the Monopoly Coffin

- Economics and the Environment
  - Existing and proposed environmental regulations increase cost of fossil fuel generation
  - Causes and consequences of climate change push consumers, communities and corporations to find alternatives to fossil fuels
  - Alternatives are increasingly cost competitive with traditional forms of generation

Utility Model: Conclusions

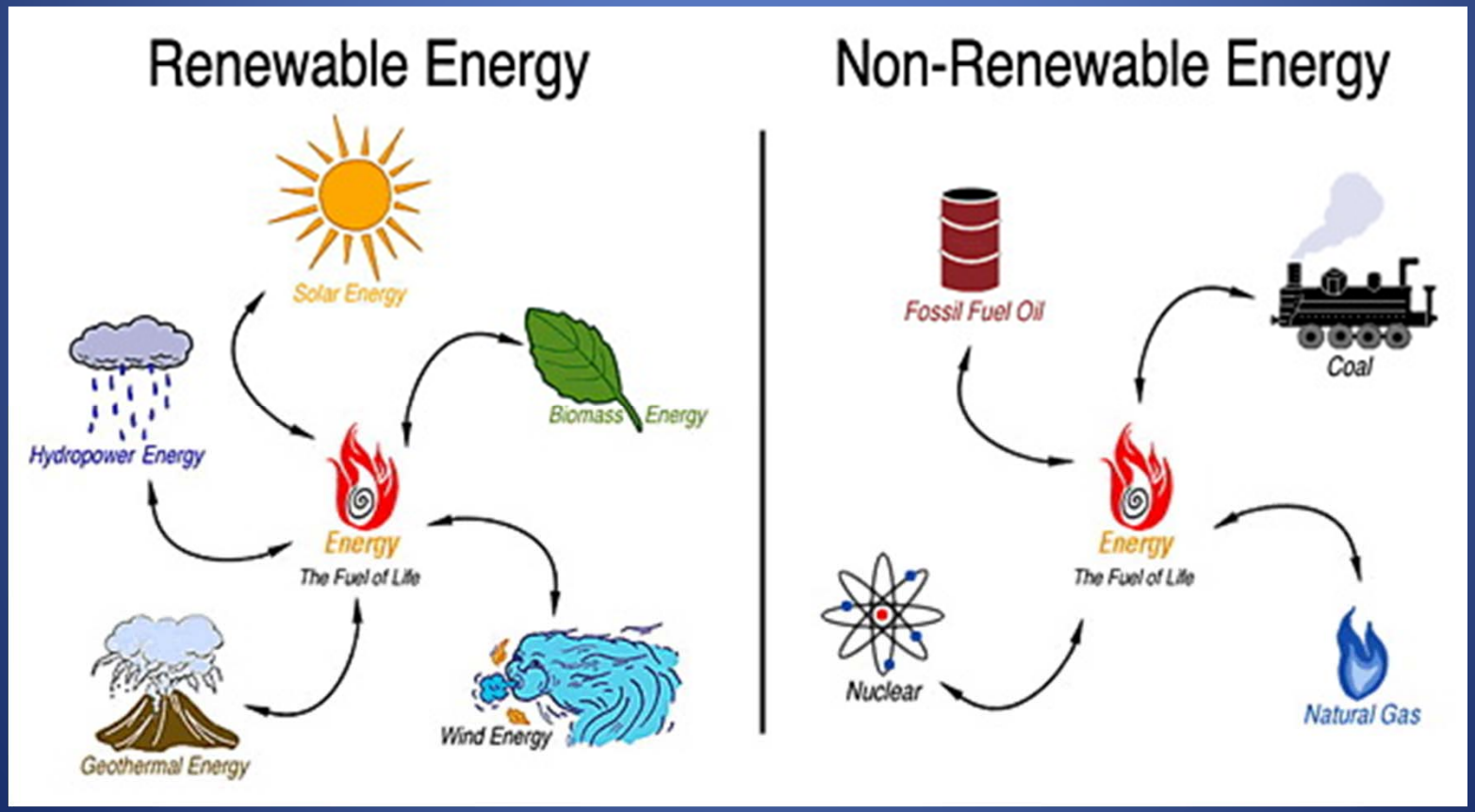
- The utility monopoly model dating back to 1882 has been undermined by legislation, economics and environmental concerns
  - Although “wire” monopolies are likely to persist
  - As will utility involvement in large scale generation including wind farms and solar
- Consumers and communities, working on their own and with their local utility, have options to “plain old utility service,” to plot their own environmentally friendly, sustainable energy future

What Next?

Exciting developments in:

- Renewable energy
- Energy efficiency
- Storage
- Mini-grids
- Business models: No upfront payments
- Technology costs down dramatically

Renewable Energy 101: Solutions and Technologies



Hydropower

American Falls Dam, Snake River

Benefits: Clean, renewable, leverages rain and gravity (PNW!)

Problems: New hydro options limited; fish migration issues

Opportunities: Run-of-River, Tidal, Wave, Large Water Pipes

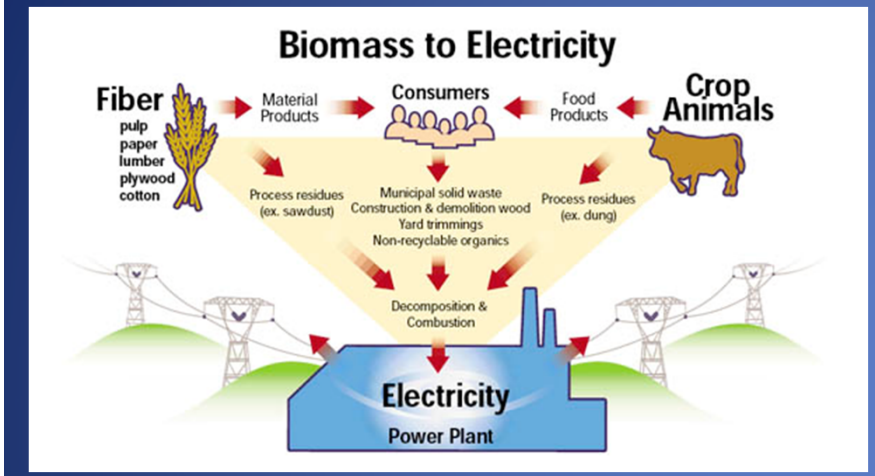
Geothermal Energy

Iceland

Benefits: Clean, renewable, leverages geothermal resources (PNW!)

Problems: Limited locations; can be expensive, inefficient

Biomass, Combined Heat/Power Cogeneration



Benefits: Great where biomass is created (farms, dumps); can be used for transportation (e.g., Biodiesel)

Problems: Foodstocks; conversion efficiency

Opportunities: Heat/power cogeneration using biomass or natural gas

Wind Power

Benefits: Clean, renewable

Problems: Wind is a variable resource; remote siting; bird kill problems

Opportunities: Couple with storage technology

Solar-PV and Solar-Thermal

Benefits: Clean, renewable; scales from rooftops (PV and Hot Water) to utility scale

Problems: The sun doesn't always shine

Opportunities: Couple with storage technology

Ivanpah Solar Electric Generating System, Mojave Desert

Energy Storage

UniEnergy Technologies

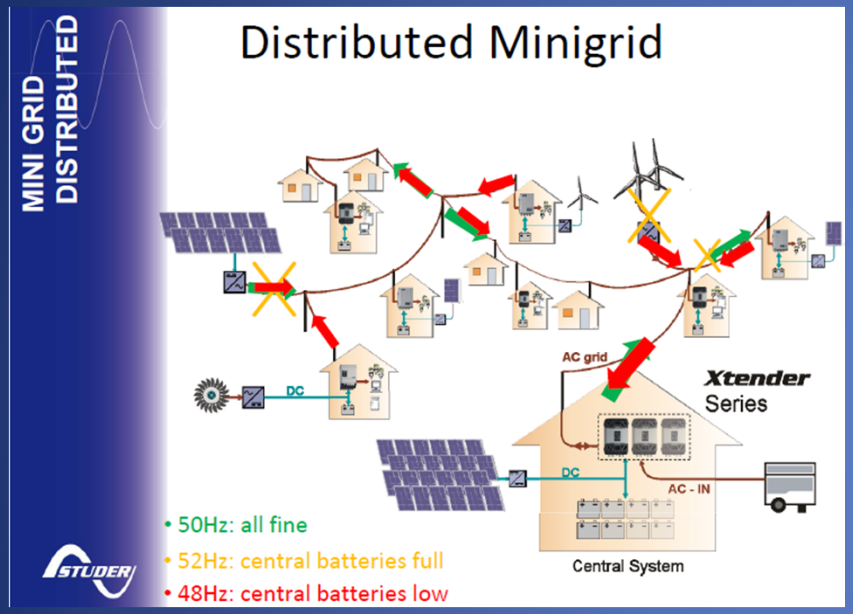
SolarCity/Tesla

Benefits: Required to normalize variable power sources and time-shift energy; both grid-scale and distributed

Problems: Still early technology options; cost, scalability

Opportunities: New battery chemistries (e.g., Vanadium Redox)

Smart Grids; Mini-, Micro-, Nano-Grids



<u>Benefits</u>: Bring more intelligence and interactivity to large-scale and localized grids

<u>Problems</u>: Standards, roll-out costs

The Future is Sunny!

Thompson-Reuters: "Solar will be our main source of energy by 2025"

THE WORLD IN 2025

10 PREDICTIONS OF INNOVATION

THOMSON REUTERS™

IN 2025

SOLAR IS THE LARGEST SOURCE OF ENERGY ON THE PLANET

Methods for harvesting, storing and converting solar energy are so advanced and efficient that it becomes the primary source of energy on our planet.

Thanks to improvements in photovoltaic technology, chemical bonding, photocatalysts and three-dimensional nanoscale heterojunctions, the use of the sun as the world's primary source of energy is no longer for the environmentally-conscious select; it is for the masses.

The sun's energy will be harvested much more efficiently. Its energy will be stored and used when needed. And the conversion of solar power will be much more efficient.

Solar thermal and solar photovoltaic energy (from new dye-sensitized and thin-film materials) will heat buildings, water, and provide energy for devices in the home and office, as well as in retail buildings and manufacturing facilities.

Chemical bonds, a photosynthetic process, will make solar energy available when needed. Increased efficiency of energy conversion will be realized through new materials such as cobalt-oxide and titanium-oxide nanostructures, photocatalysts and 3D nanoscale heterojunctions; while new methods using mesoscopic oxide films sensitized by dyes or quantum dots will contribute to improving the 2014 solar conversion efficiency rate of less than 10 percent.

FAST FACTS

- "Fabrication of novel heterostructure of CO3O4-Modified TIO2 nanorod arrays and enhanced photoelectrochemical property" most highly cited paper (last two years)
- "Design rules for donors in bulk-heterojunction solar cells – towards 10-energy-conversion efficiency" most highly cited paper (more than 1,600 times)

Germany!

Big Opportunity: Community Solar Projects

Colorado Springs, CO

Rockford, MN

Boulder, CO

Paradox Valley, CO

Putney, VT

Ellensburg, WA

Community Solar Project with Integrated Storage — Wright-Hennepin Co-op, Rockford, MN

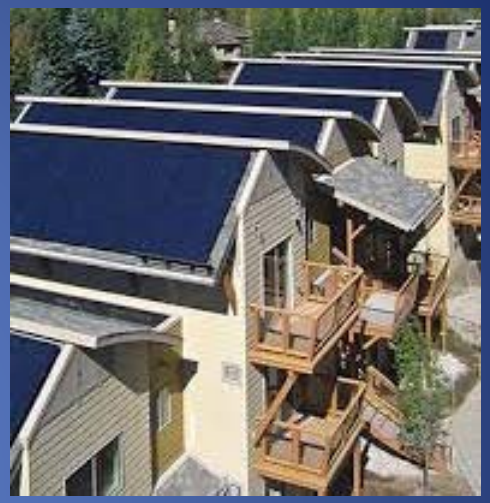
Solar Here: It's "Sun Valley" for a Reason!

- 5.5 kWh per square meter per day (Florida > 5 kWh/sq ft/day)
- ~ 80 systems currently installed
- Generating ~ 3 Mega-watt hours per year (Less than 1% of our annual energy demand)

Solar in Our Valley

100 kW Solar Hot Water & Heat
Cold Springs Crossings, Ketchum

67 kW Solar Hot Water
Blaine Co. Public Safety, Hailey



55 kW Solar Electric (PV)
Northwood Way, Ketchum

25 kW Solar Electric (PV)
Waste Water Treatment, Hailey

17 kW Solar Green House Heat
Sage School, Hailey

13 kW Solar Hot Water & Heat
Carlin Residence, Ketchum

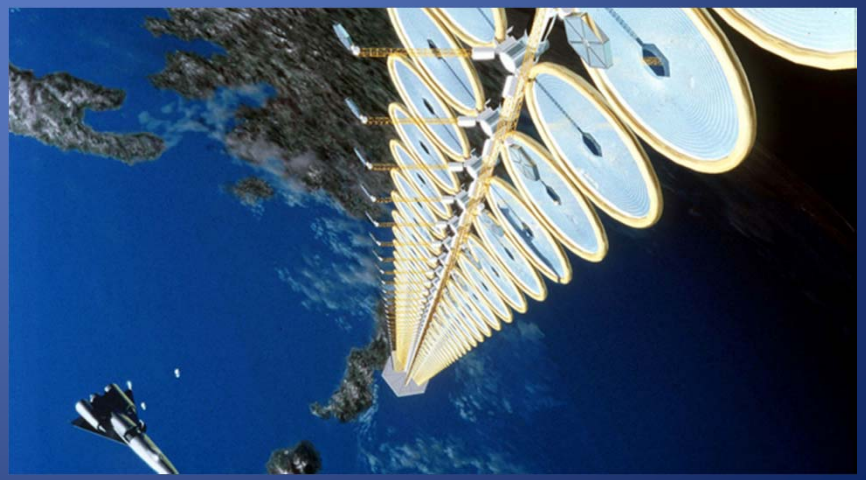
Longer Term …

Singapore Solar-Powered Supertrees

Solar array needed to power the U.S.

Solar Parking Lot

Solar power beamed from space?



North Valley Power Grid Overview

Current Hailey to Ketchum line is a 138 kV sub-transmission line.

Route:

WR Substation → Buttercup Rd → Valley Club → Over hill to East Fork → Power Ranch →Twin Creeks → Elkhorn substation → Over Dollar → Ketchum Substation

Current Hailey to Ketchum Line

Capacity

- IPCO states that the existing line has more than enough capacity for the future
- The historic peak load in 2007 was 64MW = 53.5% capacity
- Energy demand is decreasing with efficiency and awareness
- Peak load in 2013 was 54.3 MW, <u>10 MW less than 2007</u>

Current Line: Maintenance

The existing line has an enhanced maintenance schedule for structural, electrical, fire protection, avalanche studies and emergency action plans to ensure the lines reliability.

KEAC has requested:

- Continued enhanced maintenance
- Cost analysis to replace wooden poles w/ steel poles
- Risk assessment for the continued use of the existing line as the sole transmission line
- Options analysis

Current Line: Outages 1995-2014

3 maintenance outages:

- 5/31/95 1 hour 44 minutes maintenance
- 10/11/04 1 hour 48 minutes / maintenance due to vandalism / shot out conductor
- 9/27/11 5 hours 42 minutes maintenance

= 7.5 hours of planned maintenance

Current Line: Outages 1995-2014

2 momentary outages less than one minute:

- 8/14/98 5 minutes unknown
- 2/08/05 58 minutes equipment failure

2 sustained unplanned outages:

- Christmas 2009 and June 2014 were caused by the failure of one or both of the lines south of Hailey which bring power to the existing Hailey to Ketchum line.

Proposed Line: Location, Impact

Location:

- Up Highway 75 from the Wood River Substation north of Hailey to St. Luke's, then buried into Ketchum.

Impact:

- Pole size, poles and lines if not undergrounded

Time of construction for city undergrounding:

- 2 week construction time for every city block

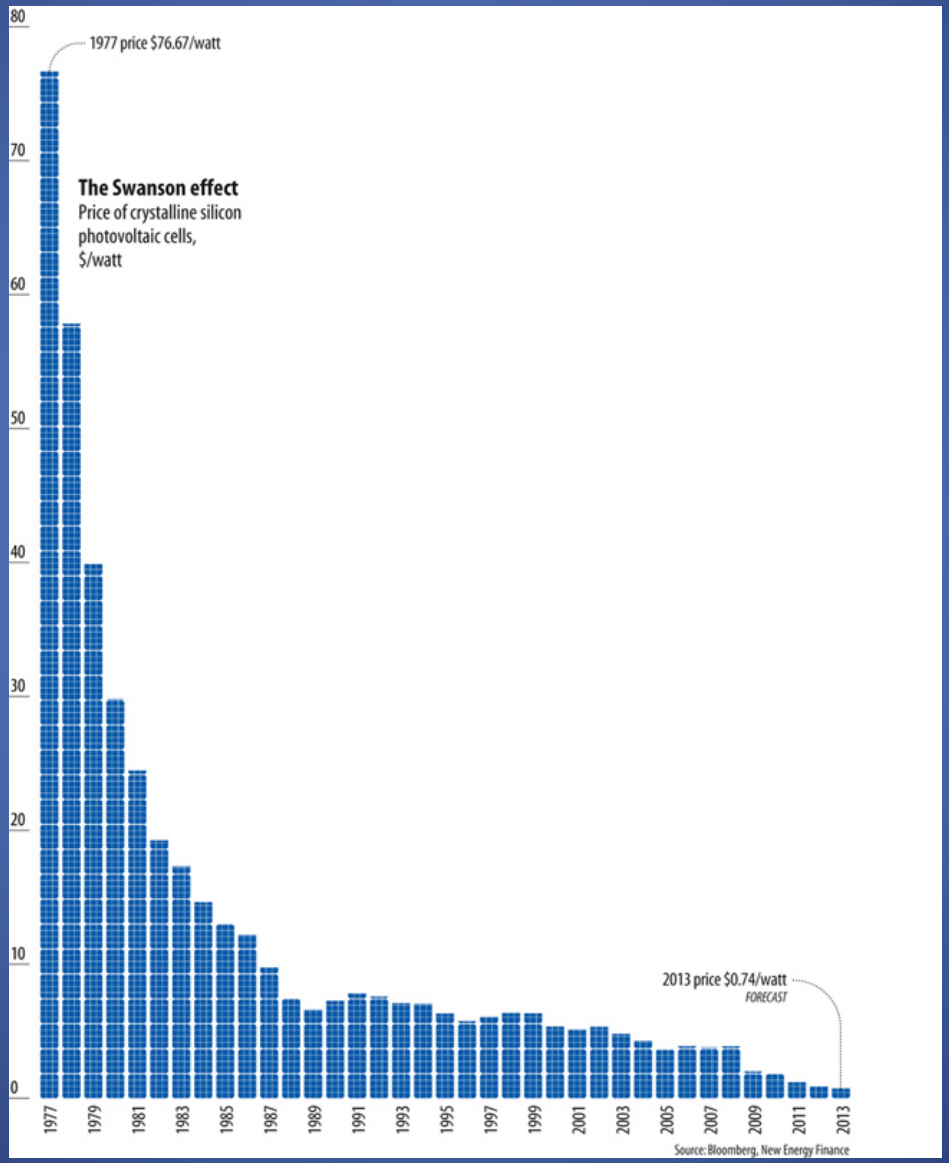
Proposed Line: Costs

- $23 million is the projected cost in 2013
- $7 million for the line paid for by all IPCO ratepayers
- $16 for the undergrounding from the St. Luke's Hospital to Ketchum substation on Sun Valley Road
- Buried section paid for by the users of the line by LID (Local Improvement District) at a rate of $230 per $100,000 property value

KEAC Take-aways

- Reliability, economy, environment are guiding priorities
- New technologies, new costs, new business models, changing climate = evolving analysis of best energy solutions for our community
- Need to be flexible
- Redundant line: need information on risks, options
- Seeking community input on our energy priorities
- Solar is revolutionizing our energy options

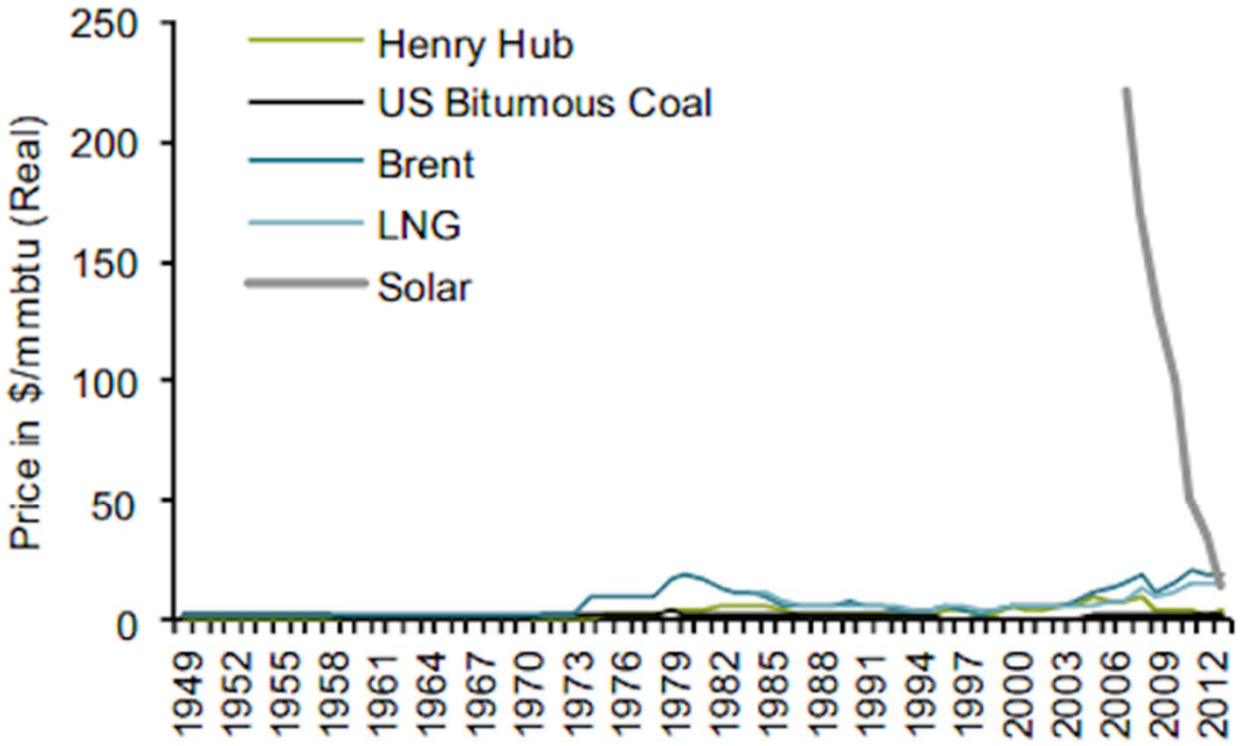
Solar Costs: 1977-2013



Solar Costs

Exhibit 2

Welcome to the Terrordome… $/MMBTU by Energy Type



Source: EIA, CIA, World Bank, Bernstein analysis

Clean Energy = Strange Bedfellows

Georgia: Tea Party + Sierra Club =

Green Tea
COALITION

Conclusion

We want to put the sun in Sun Valley!

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