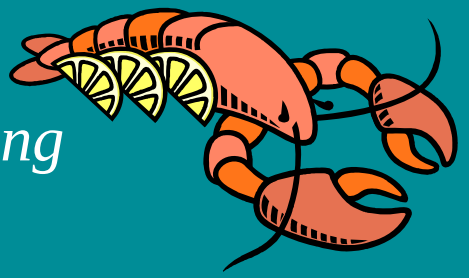
Eastern Idaho Electrical Plan

Community Advisory Committee

Meeting #2
November 14, 2008

Meeting Agenda

10:00 a.m.	Welcome and Introduction
	Review CAC meeting #1
10:30 a.m.	Generation
11:15 a.m.	Transmission
11:45 a.m.	Lunch – *Chartwells/ISU Catering*
12:30 p.m.	Transmission (continued)
1:00 p.m.	Substations
1:45 p.m.	Next Steps and Wrap up / Adjourn by 2:00 p.m.



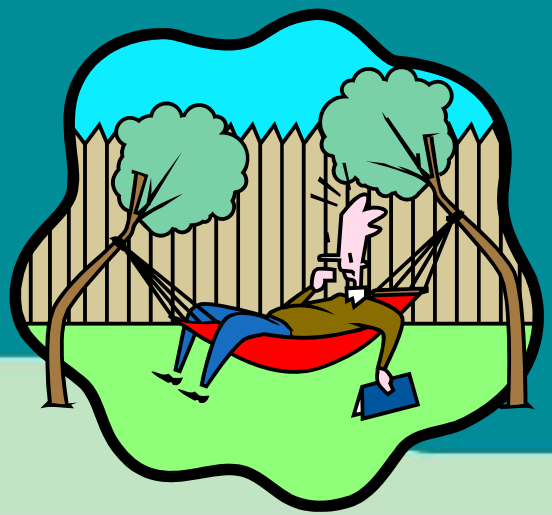
Purpose of the Project

- To create a clear and documented electrical energy supply plan to serve the load needs of Idaho Power's Eastern Idaho region from now through buildout

  – *"The public process is the starting point of all electrical supply plans and any resulting transmission rights-of-way and substation siting requirements"*

"The nicest thing about not planning is that failure comes as a complete surprise and is not preceded by a period of worry and depression."

John Preston, Boston College



Idaho Power's Perspective

- Idaho Power engineers have studied a number of different options for serving Eastern Idaho and these will all be presented in a couple months
- **However, we want the committee members to offer options too**
  - A primary reason for convening a committee such as this is to come up with ideas that don't come naturally to an engineer's mind
  - We truly want to go into this community advisory committee process with an open mind and no preconceived plans for the final outcome

General AC Meetings Outline

Mtg #1 Orientation and Education

- Initiate the process and orient the Advisory Committee
- Tour of electrical system facilities
- Basic electrical service function and operation

Mtg #2 Education (continued)

- Substations
- Transmission
- Generation

Mtg #3 Education (continued)

- Energy Efficiency
- Rates & Regulatory
- Eastern Idaho existing conditions
- Begin Developing Goals

General AC Meetings Outline

Mtg #4 Education (continued)

- Confirm Goals
- Future electrical buildout needs
- Transmission & related components to meet buildout needs
- Initial alternatives discussion

Mtg #5 Alternatives Development and Initial Screening: Identify Feasible Alternatives

- Review Goals
- Mapping/Alternatives development orientation
- Small group mapping exercises

Mtg #6 Alternatives Development Continued/Evaluation & Scoring Matrix

- Mapping/Alternatives development review & feedback
- Resume small group mapping exercises if needed
- Evaluation/Scoring Matrix orientation

General AC Meetings Outline

Mtg #7 Alternatives Evaluation: Determine Most Feasible Alternative(s)

- Alternatives evaluation & scoring process
- Identify preferred alternatives for each of the planning areas

Mtg #8 Recommendations: Develop consensus for a recommended electrical plan to meet Idaho Power Company and Eastern Idaho resident needs

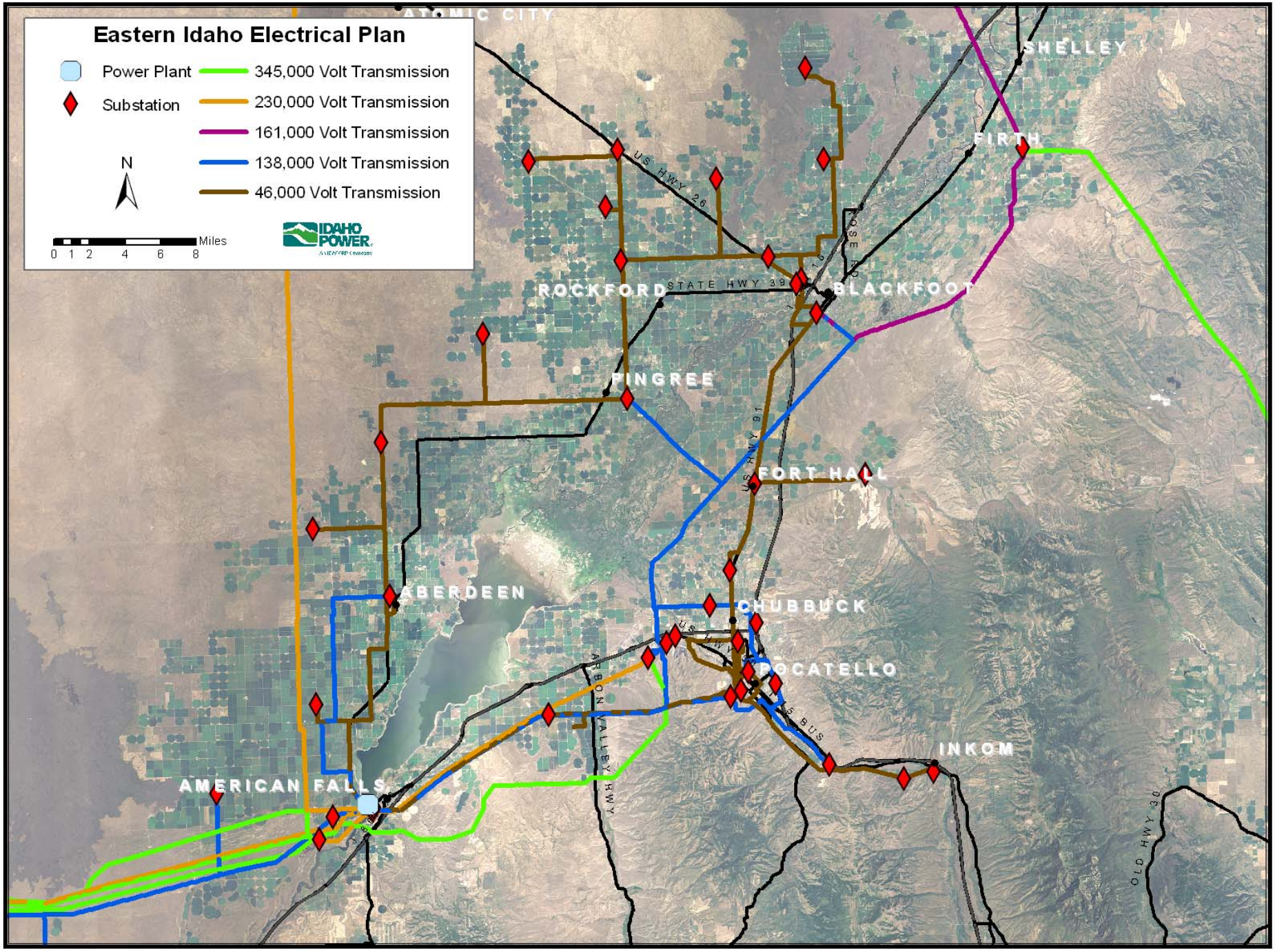
- Verify/Confirm preferred alternative(s) and ranking
- Develop implementation plan
- Discuss local plan coordination

Mtg #9 Review Draft Plan

- Review draft Plan
- Comments
- Plan rollout discussion

Review Highlights of Meeting #1

- Committee Introductions
- Bus tour of energy facilities
- Comments/Suggestions


Eastern Idaho Electrical Plan
Power Plant
Substation
345,000 Volt Transmission
230,000 Volt Transmission
161,000 Volt Transmission
138,000 Volt Transmission
46,000 Volt Transmission
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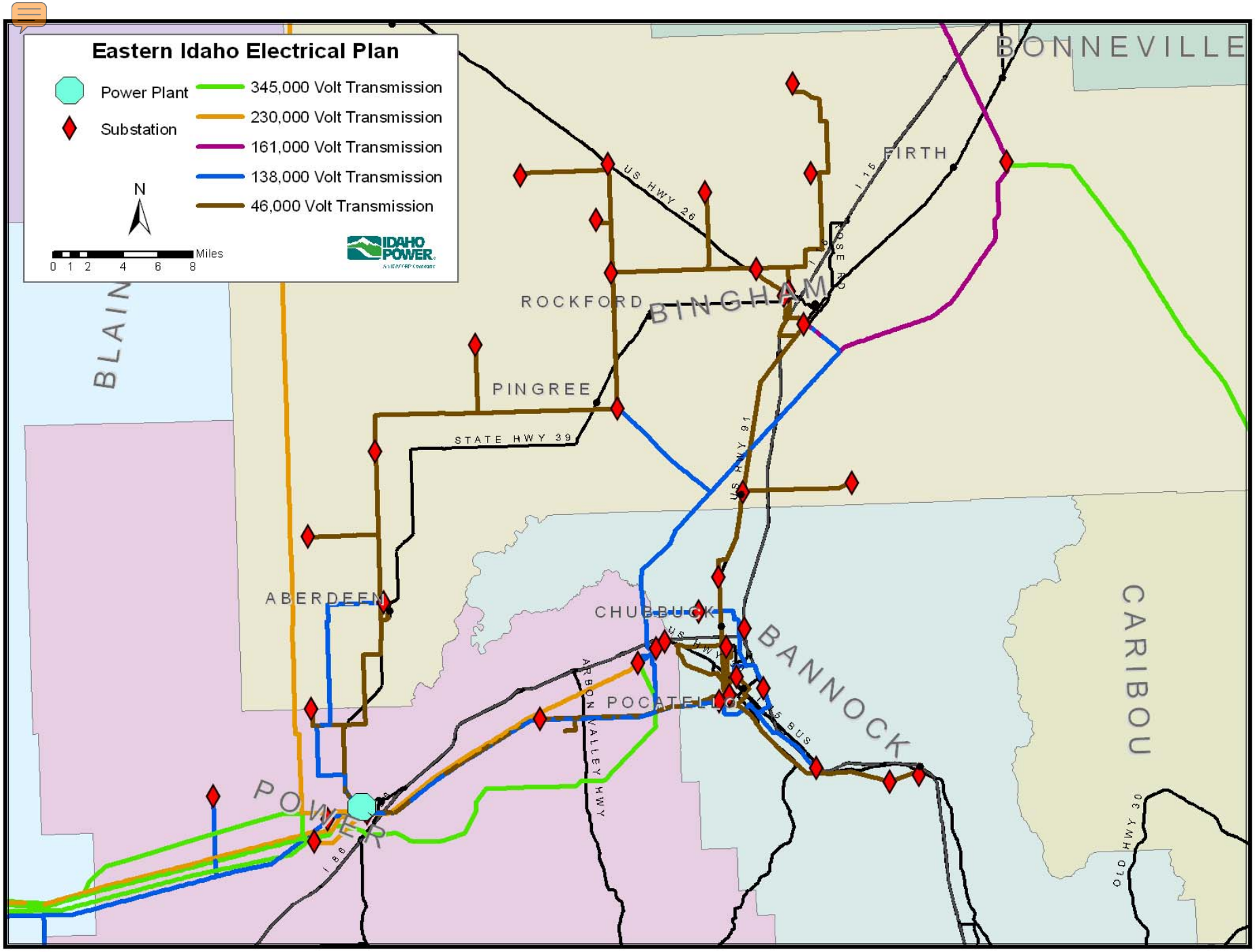
IDAHO POWER
ATOMIC CITY
SHELLEY
FIRTH
US HWY 26
ROCKFORD
STATE HWY 39
BLACKFOOT
PINGREE
US HWY 91
FORT HALL
ABERDEEN
CHUBBUCK
POCATELLO
INKOM
AMERICAN FALLS
ARBON VALLEY HWY
OLD HWY 30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Eastern Idaho Electrical Plan

Community Advisory Committee -Generation

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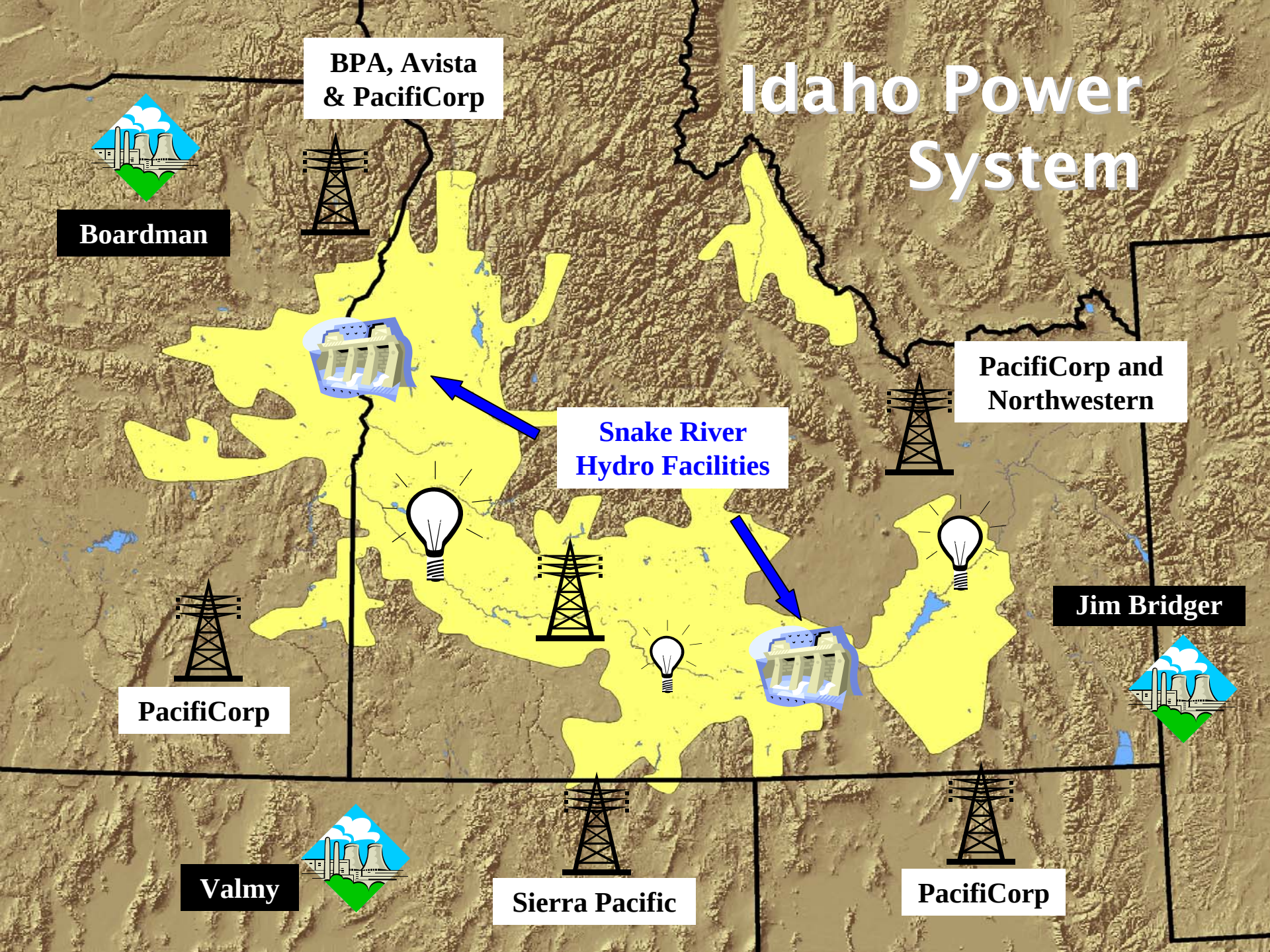
November 14, 2008


Idaho Power System
BPA, Avista & PacifiCorp
Boardman
Snake River Hydro Facilities
PacifiCorp and Northwestern
Jim Bridger
PacifiCorp
Valmy
Sierra Pacific
PacifiCorp

Generation Resources in Idaho

- There are about 3,200 MW of generation within the state of Idaho. This includes about 1,500 MW owned by Idaho Power
  - The remainder of Idaho Power's generation is located in Oregon, Nevada and Wyoming
- Idaho Power's total generating capacity is about 3,300 MW
  - Idaho Power cannot use its hydro resources to their maximum capacity at the same time
    - Reservoir levels
    - Regulated water flow restrictions
- Idaho is a net importer of energy

Integrated Resource Plan

- Every 2 years Idaho Power is required to file an Integrated Resource Plan (IRP) with the IPUC and OPUC
- Describes Idaho Power's plans for resources to supply its growing load
  - Projects load and resources out 20 years
  - Generation, transmission, demand side
  - Idaho Power must ensure that resources are cost-effective, low risk, and meet the increasing electrical energy demands of its customers
  - IRP is created using a collaborative process with customer and advocacy groups

http://www.idahopower.com/energycenter/irp/2006/

2006 Integrated Resource Plan

- In next twenty years, the IRP calls for:
  - 187 MW Demand Side Management (peak)
  - 250 MW Wind
  - 150 MW Geothermal
  - 150 MW Combined Heat & Power
  - 250 Combined Cycle Combustion Turbine
  - 250 MW Integrated Gasification Combined Cycle (coal)
  - 250 MW INL Nuclear (2023)
  - 285 MW Transmission (to bring in outside energy)

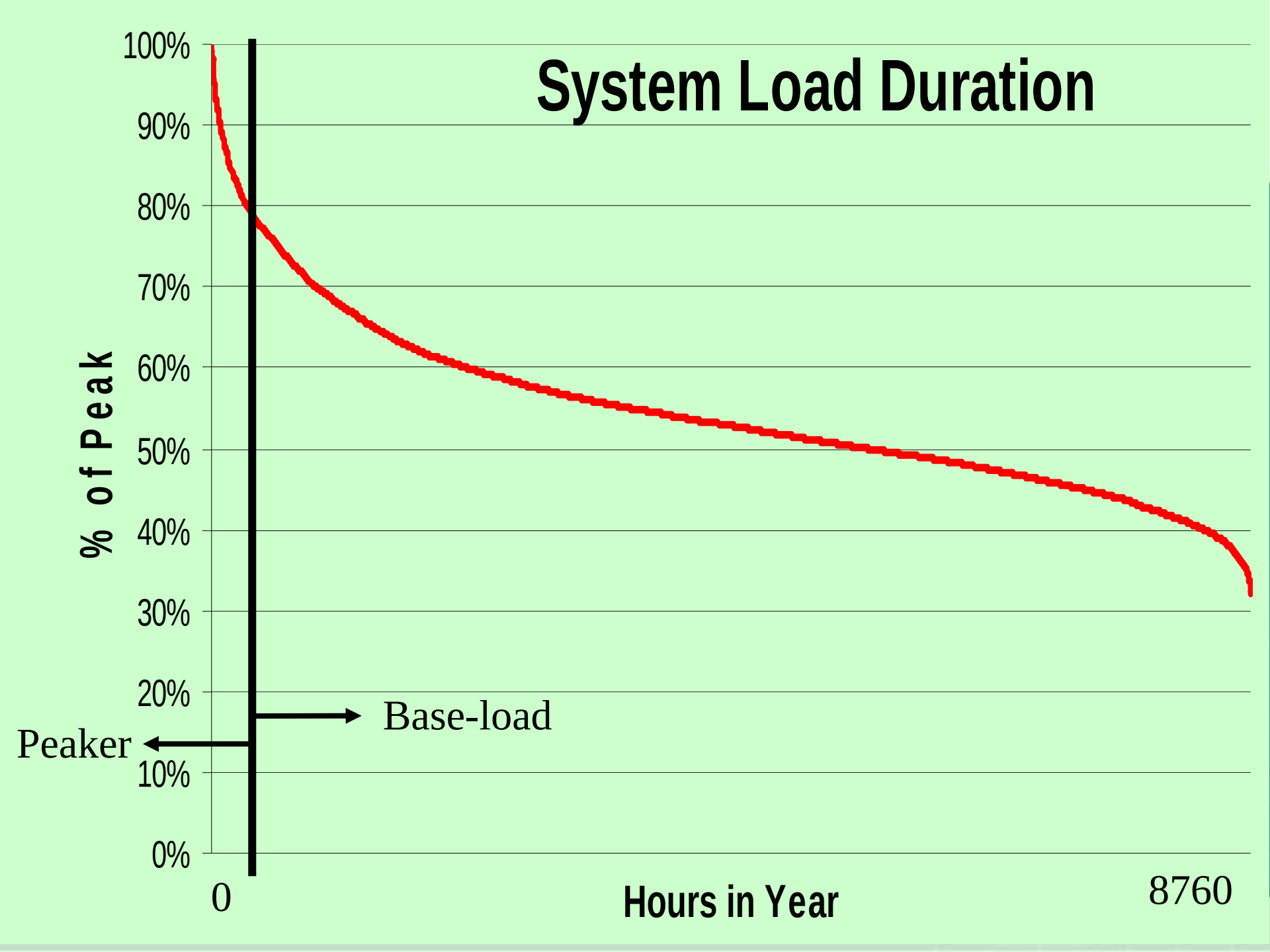
- Eastern Idaho is served by both transmission and generation
- The nearest Idaho Power generator is American Falls (112 MW)
- Other nearby generation includes:
  - 12.5 MW Shoshone Falls
  - 54.3 MW Twin Falls
  - 80 MW Bliss
  - 59 MW Milner
  - 70 MW Lower Salmon
  - 39 MW Upper Salmon
  - 112 MW American Falls
  - 2.4 MW Clear Lake
  - 15 MW Lower Malad
  - 9 MW Upper Malad
  - 8 MW Thousand Springs

Base-Load vs Peaking Generation

- Idaho Power's average energy needs are supplied by *base-load generation* and imports from out of state
  - Typically
    - Hydro
    - Coal-Fired
    - Wind
  - Long start-up times
  - Lower operating cost
  - Long run times

Base vs Peaking Generation

- Often times, base generation is inadequate to supply Idaho Power's load. During these periods we use *peaking generation*
  - Quick start
    - Combustion Turbines
    - Hydro
  - Peaking generation can also be used in emergency situations when other generation is out of commission
    - Bennett Mountain
    - Danskin


System Load Duration
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% of Peak
Base-load
Peaker
0
Hours in Year
8760

Idaho Power Hydro Plants

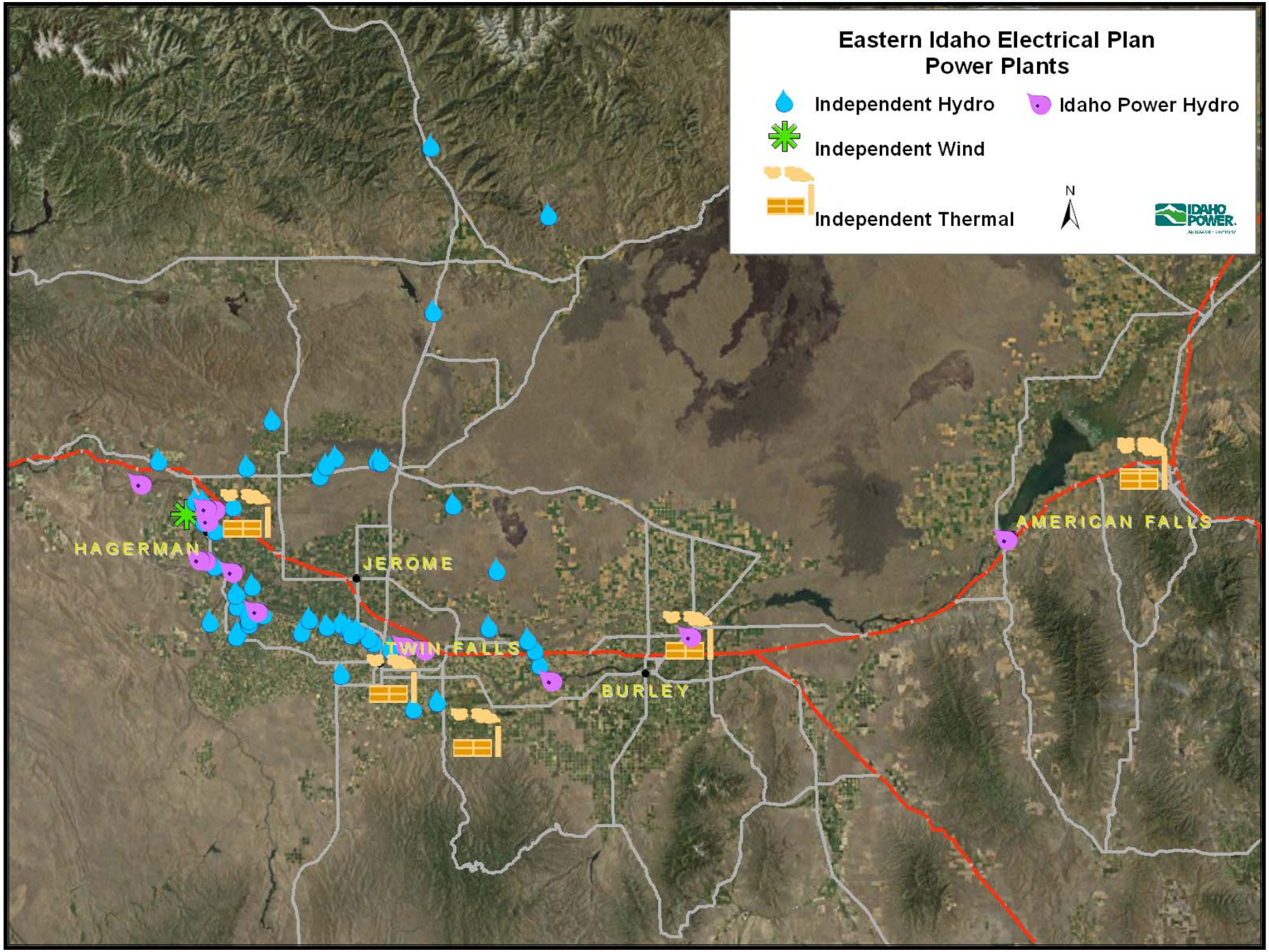
- American Falls-112 MW
- Bliss-80 MW
- Brownlee-728 MW
- Cascade-14 MW
- Clear Lake-2.4 MW
- Hells Canyon-450 MW
- Lower Malad-15MW
- Upper Malad-9MW
- Milner-59MW
- Oxbow-220 MW
- Shoshone Falls-12.5 MW
- Lower Salmon-70 MW
- Upper Salmon-39 MW
- CJ Strike-89 MW
- Swan Falls-25.5 MW
- Thousand Springs-8 MW
- Twin Falls-54 MW

Idaho Power Thermal Plants

- Boardman (Coal) – 55 MW
- Jim Bridger (Coal) – 707 MW
- Valmy (Coal) – 261 MW
- Danskin (Natural Gas) – 160 MW
- Bennett Mountain (Natural Gas) – 160 MW
- Salmon (Diesel) – 5.5 MW

Customer Owned Generation

- More than 120 MW is available during the summer from customer owned generation
  - Forest Waste
  - Canal based hydro projects
  - Co-generation from food processors
  - Wind
- Non-hydro customer owned generation is available year-around


Eastern Idaho Electrical Plan
Power Plants
Independent Hydro
Idaho Power Hydro
Independent Wind
Independent Thermal
N
IDAHO POWER
HAGERMAN
JEROME
TWIN FALLS
BURLEY
AMERICAN FALLS

Market Purchases

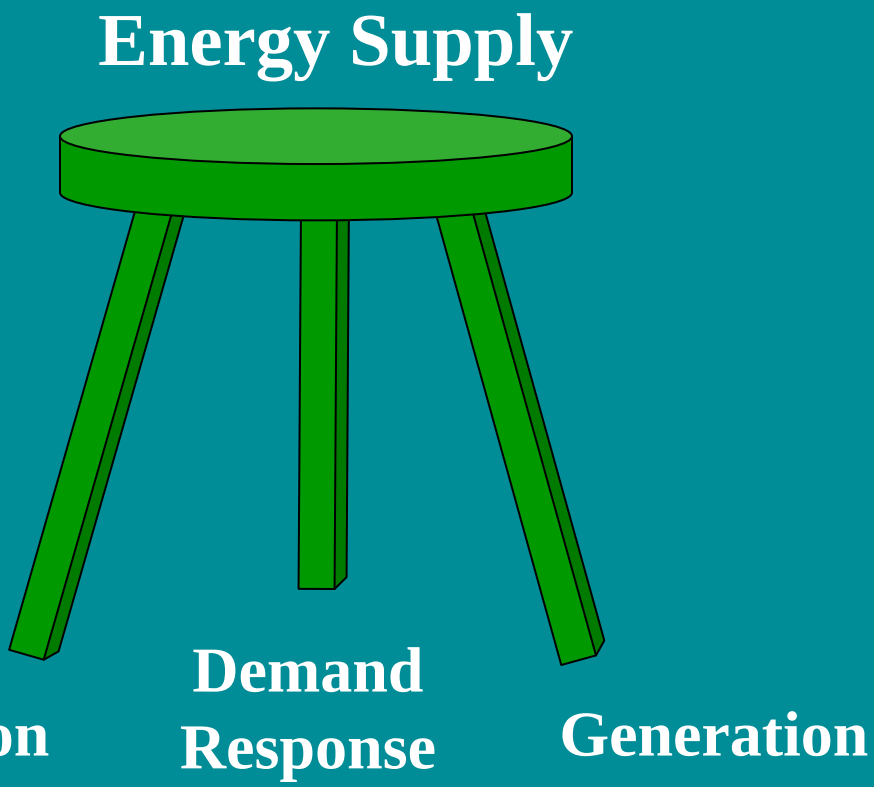
- Idaho Power purchases power from the market to augment its own generation
- In middle of summer, cost is high
  - Highest in late afternoon when Idaho Power's peak hits
- Sometimes, must purchase power from the southeast (Utah, Arizona, New Mexico)
  - This power can be quite expensive

- In 2007, Idaho Power purchased 28% of its energy on the market

Demand Side Management

- We are going to deal with DSM a great deal during a later meeting
- A special case of DSM is *Demand Response (DR)*
- DR attempts to decrease the load only during peak hours
- DR doesn't always reduce overall energy use. It merely shifts the use to different hours when the power is more available and/or cheaper
  - Lessens the need for peaking generation and buying from the market when it's the most expensive

Demand Response is a Third Leg to Energy Supply

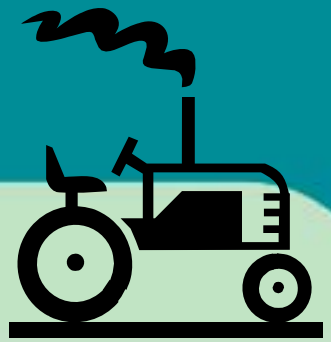


Demand Response Programs

- AC Cool Credit
  - Cycles customer air conditioners on and off in 15- to 20-minute intervals over a 2- to 4-hour period
  - Commanded via pager signal
  - Began installing in 2005. Ultimate goal of 40,000 customers on program
    - Had 19,213 customers by June 1, 2008 (33 MW)
    - Installation due to be finished in 2009 or 2010
  - 40,000 customers will give us up to 70 MW of demand response.
  - Customers get $7 per month during the summer for participating
  - Expanding the program into Eastern Idaho in 2009

Demand Response Programs

- Irrigation Peak Clipping
  - Turns off irrigation pumps at the same time of day, once per week
  - Program spread over many irrigators so we get response 5 days a week
  - Pumps off for 2 hours, from 4 to 6 p.m.
  - Irrigators are rewarded with a reduced demand charge
  - Idaho Power gets about 40 MW of demand response



Hydroelectric Generation

- A hydroelectric plant converts falling water into electrical energy. The falling water is used to turn a generator that then makes electricity

Coal-Fired Generation

- A coal-fired power plant uses the energy released from burning coal to make steam that is then used to turn an electrical generator, thus producing electricity
- Two primary types of coal-fired power plants
  - Pulverized coal
    - Crushes the coal and burns it in a boiler to make steam.
      - Jim Bridger
      - Valmy
      - Boardman
  - Coal gasification
    - Converts the coal energy into a gas that can be burned in a combustion turbine (to be described in following slides)

Natural Gas/Steam Generation

- A natural gas/steam power plant uses the energy released from burning natural gas to make steam that is then used to turn an electrical generator, thus producing electricity. Very similar to a coal-fired power plant
  - Simple Cycle Combustion Turbine
  - Combined Cycle Combustion Turbine

Simple Cycle Combustion Turbine

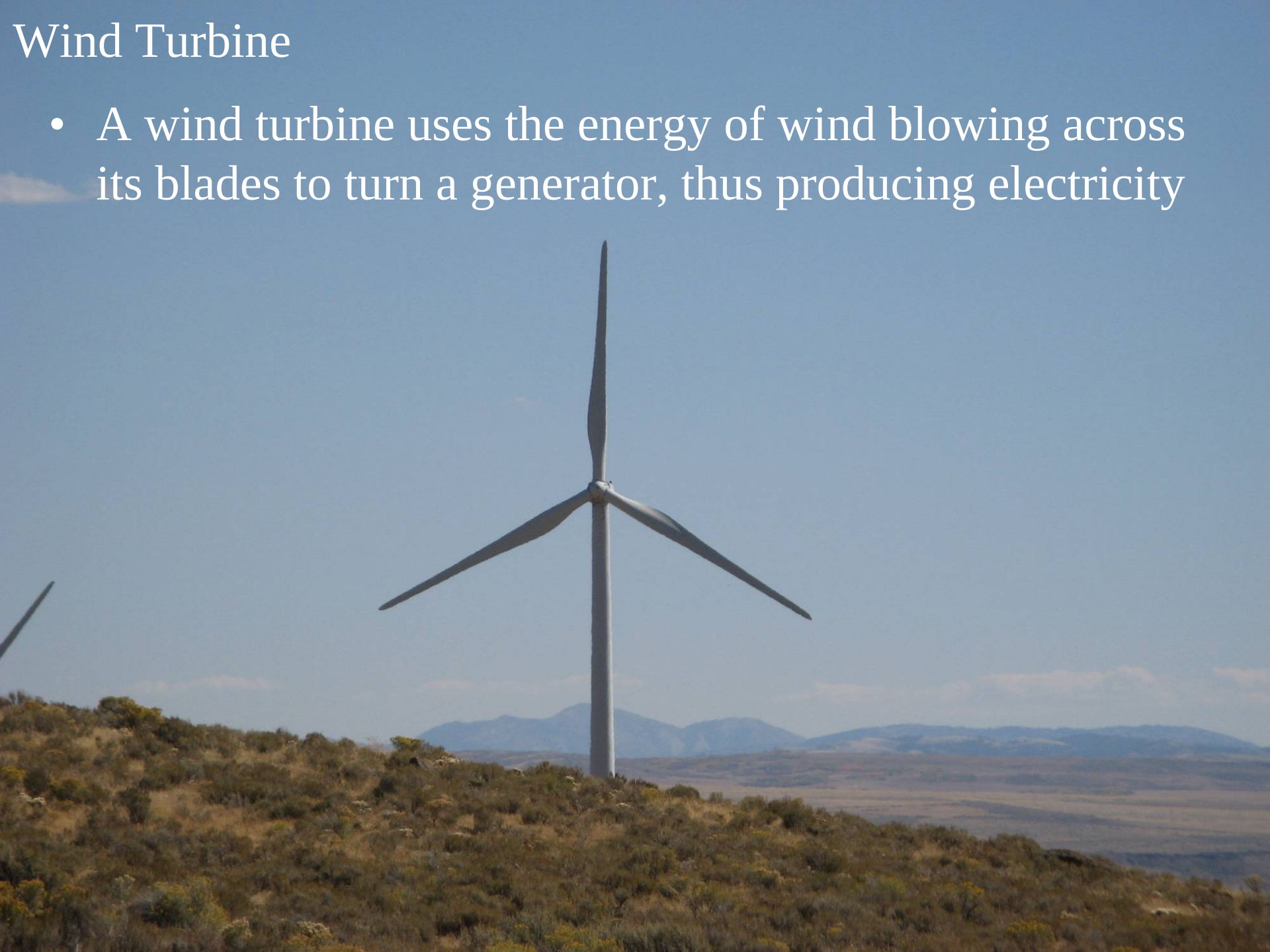
- A simple cycle combustion turbine (SCCT) power plant is similar technology to a jet engine used on an airliner
  - On an airliner, the turbine engine is used to create thrust to push the airliner through the sky
  - For electrical generation, that thrust is instead fed into another turbine that turns an electrical generator to produce electricity
  - The efficiency of a combustion turbine goes down as altitude increases
  - Bennett Mountain
  - Danskin

Combined Cycle Combustion Turbine

- A combined cycle combustion turbine (CCCT) power plant takes the excess heat from a simple cycle combustion turbine power plant and uses it to create steam that then turns another electrical generator
  - This type of power plant can be very efficient
  - Idaho Power issued a Request for Proposals to build a baseload power plant (likely a combined cycle combustion turbine power plant) to be in-service in 2012

Wind Turbine

- A wind turbine uses the energy of wind blowing across its blades to turn a generator, thus producing electricity



Geothermal Generation

- A geothermal generator uses hot water from the earth to make steam to turn a generator, thus producing electricity.

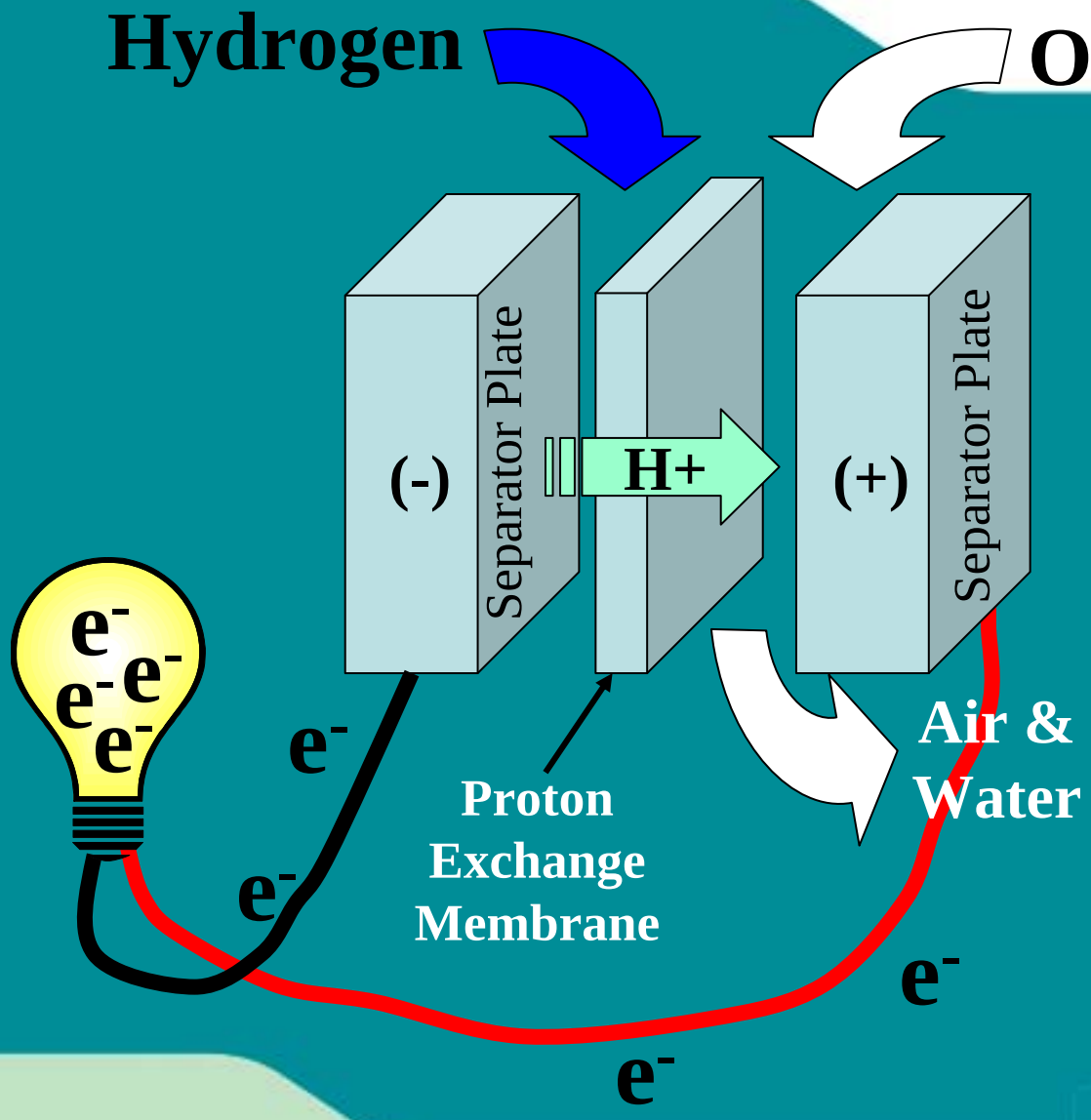
Geothermal Generation

- Three basic types of geothermal generating plants
  - Direct (dry) Steam – Steam directly out of the ground turns a turbine
  - Flash Steam – The geothermal resource produces hot water above 360 degrees F. The high pressure underground keeps the water as a liquid. As it comes out of the ground to the lower atmospheric pressure, it flashes to steam and is then used to turn a turbine
  - Binary Cycle – Uses a secondary fluid to turn the turbine
    - Usually lower temperature geothermal resource
    - Raft River project

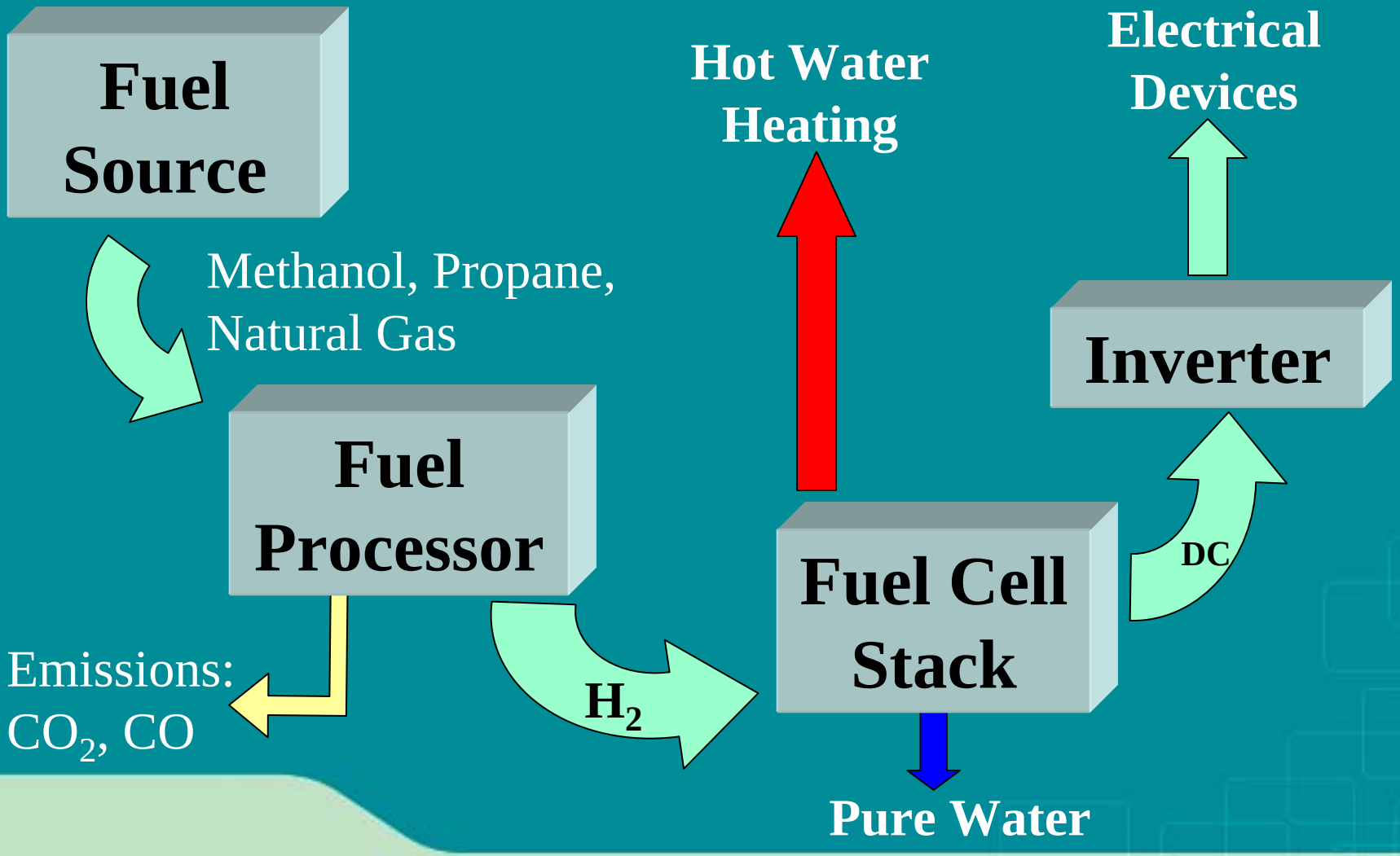
Fuel Cells

- In its purest form, a fuel cell combines hydrogen with oxygen to produce electricity and pure water…with no emissions
- First conceived in 1839, fuel cells are silent electron factories with no moving parts and no combustion
- Keep in mind that the electrical current that runs our lights is nothing but a stream of electrons pushing a charge down a wire

Fuel Cell Systems



Fuel Cell Systems

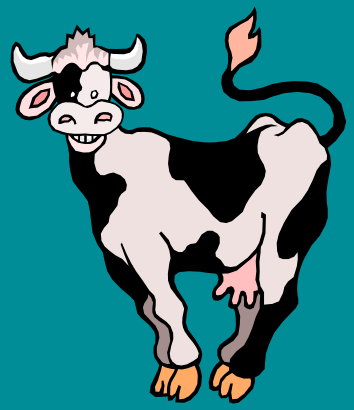


Biomass

- Power made from forest and crop waste and from animal waste
- Forest industry is already a fairly big producer of power in Idaho
- Dairy and feed lot operators interested in anaerobic digesters
  - Prevents much waste from entering aquifers and rivers
- Ethanol production from crops

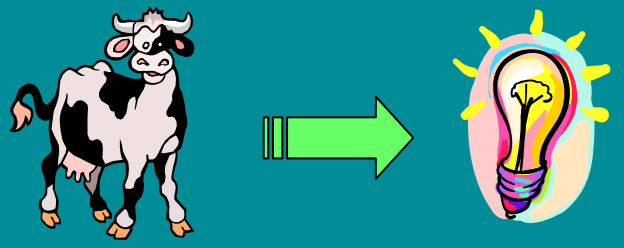
Biomass Generation

- Anaerobic Digestion (AD) from dairy and feed lots
  - The most common feeds for AD is dairy cow waste
  - Idaho has nearly 500,000 dairy cows
  - An average size dairy cow can produce nearly 120 lbs of manure each day



Biomass Generation

- It is estimated that .212 kW of electricity (on average) can be produced from the manure of a single cow



- Other byproducts
  - Compost material that is nearly free of coliform bacteria and odor that can be readily used as livestock bedding
  - Relatively odor free liquid fertilizer

Solar Power

- As its name implies, solar power uses the energy of the sun to produce electricity
- Two basic types
  - Photovoltaic
    - Converts solar energy directly into electricity
  - Solar-thermal
    - Uses the sun's energy to heat water that is turned to steam to turn a turbine