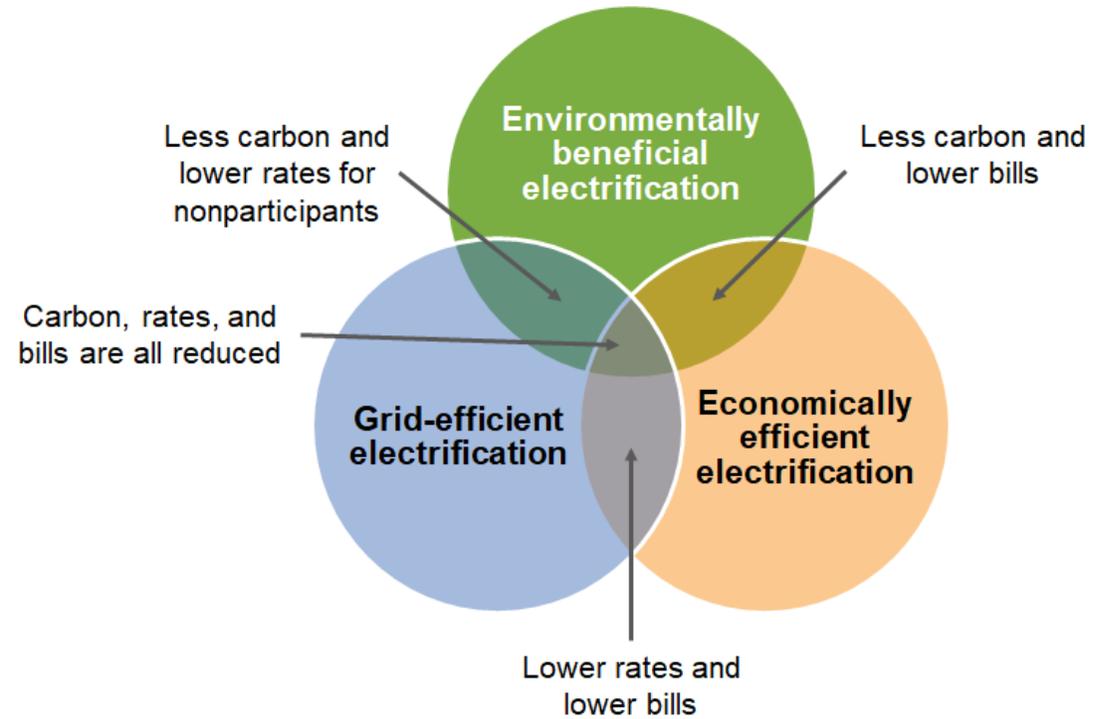


Beneficial Electrification for Ski Towns & Rural Colorado

Kevin Cooney
CAST Meeting
Telluride
August 27, 2021



What makes electrification beneficial?



© E Source



A little local history

ELECTRICITY'S HOLY GRAIL



I was here, before the turn of the twentieth century, that the modern electric current was first generated for commercial use in the United States.

The Ames Power Plant, located deep in the chasm along the Lake Fork of the San Miguel River was built by Lucien L. Nunn in 1933. Nunn was the manager of the Gold King Mill above Ophir. At the time he was spending nearly \$2,500 per month to haul coal to the mill. To keep costs low he was constantly looking for more economical ways to crush and process ore. At the time, there was also a considerable national debate about the merits and safety of alternating current (AC) being tested by Nikola Tesla versus direct current (DC) as advocated by Thomas Edison.

Nunn selected alternating current and replaced coal shipments with copper wire strung from the Ames hydroelectric power plant — a distance of about two and a half miles. The cost of the new source of power was less than \$500 per month and was quickly recognized as a resounding success.

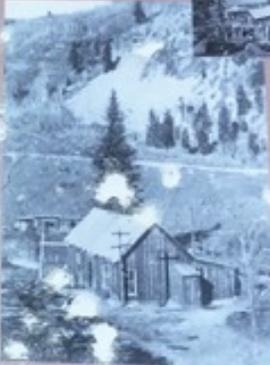
**Alternating current (AC) power reverses direction at regular intervals and can be stepped up or down for machinery with the use of transformers. Unlike direct current (DC), AC power can also be moved long distances over thin copper wire.*

The Gold King Mill, circa 1900s. Photo courtesy of Denver Public Library — Western History Department.

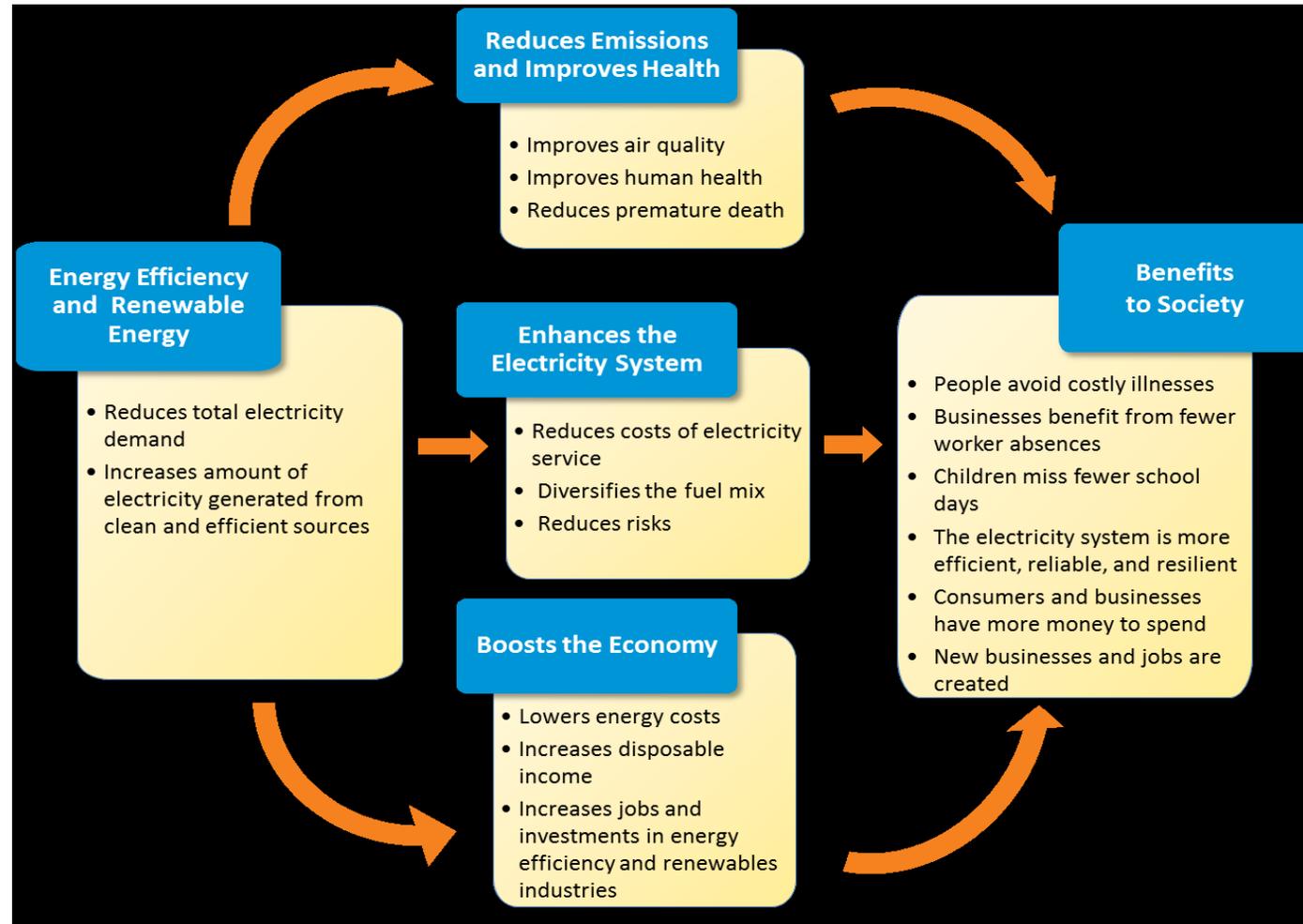
Lucien L. Nunn brought AC power to the Gold King Mine. Nunn later consulted at the Edward Dean Adams Hydroelectric Plant at the United States side of the Niagara Falls. Photo courtesy of Denver Public Library — Western History Department.

The Ames Power Plant in 1933. Photo courtesy of Denver Public Library — Western History Department.

In a national debate over electrical power, the Ames Power Plant determined the future of electrical power. Thomas Edison advocated direct current (DC) and Nikola Tesla favored alternating current (AC). Tesla won when alternating current was put to the test in the San Juan Mountains.*



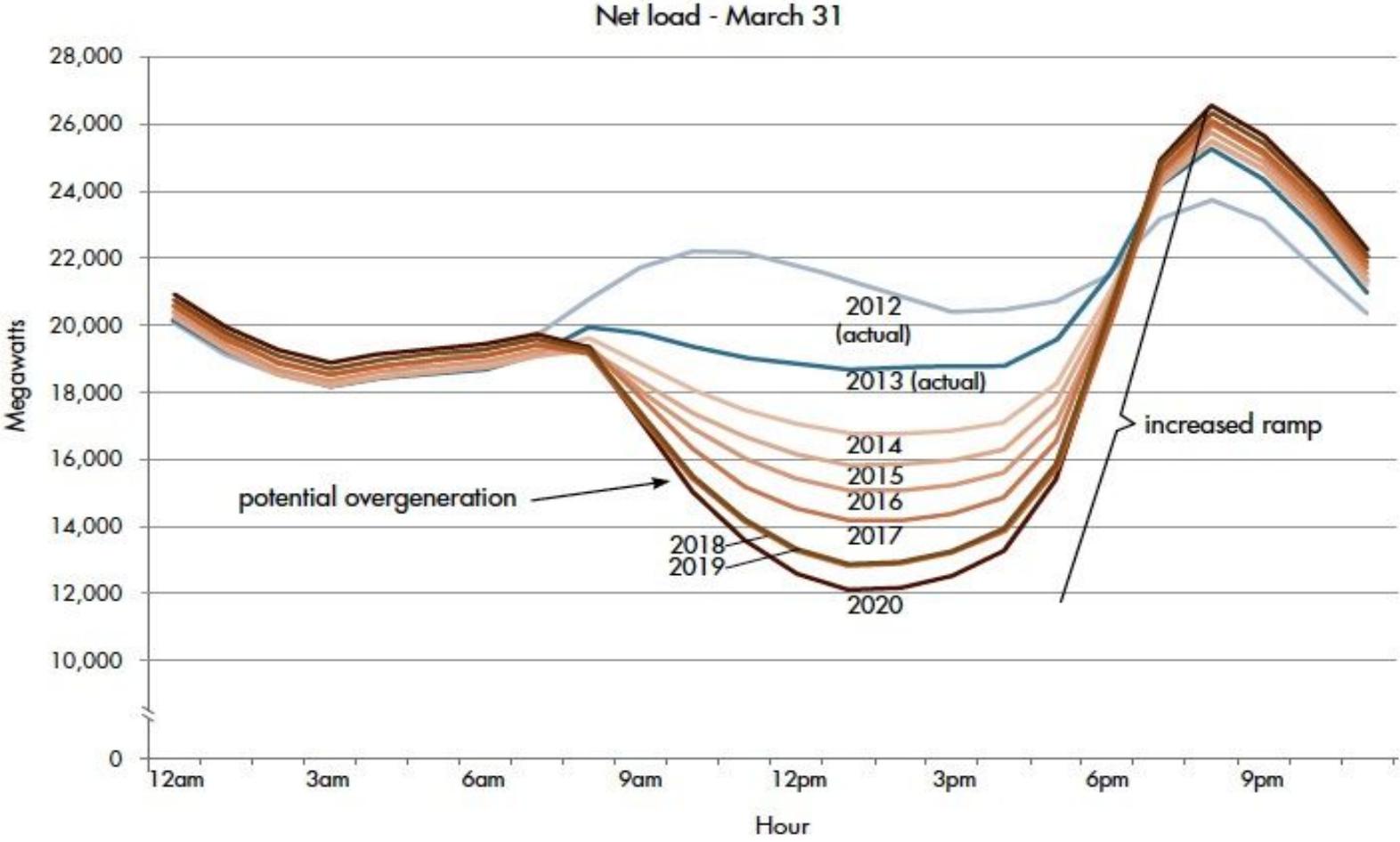
Let's look at the multiple benefits of electrification



Source: The Multiple Benefits of Energy Efficiency and Renewable Energy, EPA



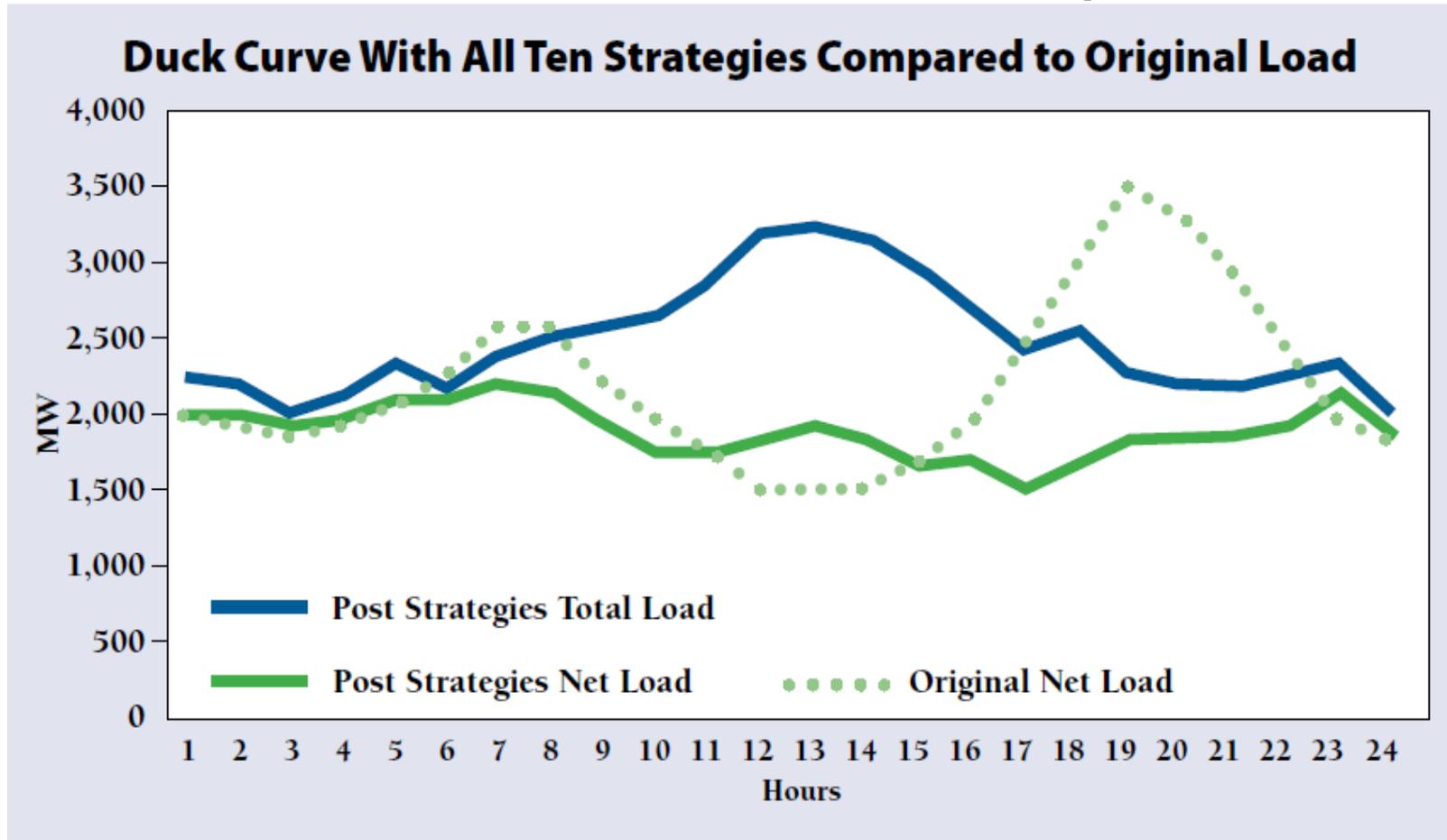
Grid issues: If it quacks like a Duck...Solar can create supply/demand imbalance



Source: California ISO



How can Beneficial Electrification help the Grid?



Source: Teaching the Duck to Fly, Regulatory Assistance Project (RAP)



Beneficial Electrification in the home



Source: Equitable Beneficial Electrification for Rural Electric Coops, *RE-AMP Network & We Own It*



BUKA ENGINEERING

SMPA promotes local Beneficial Electrification

See website for rebate offers:

[Geohttps://www.smpa.com/content/electric-vehicles-and-beneficial-electrification](https://www.smpa.com/content/electric-vehicles-and-beneficial-electrification)

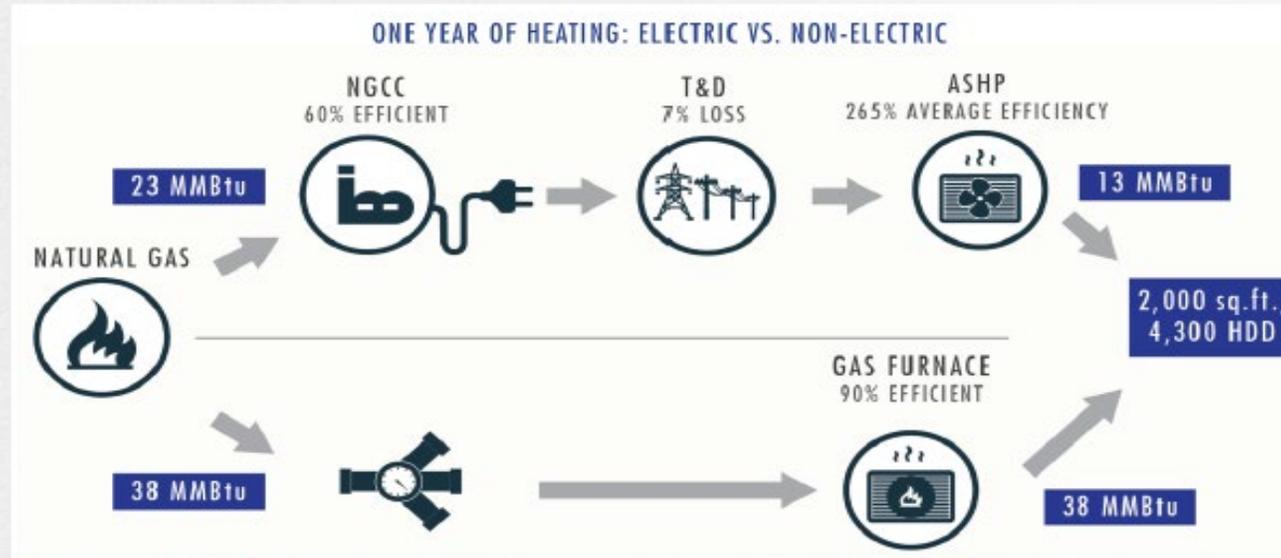
- Outdoor equipment
- Heating & Cooling, Lighting, Appliances, Water Heating, thermal storage
- EV charging, Electric Vehicles, Electric Bicycles
- Commercial equipment, motors, lighting, etc.

Programs administered by *Eco-Action Partners*, and supported by *Tri-State*



Environmental Benefits: GHG Reduction

Even with partially fossil-grid today, electrification reduces emissions



Source: EPRI, "Efficient Electrification"

EPRI: an air source heat pump powered by natural gas electricity consumes half as much energy as an efficient natural gas furnace – even when accounting for upstream electricity generation and transmission losses

Source: EPRI National Electrification Assessment



The Beneficial Electrification Toolkit

Technologies

| | |
|--|---|
|  Non-Road & Material Handling |  Manufacturing |
|  On-Road, Light-Duty |  Infrastructure (Ports/Airports) |
|  On-Road, MD & HD |  HVAC |
|  On-Road, Buses |  Water Heating |
|  Food Preparation |  Recreational |
|  Custom |  Trains |

Locations

| |
|---|
|  Home |
|  Multi-family |
|  Workplace or Destination |
|  In-route |
|  Fleets |

Strategies

| |
|--|
|  Infrastructure Deployment |
|  Rate Design |
|  Education & Outreach |
|  Incentives & Financing |
|  Partnership Planning |
|  Managed Charging |
|  Active Load Management (DR, V2G) |

Source: Peak Load Management Alliance (PLMA)



Summary

- ❑ There are many grid, consumer, and environmental benefits to electrification
- ❑ As the *Energy Transition* continues, electricity is getting cleaner & cheaper
- ❑ Energy storage costs are declining rapidly
 - Applications and types of storage go beyond batteries
- ❑ Beneficial Electrification provides a means for local & personal action
- ❑ Evaluate programs and actions to assess which provide cost effective impacts
- ❑ Climate change is already here - we must act now



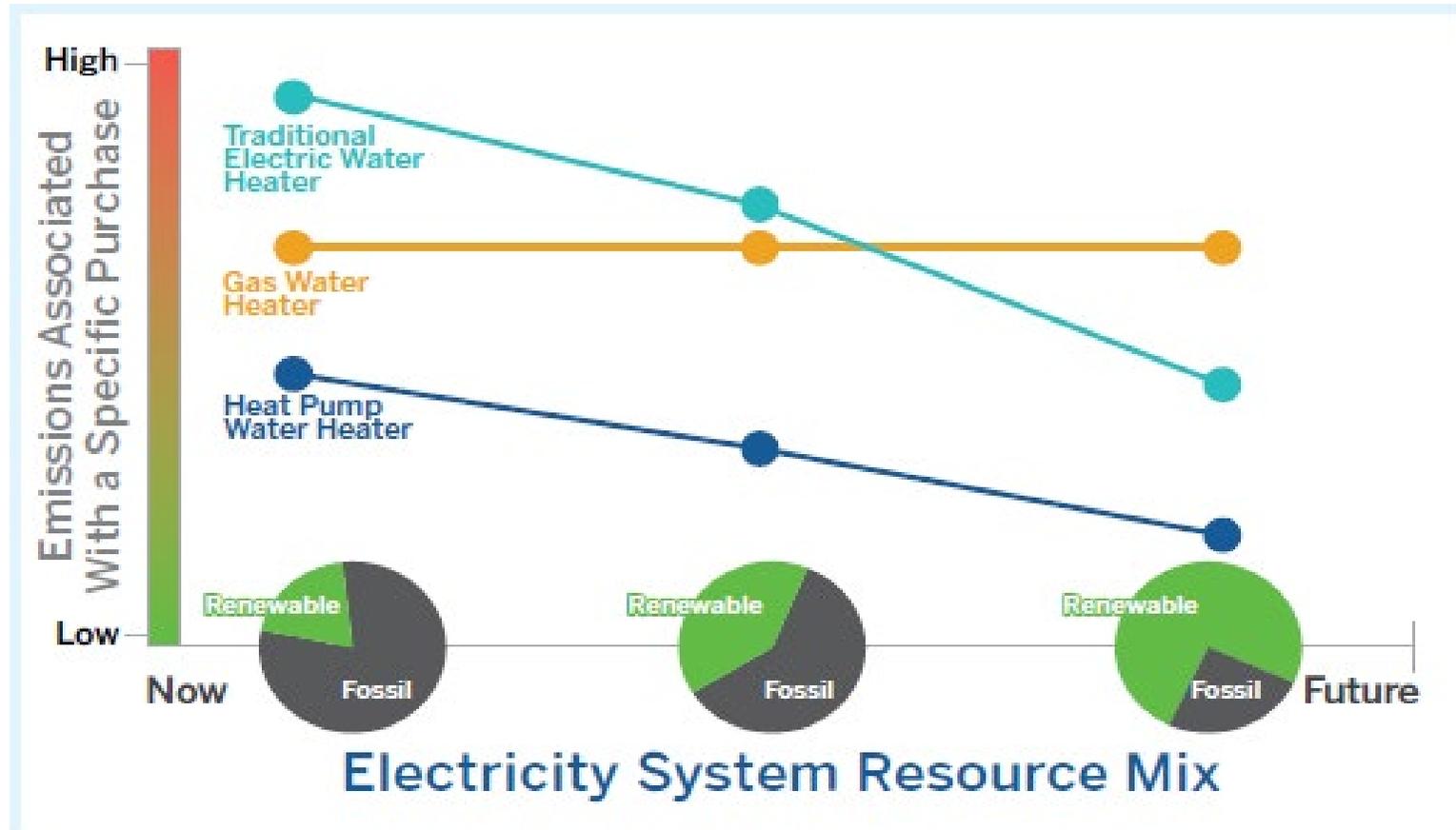
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How generation mix changes technology impacts



Source: Beneficial Electrification, Ensuring Electrification in the Public Interest; RAP

