AMERICA'S FARMS CAN LEAD ON ENERGY INDEPENDENCE

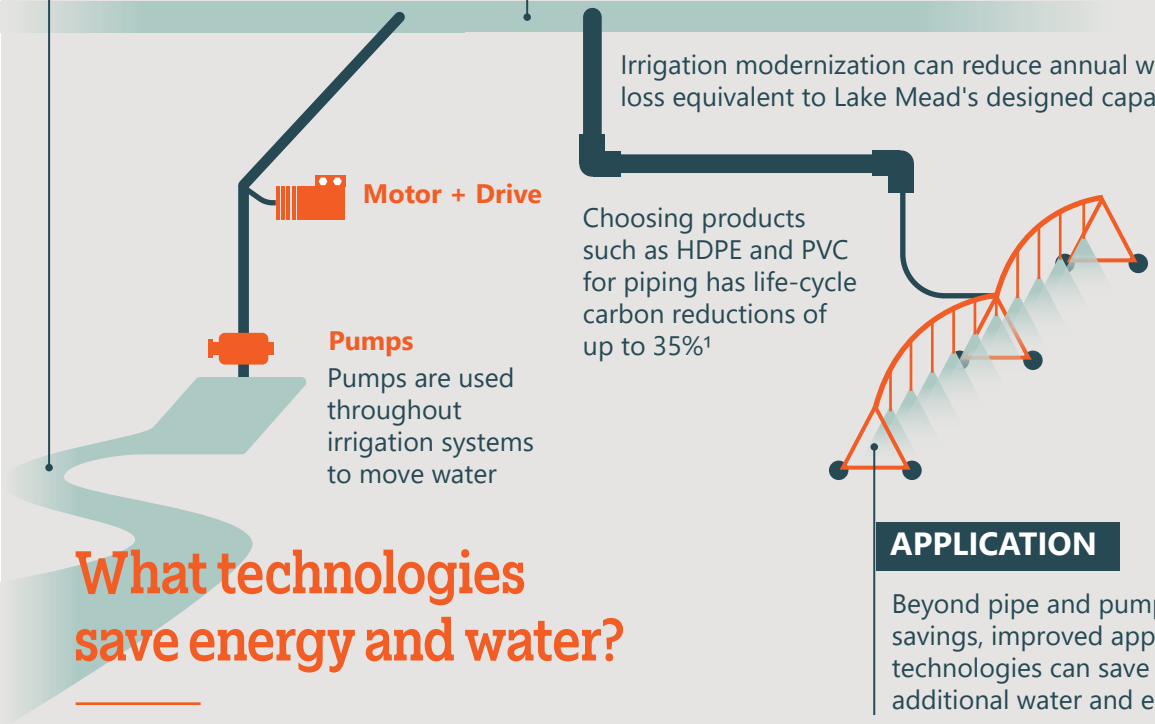
Inefficient irrigation systems waste 52% of the energy they use every year

INTAKE

Pumps are most commonly used for intake where they pull water from a well or surface water source

CONVEYANCE + DISTRIBUTION

Water travels along shared conveyance canals and on-farm distribution systems



Irrigation modernization can reduce annual water loss equivalent to Lake Mead's designed capacity

Choosing products such as HDPE and PVC for piping has life-cycle carbon reductions of up to 35%[1]

Pumps
Pumps are used throughout irrigation systems to move water

APPLICATION

Beyond pipe and pump savings, improved application technologies can save additional water and energy

What technologies save energy and water?

Pump Electrification — 26% of agricultural pumps run on expensive fossil fuels. Converting to solar or grid-connected electric pumps saves energy, cost, and carbon.

Pump Efficiency — Upgrading to more efficient pumps with variable speed drives has giant energy, cost, and carbon savings.

Pipe Conversion — Replacing old pipes with plastic or converting open canals to closed plastic pipes reduces water loss to seepage and evaporation and improves the efficiency of water conveyance

Converting to a more efficient irrigation system by improving pumps and pipes could

Eliminate 4 coal-fired power plants

Save $2.8 billion in energy costs

Reduce carbon emissions by 9.9 million tons

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Any numbers presented on these infographics without a direct footnote are the result of Cadeo research and analysis based on publicly available data and reports. Important sources include USDA Irrigation Water Management Survey, Energy Information Administration price and consumption data, Environmental Protection Agency emission data.

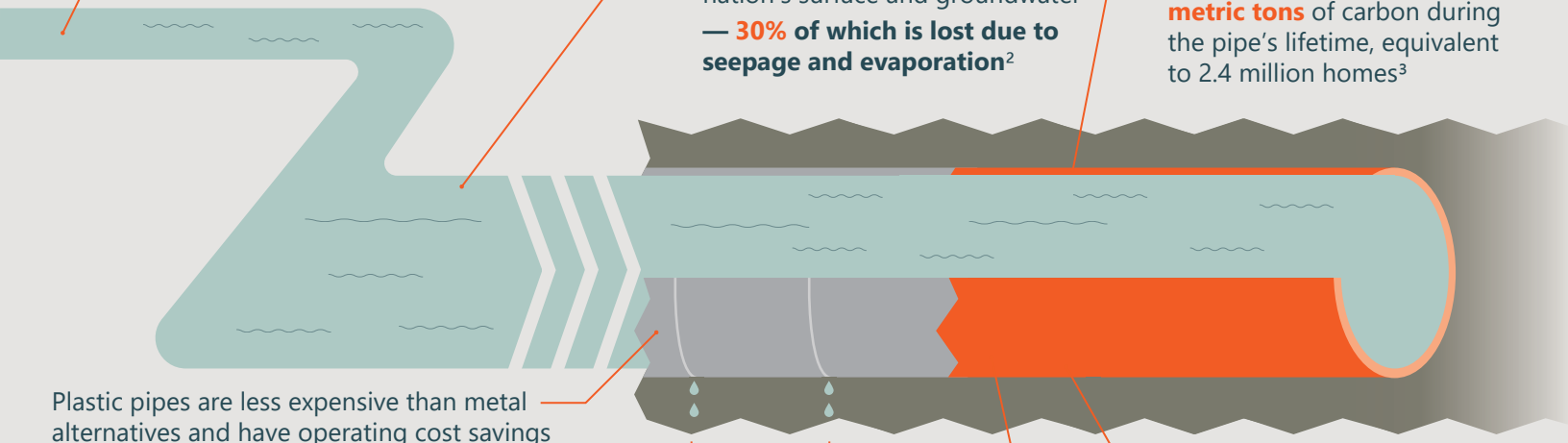
[1] https://www.mckinsey.com/industries/chemicals/our-insights/climate-impact-of-plastics

Modernizing irrigation canals and pipes to plastic reduces water, energy and carbon waste

Open irrigation canals provide water to **43%** of all agriculture land in the United States, adding up to over **228,000 miles** of canal[1]

Agriculture consumes **37%** of the nation's surface and groundwater **— 30% of which is lost due to seepage and evaporation**[2]

Replacing all the country's irrigation pipes with plastic ones can save over **19 million metric tons** of carbon during the pipe's lifetime, equivalent to 2.4 million homes[3]



Plastic pipes are less expensive than metal alternatives and have operating cost savings too. For every **10 miles** of pipe replaced with plastic, there are **2,500 kWh** of energy savings from reduced friction.[4]

Aging pipes lose **10%** of their water on average[4]

Plastic pipes have break rates **3x lower** than ductile iron and **12x lower** than cast iron alternatives[4]

Plastic pipes are earthquake resilient, important for many Western regions

Irrigation districts can realize massive benefits from modernizing their open canals[5]

Converting open canals to pressurized conveyance pipes generates energy savings equivalent to **1.2 million homes**

Installing in-conduit hydropower turbines into newly pressurized conveyance pipes generates additional, carbon-free electricity, enough to power **1.4 million homes** each year

The amount of annual water savings due to reduced seepage and evaporation is equivalent to **2.5X** the average flow of the **Colorado River through the Grand Canyon**

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[1] Cadeo estimated the distance of open canals based on the number of acres of irrigated land per mile of open conveyance canal using USDA Irrigation Water Management Survey data

[2] https://inl.gov/article/new-irrigationviz-tool-promotes-water-energy-environment-for-communities/

[3] Carbon savings calculated based on life-cycle analysis reports of pipe materials (Du, Fei et al (2013); McKinsey & Co. (2022)) and total estimated distance of installed pipe based on USDA IWMS data.

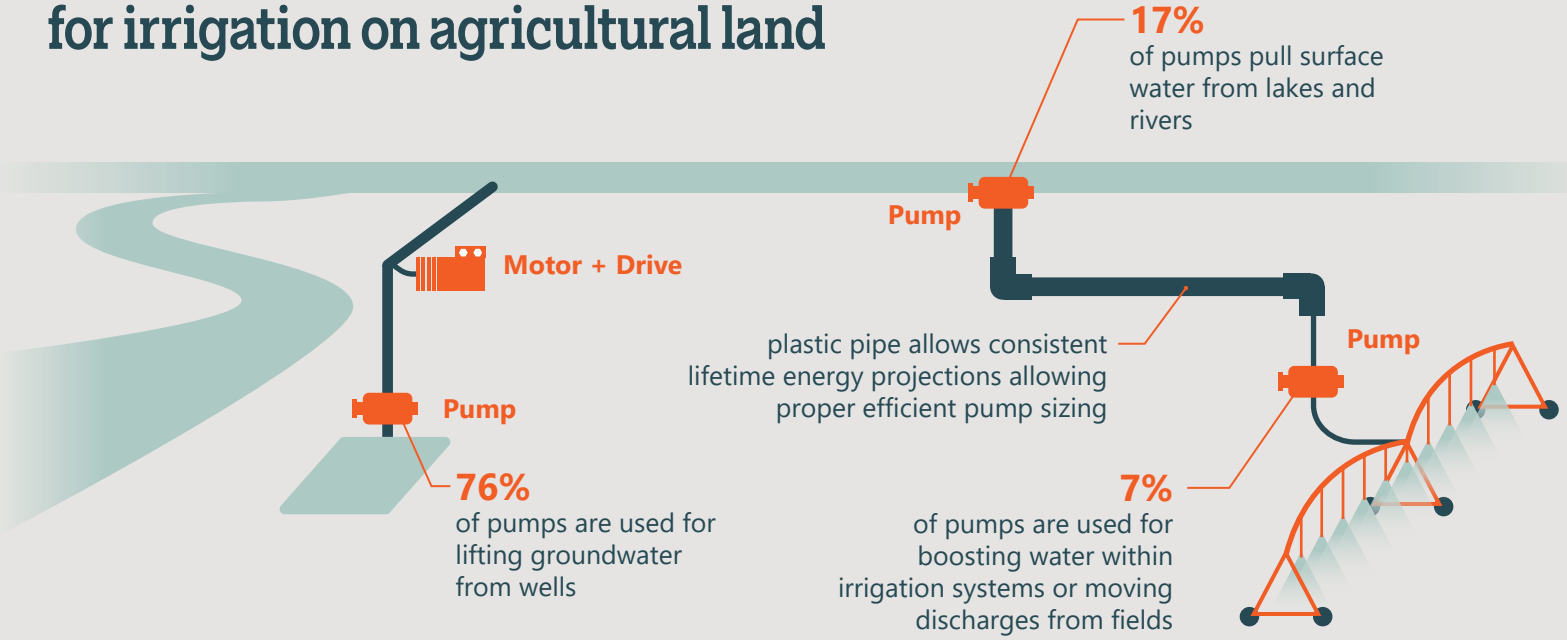
[4] https://swefcapps.unm.edu/britool/Downloads/Water_Main_Break_Rates_In_the_USA_and_Canada_A_Comprehensive_Study_2018.pdf

[5] Cadeo calculated nation-wide potential by scaling the impact analysis results from completed irrigation modernization projects to the entire country.

Upgrading the United States' irrigation pumps can save farmers billions

Farmers can save $1.8 billion annually by upgrading their irrigation pumping systems

There are over 600,000 pumps used for irrigation on agricultural land



Improving the efficiency of pumps can pay for itself in energy savings in under two years

Improving the efficiency of pumps can save **7 billion kWh per year**

Adding variable speed drives to pumps can save an additional **15 billion kWh per year**

Those combined savings can reduce carbon emissions by **8.3 million metric tons** per year

(Or the same number of emissions from 1 million U.S. homes a year)

1 billion kWh = *Energy for* **37,430** *U.S. homes for a year*

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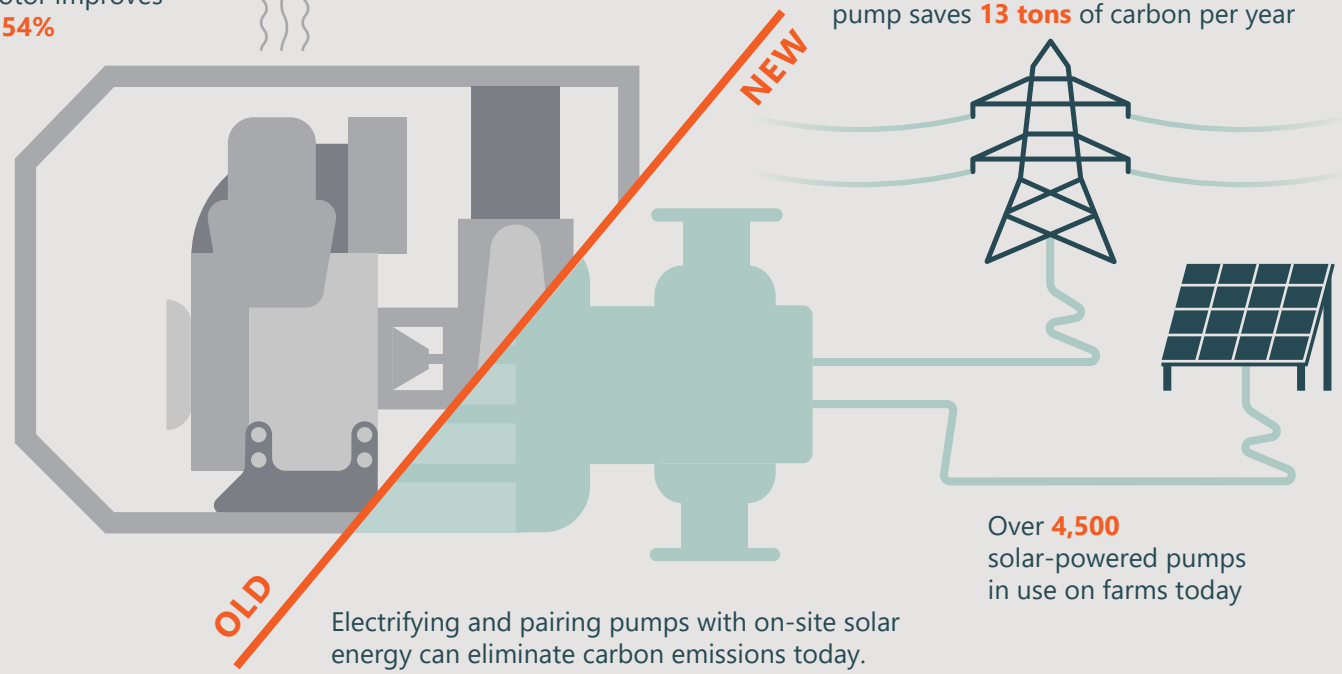
Electrifying agricultural pumps eliminates fossil fuel use

Over 150,000 pumps still run on fossil fuels

Replacing a diesel engine with an electric motor improves efficiency by **54%**

Replacing the average diesel-powered pump with a grid-connected electric pump saves **13 tons** of carbon per year



Over **4,500** solar-powered pumps in use on farms today

Electrifying and pairing pumps with on-site solar energy can eliminate carbon emissions today.

Electrifying the nation's agricultural pumps can save 13 billion kWh of energy a year

This would save **1.6 million tons** of CO_2 — *Equivalent to removing 346,000 cars from the road*

Each diesel pump replaced by a solar pump saves an additional **25 tons of CO_2 per year**

Energy savings from electrifying pumps are more than **$900 million a year**