

Montana Energy

Good News – and Challenges

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What one thing about energy is most important to you?

1. Go to pollev.com/bber297 to respond

or,

2. Text BBER297 to 22333 once to join
Then text your response.

What one thing about energy is most important to you?

In your daily life, what one primary source of energy does it seem you most depend on?

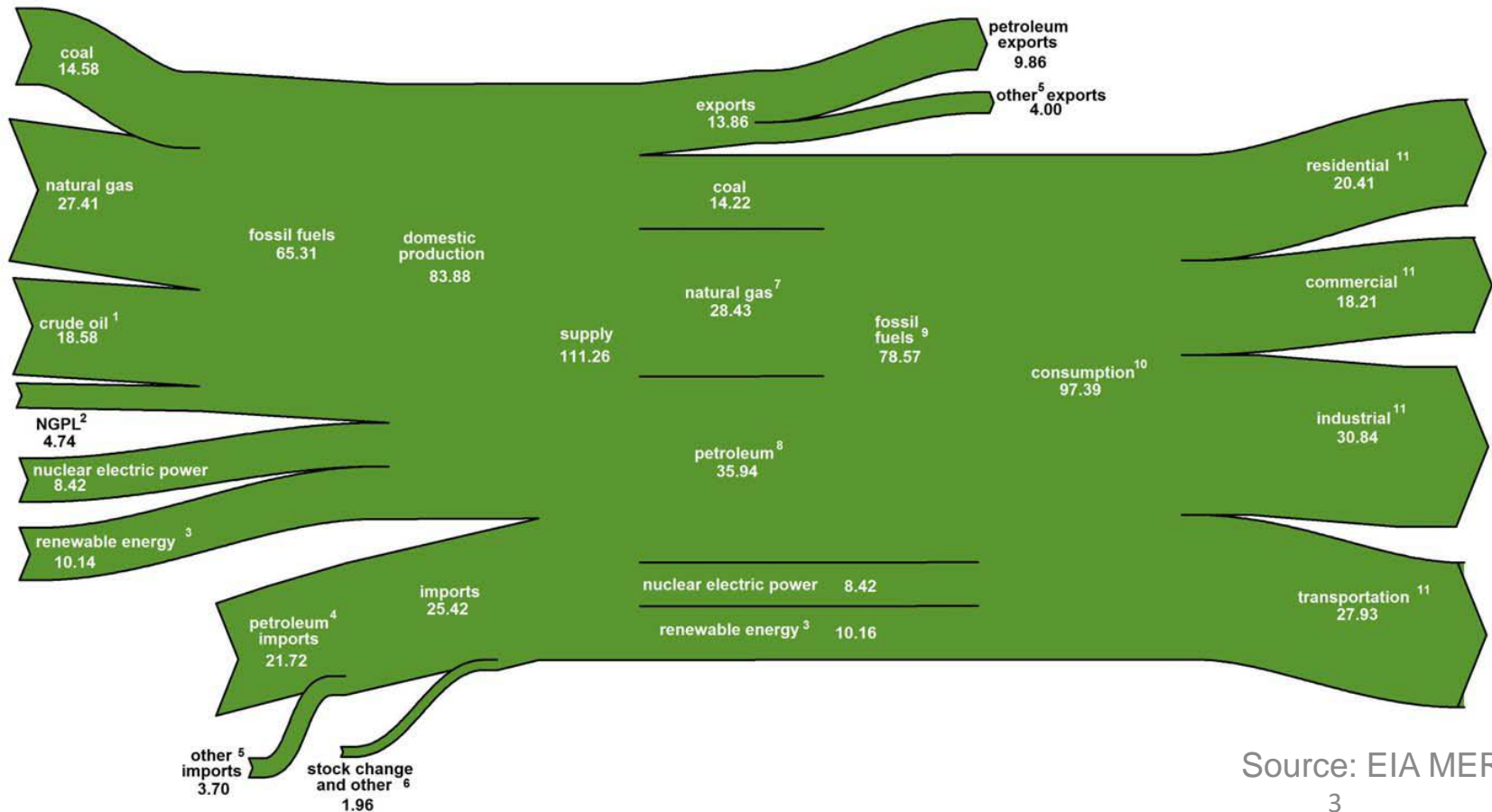
The context

America is approaching energy independence



U.S. energy flows

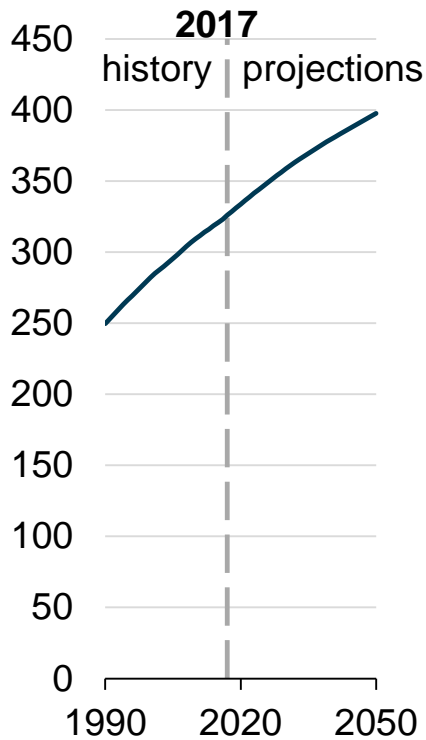
...show production near 90% of consumption



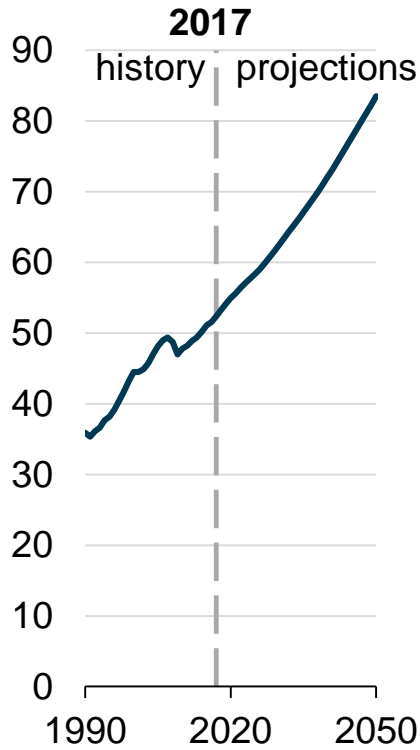
Source: EIA MER

Its an energy revolution... *for consumers*

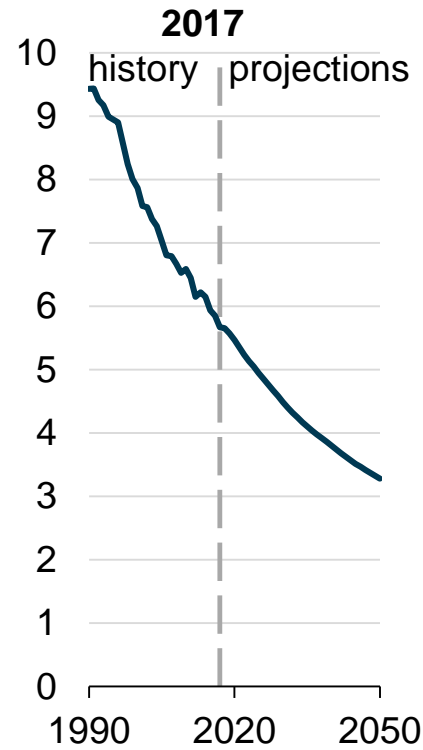
U.S. population
million people



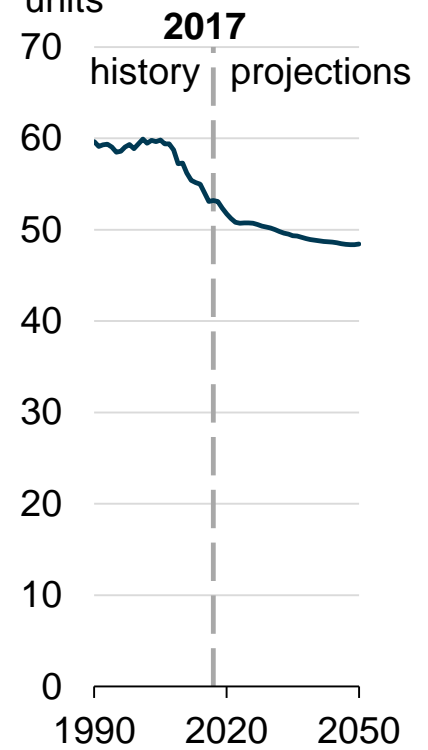
GDP per capita
thousand dollars
per person



Energy intensity
thousand British thermal
units per dollar



Carbon intensity
metric tons CO2 per
billion British thermal
units



Montana energy *is about:*



Abundant, diverse resources



Reliability



Use and costs

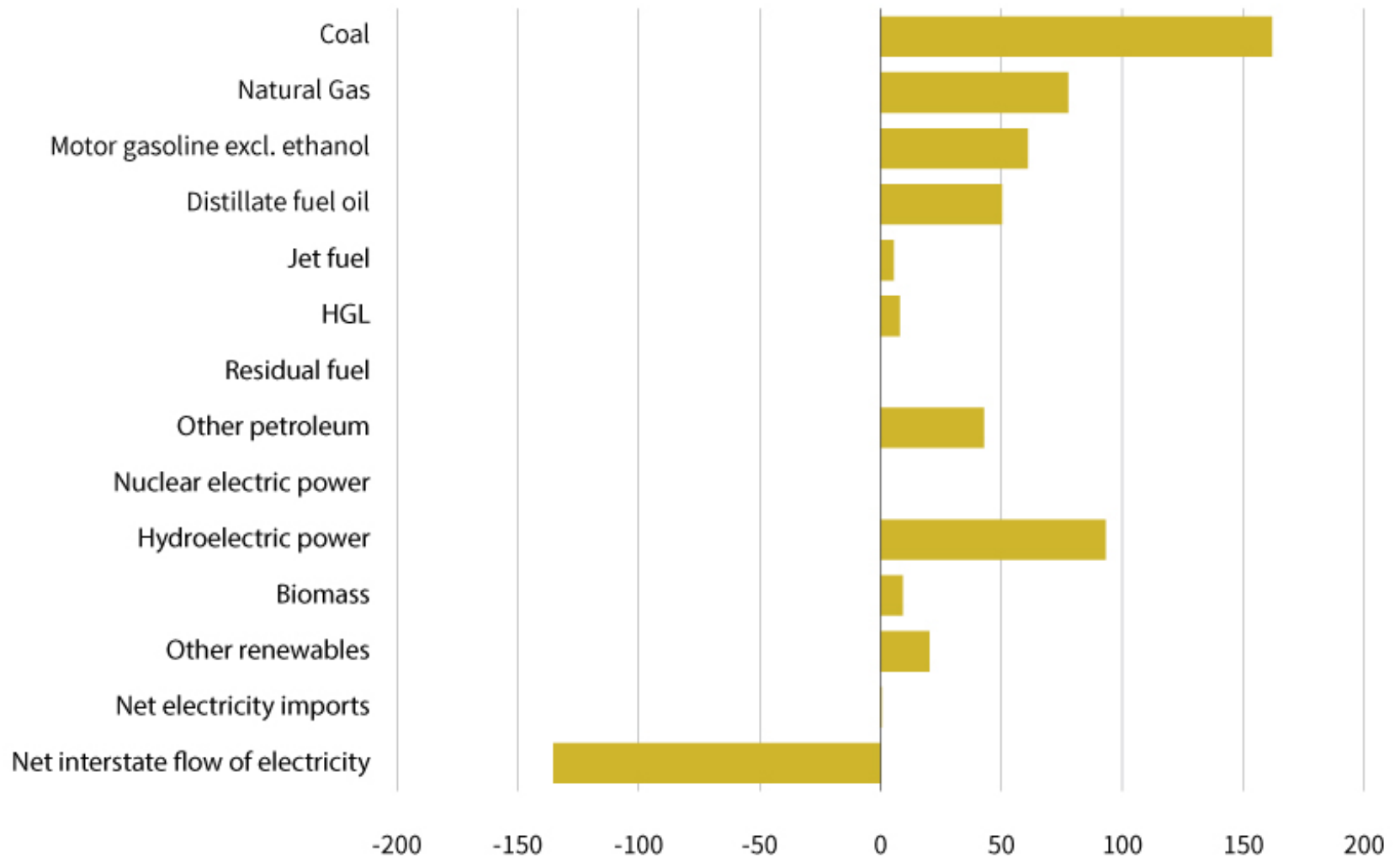


Economic contributions

Changing demand dynamics
and renewables integration



Montana energy use

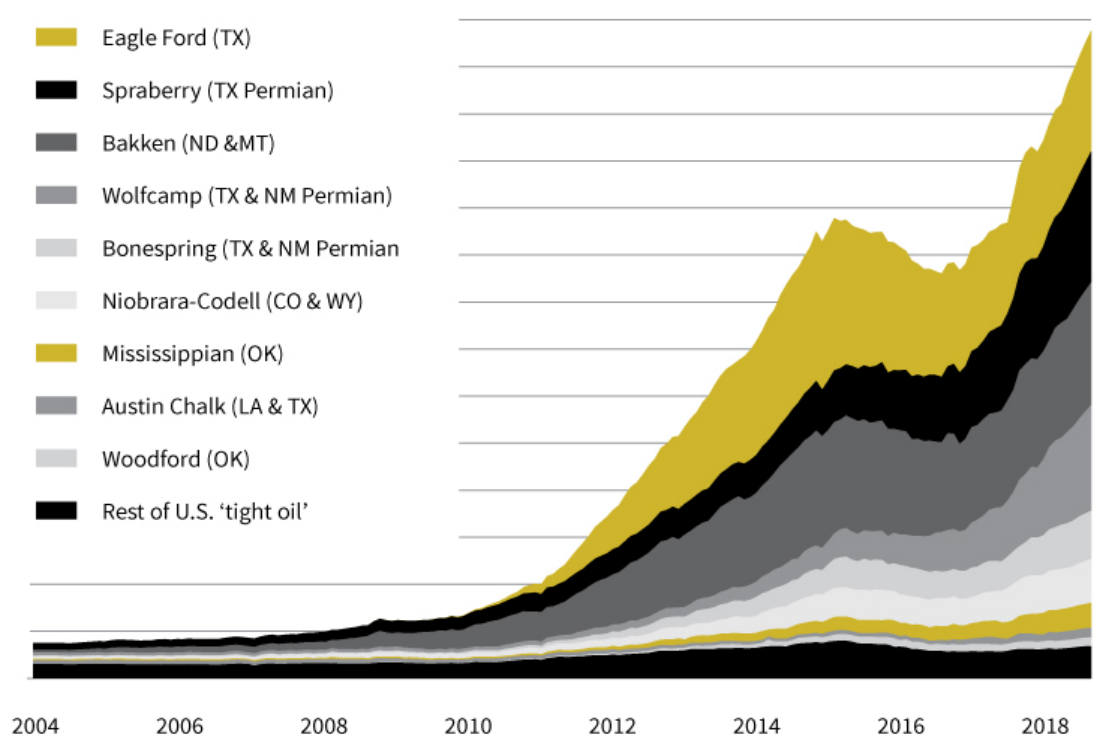


Trillion Btu

Source: EIA 2016 data

Shale revolution continues

Tight oil plays more efficient



Source: EIA



Bakken Breakeven

Estimates – selected counties

- Dunn \$ 11
- Mckenzie* \$ 12
- Mountrail \$ 12
- Burke \$ 46
- Golden Valley \$100
- ND Statewide \$ 13

3Q 2018 NDIC DMR 11/16/18

Shale revolution

Technology and efficiency are key

Big data

Downhole sensors

Fiber optic communication

Remote, centralized, monitoring

AI

Immediate adjustments

Drilling accuracy and rig efficiency

Fracture improvements

Better water handling and re-use

= Lower costs



Oil & natural gas in Montana

Signs of optimism and stability

Production still down, but with movement

Increased investment interest

Including for enhanced recovery...

Denbury Resources Operations

Bell Creek Field EOR



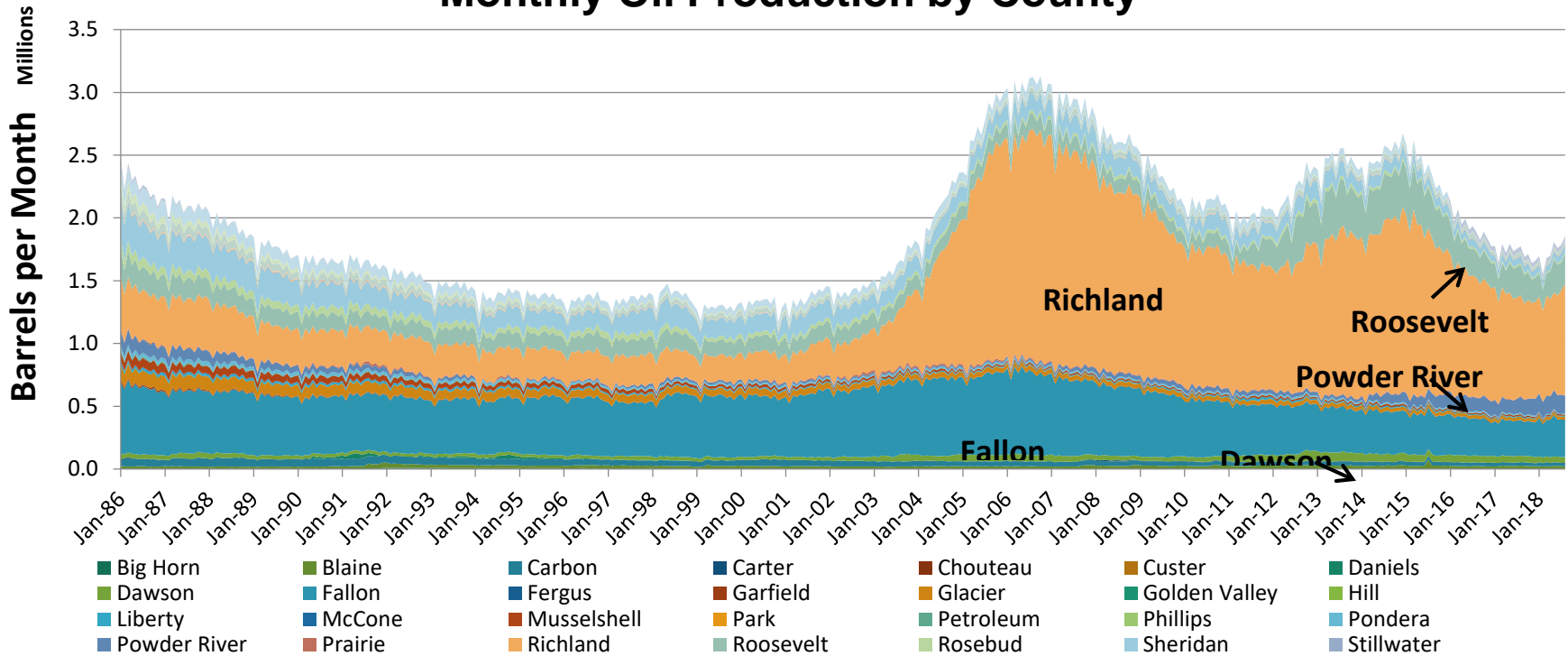
Cedar Creek Anticline Projection



Communities seeing improvements

Montana oil & gas (cont'd)...

Monthly Oil Production by County



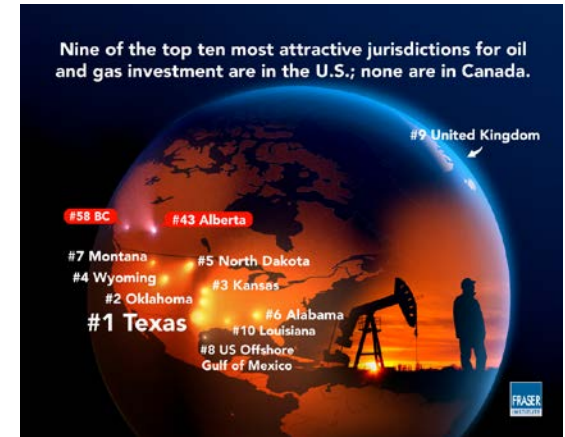
MT Board of Oil and Gas, 2018 Data

Montana oil & gas (cont'd)...

59 new-well permits by 12/18
35 in all of 2017

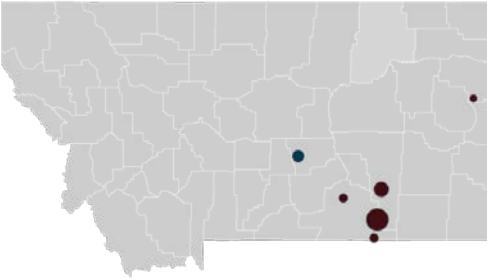
Increased investment interest
Montana in top ten E&P places

Communities seeing
improvements



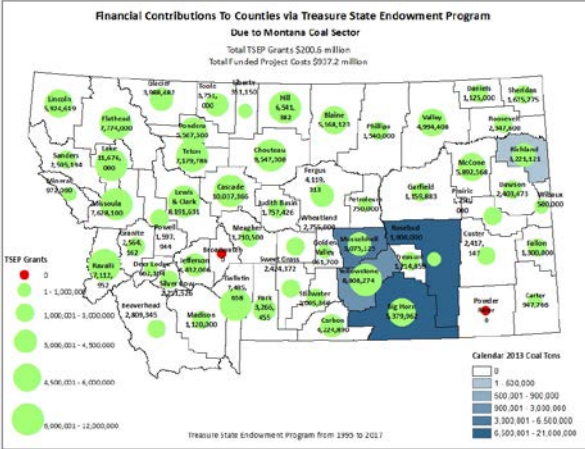
Coal in Montana

Challenges for a key sector

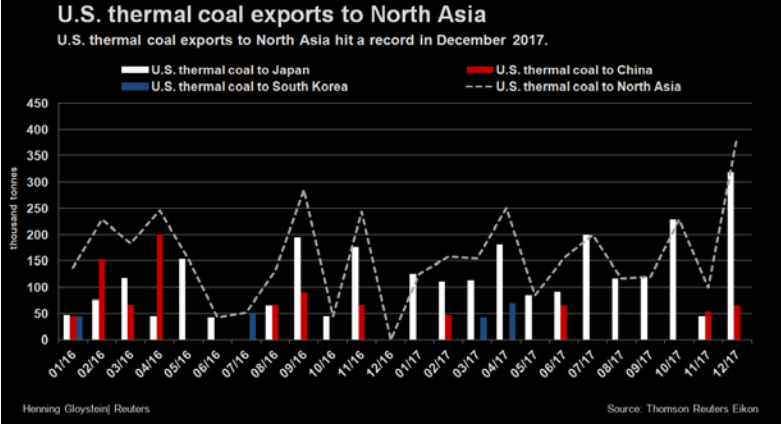
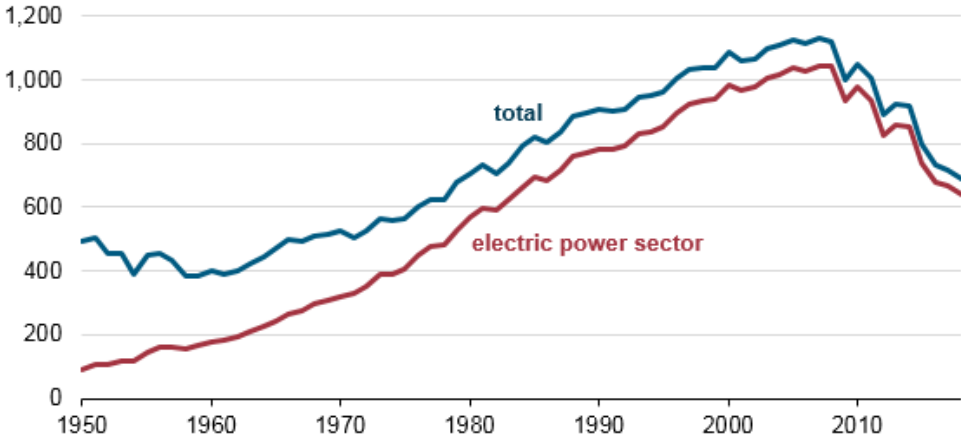


Markets

U.S declines, global increases



U.S. coal consumption (1950-2018)
million short tons



Montana coal (cont'd)...

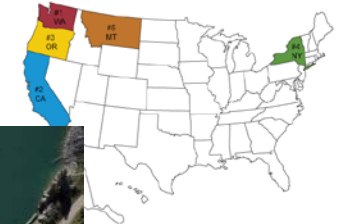
Production up in 2018

On pace for +3-million tons?

Critical future factors: demand & competition, infrastructure, politics



Top hydropower producing states, 2017



Energy Information Administration, *Electricity*, Table 1.10.B, February 2018, preliminary

Renewables in Montana

Exceptional hydro

Montana 5th in production

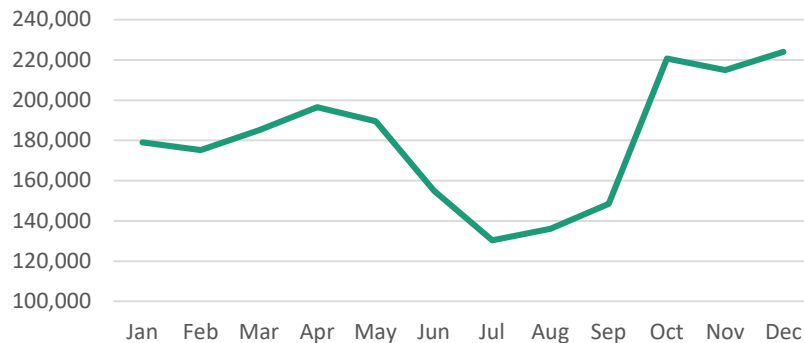


Excellent wind potential

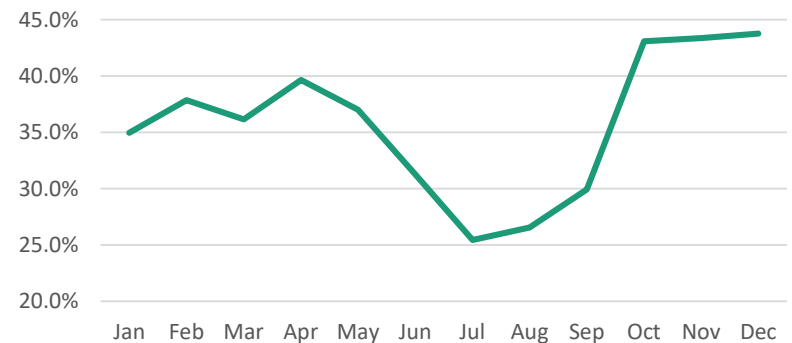
Growth in capacity; questions



Wind Generation (monthly)



Capacity Factor (monthly)

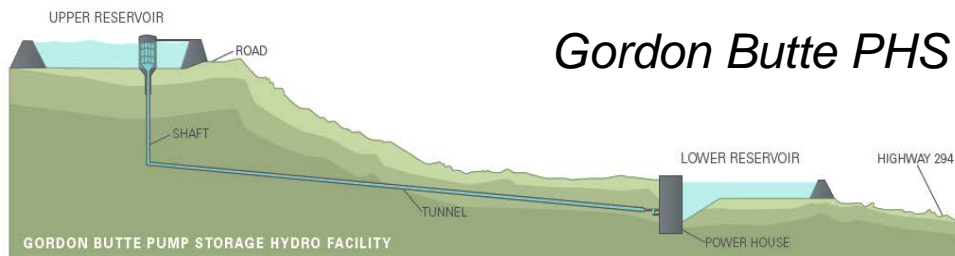


Montana renewables (cont'd)...

Solar and biomass niches



Storage, integration, transmission, challenges and opportunities



Montana Energy...

It's about meeting the challenges

Thank you



**BUREAU OF BUSINESS AND
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UNIVERSITY OF MONTANA