Community Electrification

For Life & Community

John Bagu, PhD
Email: johnbagu7@gmail.com

Problem 1 - Health/Public Safety, Air Pollution is Targeting Kids

CDC Investigation of Car Exhaust

CDC review of seven scientific studies over 8000 children

Published in April 2014 American Journal of Preventive Medicine

Kids living in high density traffic locations more likely to get leukemia

Link high density traffic with asthma, cardiovascular disease, & death

Lancet Study Volume 389, No. 10070, p718–726, 18 February 2017

Also Sci. American https://www.scientificamerican.com/article/higher-dementia-risk-linked-to-living-near-heavy-traffic/

Elevated risk Dementia (Alzheimer's) if live within 650 ft heavy traffic

The closer you get to high density traffic more risk, 1000 ft low risk

Alzheimer's getting worse, consumes $1/$5 of Medicare, will be $1/$3 in 10 years,

Will likely bankrupt Medicare in future

PNAS Study Volume 115(37), 9193–9197, 11 September 2018

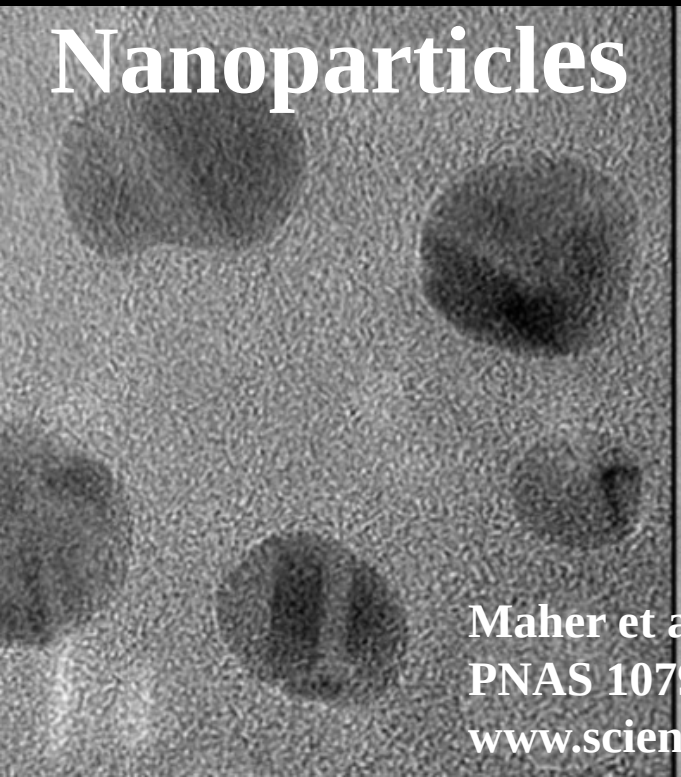
Air pollution causes huge reduction in intelligence, equals losing 1 year education

Worse for men resulting in a lower IQ, other factors include age and education level

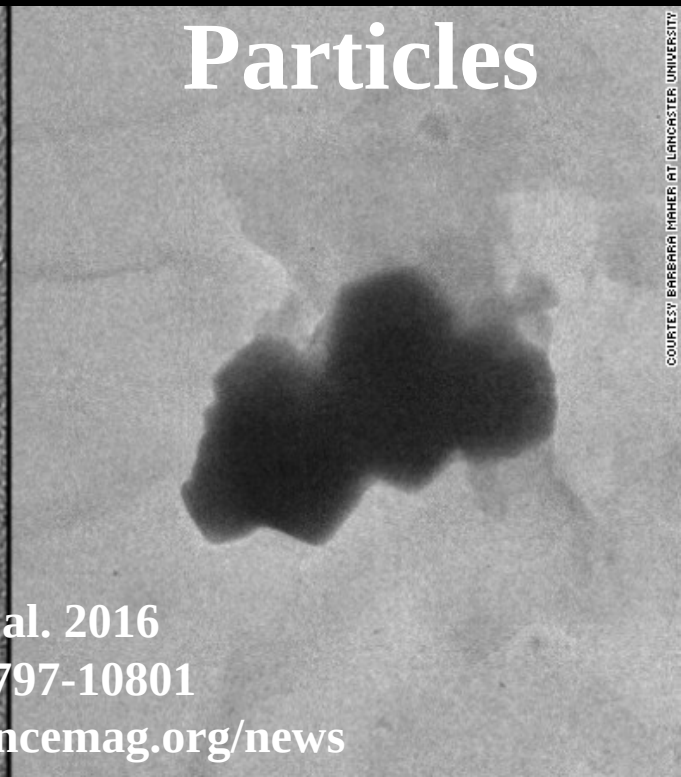
Pollution Nanoparticles in Brain

Billions of metal nanoparticles in our brains
Outnumber normal waste particles 100:1

Pollution Nanoparticles

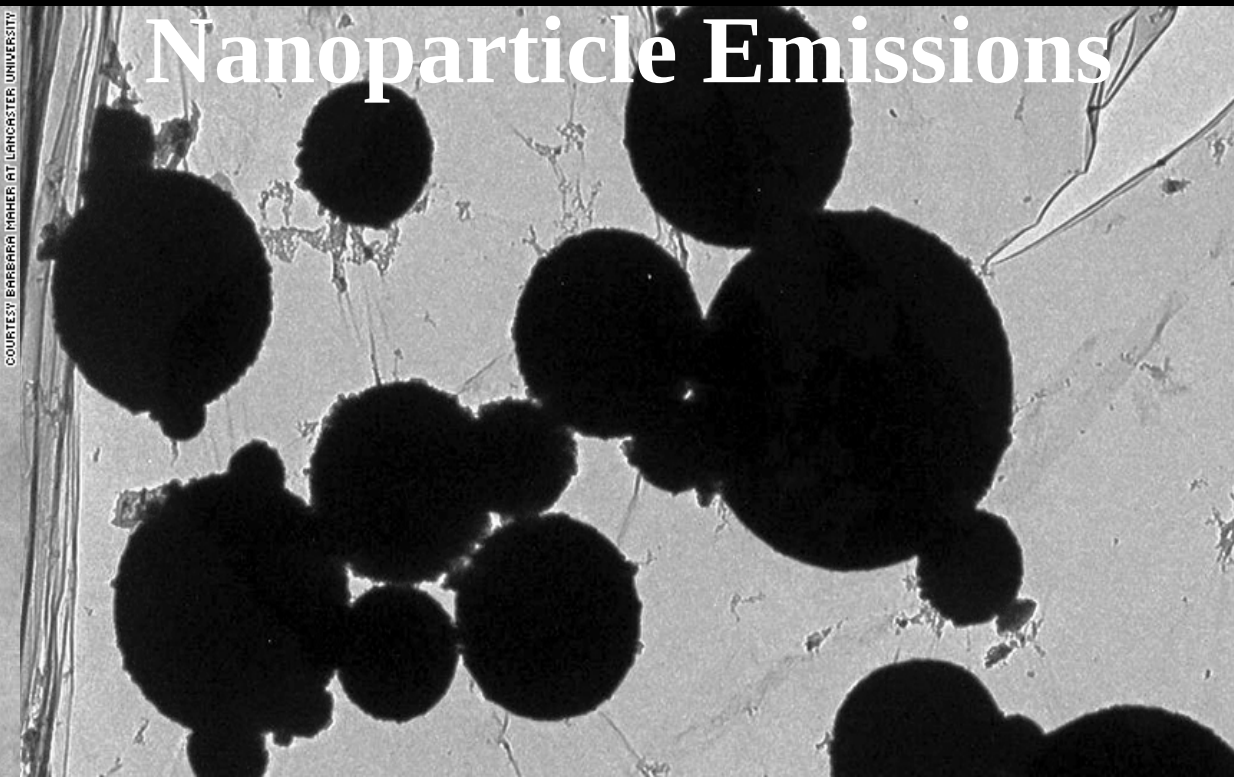


Brain Waste Particles



Maher et al. 2016
PNAS 10797-10801
www.sciencemag.org/news

Diesel Vehicle Nanoparticle Emissions



Air Pollution Causing Premature Deaths and Health Problems

MIT Study

~200 000 deaths per year attributed to air pollution in United States

~100 000 deaths outdoor air pollution, ~100 000 deaths indoor

~53 000 deaths/year from outdoor vehicle exhaust

~52 000 deaths/year power generation pollution (coal)

***Atmospheric Environment* Volume 79 November 2013 Pages 198-208**

Connecticut Study 2006 Yale Researcher

30% of residents experience health problems related to vehicle exhaust

Diesel exhaust especially dangerous has ~40 hazardous pollutants

Children are at special risk, ~9% Connecticut's youth have asthma

65 page report highlighting the harmful effects of vehicle exhaust

WHO Study for year 2012

~7 million deaths/year attributed to air pollution exposure in world

http://www.who.int/mediacentre/news/releases/2014/air-pollution/

Air Pollution Causes Premature Deaths
Gas 15 Ingredients, "Liquid Cigarettes"

1. Benzene, carcinogen

Vehicle exhaust largest source in environment

2. Toluene, like benzene in cigarettes

3. Burning Gas = toxic nanoparticles, O_3, NO_x, & CO

Coal = toxic pollutants mercury, S, NO_x, particulates

MIT study 105,000 deaths/yr

***Atmospheric Environment* Volume 79 November 2013 Pages 198-208**

Does Fargo/Cass County Have Air Quality Problem?

1.North Dakota counties receive lower air quality grades

- BLAIR EMERSON Bismarck Tribune, Apr 20, 2016
- Cass County went from A to B grade as a general measurement

2.WHO monitors air quality populations over 100,000, Fargo+West Fargo+Moorhead = 190,000

2015 Cass County had 91,153 passenger vehicles + 50,318 commercial vehicles=141,471 total

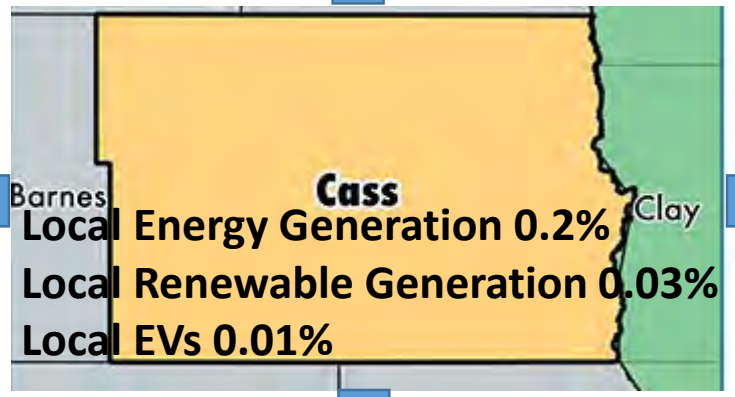
3.Fargo high density traffic volume vehicles per day statistics: DO NOT EXERCISE BESIDE HDT!

I94 62,855 to 73,560 to 73,070 to 73,191 from 45St to Moorhead
I29 24,305 to 46,795 to 63,705 to 59,345 to 49,980 from 40 Ave S to 12 Ave N
45St 12,660 to 20,775 to 34,580 to 35,015 to 28,145 to 18,665 to 11,500 from 52AveS/12AveN
42St 7,025 to 12,765 to 14,205 to 13,970 from 52 Ave S to Main Ave
25St 9,740 to 16,180 to 25,365 to 19,585 to 17,895 to 10,855 from 52 Ave S to 7 Ave N
University Dr 8,820 to 9,065 to 24,450 to 38,635 to 28,480 from 52 Ave S to 13 Ave S
32AveS 14,450 to 29,275 to 24,445 to 19,326 to 5,600 from 45St S to University Dr.
13Ave S 26,440 to 30,595 to 29,615 to 23,400 to 12,985 from 45 St S to University Dr.
Main Ave 22,145 to 26,920 to 23,565 to 22,305 to 21,930 from 45 St S to Moorhead
12 Ave N 10,100 to 16,700 to 18,845 to 10,300 from 45 St N to 4 St N

Problem 2 - Local Economies Suffer By Importing Energy

Fargo/Cass County Comprehensive Energy Study

NDSU COAL $1.4 million/yr, Total ~27 500 tons/yr



LIQUID FUEL

If $3/gallon $501 million/yr
If $2/gallon $334 million/yr
Total 167 million gallons/yr
Total 141 471 vehicles driving
Total population 171 512

ELECTRICITY

If CCEC $116 million/yr
If XCEL $110 million/yr
Total $226 million/yr
Total 2 321 734 649 kWh/yr

NATURAL GAS

XCEL $46 million/yr, Total 68 940 786 therms/yr

Total cost ranges from $607 million/yr if $2/gallon gas, $774 million/yr if $3/gallon gas

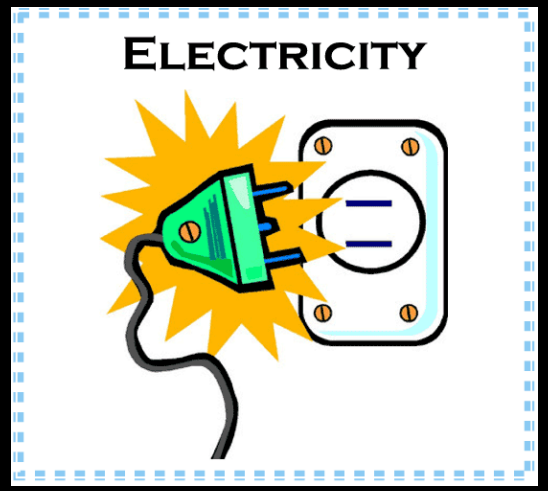
If average price of gas is $3/gallon over next 30 years will spend $23.2 billion

Air Pollution is Expensive

Fargo Comprehensive Energy Study (Population 171,512; Vehicles 141,471)

LIQUID FUEL
$501 million/yr if $3/gal
$334 million/yr if $2/gal

NATURAL GAS
$46 million/yr

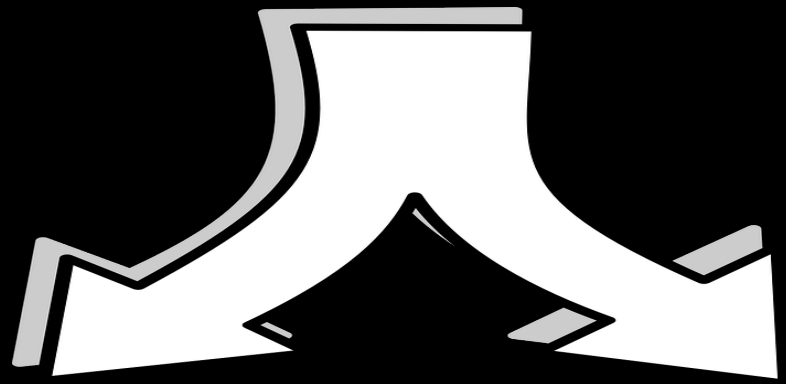


ELECTRICITY
$226 million/yr

NDSU COAL
$1.4 million/yr

Our community spends $607-$774 million/yr on energy

Cass County Energy Choice Next 30 Years



Zero Emissions

No air pollution

Spend $15 billion

Create over 2000 new jobs

Every person saves $1 600/year

Do Nothing

More air pollution

Spend $23 billion

Create 0 new jobs

10 cent ⬆ gas=$17 million

30 Year Energy Freedom Plan

Basically Fargo Cass County has a choice in next 30 years

1. **Do Nothing, Greater Air Pollution as # vehicles increase**
2. **Start Building Solar Panels, Wind, and Use EVs**

If do 2. get rid of air pollution & save ~$8 billion, per capita $1600/yr ☺!

Highlights of 30 Year Energy Freedom Plan

For every 10% transition step that covers a 3 year period build:

~200 MW solar and wind @ $1.6/watt that's roughly $320 million=300 million kWh/year

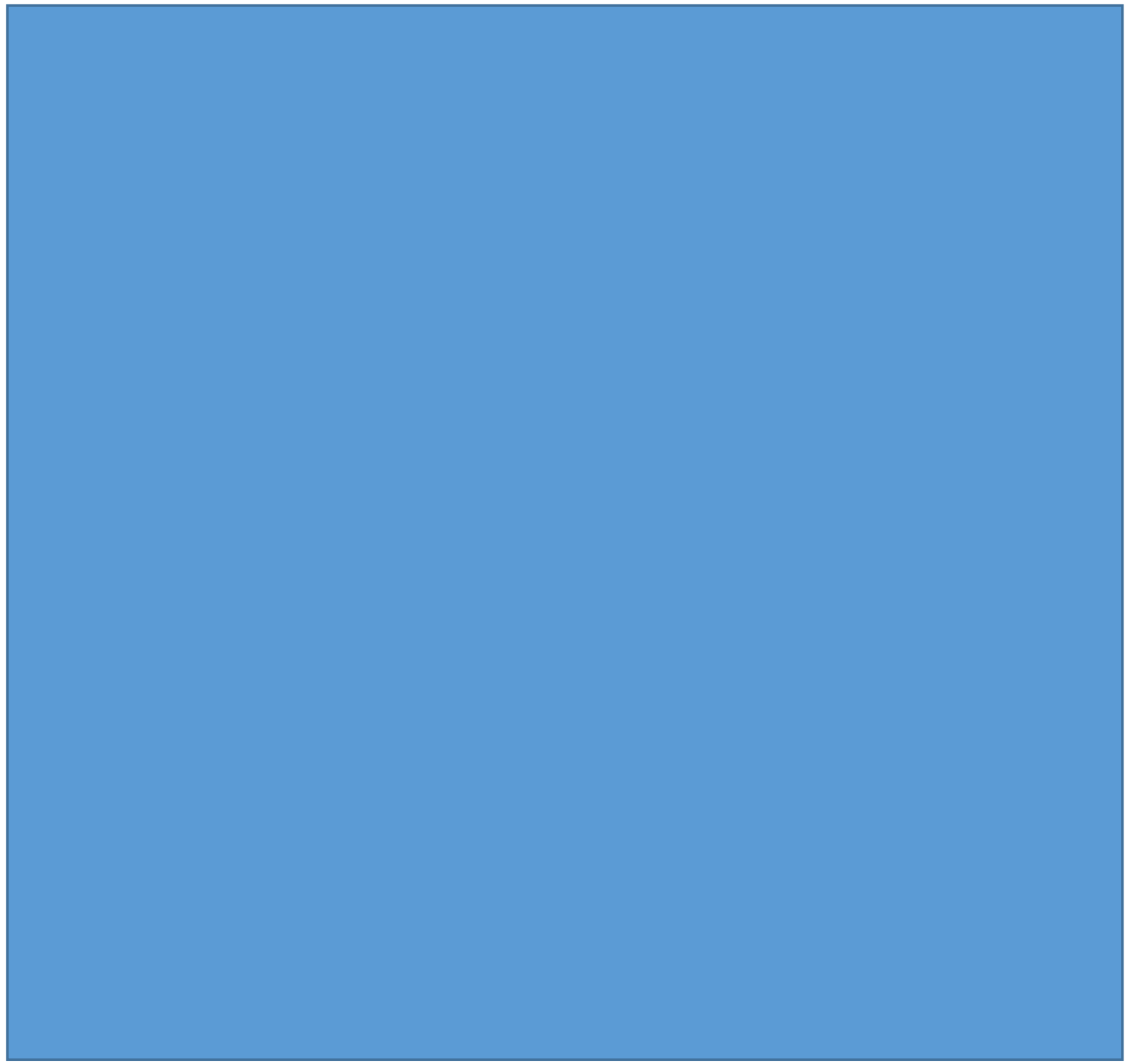
This doesn't solve vehicle exhaust problem!

To get rid of air pollution ~14 000 EVs provided by City for a 3 year period,

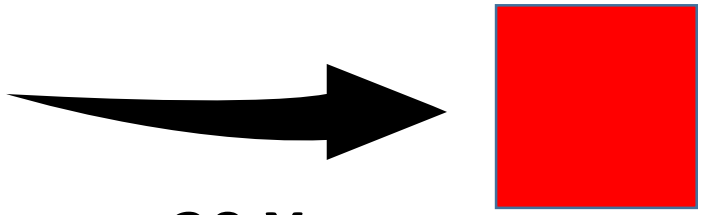
Priority for: A) Residents having newborns, young children, children

B) Residents with asthma, respiratory allergies, cardiovascular disease, cancer

C) Residents with attached garages and D) Low income residents



If you had 1000 acres of land choose:
A $1 million/year BLUE crop OR
B $30 million/year RED “crop”

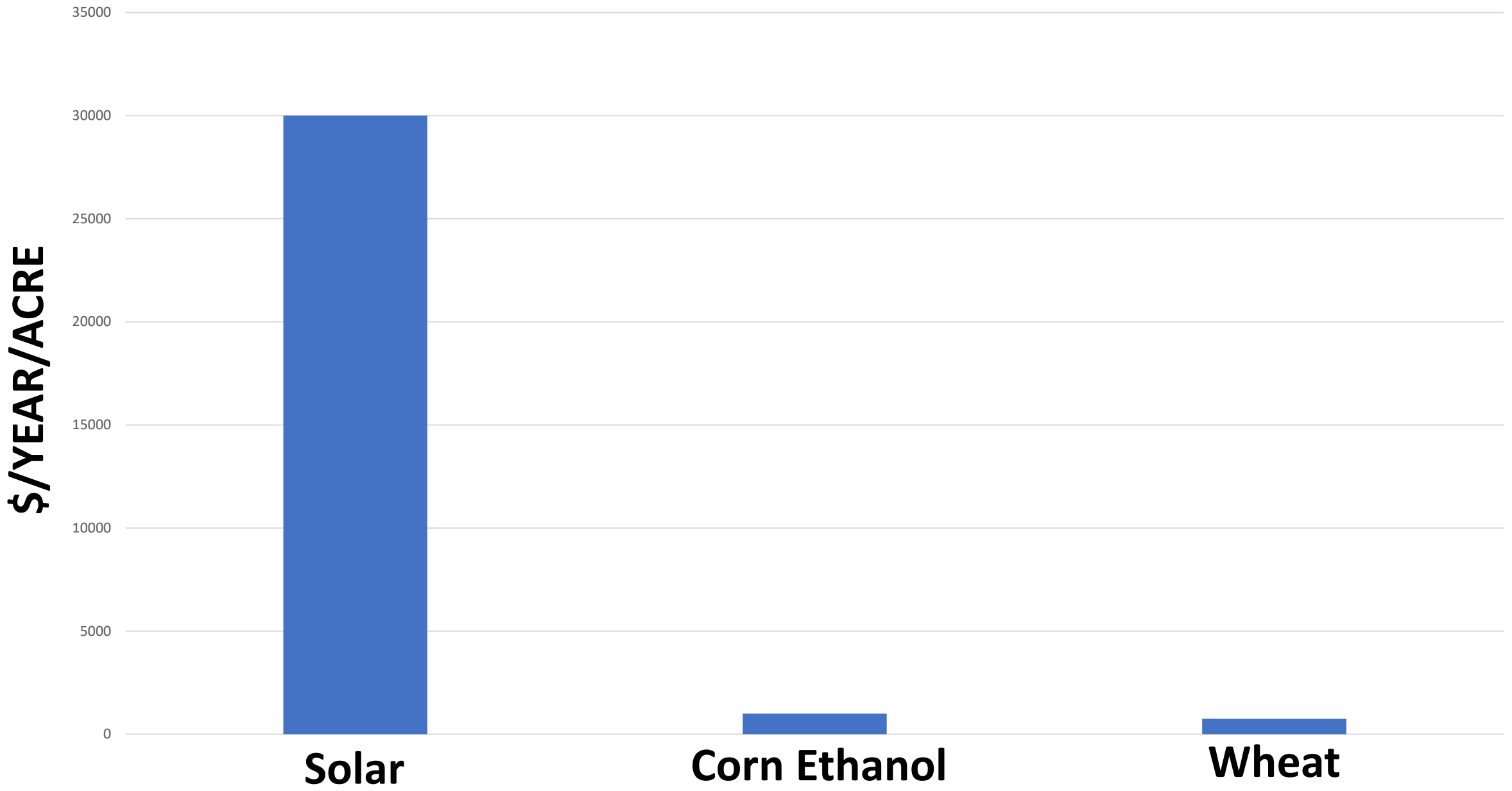


30 X Less Land!

300 000 Acres of Land
~167 million gallons corn ethanol
~$300 million economic activity
Cover Fargo Cass County fuel use

10 000 Acres of Land
2 000 MW of Solar/Wind Energy
~$300 million economic activity
Cover 141 000 EVs + 2.3 billion kWh

Gross Economic Activity For Different Forms Of Land Use




EVER SINCE I SWITCHED FROM A CORN AND SOYBEAN CROP ROTATION TO A SOLAR AND WIND POWER ROTATION I'VE HAD A GUARANTEED INCOME.
Tnyve Olson
2019 The Forum

Difference Between Simple Payback and Community Payback
Community Payback Amplifies Basic Payback Potentially Multiple Times

Example of Simple Payback (long-term payback)

Net Price Grid Tie Solar Panels 7 kW system is $12 000, you save $1 000/year

In 12 years pay back cost of system, next 12 years essentially double money put into it

Community Payback (immediate payback)

Take same $1 000/year from above Simple Payback

Spend $1 000/yr buying local doubling payback, if dentist/employees buy local more payback

This happens every year in conjunction with simple payback

Can have further amplification every time $1 000 or part of it recycled by spending locally

For energy spending this amount is huge in our community $600+ million per year potential

Best Example of Economic Stimulation by Community Payback of Energy Dollars

In the last few years Western North Dakota and State budget collapsing into black hole

Despite this Fargo/CC population and economy booming (eg. house prices and market)

Gas prices dropped $3.50 to $2/gallon = $250 million/year is kept in our community each year!

The Multiple Economic Downsides to Using Fossil Fuels

THE 3 YEAR GAMBLE!

North Dakota Crude Oil First Purchase Price, Available on https://www.eia.gov, US Energy Information Administration

2013	$/barrel	2014	$/barrel	2015	$/barrel	2016	$/barrel
Jan 31	90.52	Jan 31	82.70	Jan31	37.52	Jan 31	24.80
Feb 28	90.30	Feb 28	91.68	Feb 28	41.31	Feb 29	22.72
Mar 31	89.21	Mar 31	91.17	Mar 31	38.77	Mar 31	30.35
Apr 30	88.06	Apr 30	92.37	Apr 30	46.08	Apr 30	34.54
May 31	88.97	May 31	92.94	May 31	51.08	May 31	39.47
Jun 30	87.43	Jun 30	96.25	Jun 30	53.41	Jun 30	42.80
Jul 31	96.92	Jul 31	92.51	Jul 31	45.21	Jul 31	39.58
Aug 31	98.13	Aug 31	87.66	Aug 31	35.67	Aug 31	38.53
Sept 30	96.69	Sept 30	83.45	Sept 30	37.78	Sept 30	38.70
Oct 31	90.16	Oct 31	75.64	Oct 31	39.78	Oct 31	44.37
Nov 30	80.67	Nov 30	67.26	Nov 30	36.98	Nov 30	39.67
Dec 31	85.04	Dec 31	50.51	Dec 31	30.67	Dec 31	45.32
AVERAGE	90.18	AVERAGE	83.68	AVERAGE	41.19	AVERAGE	36.74

Oil from 2013- 2 183 wells, investment is $21.830 billion, average price $62.94/barrel, a $2 billion+ loss

Oil from 2014

2 353 wells at $10 million/well with breakeven at $70/barrel (underestimated), Investment is $23.530 billion

Average price from 2014-2016 is 83.68 + 41.19 + 36.74 / 3 = $53.87/barrel

Is on track to make only $18.1 billion income of the $23.530 billion invested, That is a ~$5 billion+ loss for year

Loss could have purchased a lot of solar panels = 2 X Cass County energy use for 25 years

Oil from 2015

1 583 wells at $9 million/well with breakeven at $60/barrel (estimate), Total investment is $14.247 billion

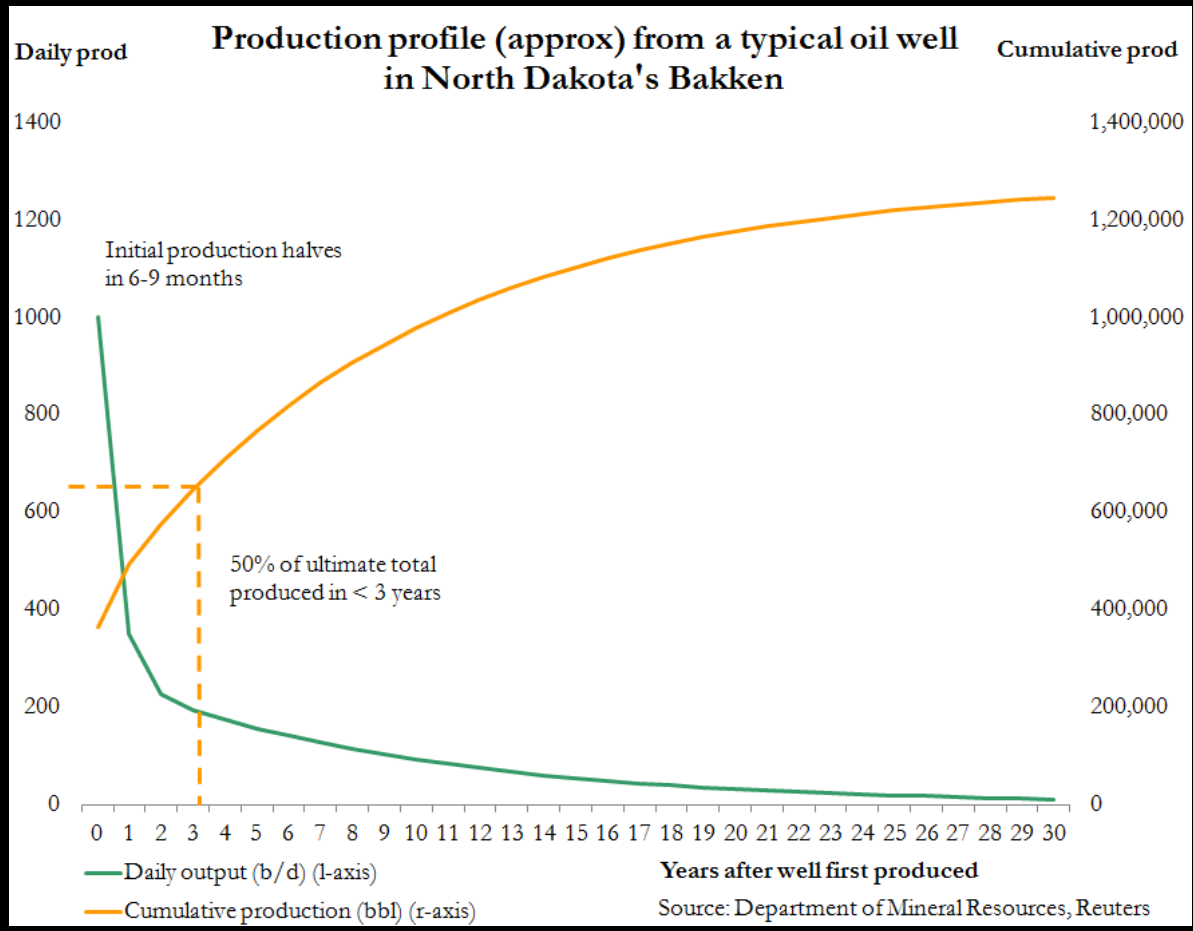
Average price from 2015-2016 is 41.19 + 36.74 / 2 = $38.97/barrel

$9.25 billion income of the $14.247 billion invested, ~$5 billion loss, if spend $10 billion solar energy for ND 25 yrs

Solutions to Problems – Local Solar Energy, Wind Energy, EVs

I Guarantee Solar Works Well in Fargo

Expect 1,000W=1,500 kWh Solar In Fargo

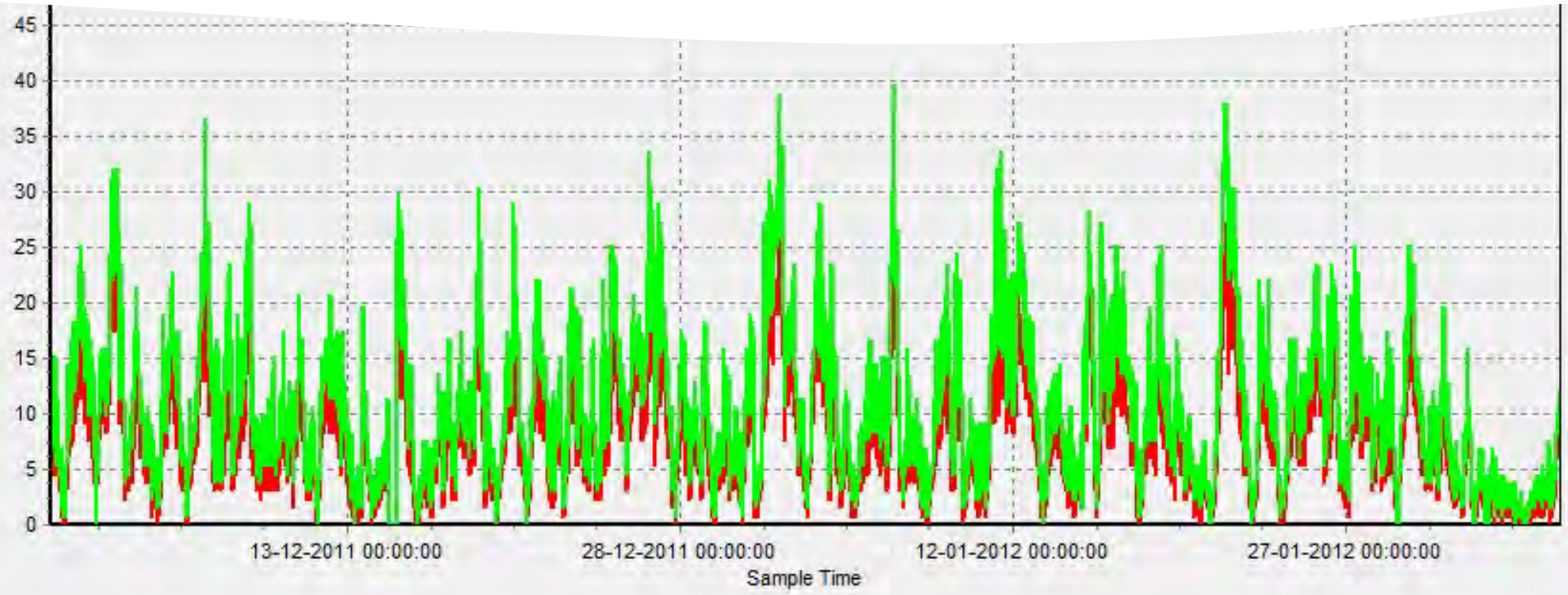


TEDx Bismarck

x = independently organized TED event

Average Wind Speeds For House

- **Average speed 10-12 mph, days higher 20+ mph**
- **Wind is an excellent complement to solar in Fargo**
- **Cloudy days=windy days!**



EVs are Economical, Ultra-efficient, & No Pollution

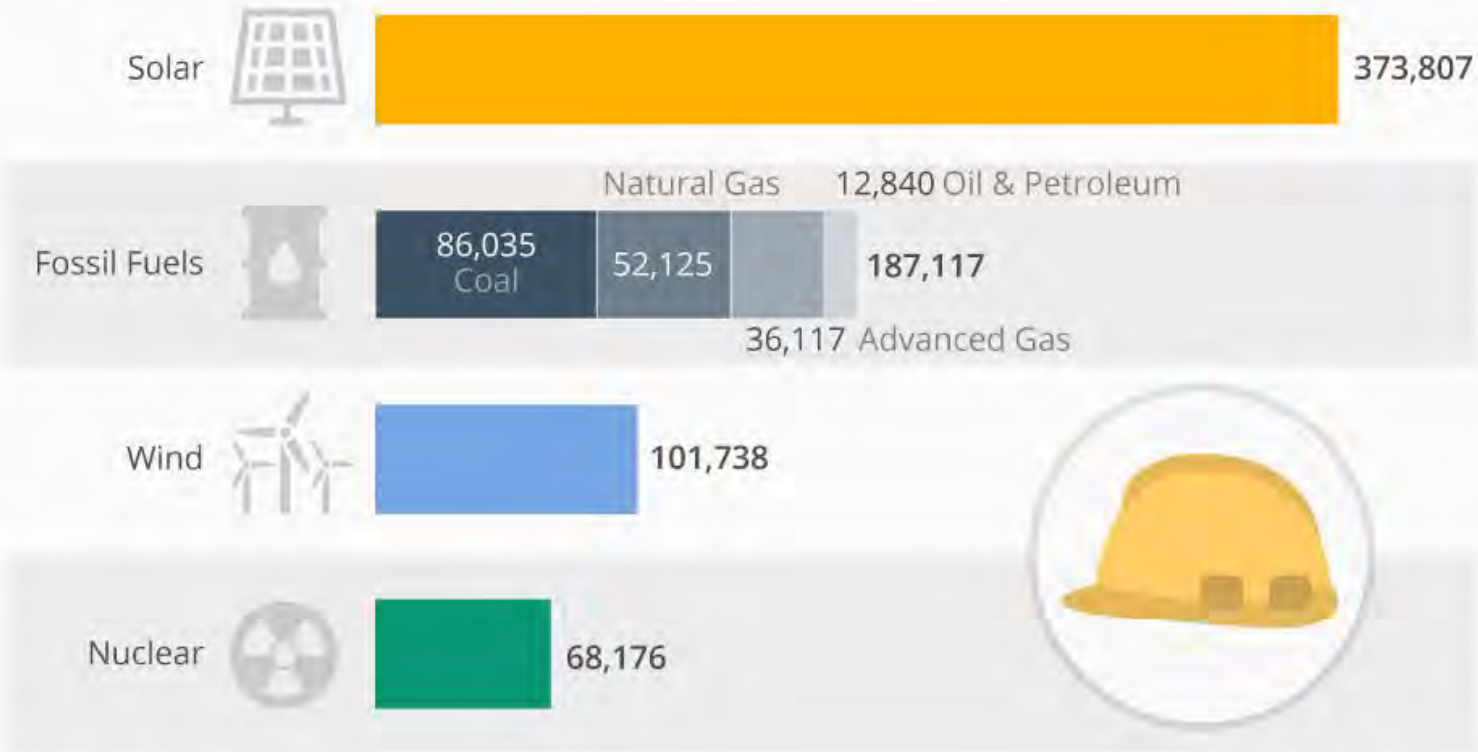
EVs use 1/3 the energy to travel the same distance as gas vehicles!

1st year drove 8000 EV miles using 4000 kWh, in 2017 drove gas vehicle 2000 miles=6 barrels oil

For 9 months of year solar provides most of energy for house + EV! Only spent $100 in 2017/8

More Workers In Solar Than Fossil Fuel Power Generation

Employment in energy generation by source in the U.S. in 2016



Source: U.S. Department of Energy

Forbes statista

GERONIMO ENERGY

The Harmony Solar Project is a 200 megawatt (MW) solar project located in Cass County, ND. Harmony will span approximately 1,600 acres and will connect to the Bison substation. The project is anticipated to positively impact both the environment and the local economy by producing up to $500,000 in tax revenue annually and reducing carbon dioxide emissions by 240,000 metric tons each year – the equivalent of taking 50,000 cars off the road every year.

Operational Capacity:	**200 MW, My estimate 600 000 solar panels!**
Location:	**Harmony Township, Cass County, North Dakota**
Capital Investment:	**~$320 million**
Local Tax Revenue:	**up to $10 million over 20 years of operation, or $500,000 annually***
Construction Timeline:	**2019-2020**
Expected COD:	**December 31, 2020**
Carbon Dioxide Emissions Reduced:	**240,000 metric tons annually**

Calculations based on National Renewable Energy Laboratory (NREL) JEDI Model & proposed ND tax for solar facilities.

2 200+ Construction and Related Services Jobs!

For every 1 MW of solar get 13 local jobs installing panels plus 20 manufacturing jobs for year!

Why Haven't We Made A Major Change From Fossil To Renewable

- **Simple Answer Money**
- **Complicated Answer Lack of Leadership Probably Due to Money**

- **<u>World Energy Outlook Executive Summary by the IEA</u>**
- **Year 2011 Global Subsidies for Fossil Fuels = ~$520 billion dollars**
- **Year 2011 Global Subsidies for Renewables= ~$80 billion dollars**

- **Year 2012 Global Subsidies for Fossil Fuels = ~$540 billion dollars**
- **Year 2012 Global Subsidies for Renewables= ~$100 billion dollars**

- **Year 2013 Global Subsidies for Fossil Fuels = ~$550 billion dollars**
- **This year the IEA said this is holding back development of renewables**

- **Year 2018 = More than 70% of $2 Trillion/yr investment from govts**

- **IF keep investing more money into fossils than renewables=status quo**