



Billings Refinery

April 30, 2016

Dear Council Member:

Please find attached a copy of the minutes from our **April 12, 2016** CAC meeting.

Just a reminder that the next CAC meeting will be **TUESDAY, MAY 10, 2016** at the Phillips 66 Learning Center. Dinner will be served from 5:00 to 5:30 p.m. The meeting will run from 5:30-7:30 including a **refinery tour**. There will be transportation available for anyone not able or willing to walk the tour.

Sincerely,

Ann L. Clancy, Ph.D.
Meeting Facilitator

**Meeting Location: Phillips 66 Learning Center
415 South 24th Street**

**PHILLIPS 66 BILLINGS REFINERY
CITIZENS ADVISORY COUNCIL
April 12, 2016**

MEETING MINUTES

- Present:** Council members: Keith Beartusk, Paul Dextras, Travis Harris, Bob Hoar, Rob Lowe, Gregory Neill, Shirley McDermott, John Pulasky, Jim Ronquillo, Heather Schwab, Andrew Sullivan, Mike Yakawich
Phillips 66 management: Colin Franks
Midstream: Mark Hilbert
Facilitator: Ann Clancy
- Absent:** Lucas Blehm, Ralph Hanser, Bruce MacIntyre, Ray Rigdon, Melanie Schwarz, Emily Shaffer, Stella Ziegler
- Guests:** Bill Kennedy, County Commissioner; Bea Ann Melichar, Adult Resource Alliance David Hobbs, EEG, Inc.; Dave Fincel, Southside Neighborhood Task Force
City College Students: Brad Cash, Jason Kills Pretty Enemy, Shelby Eckhart, Alex Songstad

AGENDA

- Welcome/Introductions
- Senior Services Mill Levy
- Honoring Michele Zahn
- Biofuels: Food for Thought & Transportation (Andy Sullivan)
- Community, Refinery & Transportation Updates
- Next CAC Meeting: May 10, 2016

WELCOME/INTRODUCTIONS

Colin Franks welcomed guests Bill Kennedy, County Commissioner, and Bea Ann Melichar with the Adult Resource Alliance, who will speak to the Senior Services Mill Levy. David Hobbs with EEG, Inc. was welcomed as a guest and Dave Fincel was introduced as the potential new representative for the South Side Neighborhood Task Force. Five students were also in attendance: Brad Cash, Jason Kills Pretty Enemy, Shelby Eckhart and Alex Songstad.

Senior Services Mill Levy

According to Bill Kennedy and Bea Ann Melichar, those who provide senior service programs in Yellowstone County are serving more people with the demand expected to rise. They presented information and distributed materials on the senior services mill levy showing the expected increase in the 60+ population in Montana. The goal of the mill levy is to provide services that keep seniors independent for as long as possible. The mill levy increase equates to \$4.67 on a \$200,000 home.

Honoring Michele Zahn

Michele Zahn was honored for her years of commitment and service to the CAC as representative of the South Side Neighborhood Task Force. She served from November 2012 to April 2016. Her contributions were especially significant in helping to plan, design and support

the Meet in the Park event in South Park. She is being replaced by Dale Fincel. She will continue to provide support for the community appreciation event in South Park.

BIOFUELS: FOOD FOR THOUGHT & TRANSPORTATION

Andy Sullivan, Process Plant Technology Instructor with City College, introduced the topic of Biofuels as “food for thought and transportation.” His presentation focused on energy use, supply and trends; the debate around greenhouse gasses; and the processes, economics and pros and cons of growing fuel in the form of biodiesel and bioethanol. He outlined his objectives in presenting material that can be controversial:

- Fossil vs. renewable fuels debates can be emotionally charged
- His goal to be impartial
- His intent is to stick to facts cited from credible sources
- His effort is to avoid drawing conclusions
- He is presenting interesting data so as to help CAC members be better able to interpret media statements and form their own opinions about biofuels

Energy Use, Supply & Trends

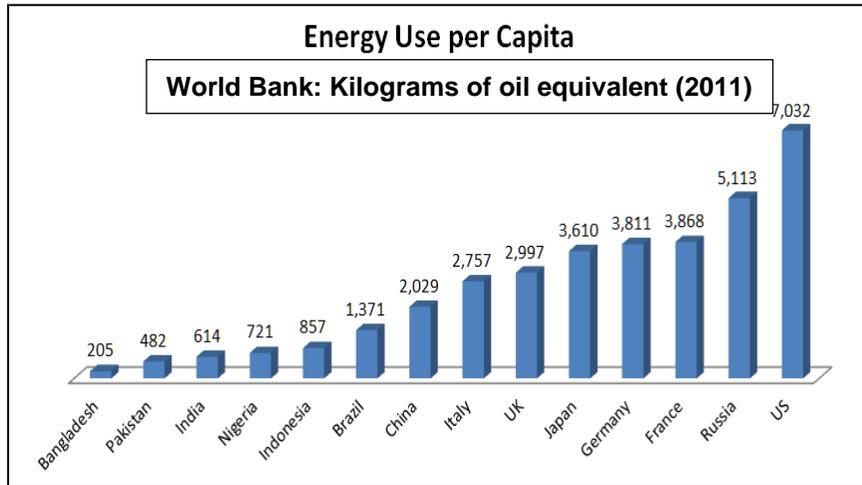
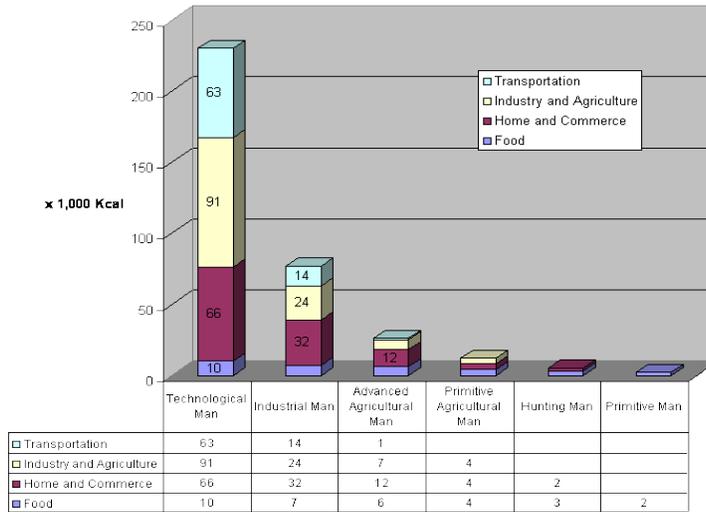
Andy began with explaining some common energy terms and concepts:

- *British Thermal Unit (BTU)*: The formula is 1 BTU = 1 pound water heated 1°F (1 pound water = about 2 cups)
 - Example: How much does your shower cost?
 - 10 minute shower uses 2.5 gallons per minute, 8.34 pounds per gallon for water warmed from 55 to 105°F; BTUs = 10,000 BTUs/shower
 - 10,000 BTUs/shower, heat with natural gas; \$6 per dekatherm (1 dekatherm = 1,000,000 BTU). Cost = 6 cents or \$90/year for a family of 4, about 1/10th of natural gas bill
- *Horse Power*: 1 hp = 550 ft-lbs/second; 550 lbs lifted 1 foot in 1 second OR 100 lbs lifted 5.5 feet in 1 second (but you have to do it every second!)
- *Watts*: A kilowatt is a measure of energy like a BTU; 746 watts = 1 horse power; 1000 watts for 1 hour is a kilowatt-hour which is the same energy as 100 watts for 10 hours. We buy electricity by the kilowatt-hour at 11 cents/kwh in Billings as of January 2012

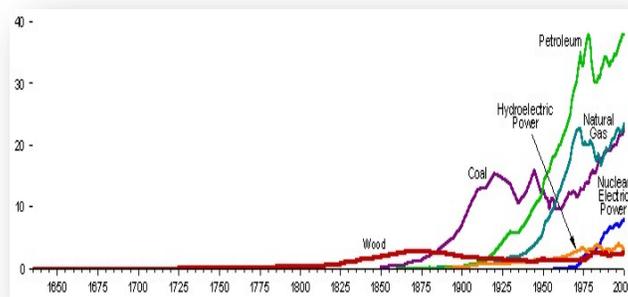
Energy consumption can be understood in terms of appetite for energy, where it is used, and whether it has changed over time.

- Daily consumption of energy per capita: about 2,310 gallons fuel per person per year

Daily Consumption of Energy Per Capita



- Energy use per person increases as a culture industrializes and increases use of technology
- Population is increasing at the same time as energy consumption
- U.S. energy consumption is increasing and a good part of that increase is fossil fuels

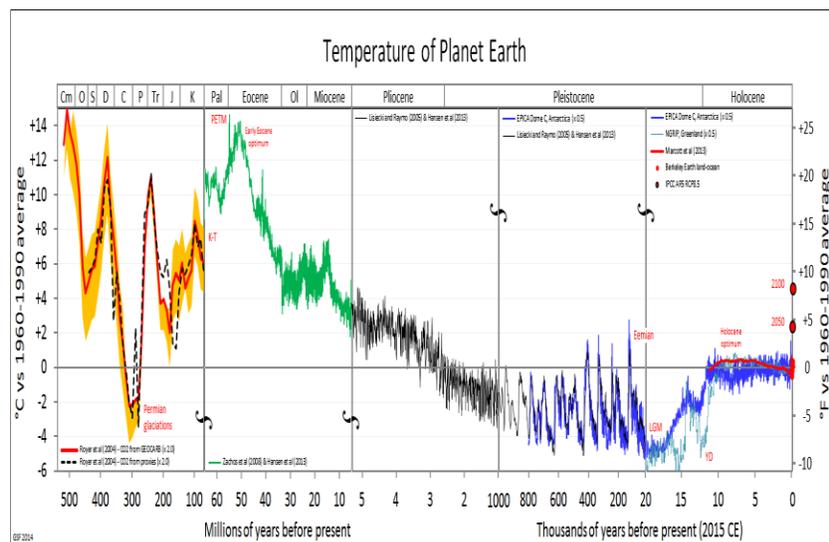
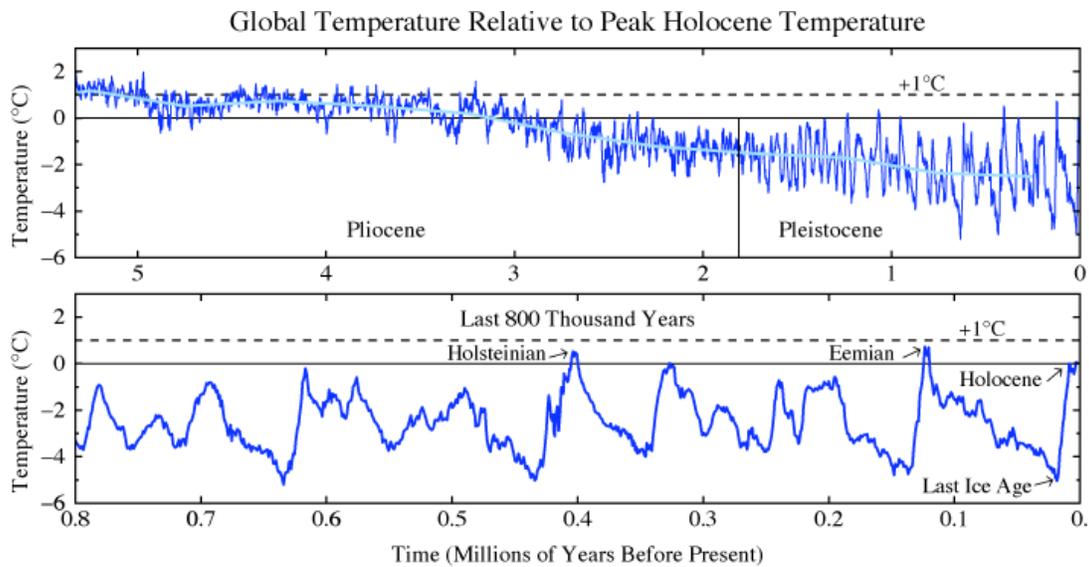


- Combustion reaction is burning carbon with oxygen to form carbon dioxide (like the reaction of barbecuing with charcoal briquettes)
- Transportation fuels are more complex, e.g., an iso-octane is a molecule in gasoline with 100 octane by definition; refiners make it from butanes in an alkylation unit

Greenhouse Gasses Debate

Andy talked about the concern around global warming. The fuels that are burned create carbon dioxide and they have been buried for a long time. CO₂ is a greenhouse gas and the concerns are that: it can hold heat in the atmosphere, it is invisible to incoming short-wave light, and it absorbs outgoing longer-wave light (infrared). For 650,000 years, atmospheric CO₂ was never above 350 parts per million until 1950.

- Possible implications of a warming environment: changes in agriculture, sea level increases, acidification of water bodies. CO₂ is a weak acid.
- Climate history over a long span:



- Sea levels have risen around 8 inches since the beginning of the 20th century. The ocean is projected to rise by as much as 3 feet by the end of this century. Earth’s climate history shows there have been times when ice sheets rapidly changed and created multiple meters of sea level rise in a century. As earth’s ice sheets continue to change, a key question facing scientists is, “Could human-caused global warming push us toward one of those times?”
- Global warming concerns: we might be changing the climate but not everyone is in agreement; we have benefitted from industrialization which supports a lot of people economically; should we curb CO2 emissions and if so, how much?

Alternative Fuel Sources

In addition to wind and solar, there are biofuel alternatives from biomass such as ethanol and biodiesel. Biomass is solar energy in the form of plants which produce combustible materials. Energy is harvested from sunlight and CO2 is consumed in the process to produce organic usable waste. Andy asked some questions regarding corn ethanol: Does it take more energy to make ethanol than is recovered, is the amount of land use excessive, and does it negatively impact food markets? Andy noted that it takes 1 million gallons of ethanol to produce 76,000 million BTUs with the result that it takes more energy to make ethanol than it can create. But there are upgrades and byproduct credits that can be added to the equation.

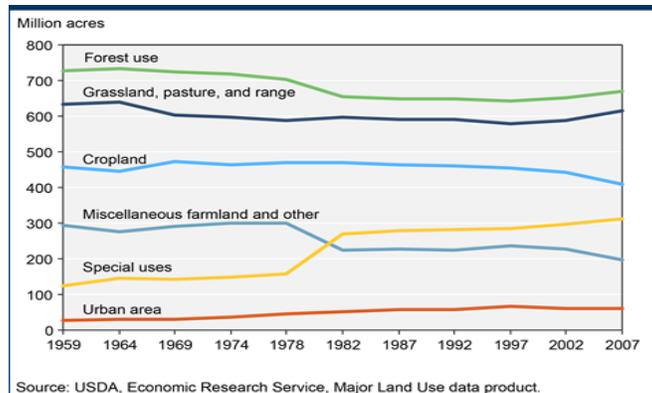
**Basic Corn-Ethanol Cycle
Total Energy Investments in the manufacture of 1 million gallons of ethanol
(without byproduct credits)**

OPERATIONS	FUELS (MILLION BTU)						
	GASOLINE	DISTILLATE	RESIDUAL	NATURAL GAS	COAL	OTHER	TOTAL
Corn Production	7,307	9,569	387	15,897	1,666	758	35,584
Ethanol Plant	717	488	504	2,141	51,890	166	55,906
TOTAL	8,024	10,057	891	18,038	53,556	924	91,490

According to Andy, there is energy and value in *dried distillers grain* as a byproduct of the process which can be fed to cows. In terms of ethanol energy balance overall, Andy states that calculations show a small excess of 23,397 million BTUs per 1 million gallons.

Land Use

Andy showed the major uses of land in the U.S. from 1959-2007:

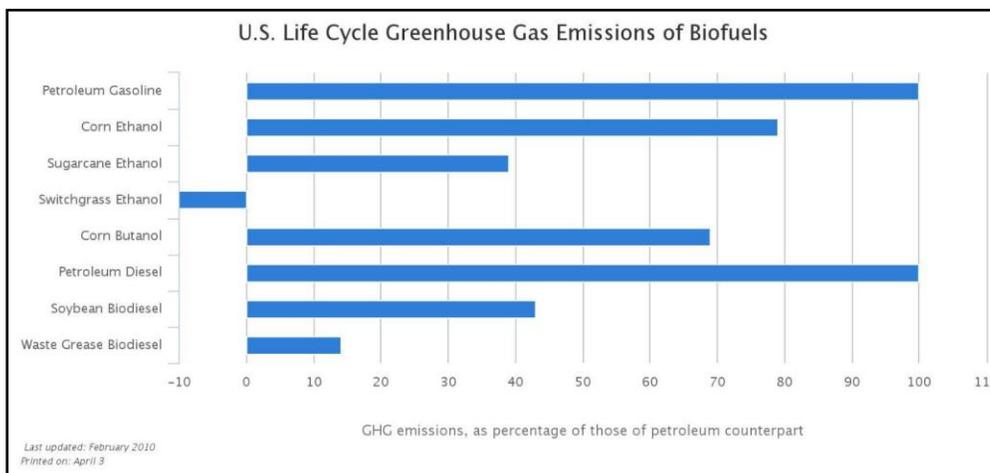


- Corn and grain yields increased dramatically beginning around the 1960s till 2010 when they began to drop off.
- Inflation-adjusted prices for corn, wheat and soybean have steadily decreased from 1910 to 2010 with the exception of a couple of spikes in 1950 and 1970.

Andy made the following observations regarding production of ethanol:

- Land use is apparently not a major problem
- Food cost is apparently not a major problem
- It takes a lot of energy to produce ethanol
- There is an energy excess if byproducts are considered (e.g., dried distillers grain)
- Net liquid fuels are produced
- Natural gas is used to produce a liquid fuel
- Greenhouse credits seem less apparent
- More BTUs of fossil fuels are used than BTUs of ethanol produced
- Natural gas produces less CO₂
- Credits may exist, but need to sharpen pencil

In answer to the question of whether the U.S. could do better with biodiesel, Andy shared the chart below which compares life cycle greenhouse gas emissions of various biofuels with those of petroleum fuels. The negative emissions of switchgrass indicate a net capture of carbon into the soil and biomass.



Biodiesel Positives and Issues

Andy pointed out that biodiesel has advantages over ethanol as it is easier and less expensive to process. Made from most any vegetable oil or animal fat, it can be blended with petroleum diesel in any proportion and used in diesel engines without major modifications. It is typically a 20 percent blend with #2 diesel. Up to 5 percent is combined with home heating oil to create Bioheat®, which is used in home heating systems with no modifications necessary. It releases up to 78 percent less carbon dioxide and crops used to produce biodiesel absorb large amounts of carbon dioxide as they grow. Biodiesel reduces particulate emissions by 68 percent.

Some issues with biodiesel include emission of about 10 percent more NOX, cold flow properties inferior to diesel for engines, less fuel stability in high concentration biodiesel blends, and solvency issues at high concentrations. All these issues can be mitigated with blending. In terms of safe use of biodiesel in vehicles, Andy quoted from Edmunds.com, Inc., an American online resource for automotive information:

- No automaker recommends the use of biodiesel in quantities higher than B5 (meaning fuel is 5% biodiesel, 95% petroleum diesel) for passenger vehicles in the U.S. with one notable exception: The General Motors warranty covers use of biodiesel blends of up to B20 in the new diesel-powered 2014 Chevrolet Cruze TD.
- Chrysler, Ford and GM do allow the use of B20 in some heavy-duty vans and in their heavy-duty pickups.
- For Ford and GM, however, that only applies to model-year 2011 and newer vehicles.

Camelina

Process Plant Technology student Shelby Eckhart talked about local biofuel research into camelina, an oil seed crop well suited for Montana's climate. Camelina is in the mustard seed family. Shelby is in the first class that has gotten proficient at producing higher yields of oil from camelina. It yields 1000 lbs/acre and produces 35 percent oil. Thus 350 lbs oil/acre equals 45 gallons/acre. It's estimated that 44 acres can meet energy needs. Compared to 65 percent use of other plants, the camelina plant can be used 100 percent. After the oil is squeezed out, press cakes can be made of the remainder of the plant and fed to livestock.

Andy concluded his presentation by noting that the energy pie in the U.S. has room for lots of difference slices and pieces. The following CAC member and guest questions and comments were recorded:

- *Are there energy efficiencies in population density?* Studies show that cities can be more energy efficient.
- *What were the conditions on earth before carbon sequestration?* Carbon was at some point plants and it's estimated that in the age of dinosaurs there was much more carbon dioxide present in the atmosphere than now. But scientists don't know whether the carbon was released all at the same time or if there was volcanic activity or some other factor involved.
- *What is the driver for sea level rise?* Scientists are not in agreement. It could be ice caps melting. Also heat expands water so the warming of the oceans could be a factor.
- *How much air is on the planet?* There are 14.7 lbs/air for every square inch.
- *Is there a limit to how many humans the planet will support?* That is not known; however, if volcanos erupt and it is not possible to grow crops, there could be a limit.
- *What part does CO2 play in smog?* I don't think any part.
- *Should we look at all sources of power instead of cutting just one, e.g., coal?* If we cut just one fuel source, we could risk making a mistake.

- *Do you have to put ethanol in gasoline?* It is added to the fuel but because a gallon of ethanol produces fewer BTUs than petroleum it drags gas mileage down.
- *How do the refineries receive the ethanol?* The refinery doesn't receive the ethanol; it goes to terminals and is mixed there. It comes in trucks as there are no ethanol plants in Montana. There is a plant in North Dakota.
- *What are the downsides of higher production per acre of corn, etc.?* With the use of heavy fertilizers, it is a chemically intensive business.
- *Will camelina push out soy?* We're not sure. It grows easily and has lots of Omega-3 fatty acids and natural antioxidants. It's well suited as cooking oil.
- *Can you use biodiesel as diesel fuel?* Yes, but it's not as good on cold days.
- *Do restaurants recycle their cooking oil?* There are waste oil plants that will take in used cooking oil.
- *Do lubricants need to be added?* They are added at the pipeline terminals.

COMMUNITY UPDATES

The following updates were given:

- South Side: The Easter Egg Hunt had a great turn out and was well structured. Prizes were also given out: six bicycles and 29 Easter baskets. Phillips 66 was thanked for its ongoing contributions.
- South Side: Refinery land behind the post office has been officially annexed into the City instead of the County, making it a unique precedent.
- South Side: Investments are being made in South Park with the installation of a splash park and tennis courts next year and hopefully with upgrades to curbs and gutters. The South Side has also been focusing on cleaning up boarded-up houses and inviting investment in housing. There will be an Earth Day clean up on the South Side on April 30, working on clearing the ditch located just off of Jackson St.
- City Council: Following a public hearing, the City Council will consider some changes to the Complete Streets policy it adopted in 2011. Complete Streets is based on making transportation routes safe for drivers, bicyclists, transit vehicles, and pedestrians. It also focuses on changing the decision-making and design process to ensure all users are considered during the planning, design, construction and maintenance of all roadways.

MIDSTREAM UPDATE

Operations: Midstream is doing well. There have been 268 One-calls in the last month, 506 total for the year in Yellowstone County. Pipelines are running well. Last year, a new 90-mile pipeline was constructed in North Dakota of which Midstream will be 50 percent owner and operator. It will transport crude oil to be put on rail cars and taken both east and west. A new railcar terminal is about one-third completed.

Environmental: There are no incidents to report.

Safety: There is a continued push in the company for life saving rules to manage and ensure safety.

June 14 CAC meeting: Midstream will do a 20 minute presentation on the company to be followed by tours of the truck loading facility and the Seminoe and Yellowstone Pipelines station.

REFINERY UPDATE

Operations: The refinery is running well. There was a problem with the FCC unit but that was fixed and there have been no further issues. There will be a small turnaround of a reformer that will bring in about 110 extra workers. In terms of the vacuum unit project, the tower is about one-third built and an extra 150 workers have been engaged for that. The new unit will not increase capacity but will be much more efficient producing more valuable output, making it easier to sell. The unit is scheduled to be completed in June 2017. Jupiter plant is also undergoing project work in parallel to support the improved product.

Safety: There have been no recordable injuries so far this year.

Environmental: Environmental permits are not necessary for the vacuum unit because the throughput is not being increased.

NEXT MEETING: May 10, 2016

Location: Phillips 66 Learning Center

- Welcome/Introductions
- Refinery 101 Presentation
- Tour of Refinery
- Next Meeting: June 14, 2016