From: Vincent Yazzie
To: Lee, Anita
Subject: Re: Calculations for NGS
Date: Wednesday, January 08, 2014 12:16:37 PM

Yes, message would not be complete without it. A search for carbon content of the coal fuel. Would have to search for a more complete analysis of the coal via lab work.

Vincent H. Yazzie

On Wednesday, January 8, 2014 11:22 AM, "Lee, Anita" <Lee.Anita@epa.gov> wrote:
Hi Vincent,

So, I just wanted to confirm that the four attached excel files are the ones you had intended to attach to your comments submitted via regulations.gov, correct?

Thanks!
Anita

Anita Lee, PhD
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From: Vincent Yazzie [mailto:vinceyazzie@yahoo.com]
Sent: Wednesday, January 08, 2014 10:16 AM
To: Lee, Anita
Subject: Re: Calculations for NGS

Dear Dr. Lee,

I am at Dilkon, Arizona so cell phone reception is spotty.

Message was truncated deliberately hoping to leave out the files. The original message is attached without truncation. It was a search to verify the energy content of the coal itself as coal contain fixed carbon, but found out later that volatiles make up the other part. The energy content of the fuels seem similar for all the power plants in Arizona with differences between coal fired plant and natural gas power plants. I can understand natural gas power plants being the same, but for coal.

Broke of my calculations to focus on the Four Corners Power plant and the Navajo Mine. Right now its Yazzie v. OSM in the DOI Hearing and Appeals in Salt Lake. Reading 30 CFR on bonding.

I have not looked at the files since. I have two copies of the files for 2009 for Arizona. One for November, 2013 and ones downloaded again for January, 2014.

Spent the whole day verifying the air emissions data for NOx for NGS on 1/6/14 from the prepackaged data. Some years the data was unsorted and had to resort by Facility Name, Unit ID and final OP Date.

Files attached at the end.

Sincerely,

/s/ Vincent H. Yazzie

Vincent H. Yazzie
Dear Dr. Lee,

Using older computer with 2007 MS Excel for while laptop power supply is in the mail.

Do not like Yahoo's new mail system so I had to recompose a reply message.

Carbon Content for Black Mesa Kayenta Mine is found at

http://pubs.usgs.gov/pp/p1625b/Reports/Chapters/Chapter_H.pdf

Which is attached as Chapter_H.pdf.

In Chapter_H.pdf page 30 of 33, Table 4, fixed carbon (%) composite is 39.6%.

I am on page 6 of 33 behind the person with the blue shirt. Henry Haven now works for Navajo Nation EPA in their gas tank leak department last I heard.

Formula to calculate carbon content is at

http://www.engineeringtoolbox.com/co2-emission-fuels-d_1085.html

qCO2 = cf/hf Cco2/Cm

qCO2 = specific CO2 emission (CO2/KWH)
cf = specific carbon content in the fuel (kg C/ kg fuel)
hf = specific energy content (KWh/kgfuel)
Cm = specific mass Carbon (kg/mol Carbon)
Cco2 = specific mass Carbon Dioxide (kg/mol CO2)

Cco2/Cm = 3.7

There is a note on heat loss. For this web page Specific Carbon Content (kgC/kgfuel) for Coal (bituminous/anthracite) is 0.75.

DLY_2009azQ1.xslx modified today 11/26/13

DLY_2009azQ1.xslx has been modified with additions to calculate various parameters. One is carbon content.

The file came from the

Air Markets Program Data
http://ampd.epa.gov/ampd/

Selecting Prepackaged data. Selecting CSV (daily), Quarterly, 2009, Arizona. All Allowance Data selected.

Part 75 Emissions data download for First quarter of 2009.

DLY_2009azQ1.xslx is downloaded.

From here I start processing the data. Original data is kept the same which from columns A to R and Rows 1 to 7021 approximately. Row length may vary on the original data as prepared by the Prepackaged Data. Navajo Generating Station data is copied and pasted at the bottom. Data for NGS at the bottom is resorted by data and unit number.

More columns are added.

Column H, GLOAD (MW). Should be GLOAD (MW-Hr)

Column N, CO2_Mass (tons)

Cholumn O, CO2_Rate (tons/mmBtu)

Column P, HEAT_INPUT (mmBtu)

Coal mine production data can be found at

http://mines.findthedata.org/l/2381/Kayenta-Mine

Look for the tons v. year graph.

Put the pointer on the tons v. year graph for 2009 to get 7,474,029 tons.

Following files added as attachments with Vincent modifications. Do not update the links when opening up the files.
DLY_2009azQ2.xslx
DLY_2009azQ3.xslx
DLY_2009azQ4.xslx

7,474,029 tons added for DLY_2009azQ4.xslx at cell X7837 for comparison to cell X7835, 7,372,624.65 tons which is close to the production number of 7,474,029 tons.

I assumed a coal rank of 12,500 btu/lb for the coal. The actual number is 12, 671.93 in cell X7839 using a correction factor in cell X7838. Ratio of actual production to calculated production using 12,500 btu/lb.

Looks good so far.

12,500 btu/lb is used in column V, Coal(lbs.) in DLY_2009azQ1.xslx, DLY_2009azQ2.xslx, DLY_2009azQ3.xslx and DLY_2009azQ4.xslx

DLY_2009azQ1.xslx, Column O, CO2_RATE (tons/mmBtu). Cell O2 gives 0.103, but this is for Cholla. Recopied cells for Navajo Generating Station (NGS) is at cell O7300 which has a value of 0.103.

Two power plants burning the same fuel as its giving off the same amount of CO2 per pound of coal.

Says NGS and Cholla burn the same fuel. NGS burns Kayenta Mine coal which has a carbon content of 0.42 and Cholla burn Lee Ranch Coal which has a carbon content of 0.5367.

Peabody Lee Ranch Coal, page 10 of 29, Table 3. Character of New Mexico Coal.

http://test.trd.newmexico.gov/SiteCollectionDocuments/Tax-Library/Economic-and-Statistical-Information/Mineral%20Extraction%20Taxes/taxation_of_coal_and_other_energy_resources.pdf

Carbon Content for Black Mesa Kayenta Mine is found at

http://pubs.usgs.gov/pp/p1625b/Reports/Chapters/Chapter_H.pdf

Which is attached as Chapter_H.pdf.

In Chapter_H.pdf page 30 of 33, Table 4, fixed carbon (%) composite is 39.6%.

Older verification can be found at

books.google.com/books?id=YprBINDX07wC&pg=PA562&lpg=PA562&dq=black+mesa+"carbon+content"+%25&source=bl&ots=XdV3KsFqEL&sig=mSaXzNR_zPeU5gtoBST5ubfsRhc&hl=en&sa=X&ei=t2qUUqfZJfSnsQSH54DwAw&ved=0CDEQ6AEwAg#v=onepage&q=black mesa "carbon content" %25&f=false

Central Utah coal fields: Sevier-Sanpete, Wasatch Plateau, Book Cliffs and ...

By H.H. Doelling, Page 563, Table 3 Typical coal anaylses and estimated mine prices.

Fixed carbon is at 42.8% for Black Mesa, Arizona.

I rederive 0.103 ton/mm Btu in column AA, Specific CO2 emissions (tons/mm BTU). Column AB is the metric equivalent for comparison to the table at

http://www.engineeringtoolbox.com/co2-emission-fuels-d_1085.html

The above link says coal (bituminous/anthracite) has a Specific CO2 emission of 0.37 kgCO2/kWh.

qCO2 = cf/hf Cco2/Cm or qCO2 = (cf/hf) * 3.7

qCO2 = specific CO2 emission (CO2/KWH)
cf = specific carbon content in the fuel (kg C/ kg fuel)
hf = specific energy content (KWh/kgfuel)
Cm = specific mass Carbon (kg/mol Carbon)
Cco2 = specific mass Carbon Dioxide (kg/mol CO2)

Cco2/Cm = 3.7

cf = hf * qCO2 / 3.7 carbon content in the fuel (kg C/ kg fuel)

hf =cf *3.7 / qCO2 specific energy content (KWh/kgfuel)

There is a note on heat loss.

For this web page Specific Carbon Content (kgC/kgfuel) for Coal (bituminous/anthracite) is 0.75, 7.5 kWh/kgfuel Specific Energy Content , 2.3 kgCO2/kg CO2 Specific CO2 content, 0.37 kgCO2/kWh Specific CO2 Emission.\

For this web page Specific Carbon Content (kgC/kgfuel) for Natural Gas, Methane is 0.75, 12 kWh/kgfuel Specific Energy Content , 2.8 kgCO2/kg CO2 Specific CO2 content, 0.23 kgCO2/kWh Specific CO2 Emission.

DLY_2009azQ1.xslx, Column Z, Specific Energy Content (mm Btu/ton) using Column P (HEAT_INPUT (mmBtu) divided by Column W Coal (tons).

25 mm Btu/ton for NGS.

NGS has a Specific Energy Content of 25 mm Btu/ton(Z7300) or 8.06 kWh/kg fuel (AA7300).

On Monday, November 18, 2013 9:51 AM, "Lee, Anita" <Lee.Anita@epa.gov> wrote:
Hi Vincent,

Attached is the spreadsheet I used to calculate emissions from NGS for the various scenarios (BART, Alternative 1, TWG Alternative). This is also in the docket here:

http://www.regulations.gov/#!documentDetail;D=EPA-R09-OAR-2013-0009-0191

If you would like to share them at this point, I would be interested in seeing your calculations as well. If you prefer, of course you can also just submit them with your comments, due January 6, 2014.

Thanks very much, and it was very nice to meet you in person last week. Hope you had a safe trip back home.

Anita

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