COOKING THE BOOKS:

How The State Department Analysis Ignores The True Climate Impact of the Keystone XL Pipeline

THE KEYSTONE XL TAR SANDS PIPELINE IS A PROJECT THAT WILL CARRY AND EMIT AT LEAST 181 MILLION METRIC TONS OF CARBON DIOXIDE EQUIVALENT (CO_2e) EACH YEAR.

KEYSTONE XL IS A DISASTER FOR THE CLIMATE

At the top of the long list of serious problems with the State Department's Draft Supplemental Environmental Impact Statement (SEIS) for the Keystone XL tar sands pipeline is the assertion that the pipeline will have no impact on climate change. The State Department asserts that if the pipeline is not built, the tar sands in Alberta will be exploited one way or another. Therefore, State asserts, the emissions in question will be released regardless of the Keystone XL pipeline. This is simply incorrect.

Like the first two environmental impacts reports prepared by State Department contractors, this third review again attempts to rubber stamp the project without a thorough, unbiased examination of the impacts of this project on climate. And yet again, the State Department should be sent back to the drawing board.

Destruction of the Alberta Boreal forest and development of the tar sands are not inevitable. Without Keystone XL, with strong and growing opposition to other tar sands pipelines, and with continued decline in US oil demand, America simply does not need this extreme source of oil. And we do not need and cannot afford the additional climate risk of this pipeline.

There are many compelling arguments against the fatalistic assertion that the tar sands will be fully exploited regardless of the Keystone XL pipeline. Other proposed pipelines also face substantial opposition in Canada and other regions of the United States. Further, increased costs associated with alternatives such as rail make it clear that the Keystone XL pipeline is far and away the industry's first choice, and industry experts have been the first to admit this.[1]

Once we accept that tar sands production growth is not inevitable and that Keystone XL – as industry freely admits – is a crucial linchpin in their tar sands growth plans, we can start to uncover the real climate impact of the project. As part of this discussion, we can also begin to evaluate the enormous opportunities the United States has to reduce our reliance on oil and all fossil fuels.

Another major flaw in the State Department's climate impact analysis is that it is based on a business as usual scenario that assumes that no action will be taken to prevent catastrophic climate change. In fact in one section of the report, State references ExxonMobil's assertion that the oil "industry will not leave 55 percent of the World's proven reserves in the ground."[2] Given that the International Energy Agency is already warning that 66 percent of proven reserves must be left in the ground to avoid climate catastrophe, this is a truly shocking statement by Exxon and a genuinely disastrous basis for public policy.[3]

In short, accepting the oil industry's self-serving outlook of the inevitability of future oil production is hardly a basis upon which to make sound policy to safeguard the climate and serve the interests of the American people.

In a world constrained by the realities of climate change, the proper measure of any project's climate impact should not be based on the assumptions inherent in a business as usual scenario that guarantees climate disaster. Instead, the State Department should base these critical decisions on whether the project makes sense in a world that is actually seeking to minimize the real dangers of climate change. On this basis, we recommend that decision-makers consider the total amount of carbon that will be released by the project into the atmosphere.

The Keystone XL tar sands pipeline is a project that will carry and emit at least 181 million metric tons of carbon dioxide equivalent (CO_2e) each year. This is a conservative figure, based on industry analysis of the carbon emissions associated with current tar sands production. This estimate includes the extraction, processing and pipeline transportation emissions as well as the combustion of all the products refined from the oil that will be delivered, including petcoke.[4]

The 181 million metric tons of CO_2e from Keystone XL is equivalent to the tailpipe emissions from more than 37.7 million cars.[5] This is more cars than are currently registered on the entire West Coast (California, Washington, and Oregon), plus Florida, Michigan, and New York – *combined*.[6]

Between 2015 and 2050, the pipeline alone would result in emissions of 6.34 billion metric tons of CO_2e. This is greater than the 2011 total annual carbon dioxide emissions of the United States.[7]

THERE IS A CLIMATE IMPACT FROM BURNING 830,000 BARRELS PER DAY OF ANY CRUDE THAT CANNOT BE IGNORED. THIS IS A MATTER OF PHYSICS, AND NOT SUBJECT TO DEBATE.

There is a climate impact from burning 830,000 barrels per day of any crude that cannot be ignored. This is a matter of physics, and not subject to debate. Whether or not that crude would have been burned anyway is a separate question, involving a variety of economic assumptions, none of which are as robust as our understanding of atmospheric physics.

These emissions estimates are conservative as they do not account for a variety of factors that will likely result in greater greenhouse gas emissions from the tar sands. For example, our analysis does not include emissions related to land use changes in the Boreal forest of Canada associated with tar sands extraction and production. Additionally, it is likely that the majority of products refined from Keystone XL oil will be exported to foreign markets. However, the additional transportation emissions from the export of diesel, petroleum coke and other refined products to Latin America, Europe and elsewhere are not included in our figure. The petcoke emissions in the tar sands emissions calculation are based on the petcoke yield of average crude oil. The petcoke yield from upgrading and refining bitumen and dilbit is higher than the average crude so these additional combustion emissions are higher for tar sands.[8] Nevertheless, we have used an average figure here.

Based on this per barrel emissions figure, we calculated a total emissions figure for the pipeline based on its full potential capacity carrying the same blend of tar sands crude as the average tar sands refined in the United States in 2011.[10]

In short, these calculations are a conservative, realistic assessment of how much carbon will enter the atmosphere via the Keystone XL pipeline.

Figure 1. Keystone XL Pipeline Well to Atmosphere Emissions, Per Barrel[9]

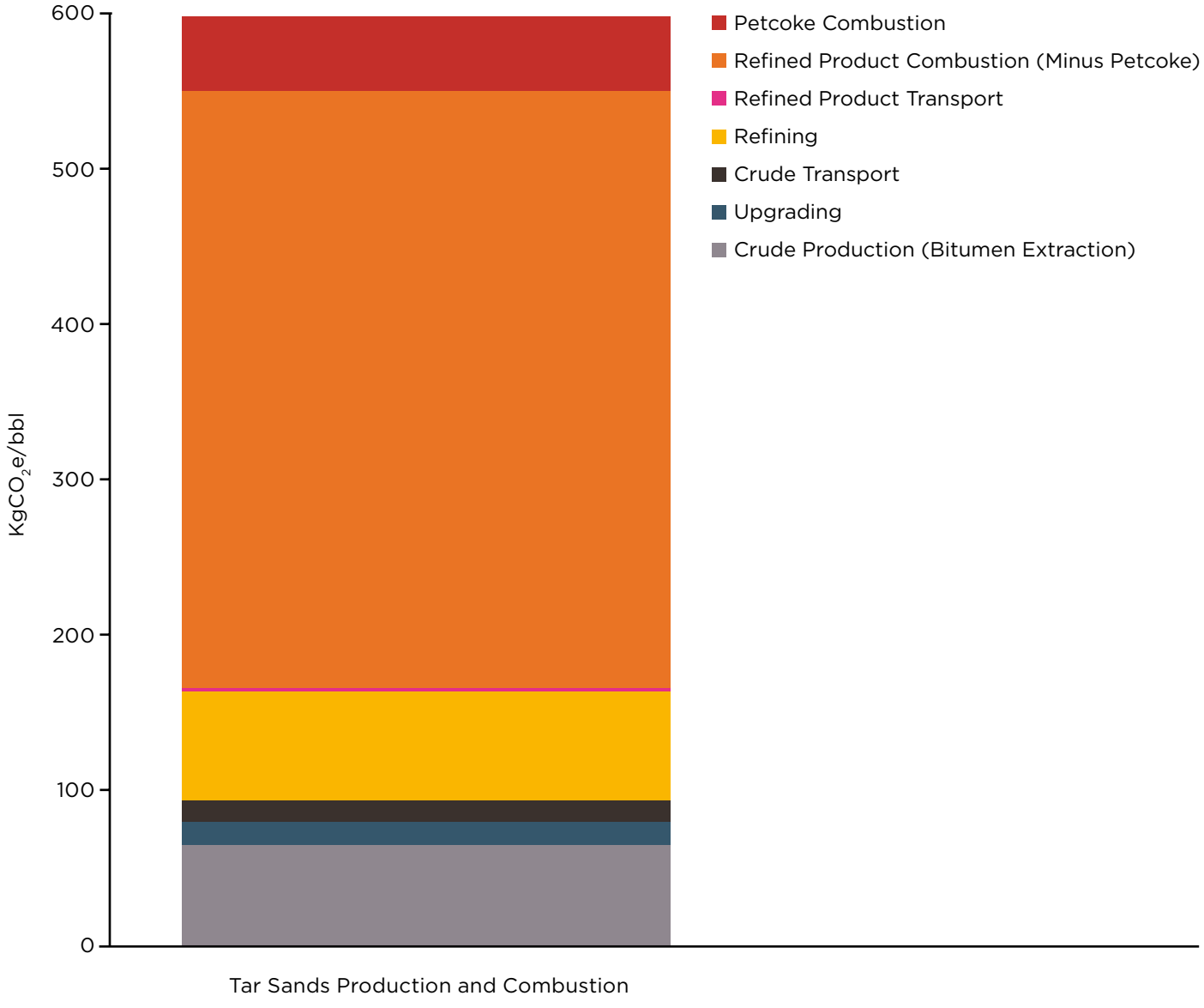

Table 1: Annual Carbon Dioxide (CO_2e) Emissions from the Keystone XL Pipeline[11]

$kgCO_2e$/bbl	KXL Full Cap bbl/Day	KXL bbls/year	Metric tons CO_2e/year	Passenger Cars Equiv.	Coal Plant Equiv.
598	830,000	302,950,000	181,164,100	37,742,521	51

The key issue facing the State Department and the Obama Administration is the measurement of the pipeline's climate impact. One measure is the difference between climate emissions from oil from tar sands versus oil from conventional sources. This is relevant if one is to compare different types of oil, but it is also important to account for the total emissions that would flow through the pipeline to consider the total impacts on the climate.

The State Department is responsible for assessing whether the project is in the national interest, which requires a consideration of the total amount of greenhouse gases going into the atmosphere.

A CHANGING CLIMATE NEEDS NEW MEASURES

Over the last year, the International Energy Agency (IEA) has begun to echo a point that has been made for more than a decade by climate scientists. If we want to limit future warming to less than two degrees Celsius,[12] we cannot burn all global, proven, currently existing reserves of oil, gas and coal. In fact, it's not even close.

IEA notes that the carbon embedded in these fuels significantly exceeds our global "carbon budget." "With current policies in place, global temperatures are set to increase 6 degrees Celsius, which has catastrophic implications," IEA Chief Economist Fatih Birol said in 2012.[13] The World Energy Outlook, IEA's premier publication, further noted that, "No more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2 [degrees Celsius] goal." Climate scientists warn that leaving four-fifths (80 percent) would be significantly safer.[14]

The World Bank[15] has joined the IEA in the assessment that business as usual is a disastrous

way forward, outlining what a world with a 4 degrees Celsius temperature increase in 2100 (on the way to 6 degrees in the next century) would look like and arguing for a change in course to avoid such a disastrous scenario.

Energy analysts and policy makers have not yet absorbed the implications of the global carbon budget. This is, apparently, particularly the case for the U.S. State Department as evidenced by its flawed climate analysis of the Keystone XL pipeline.

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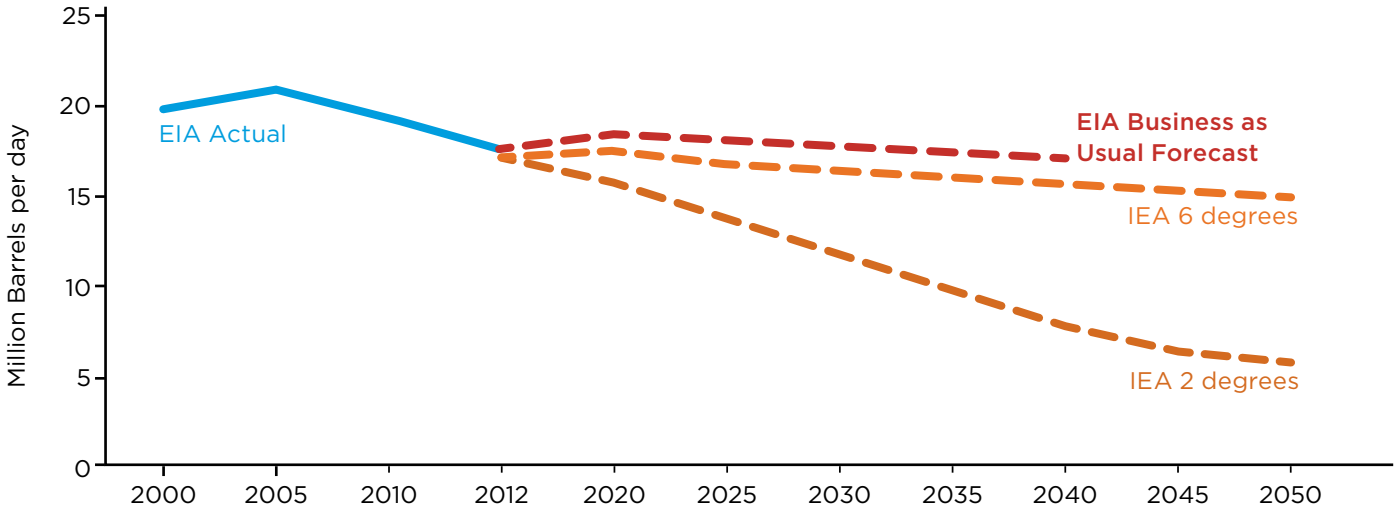
Figure 2: U.S. Oil Demand – Business as Usual vs. Climate Stabilization



Sources: EIA Annual Energy Outlook 2013 Early Release, Liquid Fuels Supply and Disposition, Reference Case and IEA Energy Technology Perspectives 2012.

THE IMPLICATIONS OF CLIMATE POLICY ON U.S. OIL DEMAND

The IEA is very clear about the impact of climate policy on U.S. oil demand. Meaningful climate policy would slash U.S. oil demand 50 percent by 2035 and 70 percent by 2050 based on a 2012 baseline. The difference between this pathway and the IEA's business as usual scenario (6 degrees), as well as the EIA's Reference Scenario used by State in its analysis, is clearly illustrated in Figure 1.

U.S. demand for oil has in fact declined since 2005 by 2.25 million barrels per day – or the equivalent of almost three Keystone XL pipelines. U.S. exports of refined products have increased significantly during that time. As previous research has shown, much of the diluted bitumen from Keystone XL is likely to be refined into products for export.[16] From a climate perspective, it is not important where the oil is burned.

There are several important questions that this should raise for State's assessment of Keystone XL's climate impact as part of its environmental review but also its determination whether the project is in the national interest:

- Does the proposed Keystone XL tar sands pipeline help or hinder the United States reach the goal of reducing oil demand in line with climate objectives?
- How would the carbon intensive production of tar sands bitumen be affected by policies that would achieve demand reduction in line with climate objectives?

In the G8, the United Nations and other forums, the Obama Administration has stated its goal of limiting climate change to below two degrees Celsius of warming globally. Paragraph two of the Copenhagen Accord signed by the United States reads:

We agree that deep cuts in global emissions are required according to science, and as documented by the IPCC Fourth Assessment Report with a view to reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius, and take action to meet this objective consistent with science and on the basis of equity.[17]

Given this commitment, one of the questions that State Department should be asking is whether or not approving the project – which is primarily designed to enable Canada to export its bitumen to foreign markets will hinder achievement of the below two degrees goal.

The State Department does refer briefly to an IEA report that calculates that even under a 2 degree scenario (450 Scenario in the IEA report), tar sands production would still grow to 3.3 million bbl/day from 1.6 million bbl/day in 2011, and concludes that within that scenario there is still room for Keystone XL and the tar sands it will deliver. However, the 3.3 million figure is the same the IEA reported in 2010. This figure is now substantially out of date.

A lot has changed since 2010 in the North American oil market. Vast new oil resources have been opened up by horizontal drilling and hydraulic fracturing (fracking) that are changing the supply-demand dynamic in North America as well as themselves raising the pool of carbon from which we have to draw our limited carbon budget.

There is also concern that the IEA's calculation of the carbon budget still significantly risks missing the below 2 degrees goal and precipitating devastating climate impacts. The IEA puts the world's carbon

budget up to the year 2050 at 900 billion tons of CO2. This allows about a 50 percent chance of keeping within the 2 degrees goal.[18] A 50/50 chance of success is poor odds for something as crucial as the stability of the world's climate system. A much safer goal would aim for an 80 percent chance of success, which reduces the carbon budget from 2010 to 2050 to 565 billion tons.[19]

The case for rejecting all major new fossil fuel infrastructure could not be clearer. The IEA asserts that 81 percent of its carbon budget is "already locked-in with the existing energy infrastructure."[20] This means that we have likely already locked in the emissions that we can afford in order to achieve an 80 percent chance of success.

Any calculation that we can afford to raise tar sands production to 3.3 million b/d and still keep to 2 degrees needs to be reexamined in light of these startling realities.

THE DIFFERENCE BETWEEN OIL FROM CONVENTIONAL CRUDE AND TAR SANDS

In 2010, the Environmental Protection Agency (EPA) estimated that Keystone XL would increase annual U.S. emissions by up to 27 million metric tons of carbon dioxide equivalent. EPA just accounts for the difference between the tar sands that would come through Keystone XL and the same amount of conventional oil, not for the total emissions of the tar sands that would flow through the pipe. Further, according to EPA, this difference is equal to seven coal-fired power plants operating continuously.[21] This is also equivalent to adding 5.6 million cars on the road.

The EPA based this analysis on the undeniable fact that gasoline and other petroleum products derived from tar sands produce significantly more greenhouse gas emissions than conventional oil. In particular, the extraction and upgrading of tar sands bitumen into synthetic crude oil causes three times more greenhouse gas emissions than the production of conventional oil.[22] Even the State Department has acknowledged that tar sands cause up to 17 percent more greenhouse gas emissions than conventional oil.[23]

Multiple studies have shown that tar sands oil is significantly more polluting than conventional oil. But focusing exclusively on incremental lifecycle emissions ignores the reality that a significant volume of oil – no matter what kind it is – must be left in the ground in order to avoid catastrophic climate change.

COUNTING THE BOTTOM OF THE BARREL - PETCOKE

Recent research by Oil Change International shows carbon emissions associated with the Keystone XL pipeline are higher than those previously estimated by the EPA.[24] In particular, the tar sands refining process produces significant volumes of petroleum coke (petcoke), a high-carbon refining byproduct that is increasingly being used as a cheaper, more carbon-intensive substitute for coal. Gulf Coast refineries export the majority of petcoke

internationally where it is used as a coal substitute. The Keystone XL pipeline would produce enough petcoke to fuel 5 U.S. coal plants. The carbon emissions from this petcoke have not been previously factored into a climate analysis of the pipeline.

The State Department acknowledges that "the treatment of petroleum coke in [Life-Cycle Analysis] studies [is] an important factor that influences the life-cycle [greenhouse gas] emission results." However, the life-cycle studies that State relies on to calculate the greenhouse gas emissions from tar sands production all assume that petcoke simply replaces coal in the market and therefore the emissions from petcoke are either not counted or only the additional carbon in petcoke compared to coal is counted.

The fuel replacement argument used by these studies ignores the fact that petcoke is sold into the market at a discount to coal and therefore makes the combustion of coal blended with petcoke (the main use of petcoke) cheaper than combusting coal alone. This is a market signal that supports coal-fired power generation and has an effect on the demand for coal-fired generation that is not being considered.

But this still does not get to the bottom of the full impact this pipeline will have in a climate-constrained world.

HOW DIFFERENT ASSUMPTIONS LEAD TO DIFFERENT MEASUREMENTS OF KEYSTONE XL'S CLIMATE IMPACT

The State Department, and all agencies of the U.S. government, are required by the National Environmental Policy Act (NEPA) to evaluate the environmental impacts – including climate impacts – of proposed projects such as the Keystone XL pipeline.

The Keystone XL pipeline would, if built, carry 830,000 barrels of tar sands each day from Alberta, Canada to the Texas Gulf Coast. The State Department's draft SEIS calculates the emissions difference between tar sands and conventional oil, but dismisses the climate impact of this heavy tar sands crude by arguing that the tar sands will be extracted and burned regardless of whether the pipeline is built, implying that the project is irrelevant to this issue. Taking this view to its conclusion, the SEIS thus finds that Keystone XL: will result in "*no substantive change in global greenhouse gas emissions*."[25]

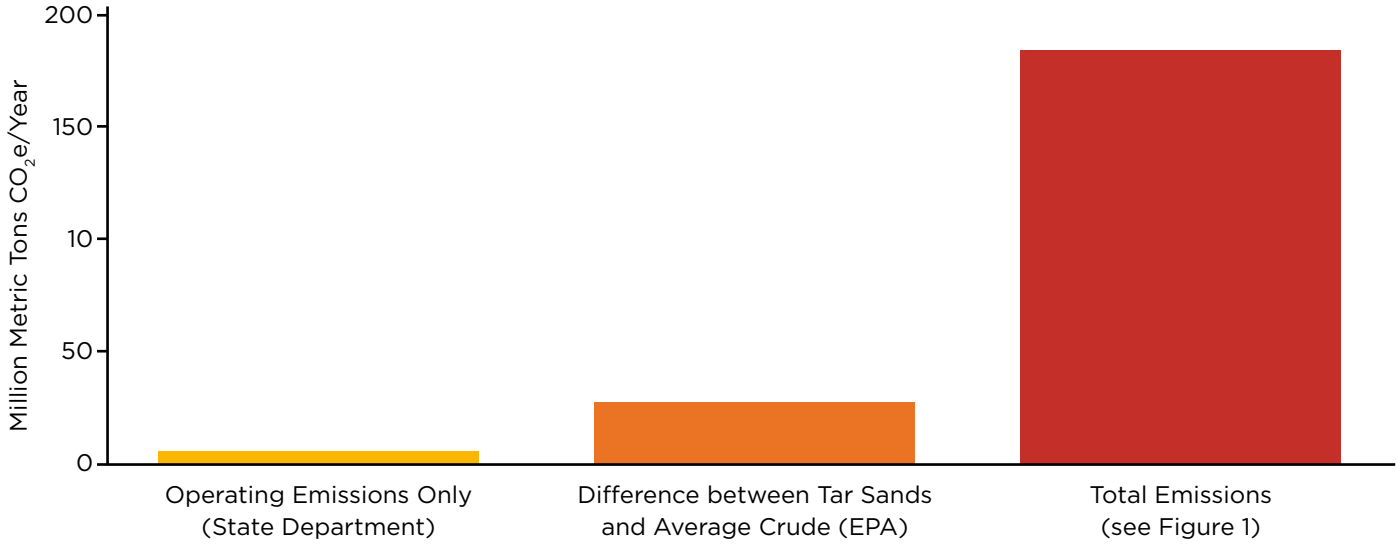
The State Department does conclude that 4.4 million metric tons of CO_2e will be emitted annually from the pipeline's pump stations as well as 240,000 metric tons emitted during the construction phase. The pump station emissions alone are equivalent to adding a new average sized U.S. coal plant.[26]

Unfortunately, only counting the pipeline's operating emissions ignores not only the emissions that would be caused by Keystone XL above and beyond that amount of conventional oil, but also the full impact of 830,000 barrels per day of tar sands diluted bitumen on the atmosphere, and the climate-constrained reality we now live in.

INCLUDING THE WHOLE BARREL – ALL OF THE CARBON

The key assumption in the existing estimates is that only those emissions that are above the "norm" are measured. The "norm," in this case, is to assume the oil will be burned anyway in a business as usual scenario regarding oil demand, and in the case of petcoke, coal demand. The oil or coal will be burned anyway, the thinking goes, because demand projections tell us that it will. For this reason,

Figure 3: Estimate of Keystone XL Greenhouse Gas Emissions



the largest part of emissions from the pipeline – those that result from using all that oil in our cars, trucks and airplanes – is not actually counted.

The problem with this approach is that business as usual is leading us towards climate disaster. Climate science has been clear on this point for decades, and institutions like the IEA and the World Bank are catching up to this fact. The simple truth is that we cannot continue to burn oil as business as usual projections suggest we will.

There is a climate impact from burning 830,000 barrels per day of any crude that cannot be ignored. It is essential that the Obama Administration consider these larger climate impacts as part of their evaluation in the decision whether to approve the Keystone XL tar sands pipeline.

SUBSIDIZING CLIMATE CHANGE: THE SOCIAL COST OF CARBON

According to the Obama Administration, estimating the social cost of carbon is a "critical step in formulating policy responses to climate change."[27] The social cost of carbon is the monetized damage of some of the impacts of climate change on health, property, agriculture, ecosystem services, and more, resulting from adding one metric ton of CO_2 to the cumulative global sum of emissions.

Social cost of carbon estimates depend dramatically on the choice of discount rate. In 2010, the Interagency Working Group on the Social Cost of Carbon (IAWG) estimated the social cost of carbon given a limited set of discount rates and emphasized the incompleteness of these estimates.[28] The estimates spanned from $6 to $73 per metric ton CO_2, for 2015, and reached $16 to $136 per metric ton by 2050.

Based on this, in January 2013, the International Monetary Fund (IMF) used a social cost of carbon value of $25 per metric ton to estimate the current global fossil fuel subsidy arising from the failure to put a price on climate pollution. This subsidy reinforces inequalities, encourages excessive energy consumption, reduces incentives for investments in renewable energy, and accelerates depletion of natural resources.[29] Using that same value, the Keystone XL's subsidy in its first year of operation would be over $4.5 billion. The IAWG's full social cost of carbon span would put the corresponding fossil fuel subsidy span at $1 billion to $13 billion per year, and growing.[30]

Other studies include much higher values for the social cost of carbon,[31] which could yield fossil fuel subsidy estimates for the project that range to over $125 billion, in just its first full year of operations.

A NEW REALITY FOR ENERGY PLANNING

It is clear that in order to maintain a livable planet we must look at each new fossil fuel project from a new perspective considering its climate impacts. This perspective is increasingly endorsed whether it's the IEA, the World Bank, or climate scientists. Science is changing and improving, and a new accepted reality is emerging. Every new infrastructure project that facilitates the burning of fossil fuels – whether it's a coal plant in Kansas or a pipeline cutting through our nation's heartland – will cut into the remaining budget we have left of the world's burnable carbon.

Therefore, the Keystone XL tar sands pipeline must not only be viewed from the perspective of its **additional** emissions compared to conventional oil. It must also be viewed from the start from the perspective of the emissions that result from what it will do – carry 830,000 barrels per day of tar sands crude.

The State Department should assess the climate impact of Keystone XL by assessing whether the project would survive policies designed to limit climate change to 2 degrees Celsius. In order to do this State must assess the impact of effective climate policy on not only the project but also the tar sands more generally. State must do this using the latest economic, market and emissions data rather than industry projections or assessments that are out of date. An assessment of the pipeline must clearly state the amount of greenhouse gas emissions that will be emitted by the project and the product it carries.

Activists, oil industry executives, Canadian government officials and financial analysts are all saying the same thing – if the Keystone XL pipeline is rejected, it will limit the growth of the tar sands.

The United States – and the world – must break free from business as usual scenarios and reduce oil use drastically. Basing analysis on the assumption that oil use will continue as currently planned is accepting climate disaster. Acceptance of this climate disaster is simply morally wrong. It cannot and will not go unchallenged.

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ENDNOTES

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3 Organization for Economic Cooperation and Development (OECD)/ International Energy Agency (IEA), "World Energy Outlook 2012 Executive Summary," page 3. http://www.iea.org/publications/freepublications/publication/English.pdf

4 We use figures from IHS CERA, "Oil Sands, Greenhouse Gases, and US Oil Supply: Getting the Numbers Right – 2012 Update," http://www.ihs.com/products/cera/energy-industry/download-freecanadian-oil-sands.aspx Our use of these figures does not imply endorsement of their accuracy, because we view them as likely too low for reasons described in the text. Nonetheless we use these as the basis for our analysis for ease of calculation and in order to demonstrate that even using these figures as a base, the climate impact of the Keystone Pipeline is enormous.

5 U.S. Environmental Protection Agency (EPA), "Greenhouse Gas Equivalencies Calculator," Accessed April 8, 2013. http://www.epa.gov/cleanenergy/energyresources/calculator.html The 181 million metric tons of CO_2e is also equivalent to adding 30.4 million cars to the roads when including the full lifecycle emissions from producing the gasoline in addition to the tailpipe emissions. According to the EPA, the Well-to-Tank emissions for producing gasoline are 19,200 g CO_2e/mmbtu of fuel, and the full life-cycle emissions are 98,205 g CO_2e/mmbtu of fuel. Thus, the full life-cycle emissions are 1.24 times the combustion only emissions. EPA, "Renewable Fuel Standard Program (RFS 2): Regulatory Impact Analysis," EPA-420-R-10-006, February 2010. http://www.epa.gov/otaq/renewablefuels/420r10006.pdf

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9 We calculate a figure of 598 kgCO_2e/bbl for the Well-to-Atmosphere emissions of the average tar sands barrel that will move through the pipeline based on the 'Wide Boundary' figures for 'Average tar sands refined in the U.S. in 2011' in Table 2 in IHS CERA 2012, but with two important changes that better reflect the total emissions per barrel of tar sands. First, to account for petcoke combustion, we raise the 'Refined Product Combustion' figure of 385 kgCO_2e/bbl to 430 kgCO_2e/bbl based on IHS CERA's discussion of petcoke combustion emissions in the Appendix of the 2012 report. We then add IHS CERA Upstream emissions (Well-to-Refinery gate) figures except for the crude transport figure. We replaced the IHS crude transport (to refineries) figure because it was based on 2011 imports into the U.S. which mostly went the shorter distance to the Midwest. Instead, we used the State Department's figure of 4.4 million tons of CO_2e per year for operating the Keystone XL pipeline which we divided by the total annual carrying capacity to get a per barrel crude transport figure of 14.5 kgCO_2e/bbl. The 4.4 million ton figure is based on the full length of the pipeline as assessed in the 2011 FEIS rather than the shorter pipeline distance assessed in the March 2013 Draft SEIS.

10 State has used a 50/50 SCO/Dilbit blend for its assessment of GHGs although in the 2011 Temperature Effects Study it used an 80/20 Dilbit/SCO blend for its analysis. (See http://keystonepipeline-xl.state.gov/documents/organization/182235.pdf) We believe that it is in fact impossible to predict what the blend of different tar sands products will be over the entire 50-year lifetime of the project so we are using the 2011 average as a best available proxy.

11 See EPA, "Greenhouse Gas Calculator." http://www.epa.gov/cleanenergy/energyresources/calculator.html Note that emissions for cars are tailpipe only, and emissions for coal are only from the power plants.

12 A two degree Celsius rise is now thought by many climate scientists to be too high, but we use it here only because every country in the world has agreed it as a target under the auspices of the United Nations Framework Convention on Climate Change.

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