

**Do Your Homework before Making a Decision:  
A USC Technology and Environment Class' Advice for Keystone XL Pipeline  
Project**

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By:

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Economic costs and benefits, environmental safety and health impacts, and national and energy security considerations – these are the three key issues that must be thoroughly addressed before deciding upon and developing any new energy source. Such analyses are especially necessary when considering TransCanada Corporation's proposal, the 1,711-mile Keystone XL project involving the construction of a \$7 billion pipeline carrying strongly corrosive and unrefined tar sands crude oil from Canada through the United States.

As USC students studying various majors - from engineering to business to physical and social sciences - enrolled in the Technology and Environment Freshman Seminar class, we aim to provide a scholarly, unbiased and neutral evaluation of this project after studying almost all of the publicly available reports from main stream media and reliable sources.

### Economic Impact

The Keystone XL pipeline has generated heated economic debate among supporters and opponents of the project. Advocates of the pipeline tote that it will boost the US economy because it will provide a whooping 20,000 new "high quality" construction jobs. In response, critics argue that the potential for job creation is far less. Sean Sweeney and Bill McKibben pointed out in their Op-Ed for the *Los Angeles Times* on October 5, 2011<sup>2</sup> that the State Department estimates 2,500 to 4,650 jobs will be created. Additionally, TransCanada claims that \$7 billion dollars will be budgeted toward job growth, but, according to an independent investigation published by Cornell University<sup>3</sup>, only \$4

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<sup>1</sup> Ian Beck, Troy Cardona, Kevin Chan, Zachary Chen, Kenny Fan, Michael Goulis, Derek Horner, Jiashu Li, Amy Nham, Chiara Nosse, Steven Petrovich, Evan Pye, Yue (Joyce) Ren, Eugene Shin, Tao Wu, Bronte Yang, Peter Zhang, and Jordan Raffo. The Freshman Seminar on Technology and Environment has been developed and taught every fall semester by Professor Najmedin Meshkati of the Viterbi School of Engineering, University of Southern California (USC).

<sup>2</sup> Sweeney, Sean, and Bill McKibben. "No to the Keystone XL Pipeline - Los Angeles Times." *Featured Articles From The Los Angeles Times*. Los Angeles Times, 05 Oct. 2011. Web. 04 Nov. 2011. <<http://articles.latimes.com/2011/oct/05/opinion/la-oe-mckibben-tarsands-pipeline-2011005>>.

<sup>3</sup> "Cornell University - ILR School: Global Labor Institute Keystone XL Pipeline Study." *Cornell University - ILR School - Home*. Web. 04 Nov. 2011. <<http://author.ilr.cornell.edu/globallaborinstitute/research/keystonexl.html>>.

billion is actually going to have an effect on the United States job market. The State Department also cites that many of the jobs that the pipeline is able to create will only be temporary and non-local. Furthermore, most of the employment of workers, with the exception of the small few who will work to operate and maintain the line, is expected to end when construction is completed. Supporters of the pipeline also argue that its creation will bring a needed influx of money into the US economy. However, the amount of net economic benefits of the project for the US, projected at \$100-600 million by the Energy Policy Research Foundation<sup>4</sup>, is being questioned. Already, three quarters of the potential oil has been contracted to six different companies – five of which are foreign, thus leaving the US with the risk associated with the pipeline without the majority of its benefits.

The economic concerns of opponents of the Keystone XL pipeline are heavily tied in to the environmental dangers. If there is a tar sands leak or spill, there will be major economic repercussions. According to the NRDC report of the Keystone XL pipeline<sup>5</sup>, a spill of the tar sands will be difficult to clean up since “the heavier fractions of diluted bitumen (DilBit) will sink into the water column and wetland sediments.” The dire ecological consequences of possible prolonged spill entail the immediate assistance of the federal or state governments in the cleanup process. Because of the nature of the tar sands, cleaning up each liter of the tar sands will most likely cost more per liter spilled than any other type of spill, a cost TransCanada will most likely not pay for in full. Thus, before the approval the process for cleanup payment must be clearly agreed upon between the US State Department and TransCanada. There should be no unexpected expenditures for any parties involved with the pipeline, especially the US taxpayer.

Furthermore, there remains no consensus on the effect the Keystone XL pipeline will have on American gasoline prices at the pump. Proponents and opponents of the pipeline agree creation the pipeline’s production will raise the price per barrel of oil Midwestern refineries pay for Canadian crude. Louis Fenyvesi of TransCanada’s Calgary headquarters and Philip Verleger, a business professor at the University of Calgary, echo this assertion<sup>6</sup>. In a February press conference, even TransCanada spokesman, Terry Cunha, stated that the price per barrel for heavy crude oil from Canada could increase by \$3. Yet Fenyvesi and other pro-pipeline authorities stress that the higher price burden for refineries will not translate into higher gas prices paid by the American consumer. This lies in direct conflict with the opinion of credible authorities against the pipeline who claim its operation will indeed lead to higher gas prices.

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<sup>4</sup> "The Value of the Canadian Oil Sands." Energy Policy Research Foundation, Inc. Web. 3 Nov. 2011. <<http://www.eprinc.org/pdf/oilsandsvalue.pdf>>.

<sup>5</sup> *Say No to Tar Sands Pipeline: Proposed Keystone XL Project Would Deliver Dirty Fuel at a High Cost.* Natural Resources Defense Council March 2011. Web. 3 Nov. 2011. <<http://www.nrdc.org/land/files/TarSandsPipeline4pgr.pdf>>.

<sup>6</sup> Hovey, Art. "Some See Keystone XL as Path to Higher Gas Prices in Midwest." *The Lincoln Journal Star Online*. 16 Feb. 2011. Web. 04 Nov. 2011. <[http://journalstar.com/news/state-and-regional/nebraska/article\\_7c6a08e6-ofbe-5ee4-89ef-a599b315a3f9.html](http://journalstar.com/news/state-and-regional/nebraska/article_7c6a08e6-ofbe-5ee4-89ef-a599b315a3f9.html)>.

In addition to the question of gas prices, Verleger warns that the US must have regulations in place to ensure oil supplies are not manipulated. His concern is warranted because TransCanada certainly wants to deliver most of its supply to refineries in the Gulf Coast—not to the Midwest.

In the light of serious economic, environmental, and security risks, the American public will have to ask itself: Do we have an accurate idea of the real benefits that this pipeline will bring to the US?

This is the first HW assignment for decision makers.

### Environmental, Safety and Health Impact

A major risk associated with the Keystone XL pipeline is that it runs right over the Ogallala Aquifer, an underground source of stored water for the Midwest. This aquifer, the largest source of fresh water in America, over five billion gallons, supports America's vital farming industry in the Great Plains. The potential risk of an oil spill contaminating this important resource is very serious. A spill could seep into the soil and contaminate the groundwater, which could render the water unusable for farming and drinking. Keystone's website says that in the event of contamination they are responsible for supplying "an alternative water supply." Even if they supply another source of water, the damage to the essentially non-renewable aquifer could be irreversible and, in the long term, the damage would already be done to the people, the agriculture, and the industry.

In the event of a spill from the Keystone XL pipeline, there will be a significant effect on human health. The health consequences that the community and volunteers faced after the BP Horizon spill can serve as a warning of the possible health effects a spill from the Keystone pipeline could create. In the Gulf, health impacts ranged from minor health effects, such as stinging eyes, rashes, nausea, and respiratory problems, to major, long term health risks, such as an increased danger of getting cancer. A study performed by the Spanish University of A Coruña<sup>7</sup> demonstrated that oil worker's DNA was damaged while they were working, but went back to normal a couple months later after their work was finished. Another study carried out by Dr. John O'Connor and Andrew Nikiforuk<sup>8</sup> reported a recent spike of cases of rare cancer in Fort Chipewyan, a small community close to where the tar sands are mined. Often, runoff from mining can release toxic metals and arsenic into the groundwater which can lead to an increase in cancer in the areas near the spill.

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<sup>7</sup> Stier, Caitlin. "Gulf Oil Spill Poses Unique Health Challenges - Health - 28 June 2010 - New Scientist." *Science News and Science Jobs from New Scientist - New Scientist*. Reed Business Information Ltd., 28 June 2010. Web. 04 Nov. 2011. <<http://www.newscientist.com/article/dm19099-gulf-oil-spill-poses-unique-health-challenges.html>>.

<sup>8</sup> Nikiforuk, Andrew. "The Tyee – Oil Sands Pollute with Fish-Killing Toxins, New Study Shows." *The Tyee – Home*. 30 Aug. 2010. Web. 04 Nov. 2011. <<http://thetyee.ca/News/2010/08/30/TarSandsStudy/>>.

The environmental damage of the Keystone XL project continues even past the pipeline itself because risks do not stop at the pipeline either because refining tar sand oil causes more air pollution than normal crude. The main problem with pollution is that there is no such thing as “away”. Once it is created, it is difficult to get rid of and frequently pollution is moved from one area to another. For this reason, we should be even more cautious of allowing the potential for environmental pollution.

The U.S. Department of State Environmental Impact Report (EIR)<sup>9</sup> mentions many of the environmental demands that Keystone XL owners and operators must abide to for the approval of its construction on U.S. soil. Among them, Keystone agreed to implement topsoil segregation methods to mitigate soil erosion, obtain permits for pipeline pressure tests, and minimize vehicle contact with surface water during construction, among other compliances. However, the EIR is lacking detail about how to enforce these regulations imposed on the Keystone XL project.

Without any way to ensure the safety and reliability of this pipeline, the potential of failure is all too real; the consequences, almost unreal.

This is the second HW assignment for decision makers.

#### National and Energy Security Considerations

Although Keystone XL is supposed to reduce oil imports to the US, increasing energy security and Valero Energy Corporation is supposed to refine a lion share of its throughput. However, Valero still plans to import gasoline and oil from a recently bought refinery in the United Kingdom in Wales. This oil will be sold in the United States, while the tar sands oil from the Keystone XL pipeline will be refined into diesel at the Port Arthur refinery, and then exported. Even though the pipeline would increase efficiency of distribution of oil resources inside the United States, the fact that the Keystone XL Pipeline will be used as main revenue to transship oil from Canada for export to other countries doesn't seem to improve our country's energy security.

To our disappointment, we found that the Environmental Impact Report on the Department of State website only briefly covered the security risks and dangers that the pipeline would create. Among the many questions unanswered, one that stood out the most was about terrorism. This pipeline could easily become a 1700 mile long sitting duck that could be targeted by those unfriendly to the US. According to Gal Luft, the Executive Director of the Institute for the Analysis of Global Security (IAGS)<sup>10</sup>, “pipeline sabotage is becoming a ‘weapon of choice’ for insurgents in Iraq.” He explains that similar attacks have been observed in pipelines in other countries, such as India, Turkey and Colombia.

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<sup>9</sup> U.S. Department of State. Web. 04 Nov. 2011. <<http://www.keystonepipeline-xl.state.gov/clientsite/keystonexl.nsf?Open>>.

<sup>10</sup> Luft, Gal. "Pipeline Sabotage Is Terrorist's Weapon Of Choice by Gal Luft." *Energy and Security Research*. Institute for the Analysis of Global Security, 28 Mar. 2005. Web. 04 Nov. 2011. <<http://www.iags.org/no328051.htm>>.

Given the risks associated with building the Keystone XL pipeline, we have to analyze every angle of the project and make sure that our national security and our energy security are well protected.

This is the third HW assignment for decision makers.

### Final Thoughts

A common characteristic of complex technological systems, such as the Keystone XL, which are operated and maintained by organizational systems, is that they are under the centralized control of a few (control room) operators. For the foreseeable future, despite increasing levels of computerization and automation, human operators will have to remain in charge of the day-to-day controlling and monitoring of these pipeline systems.

Almost all major oil and gas pipeline systems are run by human operators (called “controllers”) who use computer-based workstations in control rooms to “control” pipelines. According to a major study of pipeline accidents and spills by the National Transportation Safety Board (NTSB), which is charged with the investigation of major accidents in five modes of transportation in the United States, including pipeline systems, a majority of such accidents were caused by “controllers’ actions, reactions or inactions, or the computer systems they use, as significant factors in detecting or contributing to the initial event, influencing recovery time or affecting the magnitude of an event.”

The most recent natural gas pipeline explosion in San Bruno, California, that killed eight people and destroyed three dozen houses last September, once more highlighted the critical role of human and organizational factors in the safe and spill-free operation of hazardous liquid and gas transmission pipeline systems. According to the NTSB, it was considered as “an organizational accident” that was caused primarily by “a failure of the entire system.”

Thus, before making the decision to build the Keystone XL we must ensure that it doesn’t become another victim of those factors that have plagued pipeline systems in the US. And this can only be done by doing our homework and a total systems orientation through concurrently strengthened the regulatory oversight regime, designing pipeline’s technological components while devising a robust organizational and operating system, nurturing a strong safety culture, and proactively considering relevant human-systems integration issues.

As every college student knows, be smart: do your homework before taking the final...