The Honolulu Rail Line

Greenhouse Gas Emissions Evaluation

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The Honolulu Rail Line:
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EXECUTIVE SUMMARY

A new urban rail line is proposed in Honolulu, which is projected to cost $4.1 billion. Among the benefits cited by rail line sponsors is the reduction of greenhouse gas (GHG) emissions. This is not surprising in view of the international concern about greenhouse gas emissions reduction. Yet, inexplicably the DEIS contains no estimate of the rail line's impact on greenhouse gas emissions.

This report corrects that oversight. The Honolulu rail line is evaluated using international evaluation standards.

Two cases are reviewed for the year 2030, differing only in the method of generating electric power. The Worst Case assumes that Hawaii's greenhouse gas emissions from the production of electricity will diminish at the projected national rate. The Best Case assumes that 70% of the state's electric power would be generated by renewable energy sources, consistent with an objective established by Governor Linda Lingle.

Step 1: Estimate Greenhouse Gas Emission Impacts: Based upon an analysis of project data, it is estimated that:

- **Worst Case:** With rail, greenhouse gas emissions would *increase* 28,000 tons in 2030 compared to without rail (2.1% more than without rail).

- **Best Case:** With rail, greenhouse gas emissions would *decrease* 12,000 tons in 2030 compared to without rail (0.9% less than without rail).

Step 2: Estimate Greenhouse Gas Emission Reduction Costs: The generally accepted method for costing greenhouse gas emission removal is cost per ton.

- A cost per ton of greenhouse gas reduced cannot be calculated under the Worst Case because there is no reduction in greenhouse gases.

- The cost to remove each ton of greenhouse gas is $29,900 under the Best Case.

Step 3: Evaluate Greenhouse Gas Reduction Costs: The United Nations Intergovernmental Panel on Climate Change (IPCC) has indicated that sufficient reduction in greenhouse gas emissions can be achieved for no more than $20 to $50 per ton. The present price for greenhouse gas offsets is between $10 and $15 per ton.

- Rail reduces greenhouse gas emissions *only* under the Best Case and this reduction would be at an exceedingly high cost. The $29,900 per ton reduced is nearly 600 times the maximum IPCC maximum and nearly 2,000 times the maximum price for greenhouse gas.

- The cost per ton is so much that if the same amount were spent per ton to reduce Hawaii's greenhouse gases by 80%, it would cost nearly $650,000,000,000 ($650 billion)

annually. This is more than 10 times the state's gross domestic product and nearly $500,000 annually per resident (under the Best Case).

- Under the Best Case, the reduction in greenhouse gas emissions with rail is so small that greenhouse gas offsets could be purchased for a maximum of $180,000 annually. This is the equivalent of *3 hours* of rail costs in 2030. Purchasing greenhouse gas offsets would be a far more cost effective strategy and would achieve the same reduction.

Optimistic Estimates: The estimates above are optimistic. A number of factors could materially increase the greenhouse gas emissions relative to the case outlined above.

Conclusion: Despite being promoted as contributing to the reduction of greenhouse gas emissions, the Honolulu rail line is likely to *increase* greenhouse gas emissions in the Worst Case. In the Best Case, rail would marginally reduce greenhouse gas emissions at an extremely high cost per ton. At the IPCC maximum of $50, an 12,000 ton reduction in greenhouse gases should cost no more than $600,000, not $350,000,000 as in the case of the rail line. As a strategy for reducing greenhouse gas emissions, the Honolulu rail line is exorbitantly expensive.

INTRODUCTION

A new rail line is proposed for Honolulu (the Honolulu High Capacity Transit Corridor). The city and county of Honolulu is the project sponsor and commissioned a Draft Environmental Impact Statement (DEIS) on the rail line, which was published in November 2008.[1] Three rail alternatives were considered, "Salt Lake," "Airport" and "Airport & Salt Lake." The DEIS compared these alternatives to not building rail.

The city and county of Honolulu has adopted as its preferred alternative the "Airport" alignment, a 20 mile long line from downtown (Ala Moana) westerly past Honolulu International Airport to East Kapolei. According to the DEIS, the capital cost of the Airport alternative would be $4.1 billion (2007$). However, more recent information on the city's "honolulutransit.com" internet website indicates that the line will cost an inflation adjusted $5.4 billion, an increase of 30% from the amount in the DEIS. Nonetheless, this report will principally rely on the DEIS $4.1 billion amount.

Greenhouse Gas Emissions: Various benefits have been indicated by rail line sponsors, including the reduction of greenhouse gas (GHG) emissions.[2] This is to be expected, given the general assumption that mass transit is more greenhouse gas friendly that roadway travel.

International agreements seem likely to call for greenhouse gas emission reductions in the range of 50% to 80% by 2050. At this writing it seems likely that the United States will enact legislation to achieve at least an 80% reduction. Given the high policy priority of this issue, it is surprising that the DEIS did not provide a complete analysis of the greenhouse gas emission impacts of the rail project. Yet the DEIS contains no such analysis. Indeed, searches of the DEIS document indicated no instance of terms that would be associated with greenhouse gas emissions, such as "green house gases," "carbon dioxide" and "climate change."

It is possible that the project sponsor believed that there was no point in conducting a greenhouse gas emissions evaluation, based upon the widely held assumption that rail transit is inherently more environmentally friendly than roadway travel.

Greenhouse Gas Emission Policy: This It will not be a simple task to significantly reduce greenhouse gas emissions, nor will it be inexpensive.

If the nation and Hawaii are to sufficiently reduce greenhouse gases, policy makers must have complete and accurate information for each strategy. Otherwise, there is the very real possibility that objectives will not be met because more money than necessary will be spent to achieve small reductions in greenhouse gases. The DEIS does not contain a greenhouse gas emission evaluation. This omission is surprising in light of the prominence that this greenhouse gas reduction has obtained at every level of government.

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[1] http://www.honolulutransit.org/library/files/front.pdf. The analysis in this report is based upon data from the Draft Environmental Impact Statement except where otherwise noted.
[2] See, for example, http://honolulutransit.com/pdfs/QA_100808.pdf.

Greenhouse Gas Emissions Evaluation: There are three steps to greenhouse gas emission reduction analysis.

- **Step 1: Estimate Greenhouse Gas Impacts:** The first step involves estimating the greenhouse gas emissions impacts. In the case of the Honolulu rail line this involves estimating the change in greenhouse gas emissions with rail compared to without rail.

- **Step 2: Estimate Greenhouse Gas Reduction Costs:** The second step is to estimate the annual cost per ton of reducing greenhouse gas emissions.[3] For the rail line, this means dividing the annualized cost of the project by the annualized reduction in greenhouse gas emissions from the project (from Step 1).

- **Step 3: Evaluate Greenhouse Gas Reduction Costs:** The third step is to review the rail cost per ton of greenhouse gas reduction (from Step 2) relative to evaluation standards and broader economic measures. Greenhouse gas reduction should be cost effective; otherwise it could unnecessarily inhibit economic growth (which increases poverty) and makes it more difficult to obtain sufficient funding to achieve greater reductions.

  Evaluation Standards: Fundamental evaluation standards include the United Nations Intergovernmental Panel on Climate Change (IPCC) maximum and the current price of greenhouse gas per ton. The IPCC has determined that a maximum of between $20 and $50 per ton is necessary to accomplish deep reversal of greenhouse gas concentrations between 2030 and 2050. Further, the current price for greenhouse gas emission reduction is between $10 and $15 per ton (Figure 1).[4] The cost per ton of greenhouse gas reduction should be compared to the IPCC maximum, the greenhouse gas price and other evaluation standards (Table 1). Generally, projects that compare favorably can be justified based upon their greenhouse gas emission reduction.

Table 1 Greenhouse Gas Emission Reduction: Cost Evaluation Standards
FUNDAMENTAL EVALUATION STANDARDS
United Nations IPCC Maximum: $20-$50 per greenhouse gas ton
Current Price: $10-$15 per greenhouse gas ton
OTHER EVALUATION STANDARDS
Rail cost per greenhouse gas tons reduced applied to state greenhouse gas tons
Cost of project greenhouse gas equivalent reduction at current price

[3] The annual cost per ton of GHG emissions removed is the change in annual GHG emission tons divided by the net annual cost of the rail line (Table 4).

[4] The price of GHG offsets is generally between $10 and $15. Public officials such as California Governor Schwarzenegger, Speaker of the House of Representatives Nancy Pelosi and former Vice-President Al Gore routinely use such offsets to compensate for their use of air travel; see for example: www.nativeenergy.com/pages/individuals/3.php, www.pacificforest.org/news/pdf/Gov-ERs-Purchase-PR-12-3-07.pdf, www.pacificforest.org/news/pdf/PelosiPRfinal.pdf. https://www.carbonfund.org/xcart/cart.php?mode=checkout&source=individualCalculator&keep_https=yes and http://sasems.port.se/Emissioncalc.cfm?sid=simple&utbryt=0&res=Result&lang=1

Purpose of this report: The purpose of this report is to supply the greenhouse gas emissions analysis that is not included in the DEIS. The report uses information from the DEIS and other official sources to estimate greenhouse gas impacts of building the rail line for the year of 2030.[5] The report will follow the evaluation procedure outlined above.

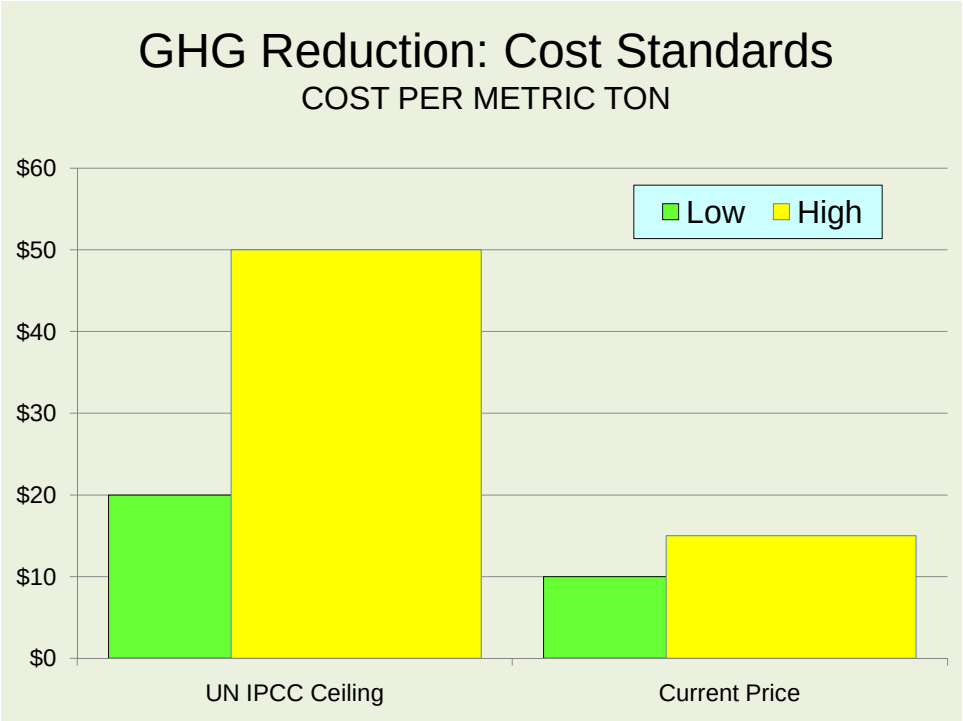

Figure 1

BACKGROUND

Under the rail proposal, greenhouse gas emissions would occur from two sources with respect to local transportation in Honolulu. The first source is greenhouse gas emissions from roadway traffic, principally automobiles.

Greenhouse gas emissions from roadway transportation are directly related to the amount of fuel used. Thus, with fuel efficiency of 40 miles per gallon, a car's greenhouse gas emissions will be one-half that of a car that achieves 20 miles per gallon. The proposed rail line will rely on electric power for its operations. The change in greenhouse gas emissions is calculated as the savings from reducing driving (trips that are projected to be diverted from cars to the rail line) minus the additional emissions that occur from electric power production for the rail line.

The second source of greenhouse gas emissions is the rail line. These greenhouse gas emissions are from the energy required to build the rail line and electricity generation to operate the rail line.

[5] 2030 is the DEIS planning horizon year.

How Rail Could Reduce Greenhouse Gas Emissions: Rail could reduce greenhouse gas emissions by attracting enough drivers out of their cars that the greenhouse gas reduction from driving is greater than the additional greenhouse gas emissions required to build and operate the rail system.

Projected Trends in Driving: 2000 to 2007: The DEIS projects a driving increase of 17% from 2007 to 2030 without rail. Nonetheless, roadway greenhouse gas emissions are expected to decline 26% between 2007 and 2030,[6] without rail. This is because of expected improvements in automobile fuel economy, as projected by the Energy Information Administration (EIA) of the United States Department of Energy.[7] The DEIS projects a driving increase of 13% from 2007 to 2030 with rail (Figure 2).[8]

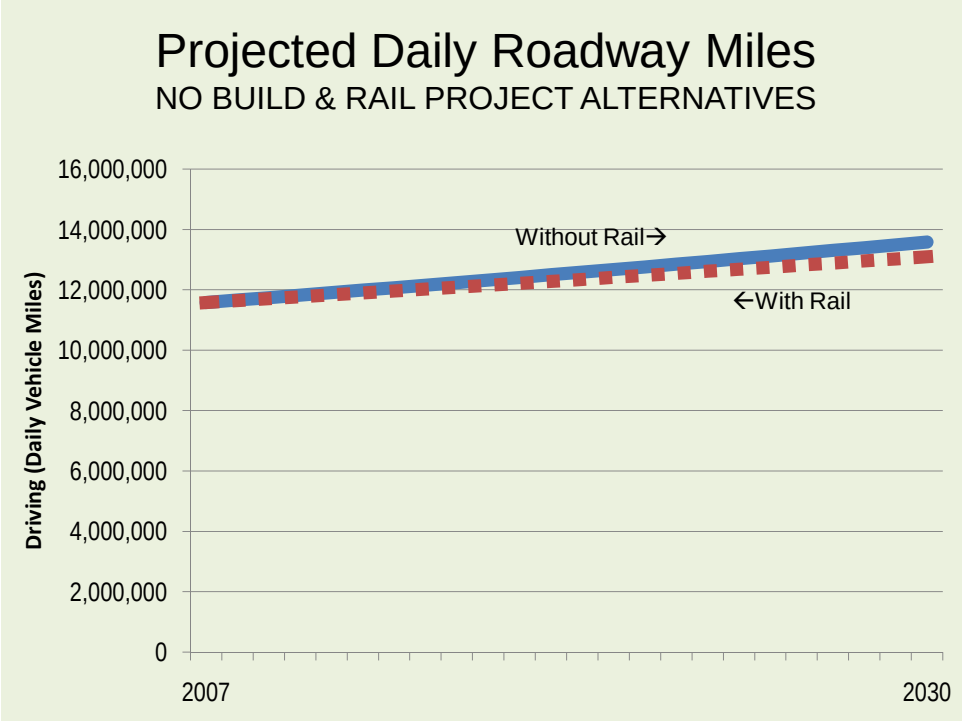

Figure 2

STEP 1: ESTIMATE GREENHOUSE GAS IMPACTS

Two cases are presented for 2030. Both of the cases use the projected change in traffic volumes (vehicle miles) from 2007 to 2030 from the DEIS. The two cases differ only in the fuel mix of the electricity that the rail line will use. It is likely that the actual 2030 greenhouse gas emissions level will fall in the range between the two cases.

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[6] Emissions factors based upon GHG emissions factors for gasoline, see http://www.eia.doe.gov/oiaf/1605/coefficients.html.

[7] This report relies on EIA projected greenhouse gas emissions and fuel economy projected trends, which are different from the fuel economy trend in the DEIS. See Appendix B.

[8] Analysis assumes that that transit system operates a 308 weekday equivalents per year (lower service levels are operated on Saturdays, Sundays and public holidays).

- The **Worst Case** assumes that Hawaii's electric power would reduce its greenhouse gas emissions per kilowatt hour at the EIA projected national reduction rate between 2007 and 2030.[9] Under the Worst Case, Hawaii would continue to produce more in greenhouse gas emissions per kilowatt hour than the national average.

- The **Best Case** assumes that 70% of Hawaii's electricity would be generated by renewable resources by 2030, consistent with the objective set by Governor Lingle.[10] Currently only 9.8%[11] of Hawaii's electricity is produced by renewable resources.

Worst Case

Assuming greenhouse gas emissions from electricity generation in Hawaii are reduced at the projected national rate and assuming a reduction in car trips, building rail would increase greenhouse gas emissions by 28,000 tons annually in 2030. In other words, building rail would increase greenhouse gas emissions by 2.1% relative to not building rail (Figure 3 and Table 2).

- Roadway greenhouse gas emissions would decline 48,000 tons in 2030 as a result of a reduction in driving by people attracted to the rail line.

- Electricity generation for rail would increase greenhouse gas emissions by 62,000 tons annually in 2030.[12]

- Construction of the rail line would add approximately 550,000 tons of greenhouse gases to the atmosphere.[13] A "payback" period of 40 years is used, for an annual allocation of construction greenhouse gas emissions of 14,000 tons.[14]

- Altogether, building rail would *add* 28,000 tons of greenhouse gases in 2030, which is composed of the reduction in greenhouse gases from less driving and the increase in greenhouse gas emissions to generate electricity for the rail line and to construct the rail line.

[9] Calculated from EIA *Annual Energy Outlook: 2009* (http://www.eia.doe.gov/oiaf/aeo/).
[10] http://hawaii.gov/gov/initiatives/2009/energy. Some renewable sources produce GHG emissions (such as biomass fuels). For this analysis it is assumed that the renewable sources would not emit GHGs.
[11] http://apps1.eere.energy.gov/states/energy_summary.cfm/state=HI.
[12] Hawaii electricity generation GHG emissions based upon http://tonto.eia.doe.gov/ftproot/environment/e-supdoc.pdf. The DEIS uses an average national factor for rail transit energy use. Hawaii's electricity generation is more greenhouse gas intensive than the national average. This analysis makes and adjustment to reflect electricity generation greenhouse gas emissions in Hawaii.
[13] The DEIS does not provide detailed information on the construction impacts, but does provide a gross construction energy estimate in BTUs. Construction GHG emissions are estimated using diesel fuel conversions, since that source of energy is likely to predominate.
[14] A 40 year pay back is considered the "outside" period for such analysis. Generally transit capital facilities are depreciated over a period of no longer than 30 to 40 years.

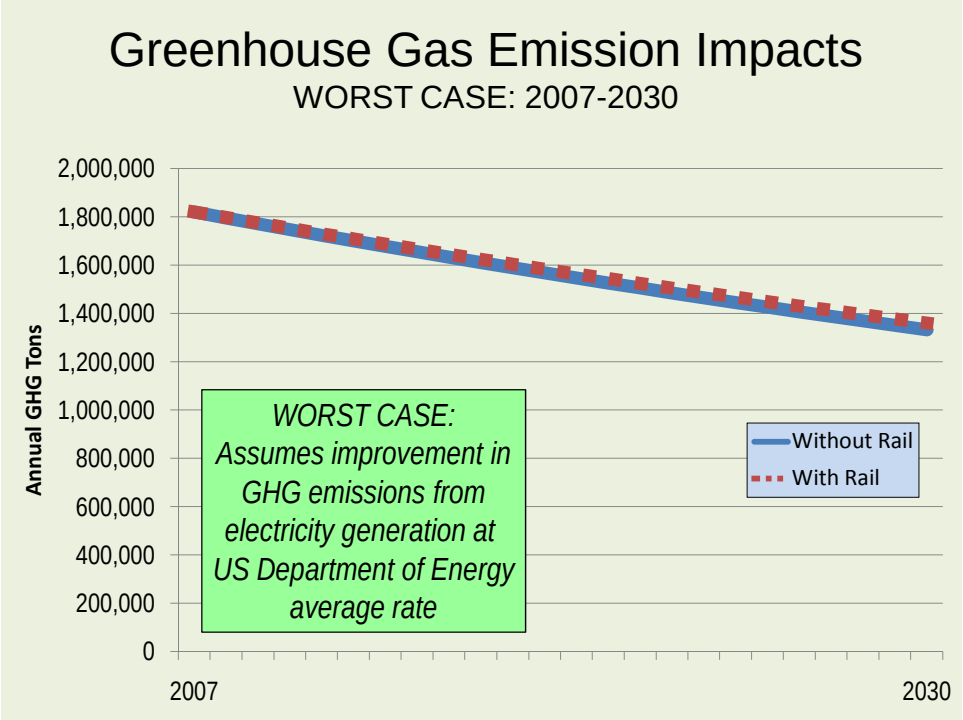

Figure 3

Best Case

The Best Case assumes that Hawaii would be able to produce 70% of its electricity from renewable resources in 2030.

With rail, greenhouse gas emissions would be *reduced* 12,000 tons compared to without rail (Figure 4 and Table 2). In other words, greenhouse gas emissions with rail would be reduced less than 1 percent (0.8%).

- As in the Worst Case, roadway greenhouse gas emissions would decline 48,000 tons in 2030.
- Electricity generation for rail would increase greenhouse gas emissions by 22,000 tons annually in 2030.[15]
- The annual allocation of construction greenhouse gas emissions would be 14,000 tons (as in the Worst Case).
- Altogether, building rail would *subtract* 12,000 tons of greenhouse gases in 2030, which is composed of the reduction in greenhouse gases from less driving and the increase in

[15] Hawaii electricity generation GHG emissions based upon http://tonto.eia.doe.gov/ftproot/environment/e-supdoc.pdf. The DEIS uses an average national factor for rail transit energy use. Hawaii's electricity generation is more greenhouse gas intensive than the national average. This analysis makes and adjustment to reflect electricity generation greenhouse gas emissions in Hawaii.

greenhouse gas emissions to generate electricity for the rail line and to construct the rail line.

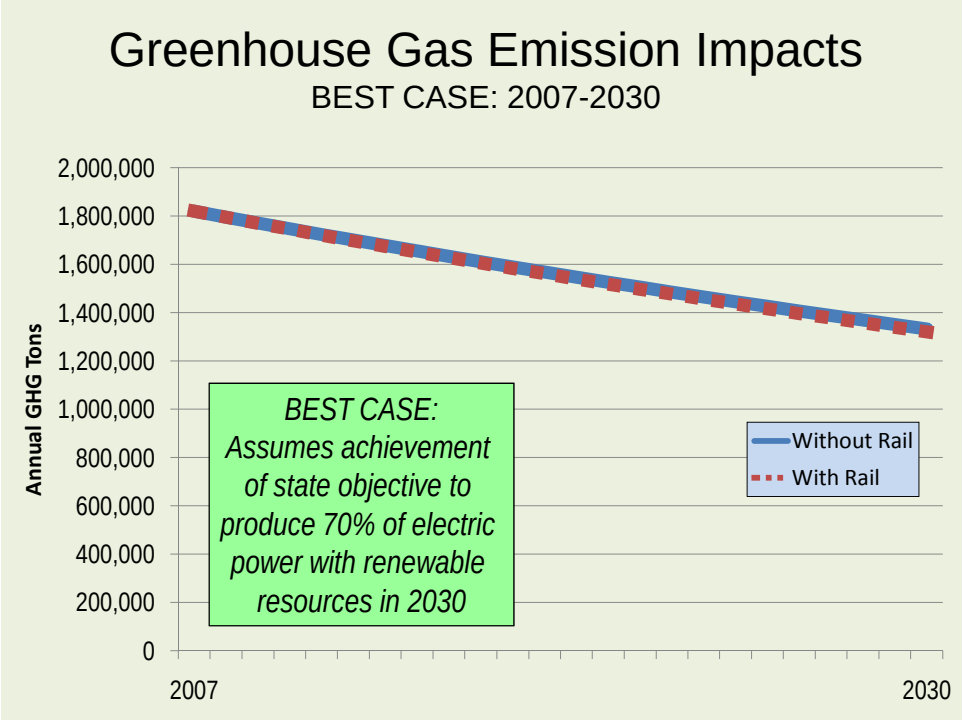

Figure 4

Greenhouse Gas Impacts by Source: In the Worst Case, rail, *all* of the greenhouse gas emission reduction from 2007 to 2030 is from the improved fuel efficiency of cars. The rail line actually *increases* total greenhouse gas emissions. Under the Best Case, approximately 98% of the greenhouse gas emissions reduction is from the improved fuel efficiency of cars (Figure 5)

Table 2 Estimated Greenhouse Gas Emissions from Local Transportation: 2030 In Metric Tons Annually			
WORST CASE			
Factor	Without Rail	With Rail	Difference
Roadway	1,332,000	1,284,000	(48,000)
Rail System Electricity	0	62,000	62,000
Construction Allocation	0	14,000	14,000
Total Rail Line	0	76,000	76,000
Total Roadway and Rail Line	1,332,000	1,360,000	28,000
BEST CASE			
Factor	Without Rail	With Rail	Difference
Roadway	1,332,000	1,284,000	(48,000)
Rail System Electricity	0	22,000	22,000
Construction Allocation	0	14,000	14,000
Total Rail Line	0	36,000	36,000
Total Roadway and Rail Line	1,332,000	1,320,000	(12,000)
Worst Case: Electricity generation fuel mix improves at the projected national rate *Best Case: State objective 2030 electricity generation fuel mix (70% renewable)*			

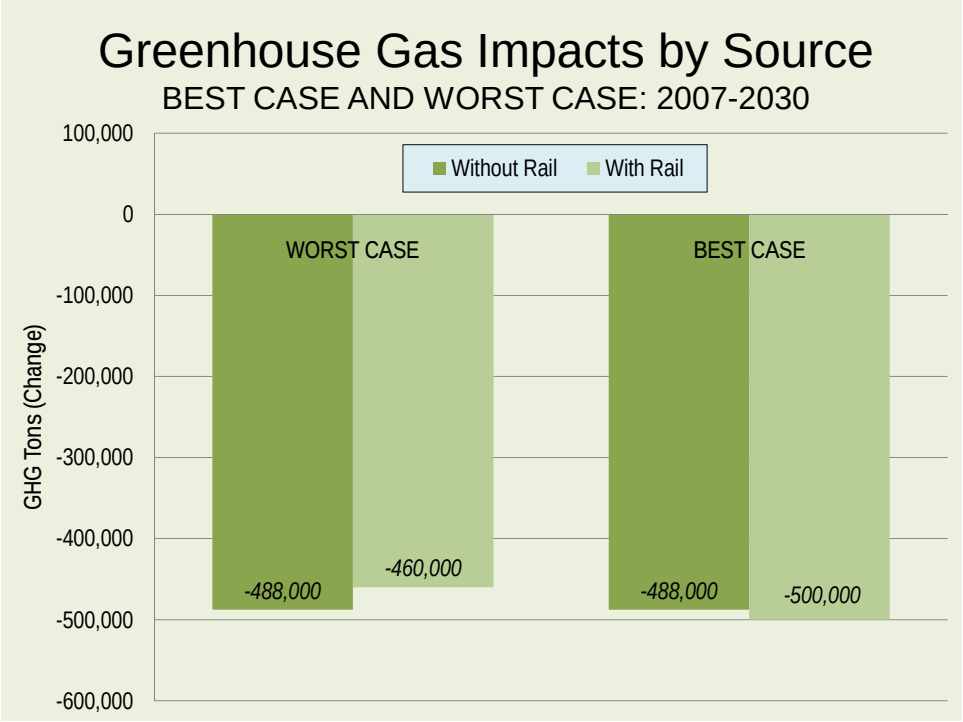

Figure 5

STEP 2: ESTIMATE GREENHOUSE GAS REDUCTION COSTS

The rail line would cost $4.1 billion (2007$), according to the DEIA. Annualized capital costs and operating costs would amount to $392 million annually. These costs would be partially offset by $33 million in consumer savings from less driving. Overall, the net annual cost increase would be $359 million (Table 3).[16]

Table 3 Rail Line Annual Costs	
Construction Cost	$4,106,000,000
Annual Construction Cost	$331,000,000
Additional Annual Operating Cost	$61,000,000
Total Annual Rail Line Cost	$392,000,000
Driving Reduction Savings	-$33,000,000
Net Change in Costs	$359,000,000
All costs in 2007$.	

The cost per greenhouse gas ton removed is calculated by dividing the "net change in costs" (Table 3) by the change in annual greenhouse gas Emission reduction estimates (Table 2). The results are indicated in Table 4.

- Under the Worst Case, greenhouse gas emissions *increase*. As a result no cost per greenhouse gas ton can be calculated.

- Under the Best Case, the cost per greenhouse gas ton removed is $29,900.

STEP 3: EVALUATE GREENHOUSE GAS REDUCTION COSTS

The cost per ton of greenhouse gas removed exceeds both the IPCC maximum and the current price under both the Best Case and the Worst Case.

- Under the Worst Case, there is no reduction in greenhouse gas emissions, which means that there can be no cost of greenhouse gas emission removal.

- The $29,900 per ton of greenhouse gas removed under the Best Case is nearly 600 times the IPCC $50 maximum and nearly 2,000 times the current price for greenhouse gas emissions.

[16] Capital costs (incremental) discounted at 7% over 30 years. Roadway cost savings based upon variable automobile operating costs per mile, reflecting EIA improved fuel economy trend and EIA projected cost of fuel. All costs in 2007$.

Table 4 Cost per Greenhouse Gas Emission Ton Reduced		
	Worst Case	Best Case
Cost: Annual	$359,000,000	$359,000,000
OPERATIONS ONLY		
Change in Greenhouse Gas Emissions: Annual	14,000	(26,000)
Cost per Greenhouse Gas Ton Reduced	No Reduction	$13,800
Times IPCC $50 Maximum	Incalculable	276
Times Maximum $15 Price	Incalculable	920
INCLUDING CONSTRUCTION ALLOCATION		
Change in Greenhouse Gas Emissions: Annual	28,000	(12,000)
Cost per Greenhouse Gas Ton Reduced	No Reduction	$29,900
Times IPCC $50 Maximum	Incalculable	598
Times Maximum $15 Price	Incalculable	1,993
Worst Case: Electricity generation fuel mix improves at the projected national rate *Best Case: State objective 2030 electricity generation fuel mix (70% renewable)*		

Context: The $29,900 cost per ton of greenhouse gas emissions for the rail line under the Best Case scenario is compared to the fundamental evaluation standards and other indicators.

- If Hawaii were to spend the same amount per ton to meet an 80% overall reduction in greenhouse gases, the cost would be nearly $650,000,000,000 annually ($650 billion). This is more than 10 times the state's gross domestic product and nearly $500,000 annually per resident. Of course this is impossible.

- At the IPCC maximum of $50, no more should be spent than $600,000 to achieve the 12,000 tons of reduce greenhouse gas emissions that would be saved by the rail line under the Best Case.

- The reduction in greenhouse gas emissions from rail is so small that greenhouse gas offsets could be purchased for a maximum of $180,000 annually.[17] This is the equivalent of *3 hours* of rail costs in 2030. Purchasing greenhouse gas offsets would be a far more cost effective strategy and would achieve the same reduction.[18]

- Even if it were possible to build and operate the rail line without greenhouse gas emissions,[19] the cost per ton removed would still be nearly $7,500. This is 150 times the IPCC maximum and 500 times the current price per ton for greenhouse gases.

[17] 7,000 tons at $15.00.
[18] Assumes 18 hours of daily operation at 2030 costs.
[19] This would require that all operations *and* construction energy produce no greenhouse gas emissions (for example, solar power or wind power).

CONCLUSION

Despite being promoted as contributing to the reduction of greenhouse gas emissions, the rail line is likely to either increase greenhouse gas emissions or only slightly decrease them in 2030 compared to not building rail. Under the most optimistic assumptions of the Best Case, greenhouse gas emission reductions would cost $29,900 per ton. This is nearly 600 times the IPCC maximum of $50 and nearly 2,000 times the price per greenhouse gas emission ton of $15.

Moreover, these projections are optimistic. Other factors could materially increase the greenhouse gas emissions and costs relative to the cases outlined above (Appendix A).

At the IPCC maximum of $50, an 12,000 ton reduction in greenhouse gases should cost no more than $600,000, not $350,000,000 as in the case of the rail line. The Honolulu rail line is exorbitantly expensive as a strategy for reducing greenhouse gas emissions.

APPENDIX A: ADDITIONAL FACTORS

The estimates above are considered optimistic. Other factors could materially increase the greenhouse gas emissions relative to the cases outlined above as wells as the costs of greenhouse gas emission reduction per ton. The most important of these factors are the following:

- Ridership: Rail transit projects often attract fewer passengers than projected in project documents. Lower ridership, especially a lower rate of attracting drivers from their cars would reduce any benefits from the rail line.

- Rail Capital Cost Increases: Rail transit projects often experience capital cost increases. Capital cost increases would raise the cost of any greenhouse gas emission reductions. This is confirmed by a the Federal Transit Administration report[20] and the international academic literature.[21] Already, there are indications that the cost of the rail line has risen approximately one-third since November (from $4.1 billion to $5.4 billion).

- Recently accellerated federal fuel economy standards: The estimates above are based upon the current EIA projections for greenhouse gas emissions. The EIA projections have not been updated to reflect the accellerated fuel economy standards approved by the Obama Administration earlier this year. The new standards will reduce greenhouse gas emissions from roadways even more than forecast in this study.

- Future fuel economy improvements: It seems likely that there will be additional fuel economy improvements in the future, even beyond those recengly implemented by the Obama Administration. For example, the European Parliament has adopted a standard for 2020 that is more than double the US standard. Any further increase in autombile fuel efficiency will reduce greenhouse gas emissions from cars and make the rail line less effective in terms of its greenhouse gas emissions reduction potential.

- Future electric power generation: It is possible that the Governor's goal of achieving 70% renewable generation will not be met. This would increase greenhouse gas emissions from the estimates above and increase the cost per ton of greenhouse gas emission removal.

- Alternative fuels advancements: Advances in alternative fuels could reduce even further the greenhouse gas emissions from roadway transportation.

- Greenhouse gas Emissions from Renewable Resources: Some renewable resources, such as biomass, may produce greenhouse gas emissions. If some of Hawaii's 2030 renewable resource electricity generation produces greenhouse gas emissions, the rail line would remove proportionally less greenhouse gas than under the Best Case and the cost per ton removed would be greater.

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[20] http://www.fta.dot.gov/publications/reports/other_reports/publications_8166.html

[21] Bent Flyvbjerg, Nils Bruzelius and Werner Rothengatter, *Megaprojects and Risk: An Anatomy of Ambition,* Cambridge, UK: Cambridge University Press, 2003.

- Electricity system upgrades. The DEIS indicates that the Oahu electricity system would need to be upgraded to serve the rail line. The costs of this upgrade are not included in the DEIS and their inclusion would increase the cost per greenhouse gas ton removed.[22]

- Ancilliary transit activities: No information was available for greenhouse gas emission increases from ancilliary activities and facilities, such as increases stations, parking lots, maintenance, service vehicles and administration. Inclusion of this data would reduce the greenhouse gas emissions reductions above.

- Additional traffic congestion: Greenhouse gas emissions are generally increased as a result of traffic congestion. No data was available to estimate the additional greenhouse gas emissions from construction related traffic congestion. These emissions as well as any congestion related emissions that might occur from future traffic pattern changes due to the rail project would increase greenhouse gas emissions above the levels estimated in this report.

APPENDIX B: DEIS 2030 ROADWAY ENERGY ESTIMATES

This report relies on official sources to the maximum extent feasible and defensible. However, this report does not use the DEIS 2030 roadway energy projections, because they are in substantial disagreement with projections by the authoritative source for such projections, the United States Department of Energy, Energy Information Administration (EIA). Similar EIA projections were available to the DEIS consultants at the time the report was being drafted.[23]

The DEIS assumes that roadway fuel economy (miles per gallon) improve 6% from 2007 to 2030. EIA projects a 40% improvement (Figure 6).[24] As is noted above, the current EIA projections do not take into account the accelerated fuel economy standards that were recently adopted.

[22] DEIS, Page 4-108.
[23] EIA *Annual Energy Outlook: 2008*.
[24] Calculated from EIA *Annual Energy Outlook: 2009.*

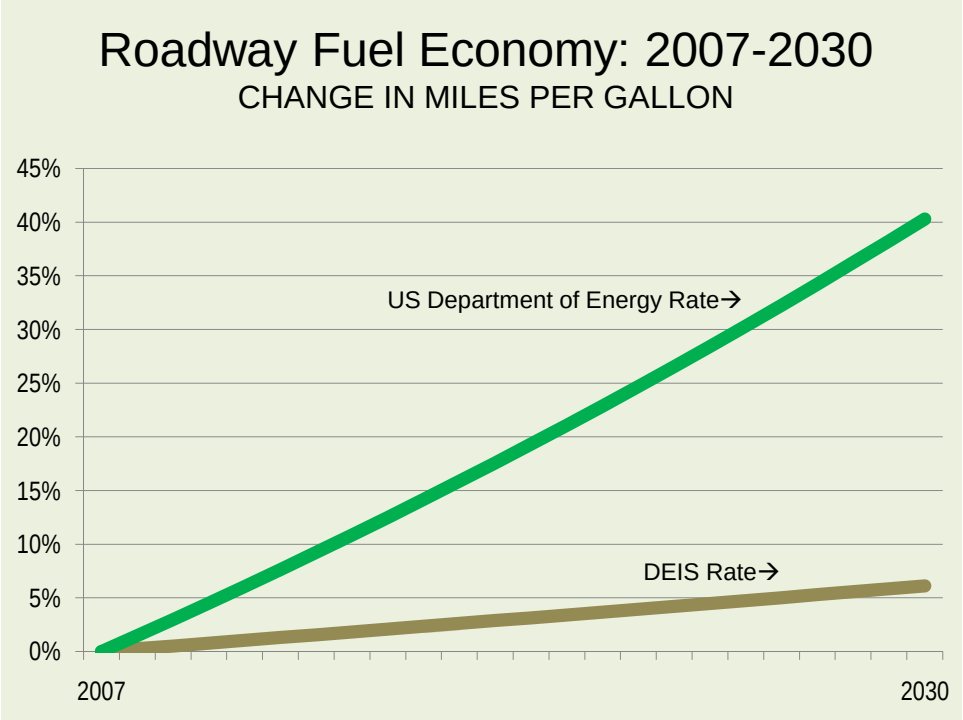
Roadway Fuel Economy: 2007-2030
CHANGE IN MILES PER GALLON
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
US Department of Energy Rate→
DEIS Rate→
2007
2030

Figure 6