**A PACE Program in Alberta: An Analysis of the Issues**

**REVIEWER B’S COMMENTS AND RESPONSE**

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| **Reviewer’s comment** | **Author’s response** |
| I would urge the author to discuss what solutions are available for Alberta to not fall into some of the problem noted. Does that include making PACE part of a larger financing strategy or “green bank” like institution? Does it mean proper approval of contractors and consumer advocacy?Ensuring that PACE is integrated within Energy Efficiency Alberta incentive programs (none of the financing limits in the text suggest PACE can finance a deep retrofit), working with CHMC to create mortgage rules? What should the government do? | According to the OECD’s definition, a green bank is a “public, quasi-public or non-profit entity” that facilitates private investment into domestic low-carbon, climate resilient infrastructure. As far as we are aware, a “green bank” has not been proposed in Alberta, in the sense of a public sector institution that would finance these loans. Energy Efficiency Alberta is the agency responsible for administrating the program, but it will only play the role of an administrator and not the actual lender. As the paper mentions, PACE programs in the US have approved contractors list and PACE in Canada ask homeowners to find contractors to do the upgrades, and the administrator then approves/rejects the contractor. So, “approval of contractors” is built into the PACE frameworks in US and Canada. Energy Efficiency Alberta maintains an approved contractor list. Any contractor can fill out an online form (<https://www.efficiencyalberta.ca/residential-retail/contractor-sign-up/>) to apply to become an approved contractor.On the issue of consumer advocacy, it is unclear what exactly the reviewer means by this. Energy Efficiency Alberta has FAQ pages, such as this one: <https://www.efficiencyalberta.ca/home-energy-plan-faq/>, where one can find information on different programs. Energy Efficiency Alberta also runs several residential and commercial rebate and energy savings programs. It is unlikely that being a PACE participant would disqualify someone from benefitting from those other rebate and savings programs. So, yes, there are other programs to benefit from. As a result, PACE would complement the Energy Efficiency Alberta rebate programs and increase the take up rate for these rebate programs. More will be clear once the PACE regulations come out. PACE lien superiority resulted in poor PACE residential programs in the US. Hoops (2012) proposes three solutions to this problem: **negotiation with the big mortgage lenders**; **state/federal legislation**; and **litigation**. Negotiations in the US with Freddie Mac and Fannie Mae broke down. One state—Maine— passed legislation and removed the superiority of PACE liens and instituted additional criteria for qualification (<http://programs.dsireusa.org/system/program/detail/4767>). The program is still alive and well in 190 locations in Maine. Finally, as the paper mentions, litigation attempts in the US failed in 2013 as the courts sided with the big home mortgage lenders. On the issue of working with CMHC, it is unclear at this time if PACE Alberta lien will be superior to other mortgages. Having said that, experiences in Nova Scotia and Ontario do not indicate that this is an issue in Canada.  |
| The author notes PACE as a potential solution for low-income customers. The definition of lowincome is unclear. This is a controversial statement as it is generally well accepted that financing programs do not work well for low-income, and that low-income efficiency programs should be no-cost to participants. Elsewhere the author quotes a controversial study (Fowlie et al 2018) that evaluates the American low-income WAP program to dismiss the cost-effectiveness of all energy efficiency. | “Low-income” word appeared in two instances in the paper. The intent was to stress that households that otherwise could not afford to borrow could now borrow. I have now removed the word “low-income” from those two places. I only use this study to cite “the mitigation cost of a US weatherization program was $350/ton,” as an example to show that “some programs to improve residential energy efficiency come at a very high cost per ton of CO2 emissions reduction.” I make no other inference from this study in my paper. So, I am not sure why the reviewer thinks I am trying to dismiss the cost-effectiveness of all energy efficiency based on this one study. I make no such statement and no reference to this study to support that statement. Regardless, the Fowlie et al paper was published in the Quarterly Journal of Economics, which is one of the most prestigious Economics journal. It would be presumptuous to dismiss their findings by calling them “controversial.”  |
| A blanket statement that an energy efficient system is $10k is vague and not very helpful. Is this the typical cost of an upgrade? It would not be a particularly deep upgrade | It is not a blanket statement. The citation is right there in brackets after that statement. Eisen (2011) found that energy efficiency improvements typically cost “$10,000 or more for a household.” So, the average minimum is $10,000.  |
| What about all the other benefits, other than GHGs that might influence policies or determine if a project is financially attractive? | The second paragraph in Page 3 of the paper cites some of the other benefits.  |
| Pg. 9. Many of the statements on this page are not referenced, but discussed later the paper. The author could clarify by adding statements like “as will be shown” etc. | Done. |
| Pg. 13. The author makes an apples to oranges comparison of PACE interest rates versus mortgages or general financing. The issue is that financial markets are requiring too high of a risk premium on energy efficiency projects because they do not have the right data, underwriting standards and criteria, familiarity/trust etc. So you would expect the interest rates to be higher and the role of policy should be to bring them down. | It cannot be the case that PACE interest rate is higher because of financial markets factoring in the too high risk premium. PACE interest rate is determined through negotiation between the municipality/state government and the lender. With preferential status of PACE liens over other mortgages, and the government as the guarantor, how can a financial lender still consider the program to be more high-risk?Also, what does the reviewer know about these loans than the bankers don’t know? Having said that, I agree that the data cited in this paper is not comprehensive and may not be typical. |
| Pg. 20, line 579-580. Statements that Nova Scotia might run into the same problems as California of “contractor fraud”. This seems to neglect the potential for Nova Scotia to have a better system of contractor approvals (it has a very good one). Also the system seems to start with an independent audit and thus breaks the potential conflicts between contractors and auditors. There is some nuances in program design and delivery infrastructure that need to be discussed further before making a statement like this. | Are we assuming that Nova Scotia has a better contractor approval system than US states? Having said that, the good thing about Nova Scotia PACE is that the loans are not very huge amounts. The maximum amount that can be borrowed at the moment is $20,000.  |
| Pg. 20, line 589. You can’t assume the same energy savings for three different technologies to calculate an ROI. A program like RETScreen should allow you to estimate energy savings andROI more robustly, or just list the program details. | It is same energy savings in each year in the same category, not across the three categories. For example, each solar photovoltaic installation costing $20,000 and saving $57,000 in electricity costs over 25 years would have an internal rate of return of 10.4% per year. Similarly, each solar hot air installation costing $4000 and saving $6000 in space heating costs over 15 years would have an internal rate of return of 5.6% per year. |
| Pg. 4. Is the author claiming there are only 3 market failures? | Those are the three major types.  |
| Pg. 8. The discussion of economies of scale is fragmented. I am led to believe initially that energy efficiency improvements could be significantly reduced in cost if they were completed at scale. There is some evidence of this from the Energiesprong project in the Netherlands and lack of diminishing returns of the most aggressive energy efficiency jurisdictions.However the author really seems to be discussing economies of scope and the need for better coordination. It is also a blanket statement that neglects some of the best practices where “one stop shop” solutions are available for consumers. | Agree that the arguments around economies of scale are weak but suggestive.The Energiesprong project is different from the PACE that is being tried in the US and Canada. I have now inserted the Energiesprong reference as a recommendation in the concluding paragraph of the paper.This is really the reduction in transaction costs argument. |

**REVIEWER A’s COMMENTS AND RESPONSES**

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| Reviewer’s comment | Author’s response |
| While the paper identifies a range of issues it is not systematic or rigorous in evaluating the issues, comparing them to benefits of PACE, or investigating or understanding the underlying reasons for issues. As a result the recommendations are high level and difficult to apply to the situation in Alberta without further study. | Not sure what issues the reviewer has in mind here. Some of this is a result of Alberta government still not coming out with any regulations for PACE, and some of it is the result of the research topic itself. |
| In reviewing the rational for PACE the authors are narrow in their literature review – in the case of economics of energy efficiency programs looking at only one study that applied specifically to low income household investments. Similarly the review of potential market barriers and failures does not cite any existing literature on how PACE applies to these barriers/failures. | Like Reviewer B, I think Reviewer A here is again referring to the Fowlie et al (2018) study. I cite only one single cost per tonne data from that study. I do not use that study to make any other inferences. This paper is based on the literature available at the time of its writing. So, if any issue in this paper lacks citations, it probably means the literature on that issue is unavailable or very limited. The referee does not provide any references to “existing literature.”  |
| On the important question of the impact of PACE on mortgage defaults there is very limited data presented with a reliance on largely anecdotal evidence from a small number of newspaper articles. | Yes, the data is very limited. As a result, evidence is largely derived based on news accounts. While the news stories are not “data” in the traditional sense, they do provide evidence about the program’s impact in absence of hard data. |